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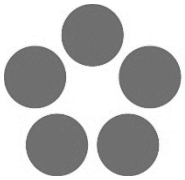

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Preface

Ladies and gentlemen, dear colleagues,

The conference Hradec Economic Days 2018 has been traditionally and continuously organised since 2003 by the Departments of Economics and Management of the Faculty of Informatics and Management, University of Hradec Králové. The 16th year was held from January 30 – to January 31, 2018. Its aim was to promote the idea of communication and cooperation of scientists from various fields with experts from practical life. In 2018, the conference is subtitled **"Production Economics in the Context of Industry 4.0"**. Currently, not only macroeconomics but also microeconomics, including operational-level management, are facing a big challenge for the next generation. This year conference scopes are to address the following fundamental issues in production economics (both macro and microeconomics) under the concept of Industry 4.0:

- Changing roles of innovation, production, logistics, and the service processes
- Key management technologies and its empowerment in production economics
- Effective methodologies for the integration of physical, informational, and financial flows
- Big Data utilization to improve the efficiency of production and services
- Impact of Industry 4.0 on the design of manufacturing, services, and workplace
- Innovation and technology management
- New business models.

Since the Conference Hradec Economic days was organised for the first time it has undergone dynamic development. The organising committee has also undergone fundamental change in favour of substantial increase in the spectrum of international participants from the USA, China, Malaysia, Spain, Croatia, Slovakia, Rumania, Poland and the Czech Republic. For the year 2018 we also started to cooperate with publishers of selected journals. The highest quality papers are revised for possible inclusion in the special issue of *Economies* open access journal and *Systems* open access journal by MDPI (ESCI index) and Scientific Journal for Economics and Management - *Acta Universitatis Bohemiae Meridionalis*. The best conference paper is awarded by 300 CHF price provided by MDPI publishing.

All submitted papers underwent thorough selection and were reviewed by 2-3 reviewers. We selected the best 112 papers in English to be published in two proceedings volumes. The authors of the papers are scientists and practitioners from the Czech Republic, Slovakia, Russia, Kazakhstan, Poland, Norway, China, Hungary, Bulgaria and Mexico.

I am very pleased we succeeded in indexation of the 2017 proceedings and I firmly believe that the changes the conference has undergone will contribute to regular indexation also in the future. We are also grateful for a tradition of the plenary opening speech by the Czech National Bank representative.

I would like to thank all who participated in organising the conference: thank you for your high quality work. My thanks also go to the authors for their trust and support and I am looking forward to seeing you again at HED2019.

Hradec Králové, January 5, 2018

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CONTENT

Quality Management in the Customer Service Process

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Abstract. The article pays particular attention to the importance of appropriate customer segmentation in the quality management of the customer service process. Detailed analysis of the changes of customer's expectations can be conducted on the basis of assumptions of customer's life cycle, understood as the stages of customer's purchasing activity. Several concepts related to this issue have been introduced in the literature of the subject: Customer Relationship Life Cycle (CRLC), Customer's Activity Cycle (CLAN), The Relationship Life Cycle (RLC). Studies were carried out in three stages: Stage 1: interviews on company's activities, employees, customers, customer service process. Stage 2: analysis and evaluation of internal documentation of enterprises, including customer service contracts, procedures, and instructions for customer service. Stage 3: confronting the opinions of respondents (I and II) with their customers' opinions on the quality of services provided by the company and the risks identified in the course of the customer service process. The research section provides a proposal of customer segmentation prepared on the basis of a case study of three manufacturing companies from the construction industry and three groups of packages of actions that can be undertaken within the framework of customer target groups were prepared.

Keywords: Quality Management, Customer Service Process, Customer Segmentation, Customer Life Cycle.

1 Introduction

Customer service can be treated as a process, i.e. as "a specific category of organization's resources that ensure synchronization of other resources used in the aspect of changes" [6]. The ISO 9000:2015 standard defines this term as: "the organization's relationship with the customer during the life cycle of a product or service" [17]. This process is required to be sustainable while maintaining adaptability in the areas of inter alia market, legal and other requirements.

Due to changing and growing needs of our customers, the intensity of competitive struggle is also increasing. In the economic literature, is there many approaches to

the term "competitiveness". The competitiveness studies can be conducted at different levels enterprises [3]. Competent staff in the customer's mind is one of the key factors in purchasing a product or service. Properly trained staff can help you achieve your competitive advantage. Therefore, every company should make employees aware of the essence of a positive approach to the customer [12]. This dynamic of change requires quick and accurate decision making by the company. Faster and easier decision making is facilitated by customer segmentation understood as a method of "analyzing the complex reality of customers' needs, perceptions and expectations by classifying clients into a limited number of homogeneous groups − i.e. groups of people with similar needs, perceptions or expectations" [9].

It should be noted that the perception modifies the initial assessment of the product/service performed by the customer. Factors influencing perception include company image, psychological filters such as memory, knowledge, beliefs, values and physical filters, which reduce/modify the level of quality and reliability of the product/service, i.e. touch, sight, etc. Perception can also be considered in terms of the ability to perceive, interpret and use information available in the environment for decision making. The system of perception consists of the senses and their ability to perceive the stimuli or to distinguish changes in their level (differences) and the process of interpretation and psychological "processing" of information [22].

Detailed analysis of the changes of customer's expectations can be conducted on the basis of assumptions of customer's life cycle, understood as the stages of customer's purchasing activity, which is dependent, among others, on from the time of cooperation with the company and characterized by varied customer behavior and customer service costs [14]. The terms used in the definition of relationship marketing suggest that there are stages in the relationship with the client. Several concepts related to this issue have been introduced in the literature of the subject. The best-known ones are [24]:

- Customer relationship life cycle (CRLC),
- Customer's activity cycle, according to K. Rogoziński (CLAN),
- The relationship life cycle (RLC) of Tzokas N. and Saren M.

The Table 1 presents the description of these three approaches to the staged approach to customer cooperation. The cyclicality of customer's relations with the company has been presented in the literature in four phases with the same description, for each of the three proposals for the name of this phenomenon.

A set of measurable and intangible characteristics determining the extent to which the customer's needs are satisfied [5, 10]. Customer value for the company is defined as "the value of these streams, which are generated by customers throughout the whole period of the client-company relationship. The higher the value of these streams for the company, the higher the customer value is, and this translates into a higher value of the company and value for other stakeholders" [2].

It is very difficult for an enterprise to determine the value offered to a customer, as it requires analysis of the rationality of customer behavior. The concept of rationality is defined on the basis of many fields. The term most relevant to the problematic issue of the article is derived from economics and mean "behavior aimed at maximizing

usability, i.e. maximizing effects while minimizing costs and efforts incurred in order to achieve the assumed objectives" [22].

Analyzing the offered value for the customer against the actual expected value gives companies the opportunity to plan and apply pre-emptive actions, understood as planning goals in a strategic perspective. Unlike the satisfaction test, it allows both corrective and preventive action to be taken. According to the concept of dynamical minimalism, one should strive towards the essence of processes [8]. Preventive action is possible due to the use of e. g. benchmarking and value assessment for potential customers.

Table 1. Cyclicality of client-business relations in the literature [4, 19, 23].

Relationships phases in concept	CRLC	CLAN	RLC
I	**Initial phase**	**Presales phase**	**Initial phase**
	Phases description: based on the analysis of information obtained from potential suppliers of goods/services, the customer is considering the possibility of making a purchase. We are dealing with the quality of preferences at this stage.		
II	**Initial phase**	**Purchase phase**	**Experiment phase**
	Phase description: the customer has specific product or service requirements and compares expectations with the offer of a particular company. The phase ends after the customer has purchased it, which enables him to proceed to phase III. The customer evaluates the product according to its quality and value.		
III	**Service consumption phase**	**Service and consumption phase**	**Identification phase**
	Phase description: The customer evaluates the product during use/consumption. There may be changes in the customer's assessment of product value in phase II.		
IV	**Consumption end phase**	**Post-sales phase**	**Relationship renewal phase or its disappearance**
	Phase description: Meeting the customer's expectations, both at the moment of purchase and use/consumption determines the further development of the customer's relations with the company, i.e. the continuation or termination of the cooperation.		

Taking into account the context of customer value and value offered by a company in the analysis of the article topic, an important aspect can be seen in the cost impact on the scope of customer service. J. Horovitz has proposed three price levels and service packages for low priced customers, performance seeking, and development customers. A general model of these relationships is shown in Fig. 1.

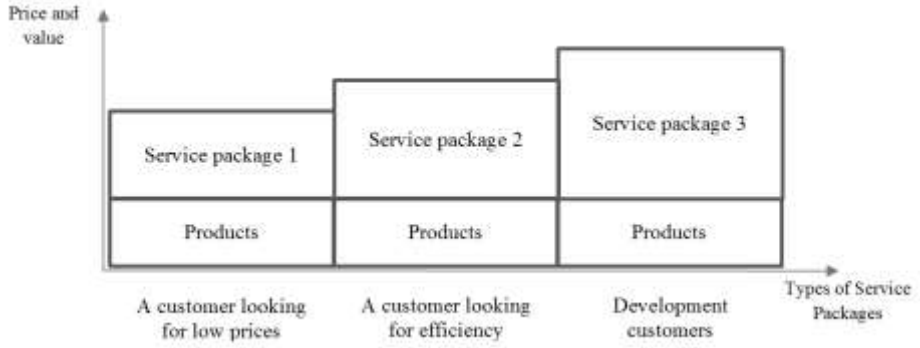

Fig. 1. Price levels of industrial service packages [9].

The assumption of the model shown in Fig. 1 is that each subsequent package includes an increased number of services while maintaining the same characteristics of the product offered. However, it is important to remember about the need to ensure and maintain customer profitability. Nowadays, the struggle for a customer should not lead to actions aimed at getting rid of unprofitable customers but rather changes in marketing strategies aimed at making their customers profitable for the company" [2]. In order to reduce the cost of the relationship, the following measures could be used [4]:

- limit customer relations,
- applying cheaper variants of relations,
- changing the cost structure of the relationship, e. g. introduction of information technology.

In the authors' opinion, the risk of running a business activity is an important aspect affecting quality management in the customer service process. “The risk of the production company originates from, among others lack of knowledge about the future state of the environment in which the enterprise will operate" [11]. “Not only the structure and the configuration of complex systems undergo constant change, but also their activity and scope of action” [7]. It is important to anticipate possible threats and to propose measures to improve and modify the existing rules of conduct (application of feedforward − controlling). Restoring service recovery "will mean the process of restoring customer satisfaction after a product or service has failed to meet expectations" [24]. Appropriate preparation of the organization enables the use of events that may become an opportunity and even an opportunity for the enterprise [18].

2 Test methodology

The article presents the following research problem: how to segment customers in order to ensure proper quality management of their service process.

Research on quality management issues in the customer service process was conducted in 2013÷2014 in three enterprises belonging to SMEs (small and medium-sized enterprises) [13]. The criteria for the division of small and medium-sized enterprises in accordance with Polish legislation have been adopted [26].

The selection of the sample was carried out randomly, intentionally and in a targeted manner to typical units using the snowball method. On the basis of the scope of industry demand for various construction projects presented by the manager of the General Contractor's company (construction projects implemented in the Poznań district) and a list of identified suppliers, one supplier from the leading industries, i.e. the supplier of armaments prefabrication and ferroconcrete prefabrication was randomly selected. The study assumes the names of enterprises in accordance with the specification of their activity. The first company was active in the reinforcement of reinforced concrete elements. Company 2 was involved in the production of construction elements of building structures, e. g. columns, rafters, beams and beams of bearing structures. The core business of company 3 was the manufacture of steel elements for the construction of building structures, as well as non-typical steel elements, e. g.: steel elements, steel elements, etc. small support elements, used as temporary supports on site.

The selection of companies used for the research sample took into account their size and determination of environmental conditions, which is consistent with the method indicated by Z. Pierścionek for research in the field of management methods [16]. All companies participating in the survey have their registered offices in Wielkopolska, Poznań district, and therefore operate under similar market and legal conditions.

The following assumptions have been made on the basis of literature analysis and presented the case study:

- Customer service consists of building and developing relationships with customers and other market players in order to establish long-term, mutually beneficial cooperation [1],
- High customer service levels can result in high costs and too low costs can lead to their loss. Each company must therefore individually determine the cost-benefit balance, if not for an individual customer, at least for the segments identified [21].

In order to identify the presented research problem, the following were applied:

- a diagnostic method, consisting of the identification of the existing state of matters, its causes, and phases. It is the basis for rational decision-making. The diagnosis is based on a causal and comparative analysis, aimed at identifying the organization's deficiencies and defects, as well as their origins. The final aspect of the method is the design and preparation for the implementation of necessary improvements [25].
- The analysis method, defined as "a method of cognition of objects, phenomena and causally-effect relationships between these elements" [20]. It usually takes place in two phases. The first phase consists of identifying the parameters of the problem, i.e. mutually dependent factors, features of the function or elements

of the problem, and the second in searching for possible states of these parameters. It can, therefore, be said that the method of analysis consists in determining the detailed structure of the problem in question [15].

Studies were carried out in three stages:

- **Stage 1**: interviews on company's activities (e. g. business development stage, sales market), employees (e. g. professional development stage, motivation system), customers (e. g. characteristics of the customer portfolio, customer segmentation), customer service process (e. g. business activity, customer service). The scope of service, reasons for complaints, identification of information and its flow in the process. These interviews were supported by a partially structured survey. The questionnaire was prepared in two parts. The first part included questions addressed to the employees involved in the implementation of the customer service process (with the possible support of the Quality Management Officer) − I, and the second part was addressed to the company's top management/managers (with possible support of the Quality Management Officer) − II,
- **Stage 2**: analysis and evaluation of internal documentation of enterprises, including customer service contracts, procedures, and instructions for customer service.
- **Stage 3**: confronting the opinions of respondents (I and II) with their customers' opinions on the quality of services provided by the company and the risks identified in the course of the customer service process. In this respect, interviews were conducted with the bridge designer from the independent Design Office and with the representative of the General Contractor.

3 Test results

On the basis of literature analysis and research results of stages 1÷3 the following were developed:

- criteria for customer segmentation,
- general characteristics of the behavior of enterprises towards target customer groups,
- levels of packages of customer service activities.

A set of information describing customer segments adequate to the industry specifics of the surveyed companies is presented in the Table below 2. Customer segments described in the Table 2 can be characterized as:

- individuals and small businesses looking for low prices,
- SMEs, which are primarily looking for effectiveness,
- big companies, with development potential.

Table 2. Criteria for customer segmentation.

Criteria for customer segmentation/customer segments.		Individual orders and orders from SMEs.	Orders from SMEs.	Orders from large construction companies.
Customer financial structure − order value/percentage of orders.	Company 1	to 20 thousand	20÷50 thousand	50 thousand and more
		approx. 50% of orders		approx. 50% of orders
	Company 2	20÷100 thousand	100÷300 thousand	300 thousand and more
		1% of orders	19% of orders	80% of orders (5÷10 projects per year)
	Company 3	no data	no data	no data
Margin		high, even up to 100%		low margin 1÷2%

The identification of three target customer groups requires adopting the general behavioral characteristics of each segment as presented in chart 3 below.

Table 3. General characteristics of the behavior of enterprises towards their target customer groups.

Undertaken actions/customer segments	Individual order and order from the SME.	Orders from SMEs.	Orders from large construction companies.
Who initiates the process?	customers	employees looking for investment	large companies or employees looking for investment
Reason for taking the order.	− replenishment of orders portfolio investments that enable loading a monthly work schedule, − short-term orders		− replenishment of orders portfolio investments that will allow for the completion of the work schedule for the next year and subsequent years, − taken to implement at least from six months in advance
The accepted method of reducing the cost of an order.	Basic analysis of waste quantity – a improvement of the project in terms of materials utilization.		Detailed analysis of waste quantities − project optimization and use of materials.
Provisions in contractual penalties for failure to meet the delivery deadline.	no	no	present
The penalty for the customer for delays in delivery.	no	no	present

Based on the information provided in the Table 3, it can be concluded that [13]:

- By providing the expected value of the relationship with the client under consideration for development clients, the company has to cover the margin of very high service costs in relation to other segments,
- The lowest customer service costs can be identified for the group of individual customers and small businesses that tend to look for low prices,
- The analysis of the costs of particular packages and their configuration would enable more accurate prediction of the profitability of offered solutions (product + service).

For the selected segments, three groups of price levels and packages of industrial services were developed in accordance with J. Horovitz's assumptions, presented in the Table 4 below.

Table 4. Levels of packages of customer service activities.

<table>
<tr><th>Cost of customer service</th><th>Individual client/small business</th><th>SMEs</th><th>Large company</th></tr>
<tr><td rowspan="11">  </td><td rowspan="5"></td><td rowspan="2"></td><td>individually selected activities</td></tr>
<tr><td>service, 30 days warranty</td></tr>
<tr><td>service, warranty</td><td rowspan="2">extended payment terms 60÷90 days (settlement phase)</td></tr>
<tr><td rowspan="2">payment terms of 30 days</td></tr>
<tr><td rowspan="2">24-hour contract manager in the office and outside it</td></tr>
<tr><td rowspan="2">service, warranty</td><td rowspan="2">care of the selected staff in the office hours: 8÷16:00</td></tr>
<tr><td rowspan="2">planning and adjusting delivery dates to meet customer needs</td></tr>
<tr><td>cash payment</td><td rowspan="2">agree on possible delivery times for the company</td></tr>
<tr><td>personal collection</td><td rowspan="2">advising on optimization solutions and current changes</td></tr>
<tr><td>advice on mistakes made in projects</td><td>consulting in range of optimization solutions</td></tr>
<tr><td></td><td>product</td><td>product</td><td>product</td></tr>
</table>

Taking into account the importance of customer segmentation, customer service quality and the costs of this process, it is possible to identify potential aspects of particular importance from the point of view of customer service quality management:

- identification of the company's customers and recognition of customer expectations and processing of complaints − stage 1÷3 research,
- customer differentiation according to the revenues and profits generated by them (customer segmentation) – see the Table 2,
- adjusting the company's offer by influencing the creation of value for the customer while taking care of the increase in revenues and profits for the company – see the Table 4.

4 Summary

The article discusses the following research problem: how to segment customers in order to ensure proper quality management of their service process.

The theoretical part discusses the aspects related to the subject of the article and defines the most important concepts.

The empirical part presents the adopted methodology of research. The scope of research carried out in three stages was also clarified. On the basis of the identified target customer groups and the J. Horovitz's model, which depicts the relationship between the scope of customer service and the specificity of customer segments, three price levels, and service packages have been developed: for low-priced customers, customers looking for efficiency and growth customers.

The issues important for the continuation of the discussion on the subject of quality management in the customer service process should include: risk analysis in the customer service process, taking into account the customer's life cycle.

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Smart Growth and Vulnerability to Crisis in the EU Regions – Evaluation with Logistic Regression

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Abstract. The paper discusses the relations among variables characterizing smart growth of the EU NUTS 2 level regions and sensitivity to economic crisis. First, the procedure identifying the status of being in crises is presented – for individual regions in individual years. Initial variables reflect the changes in macroeconomic data. Division by median was used for the kind of standardization. Four groups of regions are identified by means of cluster analysis: sensitive, adaptive, robust and outliers. Then the first selection of significant explaining variables is performed by means of parametric (Student t) and nonparametric (Mann-Whitney U) tests for the two expected values. The final list of important and independent factors is obtained through the stepwise multivariate logistic regression. The final goal is to find some spheres of smart development having the highest influence on robustness against economic crisis improvement. ROC curves with AUC measures prove models identifying robust regions, and separately vulnerable to crisis regions, to be fairly good.

Keywords: Logit Models, Smart Growth, Vulnerability, Classification, NUTS 2 Regions.

1 Introduction

The identification of determinants which either stimulate, or do not influence the sensitivity to crisis, or constitute the basis of countries' and regions' robustness against economic turbulences represent the significant challenge in economic research. The European Union regions, just like the global economy, were coping with the crisis at the end of the first decade of the current century with various effects. Therefore investigating methods and tools, allowing the successful identification of economic areas to be improved in order to reduce economic deadlocks, turns out an important problem in the discussed context [6, 9]. Logistic regression models, suggested in the subject literature for the first time in 1944 [3], representing the classical binary classification models (the explanatory variable can take two values only) and allowing the impact evaluation of $X_1, X_2, \ldots, X_K$ explanatory variables on Y dichotomous variable, seem appropriate for this purpose.

The purpose of the study is to present the proposal of logit models application in the identification of economic strategic areas, in terms of regional smart growth, in the context of their vulnerability to crisis phenomena, along with the results

verification of variables' relations characterizing smart growth of the European Union NUTS 2 level regions along with sensitivity to economic crisis.

2 Logit models – theoretical basis

In the discussed models the dependent variable is a dichotomous one (takes two values – 0 and 1). It is useful in the situation when an event presence or absence of the phenomenon to be predicted has to be determined. The dichotomous variable values can be converted into the probability of a particular event occurrence. The application of logit transformation (as the link function) allows the linearization of logistic regression model and the application of a model from the generalized linear models class. The obtained regression equation allows calculating the probability of a particular event occurrence for the predictor values used in the model. The values of model parameters are estimated by maximum likelihood method. The model formula used in this study is presented below (1):

$$P(Y=1)=\frac{exp(\beta_0+\beta_1X_1+\beta_2X_2+\cdots+\beta_mX_m)}{1+exp(\beta_0+\beta_1X_1+\beta_2X_2+\cdots+\beta_mX_m)} \quad (1)$$

The so-called odds ratio is useful in the interpretation of results (relative risk) comparing the odds of an event occurrence for a given value against the baseline value or the unit increase of the explanatory variable value.

Various applications of logit models in regional science are reviewed in Markowska [14]. The range of logit models' application refers not only to macro, but also to mezzo and micro scale, whereas this review of research areas shows that the spectrum of their applications in economic research is extremely wide.

3 Smart growth - measurement

In the EU strategic documents smart growth is approached as the improvement of results in terms of [3]:

- education by encouraging towards education, studying and improving qualifications,
- research and innovation by developing new products and services influencing economic growth, employment and facilitating solutions to social problems,
- digital society, i.e. the implementation of information and communication technologies.

D. Strahl's team [10, 11] – in project *Classification of the European regional space in the light of smart growth concept – dynamic presentation,* grant NCN 2011/01/B/HS4/04743 – suggested the following variables, grouped in three pillars (smart specialization, creative regions, innovations), to measure smart growth based on the review of database resources and availability assessment:

Pillar I – smart specialization, smart specialization indicators (whether a given variable is a stimulant (S) or a destimulant (D) was indicated in brackets):

- SS_1 – workforce employed in knowledge-intensive services as the share of workforce employed in services (S),
- SS_2 – average growth rate of workforce in knowledge-intensive services as the share of workforce employed in services (S),
- SS_3 – workforce in mid and high-tech industry sector (as % of workforce employed in industry) (S),
- SS_4 – average working rate of workforce in mid and high-tech industry sector (as % of workforce employed in industry) (S).

Pillar II – creative regions, creativity indicators:

- CR_1 – share of tertiary education workforce in the total workforce number in a region (S),
- CR_2 – share of population aged 25-64 participating in life-long learning in a region (S),
- CR_3 – human capital for science and technology as % of working population (S),
- CR_4 – people aged 15-64 born in a different country as % of population aged 15-64 (S),
- CR_5 – unemployment rate as % of active population (D),
- CR_6 – basic creative class (% of population aged 15-64) (S),
- CR_7 – share of residents in their working age who moved from different EU regions in the recent year (S),
- CR_8 – tertiary education graduates aged 30-34 (% of population aged 30-34) (S),
- CR_9 – access to broadband internet (% of households (S).
- Pillar III – innovation, indicators of innovation potential, capacity and effects:
- IN_1 – patents registered in the European Patent Office (EPO) per 1 million of workforce (S),
- IN_2 – productivity in industry and services (PPS per worker) index EU27=100 (S),
- IN_3 – employment rate (% of population aged 20-64) (S),
- IN_4 – investments in private sector per 1 inhabitant by purchasing power parity (S),
- IN_5 – R&D expenditure in business (GDP %) (S),
- IN_6 – R&D expenditure (GDP %) (S).

4 The evaluation of relations between smart growth and vulnerability to economic crisis of the European Union regions using logit models

4.1 The identification of regions sensitive to crisis

The above-mentioned sets of variables were used in the evaluation of relations between sensitivity to crisis and smart growth in each of the identified areas

(economy, job market and households) and the results were presented in e.g.: [8, 12, 13, 15, 16, 17]. In the present study we use the below presented variables (data from the years 2005-2011) or, in fact, their change rate was used for the overall dynamic classification of regions [12], in order to identify the sensitivity to crises:

- RC_GDP – GDP in millions PPS in a region (S) – change rate,
- RC_IN – investments in millions euro in a region (S) – change rate,
- RC_ER – employment rate (% of working population) (S) – change rate,
- RC_UR – unemployment rate (destimulant) (D) – change rate,
- RC_WA – wages in millions euro in a region (S) – change rate,
- RC_IH – disposable income per capita in a household in PPS (S) – change rate.

The algorithm of procedure after specifying the set of variables covered [12]:

- determining medians of each characteristic based on all years under observation;
- normalization – dividing spatial-temporal data by the median – the advantages of the applied standardization: leaves the change rate mark: negative means deterioration, positive shows improvement; reduces all variables to equal validity and although formally it is not a weight system, it can be assumed that in an initial stage the original rates are weighted by 1/Me weights. Moreover, it leaves the outliers, quite different from the rest (which do not result in artificial distribution compression, as it happens in case of dividing by standard deviation);
- dynamic taxonomy [5], including the identification of the number of groups – based on the data cube (objects – 264 regions analysed jointly (excluding Croatian (4) and overseas: French (4) and Spanish (2), in accordance with the system in force [4]) – for all 6 years (6*264), which resulted in 1584 rows and 6 columns – number of variables – using Ward method and the final classification using k-means method.

The dendrogram obtained by Ward method and the selected classification results are presented below (Fig. 1 and Tab. 1). The dendrogram clearly indicates the occurrence of four groups of operational taxonomic units.

In 2008 the following regions have been classified as sensitive and robust (explanations of acronyms are provided at the end of the article):

- sensitive (56): IE01, IE02, EL43, ES22, ES23, ES24, ES30, ES41, ES42, ES51, ES52, ES53, ES61, ES62, ES70, FR41, ITH4, ITF3, ITG2, HU21, PT18, SE32, UKC1, UKC2, UKD1, UKD3, UKD4, UKD6, UKD7, UKE1, UKE2, UKE3, UKE4, UKF1, UKF2, UKF3, UKG1, UKG2, UKG3, UKH1, UKH2, UKH3, UKI2, UKJ1, UKJ2, UKJ4, UKK1, UKK2, UKK3, UKL1, UKL2, UKM2, UKM3, UKM5, UKM6, UKN0;
- robust (38): BG31, BG32, BG33, BG34, BG41, BG42, CZ01, CZ06, CZ08, PL11, PL12, PL21, PL22, PL31, PL32, PL33, PL34, PL41, PL42, PL43, PL51, PL52, PL61, PL62, PL63, RO11, RO12, RO21, RO22, RO31, RO32, RO41, RO42, SK01, SK02, SK03, SK04, FI20.

Table 1. Dynamic cluster analysis results based on 2005-2011 period. Average change rate in groups. [12]

Group name	Taxonomic units		RC_GDP	RC_WA	RC_IN	RC_IH	RC_ER	RC_UR
	Number	%						
Sensitive	408	25.8	-0.71	-0.89	-1.30	-0.40	-1.35	-2.19
Adaptive	961	60.7	0.80	0.92	0.50	0.79	0.56	0.30
Robust	202	12.8	1.79	3.42	2.73	1.48	1.48	1.16
Outliers	13	0.8	-1.35	-22.35	-1.67	-4.21	-4.21	-2.98

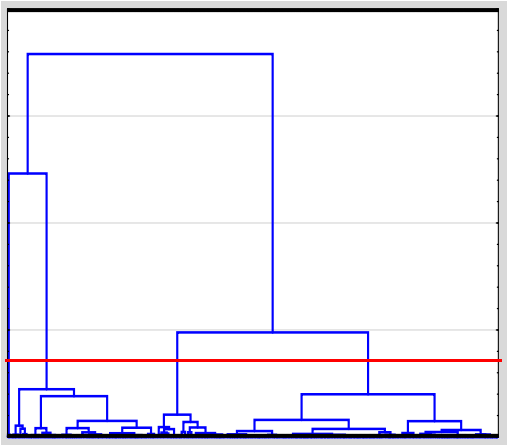

Fig. 1. Dendrogram of dynamic cluster analysis of temporal-regions. [12]

The data for smart growth variables were collected: from 2007 (SS_1, SS_3, CR_1-CR_3 and CR_5, CR_6, CR_8, CR_9, IN_1- IN_3, IN_5 and IN_6); from 2008 (CR_4); from the years 2007-2008 (CR_7); from the years 2002-2006 (IN_4); from the years 2000-2007 (SS_2, SS_4).

4.2. The evaluation of relations between smart growth and robustness to economic crisis of the European Union regions

Initially a univariate model was constructed for each variable identifying smart growth pillars, in which the explanatory variable, marked as 1, identified the regions robust to crisis. The odds ratios obtained, based on univariate models, along with the significance evaluation are presented in Table 2.

It was not possible to estimate sensible models for two variables (IN_1 and IN_4) because of measure units. Individual difference of these variables resulted in microscopic risk changes. The values were converted so that IN_1 were presented in hundreds and IN_4 in thousands of theirs original units.

Table 2. Odds ratios from logistic models and tests results comparing two groups – robust against crisis (code 1) vs. the rest (code 0).

Variable	Odds ratio (relative risk)	p-*value*	0	1	t test p-*value* (two-tailed)	M-W test p-value	0	1
				$\bar{x}$			Me	
SS_1	0.897	0.0000	49.08	42.54	0.0000	0.0000	49.85	42.04
SS_2	0.627	0.0056	100.84	100.54	0.0154	0.0165	100.74	100.37
SS_3	0.955	0.0196	23.30	19.32	0.0019	0.0092	23.52	18.00
SS_4	1.081	0.1819	99.78	100.49	0.2529	0.1214	99.95	100.66
CR_1	0.905	0.0001	28.01	21.36	0.0000	0.0000	28.45	20.92
CR_2	0.701	0.0000	10.79	4.02	0.0000	0.0000	8.30	3.73
CR_3	0.885	0.0000	36.89	29.04	0.0000	0.0000	36.65	27.00
CR_4	0.083	0.0000	6.59	0.34	0.0000	0.0000	5.66	0.16
CR_5	1.178	0.0027	6.67	8.39	0.0019	0.0004	6.10	8.50
CR_6	2.125	0.0000	66.51	70.59	0.0000	0.0000	66.13	70.67
CR_7	0.078	0.0000	1.33	0.35	0.0000	0.0000	1.02	0.29
CR_8	0.911	0.0000	30.34	21.40	0.0000	0.0000	30.35	21.85
CR_9	0.932	0.0000	46.45	26.73	0.0000	0.0000	47.73	29.99
IN_1	0.00005	0.0001	1.93	0.09	0.0000	0.0000	1.27	0.04
IN_2	0.907	0.0000	101.02	58.80	0.0000	0.0000	102.62	54.99
IN_3	0.857	0.0000	67.24	59.61	0.0000	0.0000	67.75	58.65
IN_4	0.161	0.0000	3.91	1.68	0.0000	0.0000	3.74	1.20
IN_5	0.008	0.0000	1.02	0.19	0.0000	0.0000	0.71	0.11
IN_6	0.045	0.0000	1.59	0.47	0.0000	0.0000	1.17	0.34

Next, the average values were compared in the groups of robust regions and other regions by means of a parametric test for two average values (with separate variance estimation) and Mann-Whitney U test.

All three methods gave a substantively identical results. Only one variable (SS_4) did not show the ability to differentiate the robust regions from the rest and was omitted in the multivariate model building procedure. The logistic regression model was estimated using *STATISTICA 12* program in *Generalized linear and nonlinear models* module. A multivariate logistic regression approach was applied with the criterion of adding and deleting variables p = 0.05. The results are presented in Table 3.

Table 3. Multidimensional logistic regression model estimation results for regions robust against crisis.

Variable	Odds ratio	95% C.I.	p-*value*
SS_1	1.65	1.13-2.41	0.0101
SS_3	0.63	0.44-0.90	0.0103
CR_4	0.001	0.000-0.233	0.0122
CR_5	0.47	0.25-0.88	0.0189
CR_6	3.92	1.33-11.55	0.0132
IN_5	0.0004	0.0000-0.1236	0.0072

ROC curve (Fig. 2) illustrates the very good model ability to identify the regions robust against crisis. All characteristics of this identification tool show very good values: AUC (Area Under Curve) = 0.997, Sensitivity = 0.947, Specificity = 0.987, PPV (Positive Predictive Value) = 0.923, NPV (Negative Predictive Value) = 0.991.

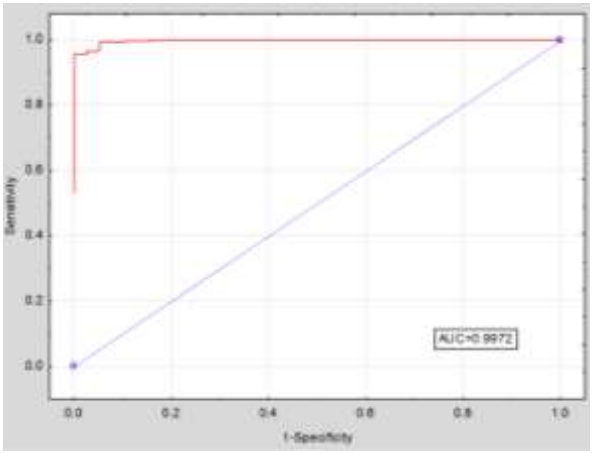

Fig. 2. ROC curve for model identifying regions robust against crisis.

The economic interpretation of the model should be approached with great caution having in mind that the illustrated relationships do not represent a cause-effect relation. The increasing values of two variables referring to job market strengthen regional chances to be included in the regions robust to crisis. It is the percentage of employment in knowledge-based services as the share of employment in services (SS_1) and the percentage of population aged 15-64 (CR_5). Unemployment rate increase reduces the chances of robustness against crisis (CR_5), likewise the share of immigrants (CR_4). The activities in industry sector, both in the period of its modern branches development, as well as investments in research and development reduce the changes of regional robustness against crisis.

4.3 The evaluation of relationships between smart growth and sensitivity to economic crisis of the European Union regions

This section presents estimation results of the logistic regression model in terms of a region included in the group of regions sensitive to crisis vs. other regions. First a univariate analysis was conducted using a univariate logistic regression models, the test for two average values and Mann-Whitney U test were performed (Table 4). These variables were eliminated from the preliminary list of explanatory variables for which the absence of difference significance was confirmed by all tests (i.e. the following variables SS_2, SS_3, CR_3, IN_2, IN_5 and IN_6).

Table 4. Odds ratios from logistic models and results of tests comparing two groups – vulnerable to crisis (code 1) vs. the rest (code 0).

Variable	Odds ratio (relative risk)	p-*value*	0	1	t test p-*value* (two-tailed)	M-W test p-value	0	1
			$\bar{x}$				Me	
SS_1	1.039	0.0386	47.58	50.22	0.0293	0.0056	47.37	53.21
SS_2	1.163	0.2923	100.71	100.89	0.2243	0.4603	100.73	100.69
SS_3	0.982	0.2696	23.07	21.47	0.2088	0.3982	23.19	21.93
SS_4	0.793	0.0001	100.28	98.40	0.0000	0.0000	100.40	98.52
CR_1	1.076	0.0001	25.84	31.55	0.0000	0.0000	24.95	31.73
CR_2	1.150	0.0000	8.42	15.01	0.0000	0.0000	7.07	17.70
CR_3	1.013	0.4754	35.57	36.48	0.3648	0.4372	36.00	35.85
CR_4	1.086	0.0031	5.17	7.61	0.0044	0.0029	4.61	5.64
CR_5	0.835	0.0034	7.21	5.82	0.0001	0.0046	6.80	5.45
CR_6	0.876	0.0488	67.26	66.49	0.0169	0.1136	66.52	66.24
CR_7	1.317	0.0344	1.11	1.46	0.0285	0.0037	0.70	1.15
CR_8	1.067	0.0002	27.46	34.97	0.0000	0.0000	25.95	34.50
CR_9	1.020	0.0230	42.28	48.57	0.0060	0.0208	42.00	51.50
IN_1	0.685	0.0030	1.86	0.93	0.0000	0.1855	1.19	0.72
IN_2	0.999	0.8508	95.11	94.31	0.7839	0.3394	99.90	94.24
IN_3	1.102	0.0002	65.27	69.39	0.0000	0.0000	65.85	70.25
IN_4	1.161	0.0751	3.49	3.96	0.0238	0.0214	3.40	3.83
IN_5	1.061	0.6915	0.89	0.95	0.7031	0.4048	0.57	0.59
IN_6	1.029	0.2273	1.42	1.46	0.8147	0.4748	1.10	1.11

The multivariate model constructed based on the stepwise multivariate logistic regression application is presented in Table 5 and ROC curve on Graph 3.

The obtained model confirms the importance of job market to economic crisis sensitivity. Higher share of population aged 15-64 in the total population number reduces the risk of a region being classified in the group sensitive to crisis, whereas the risk goes up along with higher share of people born in a foreign country. Both higher share of tertiary education workforce and the participation in life-long learning increase the vulnerability to crisis. The reason may be sought in an inadequate structure of the qualified personnel. In turn, the definitely "protective" (against crisis) role is played by economy innovation measured in terms of patent number.

Table 5. Multidimensional logistic regression model estimation results for regions vulnerable to crisis.

Variable	Odds ratio	95% C.I.	p-*value*
CR_2	1.24	1.14-1.34	0.0000
CR_4	1.10	1.02-1.19	0.0120
CR_6	0.75	0.62-0.91	0.0039
CR_8	1.05	1.00-1.10	0.0462
IN_1	0.16	0.08-0.31	0.0000

Attention should be paid to the regions incorrectly qualified by the last model. Among the twenty regions incorrectly not qualified as sensitive (actually sensitive, which was not shown by the equation) the following are included: both Irish (Border, Midlands and Western and Southern and Eastern), eight British (Cheshire, Est Yorkshire and Northern Lincolnshire, Derbyshire and Nottinghamshire, East Anglia, Bedfordshire, Hertfordshire, Berkshire, Bucks and Oxfordshire, Surrey, East and West Sussex, Northern Ireland), three Spanish (Comunidad Foral de Navarra, Cataluna, Andalucia) and three Italian (Friuli-Venezia Giulia, Campania, Sardegna), Greek (Kriti), French (Lorraine), Hungarian (Közép-Dunántúl) and Portuguese (Alentejo). Whereas the group of regions incorrectly classified as sensitive included 11 following regions: Région de Bruxelles-Capitale (BE), Hovedstaden (DE), Cyprus (CY), Flevoland (NL), Zahodna Slovenija (SI), Åland (FI), Ővre Norrland (SI) as well as two British (Inner London, Devon) and two Spanish (Extremadura, Galicia).

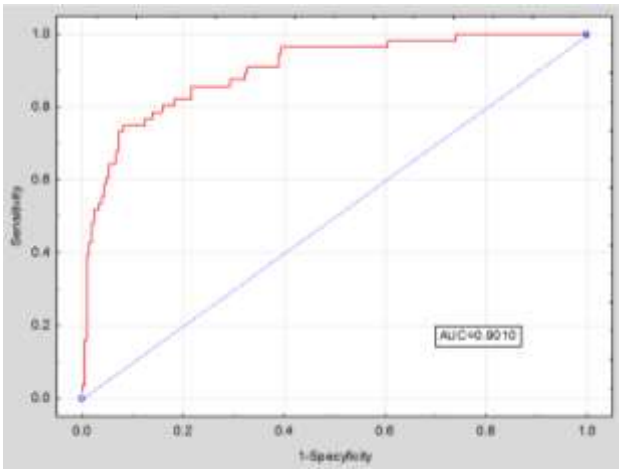

Fig. 3. ROC curve for the model identifying regions vulnerable to crisis.

The quality characteristics of the classification of regions by the model, i.e. sensitivity 0.643; specificity: 0.947; positive predictive value: 0.766 and negative predictive value: 0.908 indicate that the model can be used in determining that a region is not sensitive to crisis, since if the model indicates that the probability of it being true amounts to 0.908, which shows that it is suitable for excluding sensitivity.

5 Conclusions

Logit models, apart from their applications, discussed in the presented review, can also turn out useful in the identification of factors enhancing or reducing crisis phenomena in regions. The suggested research concept, i.e.:

- identifying groups of regions either robust or sensitive to crisis using dynamic taxonomy,

- evaluating – for each group – the significance of variables illustrating smart growth pillars based on univariate logit models (using e.g.: the test for two average values and Mann-Whitney U test),
- constructing for both multivariate model groups obtained as a result of stepwise multivariate logistic regression application (adding and deleting variables),
- evaluating model quality in terms of ROC curve and parameters (sensitivity, specificity, PPV and NPV),

allowed, due to a very good, in both cases, model ability of identifying robust and sensitive regions (ROC curve) to identify the relations among variables selected for smart growth assessment and: 1/ robustness and 2/ sensitivity of regions to economic crisis.

The identification of job market elements such as the share of employment in knowledge-based services and the overall share of productive age workforce resources in population number (basic creative class) represent important factors as the determinants constituting the "protective buffer" against regional vulnerability to crisis.

Moreover, it should be emphasized that the crisis of the first decade of the 21st century has had a much larger impact on "wealthy" countries and regions, which resulted e.g. from an overproduction of banking products (caused by the lack of moderation in meeting the needs) [1]. Less developed countries and regions in terms of e.g. high technologies experienced, at that time, the effects of allocating structural funds, including pre-accession ones (Bulgarian and Romanian regions) and the prolonged effects of financing from the years 2004-2006 and 2007-2013 (e.g. Polish regions [7]).

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Annex (list of regions and acronyms):

BG31 Severozapaden, BG32 Severen tsentralen, BG33 Severoiztochen, BG34 Yugoiztochen, BG41 Yugozapaden, BG42 Yuzhen tsentralen, CZ01 Praha, CZ06 Jihovýchod, CZ08 Moravskoslezsko, IE01 Border, Midland and Western, IE02 Southern and Eastern, EL43 Kriti, ES22 Comunidad Foral de Navarra, ES23 La

Rioja, ES24 Aragón, ES30 Comunidad de Madrid, ES41 Castilla y León, ES42 Castilla-la Mancha, ES51 Cataluña, ES52 Comunidad Valenciana, ES53 Illes Balears, ES61 Andalucía, ES62 Región de Murcia, ES70 Canarias, FR41 Lorraine, ITH4 Friuli-Venezia Giulia, ITF3 Campania, ITG2 Sardegna, HU21 Közép-Dunántúl, PL11 Łódzkie, PL12 Mazowieckie, PL21 Małopolskie, PL22 Śląskie, PL31 Lubelskie, PL32 Podkarpackie, PL33 Świętokrzyskie, PL34 Podlaskie, PL41 Wielkopolskie, PL42 Zachodniopomorskie, PL43 Lubuskie, PL51 Dolnośląskie, PL52 Opolskie, PL61 Kujawsko-pomorskie, PL62 Warmińsko-mazurskie, PL63 Pomorskie, PT18 Alentejo, RO11 Nord-Vest, RO12 Centru, RO21 Nord-Est, RO22 Sud-Est, RO31 Sud - Muntenia, RO32 Bucuresti-Ilfov, RO41 Sud-Vest Oltenia, RO42 Vest, SK01 Bratislavský kraj, SK02 Západné Slovensko, SK03 Stredné Slovensko, SK04 Východné Slovensko, FI20 Åland, SE32 Mellersta NorrlandUKC1 Tees Valley and Durham, UKC2 Northumberland and Tyne and Wear, UKD1 Cumbria, UKD3 Greater Manchester, UKD4 Lancashire, UKD6 Cheshire, UKD7 Merseyside, UKE1 East Yorkshire and Northern Lincolnshire, UKE2 North Yorkshire, UKE3 South Yorkshire, UKE4 West Yorkshire, UKF1 Derbyshire and Nottinghamshire, UKF2 Leicestershire, Rutland and Northamptonshire, UKF3 Lincolnshire, UKG1 Herefordshire, Worcestershire and Warwickshire, UKG2 Shropshire and Staffordshire, UKG3 West Midlands, UKH1 East Anglia, UKH2 Bedfordshire and Hertfordshire, UKH3 Essex, UKI2 Outer London, UKJ1 Berkshire, Buckinghamshire and Oxfordshire, UKJ2 Surrey, East and West Sussex, UKJ4 Kent, UKL1 West Wales and The Valleys, UKL2 East Wales, UKM2 Eastern Scotland, UKM3 South Western Scotland, UKM5 North Eastern Scotland, UKM6 Highlands and Islands, UKN0 Northern Ireland.

Strategic Impacts of Problematic Aspects of Developmental Tendencies in Specific Retail Activities

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Abstract. Retail has always been regarded as a small business on a local to a regional level, but over time the concept has spread to national and cross-border levels. Czech retail market is primarily price oriented and is also characterized by a high concentration of retail chains. Due to the relatively rapid development in the past twenty years, there are more large hypermarkets and thus a larger retail space than in the more gradual retail markets. The RIA study has been already a part of the retail planning policy of many European countries. The change in retail structure in Liberec was analyzed by using quantitative survey approaches. The survey included retail trades in the area of interest in selected years (2006, 2009, 2011, 2014, and 2017). Qualitative survey was made through approaches where identical factors and indicators for calculating the index of vitality and viability of the city centre were evaluated. Methodology used for feasibility of analysis highlighted the fact that a change the representation of trade units in the retail structure occurred in urban structure during the analyzed period. The main findings can be characterized as an increasing number of second hand shops in the city centre, decline of stores with branded and fashionable goods, moving merchants to newly opened shopping centres, increase of empty premises and approximately 50% change in trades units within the retail structure.

Keywords: Retail, Development, Business Strategy, RIA Study.

1 Introduction

Retail has always been regarded as a small business on a local to a regional level, but over time the concept has spread to national and cross-border levels. [4] Nowadays retail is considered to be an enterprise that includes purchase from a wholesaler or a manufacturer and its sale is mediated without further processing to the final consumer. Developments and significant changes in retail are influenced by two factors:

- Continued growth in the income of the population, influencing the increase in the purchase of goods and thus the need to increase sales units.
- Relationship between purchase and sale is increasingly determined by the customer.

What are the pillars of place attractiveness? The aspects associated with place attractiveness can perhaps be summarized based on a few essential elements of a city, such as its architecture, cultural infrastructure, labour market, public services, service sector and shops. [3]

Development trends in retail (applicable in the European and Czech conditions) are typical of the growing concentration of business firms and the decrease of the shopping street preference as the main shopping point to the preference of shopping centres.

The emergence of the concept of large business units, especially shopping centres, is being discussed in a number of specific problems for its qualitative advantages and its overall character compared to traditional sales units (specialized retail outlets).

Frequently discussed issues are the problems associated with the decline of urban centres, the outflow of business functions on the outskirts of the city, the transport and the solution of parking spaces, agricultural land, the need for legislative regulation of large-scale units, the liquidation of traders, the architectural aspect, and, last but not least, the change in buying behaviour. The problems associated with opening a new shopping centre point to the deterioration of the overall environment, see Fig. 1.

The construction of shopping centres in urban centres is an effort to fulfill the desired way of revitalization and revitalization of the city centre which is facing a state of gradual decline. Although there are some concerns about the decline of small businessmen and tradesmen in the neighborhood of a shopping mall built in this way which can lead to job losses, increased social insecurity and other negative accompanying phenomena.

Anyway, they can be described as unconfirmed with a reference to the European experience where the attractiveness of business premises benefits from its surroundings as well.

Fig. 1. A summary of the effects generated by the opening of new shopping centre [1, edited].

However, there is also the second view that small merchants cannot compete with large facilities. The success of a city's retail core is largely dependent on the composition and organization of its merchant constituents. Not only should the price-point and products of a city's retail align with its resident and visitor demographics but the stores should be strategically balanced to maximize consumer spending and interest. [2]

2 Processing of RIA study

The RIA study is part of the retail planning policy of many European countries, but in the Czech Republic this approach has not been applied yet. In an attempt to point out its possible application in the conditions of Czech cities, its approaches were used in this study.

RIA's rating is composed of two methodological parts, which include assessing the impact of a large-scale retail format from a quantitative and qualitative point of view. The quantitative part of the study is rightly based on numerous economic data and information on retail outlets. Given the focus of this analysis, data providing information on the time scale of the retail structure in the monitored territories was used. [5]

The change in retail structure in Liberec was analyzed by using quantitative survey approaches. The survey included retail sale in the area of interest in selected years (2006, 2009, 2011, 2014, 2017), qualitative survey approaches where identical factors and indicators for calculating the index of vitality and viability of the city centre were evaluated. The index was set for 2014 and 2017 only because of the availability of information. Firstly, the area of interest is defined in the analysis, the results of the partial surveys are presented and in conclusion their overall evaluation is presented.

The area of interest in Liberec was made up of traditional business streets, which are:

- Moskevská street.
- Pražská street.

Pražská and Moskevská streets are an important link between the upper and lower centre of the city. These major city streets, together with the system of squares, create the main urban compositional axis - the "resting axis". It concentrates most of the city's activities with an important part of traditionally represented retail units in the ground floor of residential buildings. The varied structure of tenants and shopkeepers, which is characteristic of these streets in the city centre, has been heavily influenced by the construction of the aforementioned shopping centres, especially those in close proximity, which have become direct competitors not only of the demanding, but also of the newly significant.

3 Quantitative evaluation

A quantitative assessment of the transformation of the retail structure in the defined territory was subject to clear working procedures. After the area of interest was defined, a visual analysis of retail was conducted to determine the percentage distribution of each category of business unit. The field survey identified the structure for 2017, then retrospectively for the years 2014, 2011, 2009 and 2006, selected to capture the time variation of the distribution of each category of business unit in connection with the opening and operation of shopping centres. In particular, interviews with local entrepreneurs were used. The results of the field survey carried out by the retail trade are as follows.

3.1 The structure of retail trade in Moskevská street in 2006-2017

Moskevská street has gained its importance thanks to the existence of a historical trade route, then also thanks to the course of the tramway, which was used until 1948. The retail structure was designed for analysis purposes in a section that concentrates retail units in the ground floor of residential buildings.

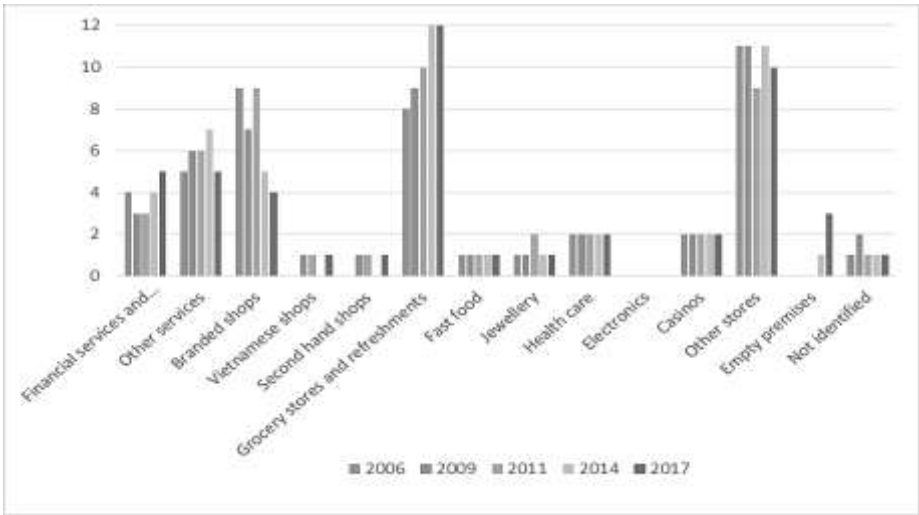

Fig. 2. The structure of retail in Moskevská Street in 2006-2014, expressed as a percentage, own survey according to [6].

During the five analyzed years the most significant changes in the structure of retail trade were observed surface investigation retail units in the case of shops with branded clothing whose representation decreased at the end of the reporting period more than half of the initial state. The main explanatory factor for this change can be found in the construction of shopping centres which are usually focused on the concentration of leading brands of fashion clothing, which often, through shopping

centre location, apply their business strategy. A continuous increase in sales units occurred at grocery stores and refreshments which, at the end of the reporting period, were also the most represented category.

During the reporting period there were identified sales units with Vietnamese goods and second-hand goods which were not identified at the end of the reference period. It points to a qualitative problem in the retail structure of this street, at the same time throughout the city centre.

3.2 The structure of retail trade in Pražská street in 2006-2014

The most important street in the Liberec region is Pražská street, which is parallel to the Moskevská street. The construction of the railway and the railway station was decisive for this street. Like Moskevská street, it was used until 1948 for the course of the tramway, but in the opposite direction, to the lower centre. It is currently known as the pedestrian zone.

To change the structure of retail in Pražská Street that initial state was comparable to Moskevská street, there was also a characteristic decline in sales units with branded and fashionable clothing that was initially the most represented category. There has been an increase in food stores or refreshments, but to a lesser extent than in Moskevská street. Asian retail outlets were registered throughout the reporting period, newly emerged categories were second hand shops, electronics and especially empty premises.

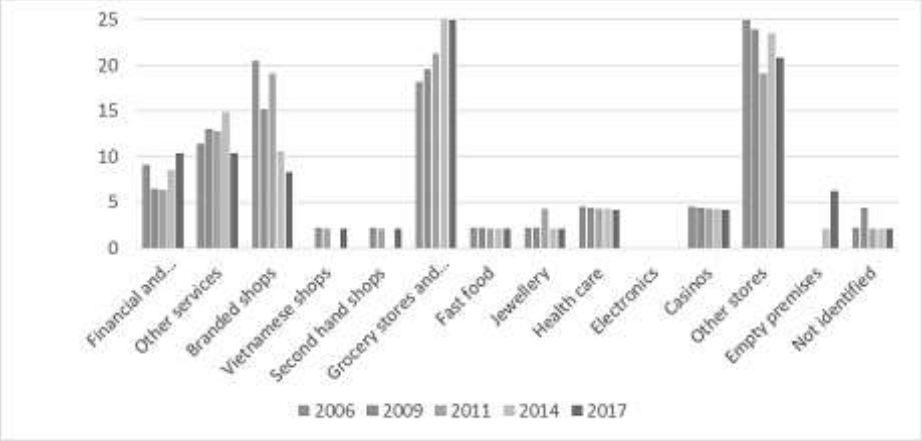

Fig. 3. The structure of retail in Pražská street in 2006-2014, expressed as a percentage, own survey according to [6].

3.3 Retail analysis of city centre

The Liberec Centre was evaluated on the basis of the transformation of the retail structure on suburban streets such as Moskevská and Pražská. It is also an attempt to

make a comprehensive assessment of the city centre from a quantitative point of view in order to unify the observed trends.

Retail units in the centre of Liberec were and are exposed to competitive pressure in the form of suburban and urban shopping centres. Transformation on selected streets has been assessed for 5 years, and Figure 4 below provides information on the change in the structure of trades at the beginning of the reference period in 2006 and at its end in 2017. The data for the suburban streets were effectively merged for the years.

Figure 4 shows the most striking changes:

- Drop in branded clothing stores (drop by 14 percent).
- Increase in share of empty premises (increase by 6 percent).
- Increasing the number of Food/Refreshment units (5 percent).
- Reduction of units with specialized goods ("Others", drop by 4 percent).

Totally newly identified business units in 2017 were:

- Second hand stores.
- Electronics stores.
- Empty premises.

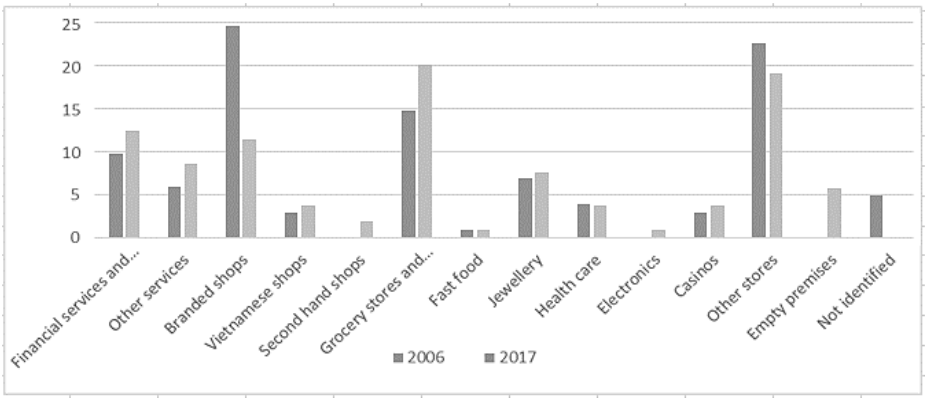

Fig.4. The structure of retail trade in the centre of Liberec in 2006 and 2017, expressed as a percentage, own survey according to [6].

Of the total number of 105 trade units in 2017 the change was found (lessee, owner) at 55% compared to 2006, while the categorical classification, respectively change of purpose changed at 47% units.

The variation in the percentage of units was recorded relatively significant that can be attributed to stronger competition from newly created and opened shopping centres. Development trends are evident both from the analysis of individual streets as well as from Figure 4 above.

The absolute expression of individual categories in analysed streets and years is contained in Table 1. The categories of business units that have been through the most dynamic change or change pointing to the non-occurring phenomenon are highlighted

here. The total number of commercial premises has increased since 2006 due to the reconstruction of the original units or their division.

The results of quantitative analysis in Liberec shows a change in more than 50% of trade units over time. Also a significant change was noted in the context of the commercial premises with a drop in trade units with branded clothing due to relocation to the shopping centre and the recent presence of second hand shops and, to a large extent, the creation of empty premises.

Again, a simultaneous qualitative change can be considered here. Further analysis results are given in the next chapter.

Table 1. Retail structure in the centre of Liberec during monitored periods (absolute data).

Category of business units	**street**	**2006**	**2009**	**2011**	**2014**	**2017**
Financial services	Moskevská	4	3	3	4	5
and	Pražská	6	6	8	8	8
telecommunications	∑	10	9	11	12	13
Other services	Moskevská	5	6	6	7	5
	Pražská	1	2	2	4	4
	∑	6	8	8	11	9
Branded shops	Moskevská	9	7	9	5	4
	Pražská	16	16	11	10	8
	∑	25	23	20	15	12
Vietnamese shops	Moskevská	0	1	1	0	1
	Pražská	3	4	2	3	3
	∑	3	5	3	3	4
Second hand shops	Moskevská	0	1	1	0	1
	Pražská	0	0	0	1	1
	∑	0	1	1	1	2
Grocery stores and	Moskevská	8	9	10	12	12
refreshments	Pražská	7	8	6	8	9
	∑	15	17	16	20	21
Fast food	Moskevská	1	1	1	1	1
	Pražská	0	0	0	0	0
	∑	1	1	1	1	1
Jewellery	Moskevská	1	1	2	1	1
	Pražská	6	6	5	7	7
	∑	7	7	7	8	8
Health care	Moskevská	2	2	2	2	2
	Pražská	2	2	2	2	2
	∑	4	4	4	4	4
Electronics	Moskevská	0	0	0	0	0
	Pražská	0	0	0	1	1
	∑	0	0	0	1	1
Casinos	Moskevská	2	2	2	2	2
	Pražská	1	2	2	2	2
	∑	3	4	4	4	4
Other stores	Moskevská	11	11	9	11	10
	Pražská	12	11	11	10	10
	∑	23	22	20	21	20
Empty premises	Moskevská	0	0	0	1	3

	Pražská	0	0	9	3	3
	∑	0	0	9	4	6
Not identified	Moskevská	1	2	0	0	0
	Pražská	4	2	1	0	0
	∑	5	4	1	0	0
∑		102	105	105	105	105

4 Qualitative evaluation

The qualitative assessment is based on the calculation of the vitality and viability index of the city centre. This index represents the average of the marks awarded to predefined indicators and factors that reflect many aspects of urban life in terms of meeting the needs of the population. Generally, eight indicators are divided into 32 factors.

In order to qualitatively assess the vitality and viability of the Liberec centre, 6 selected indicators were used with a total of 23 factors describing the situation in 2006 and 2017. These years were expediently selected for demonstration of a considerable change in the use of space in the city centre due to the opening of new shopping centres. The grades were assigned to individual factors within the range 1-5, see Table 2.

Meaning of factors:

- 1 = very bad condition (usually complete absence of factor),
- 2 = bad condition,
- 3 = sufficient condition,
- 4 = good condition,
- 5 = very good condition.

The resulting index of vitality and viability of the centre points to the status of Liberec (Pražská and Moskevská streets) qualitatively in 2017. Due to subjective assessment and ignorance of the wider context of space development in relation to the whole city centre, the key information for qualitative assessment were testimonials of owners and employees who have been contacted in a field survey.

The vital and viability index of the city centre of Liberec reached 2.91 in 2017. This points to the average functioning of the city centre, which is insufficient to modern conditions. The given area shows signs of a qualitative problem, especially in aspects of infrastructure for visitors and cyclists, as well as in the number of empty spaces. These and other critical factors are highlighted.

Regarding cyclists' infrastructure, a gradual improvement of the situation in the coming years can be expected as the City of Liberec is currently working on the Sustainable Urban Mobility Plan, which will be a key document for further mobility in the city, and proposes solutions for parking areas, construction of bicycle routes and pedestrian routes and analysis of urban public transport.

As for the streets Pražská and Moskevská, both streets are under traffic regulations. Pražská street is declared a pedestrian zone. However, there are also exceptions,

where pedestrians are forced to avoid unruly drivers driving down these streets throughout the day.

Table 2. Calculation of the index of vitality and viability of the city centre of Liberec.

Indicators	Factors	Evaluation in 2017
Representation of retailers	Number of different retailers	3
	Grocery/food stores	4
	Evidence of recent investment in stores	2
	Presence and number of discount stores or lower-quality shops	3
	Pedestrian conditions	4
Availability	Existence of facilities for cyclists	2
	Traffic impacts	5
	Parking	3
	Number of public transport lines	3
	Conditions for moving less mobile citizens and wheelchair users	4
Diversity of functions	Diversity of use	3
	Presence of financial and professional services	5
	Presence of cafes and restaurants	3
	Presence of clubs and pubs	3
	Presence of cultural facilities	3
Quality of the environment in the city centre	Appearance of space	2
	Overall purity	3
	Quality of buildings	2
	Infrastructure for tourists and visitors	2
Unused, empty premises	Number of empty premises	1
	Number of unused retail premises	2
	Impact of unused retail premises on the city centre	2
Safety	Feeling of safety	3
Total	Index of vitality and viability of the city centre	2.91

4.1 Evaluation of indicator results

The indicators and how they are evaluated it is described in the following text.

Representation of retailers. The development and current state of the retail network is identified in Figures 1, 2 and 3, depicting individual streets and then the overall city centre. The analysis shows a downward trend in the representation of branded stores and shops with consumer goods. These stores were replaced by newly created food

stores, service providers (including financial and telecommunications), second hand shops and empty premises.

In the testimonials of business owners or employees, the influence of nearby shopping centres, most notably the influence of the largest shopping centre Forum and its organized farmers markets, was most often mentioned.

Availability. Accessibility of the city centre is good, but even more transport connections from the outskirts of the city would be appropriate here. The two main streets are traffically calmed down with an authorized entrance only for supply. Pražská street is also declared a pedestrian zone. Walking is so far as possible, it allows the safe and collision-free movement with slight reservations (especially poor access to shops and poor building cobblestones) is a space designed for people with restricted mobility. Only conditions for cyclists are limited here. Registered was the absence of movables for cyclists here.

Diversity of functions. From the point of view of the diversity of functions in the centre of Liberec, it has in principle been increased. The number of stores with goods and services increased. However, it is debatable whether this was a positive change enhancing the quality of the space. In view of the testimonials from the interviews, it is possible to be more inclined to a variant of decreasing quality. The current structure which was the result of the non-transparent city management is formed from one third of the financial institutions, gambling, bars and shops with less quality goods.

Quality of the environment in the city centre. The quality of the environment in the area is positively influenced by the proximity of the historical centre. The streets are aesthetically groomed, except for those like the Square of Paper (Spanish owners) which is in a desolate state. Gradually, buildings are repaired, but urban movables are basically just waste bins. Visitor infrastructure (benches, drinking fountains, public toilets) is only available in nearby shopping centres or adjoining restaurants and many visitors also take this into consideration when choosing a place to shop and visit the city centre.

Unused empty premises. Empty spaces during the last monitored period were in Pražská and Moskevská street, although Moskevská street was fully occupied by 2014. The question of ownership of business units can be considered. In Pražská street, only 12% of the units are owned by entrepreneurs, while in Moskevská street it is 24%.

Safety. The area of the city centre is not considered a safe or pleasant location. For this reason, an average grade was awarded.

5 Conclusion

Methodology used for feasibility of analysis highlighted the fact that a change the representation of trades units in the retail structure occurred in urban structure during the period 2006 - 2017. The partial results of the survey have already been discussed, but some of them can be generalized not only to the city of Liberec, but also to the other cities that "suffer" from the construction of shopping centres. The main findings are:

- An increasing number of second hand shops in the city centre.
- Decline of stores with branded and fashionable goods.
- Moving merchants to newly opened shopping centres.
- Increase of empty premises.
- Approximately 50% change in trades units within the retail structure.

The presented findings indicate quantitative and qualitative change of public space. The change in the overall quality of the environment due to the realization of the shopping centre in Liberec resulted from the statements of the employees of the business units or their owners. Quantitative variation has been demonstrated during the application of the RIA study approach, as well as a growing number of empty and unused commercial premises in past recent years.

And what recommendations can be made to revive the city centre?

- Renovate and use empty commercial spaces.
- Unify the opening hours of merchants.
- Shops and restaurants open even on weekends.
- Take care of visualization and design of the business, called visual merchandising.
- Sufficient lighting of streets and businesses.
- Visualize retail activities in the city centre.
- Offer activities and activities in the city centre even in months with lower demand.
- Training traders in relation to customer and etailing.
- Renovation of the Paper Square from current devastated state.
- Collaboration of small entrepreneurs with city authority.
- Diversification of retail offers.
- Creation of a tourist route for tourists by historical centre and business streets - so called functional zones.

The retailers' approach in the city is different, some are being able to create strategies and conditions to customers´ needs and to shape the company's reputation. Others are only trying to generate profits regardless of their cooperation with the surrounding businesses and are do not care about creating a pleasant and unforgettable shopping experience for their customers.

The current situation in Liberec contradicts the generally accepted fact that the construction of the shopping centres will lead to the revival of its own urban centre which is declining due to suburban shopping centres. The explanatory reason for this is the inaccurate placement of these buildings into the inner city without considering

any influence on existing retailers. Secondly, their closed concept, which concentrates visitors and creates its own "centre" in the city, centre is unconnected with the entire city organization. The city needs to be more accessible to people of all ages, consider the change in transport accessibility from various parts (mainly outskirts) of the city, create suitable parking conditions, connect functional zones, try to ensure free-time and retail activities within the city centre.

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Analysis of Educational Needs – Starting Point for Identifying the Needs of Further Professional Education in Businesses

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Abstract. The practice of advanced economies confirms that permanent education is becoming an area of priority interest, and it is also an important part of the care of the quality of employees. An employee's work performance depends on the qualifications completed and personality properties, abilities and skills. The paper deals with the stage of analysis of educational needs as the basis of their identification. We paid a special attention to data collection, the quality of which determines the analysis of educational needs and secures a successful implementation of education. The scope of forms of education is not fully examined. In this paper we analyze education of individuals and team education and its impacts on the results and fulfilment of objectives set forth by employees. We also analyzed impacts on knowledge and knowledge and skills of employees, which are investigated on the basis of employee evaluation. The aim of our paper is, based on the application of MS Excel program and the statistical program PSPP Statistical Analysis Software, to evaluate benefits of individual and team employee education and propose the aims of education for which team and individual employee education is effective. Within the research project KEGA No. 014EU-4/2016 "Preparation of the content and structure of subject disciplines focused on the development of knowledge and skills of graduates from non-economic health service fields of study", we analyse a process aspect of further education also in organizations of other industries in terms of their benefits and needs for achieving business objectives.

Keywords: Educational Needs, Employee Performance, Individual Education and Training, Team Training.

1 Introduction

Dynamics of economic development and rising and demands on the work performance are placing education in the position of not only a systemic but also a continuous process. Employees have to ensure their lifelong employability, but likewise management of most businesses and non-business entities, regardless their size (in terms of the turnover and number of employees). It is frequently required to

acquire knowledge and skills from other fields of science, which promotes an interdisciplinary approach to education. Nowadays employee education is considered an efficient means of differing from other organisations and achieving success in competition. Human resources are a driving force in an organization; they set in motion other resources and decide about the organization's competitiveness. These are the most expensive and most risky sources; consequently, they require special treatment and conditions, so that they were able to create required performance. Human resources consist of individuals, who search for the possibilities of self-actualisation and are motivated by personal needs, interests and ambitions. Their quality and utilisation depend from the organization's management [13].

In each organization, there are numerous rules and procedures, which employees need to learn to be able to perform their work effectively. Education is becoming the factor by means of which organizations to ensure the growth of performance and the increase in quality. At the same time, it enables them to raise the attraction of an organization on the labour market. For education to be effective it has to be planned.The plan of education and training is one of the most important tools of managing human resource development. In this way, management of organizations ensure the consistence with the employee qualification structure. By means of planning process, businesses can decide on the employees, areas and scope of activities and theprice for which they are willing to educate. Before the preparation of the plan, it is necessary to analyze educational needs and assess whether the educational process is necessary. The identification of educational needs is an inevitable part of a systemic approach to education, and a prerequisite for the employee education of the business to be organized, meaningful, and efficient. Within the research project KEGA No. 014EU-4/2016 "Preparation of the content and structure of subject disciplines focused on the development of knowledge and skills of graduates from non-economic health service fields of study",we explored education not only in terms of the process, but we also studied links between education and employment and human resource development. In the present paper, we deal with the analysis of educational needs, which is the basic starting-point for identifying needs of further education in businesses in accordance with the principles of the 2020 Education Strategy [2].

Qualified human resources are becoming an important source of organization's success. If the organization perceives them as an asset (source), which brings economic benefits, investments in education are considered the most significant investment in the corporate capital [9].

2 Theoretical Starting Points of Analysis

Educational needs are not primary needs of humans; instead, they arise in life and are influenced by various factors [13], most often related to the realization of work activities. The emergence of learning needs begins:

- In the case of claims placed on an individual in employment (these requirements are changing and evolving in connection with increasing work requirements);

- In connection with variable requirements of the job and the tasks to be performed;
- By implementing organizational changes, change in jobs or creating new jobs;
- By implementing new career functions in relation to career growth;
- By means of various factors influencing the job performance.

Educational needs are not human primary needs, they arise in the course of one′s life and are affected by various factors [13]. Most frequently, they are connected with the performance of work activities. Educational needs arise in the context of:

- Dynamic conditions of economic developmentin connection with rising requirements on the work performance;
- Changing conditions of the workplace and tasks to be fulfilled;
- Implementation of organizational changes and changes in places of work;
- Creating new jobs;
- Performing new work functions related to career growth;
- Various forms of the job performance, etc.[13]

These factors influence the need for educating individuals, developing their abilities of coping with changing conditions of the workplace and demands of the work performance and requirements of work results. Formal education is therefore viewed as the preparation for further professional education, which is either provided by the individuals themselves according to their ideas and career interests, or it is organized and financed by the organization in which employees work.

Apart from the education and training tailor-made for the needs of individuals, which is implemented in a classicattendance form, in further education there is preferred trend to pass from the dominant role of the lecturer/instructor to that of learners (participants). Itis increasingly more required toinclude education in everyday activities rather than provideit from time to time at planned educational activities. Action learning is immediately related to the place of work and is accompanied with identifying work problems, proposing alternative solutions, and testing variants of solutions (options), while at the same time considering the consequences. Finally, the the most suitable option in real-life situations is selected. This method is a progressive and efficient education. A modified form of action learning is team learning, through which teams generate knowledge by harmonizing and developing experience and abilities of team members' abilities. Team is a basic learning unit of an organization. Team learning focuses on the ability of mutuallearning, which brings higher quality and outputs from training, in contrast to the training of individuals.

Education is an area that is at the centre of decision-making sphere, which directly implements specific activities and it via institutions issues calls for submitting projects for experts specializing in particular research activities. An important project dealing with the issues of analysis and identification of educational needs was VEGA project No. 1/0598/08 "Theoretical and methodology framework of analysis into adult educational needs", tackled at the Department of Andragogy, Faculty of Education, Matej Bel University in Banská Bystrica. The aim and essence of the project was to systematize theoretical findings on the analysis of educational needs and based on that, arrive at theoretical andragogic starting-points of identifying educational needs of a learning individual, groups and society. Another inspiring pillar related to part of

the research described in the present paper is the research project VEGA No. 1/0386/11 “Processes of institutionalisation of adult education in Slovakia”, elaborated at the Department of Andragogy, Faculty of Arts, Comenius University in Bratislava, in which comparative findings on not only implementation of education in Slovakia but also abroad. Likewise, an important role is played by experience and results of projects of nationwide and international projects. An important role is played by the Slovak Academic Association for International Cooperation with its major projects under the programme of Erasmus plus for education, vocational training, youth and sports for the period of 2014 – 2020. It is necessary to mention here grants solved under GRUNDTVIG and Comenius programmes, lifelong learning concepts presented by OECD [4], activities organized by UNESCO, in particular, the Sixth World Conference of Adult Education VI, the conclusions of which address also educational target groups and concern their educational needs [17].

Before providing education and training, it is important to determine educational objectives and design the programme of education based on these objectives. Before objectives may be determined, it is necessary to identify educational needs. These needs can be identified based on the implementation of the following two stages, namely preparatory stage – data collection and analysis of acquired information [19].

The preparatory stage of educational needs analysis therefore starts with the selection of sources for acquiring data. Subsequently, data are accumulatedabout abilities, knowledge, and performance of an individual, as well as the information about working activities and the strategy of the business. There are several information sources, which enable us to identify priorities of education [1]. They include:

- Business objectives and business plans, which indicate the direction of the development of the business and indirectly determine its priorities in education.
- Planning human resources and succession which, provide information about the future structure of employees and needs for managerial education.
- Personnel statistics, i.e. statistics describing movements of human resources.
- Interviews with leaving employees, which might also refer to problems related to education in the business.
- Consultations with top level managers, who perform essential decisions and are entitled to formulate qualification requirements on employees and managers.
- Data on productivity and quality of work, which point to differences between the expected and real results and reveal negative impacts.
- Changes in the organization structure that reveal the need for qualification preparation.
- Demands placed on managerial education resulting from their perceived needs.
- Information from financial plans about funding optionsfor education.
- Plans for introducing new techniques and technologies or systems based on information technologies and requirements of new knowledge and skills.
- Marketing plans and ensuing requirements related to employee knowledge.

– Surveys of employee opinions.

Analysis of educational and training needs is implemented based on freely available information in the employer entity (containing information from employee appraisals, inspections, meetings, discussions, absences, from the assessment of utilisation of work time, etc.) and the information collected for the purpose by means of various methods (interview, observation, questionnaire, work samples, and the like).

There are available several methods of collecting data, for instance, structured interview, observation, questionnaire survey, participation, group discussion, job descriptions developed by employees, analysis of critical event, 360 degree feedback, motivation–assessment interview, assessment centres (hereinafter AC), various types of tests (e.g. psychological tests in some tasks), self-assessment, and the like [10, 20, 16, 7]. Their implementation in practice is discussed in the empirical part of the paper.

Educational needs in individual businesses are explored:

- in the business as a whole, i.e. as corporate needs;
- in teams, functions, professions, i.e. as group needs;
- for individual employees, i.e. as personal needs.

Analysis of education and training can start from individual needs towards group and corporate needs; however, the entire process may be directed in the opposite direction: corporate needs are analyzed, which is then followed by the analysis of the needs of various units or jobs performed by individuals.

A specific aim of the human resource strategy development is developing educated and qualified individuals, professional and quality teams representing the entire organization. The required structure of human resources necessitates todevelop the culture of education and environment, in which employees are supported and motivated to educate themselves. There are also supported team education activities, focused on systemic knowledge management [5]. The priority is integrating education and training into the strategy and development of the system of education, and designing the system of education. The latter will contribute to increasing the productivity of labour and improving the work performance, increase in qualification, knowledge and abilities of employees, improving interpersonal relatins at workplace, and ensuring the growth in the organization′s competitiveness on the market [3].

British and American authors deal with various aspects of employee development [15, 8]. For instance, Laird et al. [8] survey methods, functions, and goals of training, ranging from educational needs assessment to the implementation, Schneier et al. recommend how to gain commitment, assess needs and choose suitable methods of training and its evaluation. It is emphasized that employee training is an investment rather than an expense for the company and explain that these programs increase employee loyalty and list various ways and types of employee training programs, e.g. on-the job training, off-the-job training and electronic training; orientation training, job description training, upgradation, traineeship training. [11]

3 Aim and Methods of Research

The theoretical part of the article is an excerpt of data from domestic and foreign scientific and professional sources related to the needs of empirical research. In the present paper, we deal with the importance of individual steps leading to the identification of educational needs in businesses. We pay a special attention to data collection, which is the basis of the entire analysis of educational needs.The frequency of applying methods of data collection in businesses will be presented in the research sample in results of empirical research.

The aim of the research was to describe the process of identifying educational needs as a significant stage of the systemic approach of further professional education in businesses. The starting point was the intention of further professional education to achieve a higher performance and better work results and increase knowledge and skills so that tasks set forth could be fulfilled in the best possible way. We were interested in the dependency of employee work results on the education and training of individuals and on team education and training and in the dependency of the assessment of knowledge and skills on education and training of individuals and teams.

Based on these considerations, research hypotheses were established. Each hypothesis testing is aimed at verifying the underlying hypothesis, the so-calledzero hypothesis – H_0. Compared to zero hypotheses, we determined alternative hypotheses H_1. (H_0 = zero dependency between variables, H_1 = dependency between variables). If, based on testing hypotheses, we refuse the zero hypothesis, we accept an alternative hypothesis. The alternative hypothesis says what is valid if the zero hypothesis does not apply. [12].

Research hypotheses were determined as follows:
Hypothesis No. 1:
H_0 = Results of employee work performance (EWP) do not depend on the time of the education and training of individuals (IET).
H_0 = Results of employee work performance (EWP) do not depend on the time of team training (action learning – AL).
H_1 = Results of employee work performance (EWP) depend on the time of individual education and training (IET).
H_1 = Results of employee work performance (EWP) depend on the time of team training (action learning – AL).

Hypothesis No. 2:
H_0 = Assessment of knowledge and skills (AKS) does not depend on the time of education and training of individuals (IET).
H_0 = Assessment of knowledge and skills (AKS) does not depend on the time of team training (action learning – AL).
H_1 = Assessment of knowledge and skills (AKS) depends on the time of education and training of individuals (IET).

H_1 = Assessment of knowledge and skills (AKS) depends on the time of team training (Action Learning – AL).

In our hypotheses, we chose a double zero and an alternative hypothesis to be able accept a validated hypothesis after hypothesis testing.Time of education and training is to be understood as the number of hours during which employees are involved in education and training during the period of one month. Time of education was separately examined for individual education and training on the one hand and team education on the other hand.

The research was conducted by means of the interview and questionnaire methods. The interview was applied to gain a better understanding of respondents′ opinions and experience. Interviews were conducted in the pre-research and in designing the questionnaire. Primary data collection was based on questions in the questionnaire designed. Questionnaires were distributed in person or online.

For the realization of the research, opinions from 287 respondents (from the originally addressed 360 respondents) were taken into consideration. This accounts for a 79.72% rate of return, which can be considered a success. For the purpose of this research, the number of respondents was calculated on the basis of the number of employees in divisions explored of C – section: Industrial production, at the calculated level of reliability of 95 % and 6% tolerance. The aim was to ensure that the number of respondents enabledto generalize of the information received and provide proposals for improving the learning process in their businesses. In terms of size, representation of respondents was as follows: respondents from large corporate entities – 112 respondents;
respondents from medium-sized corporate entities – 88 respondents; respondents from small corporate entities – 87 respondents.

In each group of businesses by size, 120 respondents were addressed. The greatest interest in participating in the research was recorded in large businesses, while in medium-sized and small businesses we observed some apprehension of being engaged in the research. Respondents who were addressed, i.e. those who made the assessment, were personnel managers and line managers or owners, mostly in small enterprises. Respondents were managers working in various managerial levels, i.e. the line, medium, and top management levels. In the case of small businesses, respondents were owners. Respondents represented a research sample of C– section: Industrial production, according to Statistical Classification of Economic Activities SK NACE Rev. 2 pursuant to Decree No. 306/2007.

The following are the divisions from which respondents were chosen:

10 – Foodstuffs
11 – Beverages
12 – Tobacco Products
14 – Clothing
15 – Leather and leather products
16 – Wood processing and wooden and cork articles, except furniture, straw and wicker products
17 – Paper and paper products
20 – Chemicals and chemical products

21 – Basic pharmaceutical products and pharmaceutical preparations
22 – Rubber and plastic products
29 – Motor vehicles, semi-trailers and trailers
31 – Furniture.

Individual respondents form the statistical units, and their opinions are the basis for the application of selected statistical methods. Apart from indicating the percentage of each method applied in the process of data collection in businesses analyzed, we explored mutual linear dependencies between selected variables.

Two types of methods were used for processing the data collected: Manual processing, where the bar code method was applied, and automated processing: the data collected were analyzed in MS Excel [6] and in the statistical program PSPP Statistical Analysis Software. The results of the statistical processing will be presented in statistical surveys in tables and interpreted verbally. The hypotheses are tested by regression analysis.

4 Research Results

In the course of research, we started from the fact that employees are important assets, who secure not only the very existence of businesses, but alsotheircompetitiveness. Employees are those who know best their workplace and are able to disclose the entire place where manifestations of ineffective behaviour arise. They are able to submit proposals for improving existing processes and procedures. They need to be adequately trained for this purpose, which is connected with the preparation of special-purpose educational activities. If education is to be tailor-made, educational needs of individuals have to be identified. Identification of educational needs starts with acquiring information and their analysis. Information may be classified into:

- Freely available information within businesses (information in business plans, internal statistics, information from employee appraisals, inspections, and worked-out performance tables, personnel audits, etc.);
- Information acquired for this special purpose by means of various methods (structured interview, questionnaire/assessment survey, tests for employees, workshops, self-assessment, etc.), which we analyzed in empirical research.

Table 1. Methods of special-purpose data collection for analysis and identification of educational needs

Methods and techniques of data collection	Small businesses (87)	Medium-sized businesses (88)	Large businesses (112)
Structure interview	2	12	86
Observation	5	29	105
Questionnaire survey	-	3	42
Participation	32	12	27
Group discussions	3	9	39

Job descriptions created by an employee	17	11	24
Critical event analysis	9	23	87
360-degree feedback	83	85	112
Motivating evaluation interview	69	84	109
Assessment centres	1	52	112

Each method and technique of data collection was monitored separately, since businesses use combitions of data collection methods and techniques. The methods listed were applied only in the case of individual education and training of employees.However, 72% respondents (of 287) indicated that methods and techniques of data collection were applied, but the subsequent systemic analysis of data, which would really indicatethe areasin which employees should be trained was neglected. The identification of educational needs in majority of analyzed businesses is not the starting point for designing education and training.Participation of employees in education and training is influenced by numerous factors, including the offer of educational activities, preferences of line managers (or immediate superiors), by the inteest of employees themselves, and by making education and training consistent with career plans. Important factors in team education and training include the current situation at workplace, problems arisen, employees' interests, and managers′intentions concerning the future of a section/department.

Table 2. Dependency of employee work results on education and training of individuals and on team training

	Employee work results	
	Spearman′s Corr. Coeff.	Sig. (2-tailed)
Team education and training (AL)	0.208	0.000
Individual education and training (IET)	0.345	0.000

The relation between employee work results and education and training of individuals and team training is a statistically significant relation. Employee work results are in the medium strong correlation dependency with the education and training of individuals ($r = 0.345$; $\delta = 0{,}000$) and in a weak correlation dependency of team training ($r = 0.208$; $\delta = 0.000$).

Table 3. Regression analysis of the influence of individual education and training and team training on employee work results

Model ((a. DependentVariable: PVZ)	Unstandardized Coefficients B	Std. Error	Sig.
Constant	3,064	,098	0,000
Team education and training (AL)	-,048	,042	0,246
Individual education and training and training (IET)	,339	,055	0,000

In the course of research, we were interested whether the fulfilment of the employee work results (EWR) (meeting work objectives, increase in quality, and the like) are dependent on the education and training of individuals and on that of teams. The regression analysis result is the following equation:

$$EWR = 3.064–0.048 \times AL + 0.339 \times IET \quad (1)$$

In team education and training, sigma is high (δ=0.246), i.e. – there is not a statistically significant relation towards employee work results. Individual education and training markedly predetermines employee work results as the equation shows:

$$EWR = 3.064 + 0.339 \times IET \quad (2)$$

If the time of individual education and training increases, by one unit, employee work results rise 0.339-times, after considering also a calculated constant 3.064.Employee work results are dependent on individual education and training.Based on the analysis, the alternative hypothesis is accepted: H_1 = Employee work results (EWR) are dependent on the time of individual education and training (IET).

Table 4. Dependency of assessment of knowledge and skills and education and training of individuals and teams

	Assessment of knowledge and skills	
	Spearman′s Corr. Coeff.	Sig. (2-tailed)
Team education and training (AL)	0.367	0.000
Individual education and training (IET)	0.460	0.000

Based on correlation coefficients calculated, the assessment of knowledge and skills in a medium correlation dependency of individual education and training (r = 0.460; δ = 0.000), as well as by team education and training(r = 0.367; δ = 0.000). This dependency will be further explored by means of regression analysis.

Table 5. Regression analysis of influence of individual education and team education and training on the assessment of knowledge and skills

	Unstandardized Coefficients		
Model (a. DependentVariable: AKS)	B	Std. Error	Sig.
(Constant)	3.024	0.098	0.000
Team education and training (AL)	0.062	0.042	0.140
Individual education and training (IET)	0.321	0.055	0.000

On the basis of empirical results we intended to establish if the assessment of knowledge and skills (AKS) depends or does not depend on the time of individual education and training (IET) and the time of team training (action learning – AL).For this purpose, hypothesis 2 was formulated, in which both zero hypothesis and an alternative hypothesis were doubled. Based on calculations, the equation may be written as follows:

$$AKS = 3.024+0.062 \text{ x } AL + 0.321 \text{ x } IET \quad (3)$$

In the case of team education and training sigma is high ($\delta = 0.140$), which means that team education and training is not statistically significant to dependent variable.Assessment of knowledge and skills is dependent on individual education and training, after consideration of calculated constant amounting to 3.024according to the equation:

$$AKS = 3.024 + 0.321 \text{ x } IET \quad (4)$$

This means that if we increase individual education and training by one unit,assessment of knowledge and skills increases 0.321-times, after consideration of the constant.Based on the analysis and calculations, it is possible to accept the alternative hypothesis: H_1 = Assessment of Knowledge and Skills (AKS)is dependent on the time of individual education and training (IET).

Employee work results as well as results of knowledge and skills assessment are dependent on education and training of individuals. The basic starting point for preparing an effective project of education and training should be the identification of educational needs. However, this is not fully conducted in many businesses, as the research conducted indicated.

5 Conclusion

Development of opinions of education is closely connected with conditions and development of society.It is also crucial how individual businesses adjust their approaches to employee education. There are several reasons which should influence the decision making process in the area of education in businesses:

- Both business and non-business entities have to integrate new findings and technologies in their activities to be able to compete in demanding market conditions [9].

- Existing changes on the market in customer behaviour, or competitors necessitate the ability of reacting pro-actively.
- Frequent organizational changes are also a fact to which it is necessary to adjust. Their impacts are most markedly manifested in human resources.
- A more distinct orientation to quality and its preference to quantity.
- Globalization and internationalisation, which are the reasons for expanding the market, enlarging competitive environment and the necessity to communicate in international environment.
- Efforts for stabilization and maintenance of quality qualified human resources.

Development of knowledge-based society shifts team education to the forefront. Team education and training is a modification of action learning and it is a basis of establishing learning organizations. These organizations are characteristic of systemic behaviour and a free access to information and continuous internalqualification growth. Basic units of learning should be teams rather than individuals. However, research results showed the very reverse: it was individual employees who constituted basic units of education in businesses. Their work results and level of assessment of knowledge and skills is an impulse for supporting education. Data collection for purposes of analysis and identification of educational needs is linked to education and training of individuals.

When applying statistical methods, the research hypotheses were corroborated or defied, and at the same time we verified conclusions of the research project VEGA No. 1/0386/11 "Processes of Institutionalisation of Adult Education in Slovakia", which was solved at the Department of Andragogy, Faculty of Philosophy, Comenius University in Bratislava. In this project education of individuals is prefered to that of teams. Despite a careful application of data collection methods and procedures for the purpose of analyzing and identifying educational needs, we can state based on the research conducted that a complex analysis poses problems in majority of businesses, while the application of methods, procedures and ways of their implementation is missing.

Despite the fact that there have been worked out (in theory) various methods that could be used in businesses in the process of analysis, these methods are not applied in the practice of businesses. Many respondents indicated they had inadequate knowledge and experience in their applications. This leads to an informative character of data collection, while the identifying of educational needs and designing educational plans and educational activities are often based on other factors, for instance current interests of employees and managers, or on trends in the education sciences and human resource development conceptions, as well as on developments on the labour market [14].

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Open Innovation as a Tool of Strategic Management

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Abstract. The open innovation phenomenon has developed from a small club of innovation practitioners, mostly active in high-tech industries, to a widely discussed and implemented innovation practice. Simultaneously, a small community of management researchers has recently developed into an established research field. Once a field grows rapidly there is a danger that it may become a short-term fashion. This special issue reports on recent research evidence to further develop the open innovation research field. South Moravian in Czech Republic region started to support companies and help them with organization of open innovation session. The tool perspective: Opening up the innovation process requires a set of instruments. Those tools, for example, enable customers to create or configure their own product with tools kits or enable companies to integrate external problem solvers or idea creators. Currently a broad awareness of open innovation and its relevance to corporate R&D. Aim of paper is research and measure the results after ten years since Open innovation has been supported by region government in South Moravian region in Czech republic and was implemented in innovation strategy of this region. Regional strategy is partnership of South Moravian companies, local scientists, public authorities and other parties connected to development in the region. Open innovation has become important part of strategic management and has become a well-established, though still somewhat fragmented, academic discipline.

Keywords: Strategic Management, Open Innovation Session, Regional Strategy.

1 Features of regional innovation strategy

South Moravia has got a traditional strong and expanding basis in the research and development area formed by college students and scientists. The structure of these students and scientists is also favorable because it is focused on disciplines of biology and engineering. The key approach how to improve the situation is to support innovative small and medium enterprises with a high added value that direct their attention to the introduction of novel and better products and services and also to the introduction of new approaches. A political consensus of all parties involved represent a cardinal advantage in a process of introducing the system supporting the innovative business. Universities, the regional political representation and

representatives of the City of Brno have managed to find a common ground and came to an agreement regarding goals that are mentioned the Regional Innovation Strategy. In the years 2014–2020, the South Moravian region will formulate the fourth generation of innovation strategy. It will place even greater emphasis on investments in education, increase support for rural and suburban areas of South Moravian region and will increase focus on encouraging the growth of already established companies. A big commitment is to ensure the greatest possible benefits of investing in research centers for the regional economy [5]. South Moravia region in Czech Republic in the middle of Europe has got a traditional strong and expanding basis in the research and development area formed by college students and scientists and industry. The structure of these students and scientists is also favorable because it is focused on disciplines of biology and engineering. The key approach how to improve the situation is to support innovative small and medium enterprises with a high added value that direct their attention to the introduction of novel and better products and services and also to the introduction of new approaches. A political consensus of all parties involved represent a cardinal advantage in a process of introducing the system supporting the innovative business [10].

Regional economies are keys to innovation and growth. There is a wealth of evidence and practical examples, which confirms that regions and cities play an important role in developing innovation by being the home of industrial clusters, competence centers, incubators, technology parks and many other types of formal and informal innovation spaces. Successful regions and cities become European or global nodes of innovation, technology networks and value chains [11]. Regions have an insight into their own innovation systems, as well as the capacities to mobilize regional innovation stakeholders through specific policy instruments. On the other hand, regional stakeholders have a good understanding of regional environmental performances, as well as the capacities and competences to take local action to promote environmental sustainability [9]. Universities Community associations Research organizations Business Community Consumers Environmental, innovation & energy agencies Regional Authorities, National Government EU. Regions have both the expertise and the capacity to effectively address both innovation and sustainability challenges. In many instances, connecting these expertise, creating collective capacities to act and coming up with innovative solutions is place specific. Eco-innovation, like any other innovation, should be understood as "occurring because of what are often geographically proximate concentrations and interactions amongst small, fast-moving systems of innovators and their networks" [3].

The Regional Innovation Strategy of the Moravian region represents a set of measures, sub measures and tools that should be implemented to ensure the development of innovations. The first version of the Regional Innovation Strategy was created in 2002 and it came into being in the context of that time and the environment. Since that time substantial changes happened in the environment, in priorities of the Czech Republic and in the economic area of South Moravia as well as in possibilities to obtain external financial means for innovations (in particular owing to the admission of the Czech Republic to the European Union). The sectors of business enterprises, universities and colleges as well as supporting organizations in

South Moravia are undergoing a dynamic development and because of this an obvious need to update the innovation support strategy appeared. Universities, the regional political representation and representatives of the City of Brno have managed to find a common ground and came to an agreement regarding goals that are mentioned in the Regional Innovation Strategy.

The need to update the strategy has emerged mainly from substantial changes in the environment. The first part of changes includes changes on the top level, especially the admission of the Czech Republic to the European Union, the attention of the government paid to support small and medium business enterprises and emphasizing of innovations as a tool for increasing the competitiveness of Czech enterprises. After the admission of the Czech Republic to the European Union the possibility of exploiting a financial support in the form of structural funds has proved to be a great stimulus. These funds (especially the Operational Programme Industry and Entrepreneurship) are aimed at a support of innovations and increase of the competitiveness of Czech enterprises generally.

The second part of changes includes local changes in South Moravia. It concerns mainly the change of the infrastructure of industrial companies, the development of new industries, altering requirements of companies and preferences of the society as a whole. In this connection we should mention the expanding activities of universities and colleges, the development of the biotechnology sector, a larger exploitation of grant programs from the part of companies, a relocation of companies to South Moravia and efforts made to put results of the research and development widely into practice.

The third part of changes includes the general development of the society, improving the standards of living, the development of the tertiary sector and companies oriented more to their basic businesses. The open innovation phenomenon has developed from a small club of innovation practitioners, mostly active in high-tech industries, to a widely discussed and implemented innovation practice. Simultaneously, a small community of management researchers has recently developed into an established research field. Once a field grows rapidly there is a danger that it may become a short-term fashion [8].

One of the very important tool, which was implemented into regional innovation strategy is model of Open innovation session as an efficient tool of strategic management.

2 Open innovation session

Open Innovation Session (OIS) is a one-day meeting with potential technological partners tailored to the specific demands of both Czech and international corporations. The aim of the OIS meeting is to quickly and effectively present possible solutions to a technological problem or challenge defined by a client corporation, and to connect the company with suitable partners, potential suppliers of solutions. For companies South Moravian Centre organizes a tailor-made process from identifying the long-list of potential suppliers of solution, reaching out to them, organizing the logistics of a

meeting, including the premises. Together with the client South Moravian Centre determine the technological areas of their interest, or directly determine specific technological problems where a solution may come from cooperation with external partner. A typical client of OIS is a hi-tech corporation and aim is to connect them with other, small or medium-sized companies, or research organizations, that suit the best their requirements. First there are preselect a long list of potential partners and then, together with the client, are selected those firms and research organizations that are contacted on behalf of the company. After it is organized a joint meeting – an Open innovation session – where experts from the selected companies and research organizations present their technological solutions. At the OIS proper, the participants each in turn present their respective technology or solution, followed by a discussion. This allows the client to compare the quality of different parties - their offerings and technical solutions – and make up their mind about future cooperation. The OIS may not only lead to partnerships, but can often work as an opportunity for creative problem solving. This tool demonstrate the interest of the local government in support strategic management of local companies.

Fig. 1. Global Competitiveness factors; 7 worst; 1 best [6], inner circle represents Czech Rep.

The symbolic meaning of strategic management´s tools that demonstrate the interest of the local government within the generally very poor institutional environment of the Czech Republic The development of the knowledge economy will also be strongly influenced by the continued interest of foreign companies present and not yet present in the Czech Republic. In this context, a fundamental problem in the Czech Republic is the poor quality of the Institutional Environment (see fig. 1 lagging behind developed economies), which significantly reduces the investment attractiveness of the country as a whole (and thus logically also the South Moravian Region). The importance of a high-quality institutional environment (as an enabling

factor) grows with the sophistication of economic activities (e.g. conditions for a functioning venture capital market).
The symbolic meaning of tools that demonstrate the interest of the local government within the generally very poor institutional environment of the Czech Republic The development of the knowledge economy will also be strongly influenced by the continued interest of foreign companies present and not yet present in the Czech Republic. In this context, a fundamental problem in the Czech Republic is the poor quality of the Institutional Environment (see lagging behind developed economies), which significantly reduces the investment attractiveness of the country as a whole (and thus logically also the South Moravian Region). The importance of a high-quality institutional environment (as an enabling factor) grows with the sophistication of economic activities (e.g. conditions for a functioning venture capital market).

3 Open innovation model as a tool of strategic management

Making companies able to compete is the purpose of strategic management. To that end, putting strategic management plans into practice is the most important aspect of the planning itself. Plans in practice involve identifying benchmarks, realigning resources – financial and human – and putting leadership resources in place to oversee the creation, sale, and deployment of products and services [1]. Strategic management extends to internal and external communication practices as well as tracking to ensure that the company meets goals as defined in its strategic management plan and open innovation is one of part which is complementary with all set of tools for strategic planning [9]. The use of strategic management in many areas has been able to increase the efficiency of institutions and centers and plays an effective role in their success [2]. William Darden from Hershey National Track Company takes its success into account of strategic management. Alfred Thomas Chandler, professor at Harvard University, published its studies over large American corporations and explained their senior executive managers' strategic decision-making process. He also demonstrated that how strategic decisions can lead to excel in a competitive environment [1]. The results have revealed that the use of strategic management increase the efficiency of car companies, for example Bahman Khodro Company increased the number of its produced cars up to 6000 units in 2013. Furthermore, customer satisfaction level increased to 73 per cent in this year. Using a dynamic, forward-looking, and holistic discipline, strategic management is considered as a solution for too many today's organizational issues [1]. Strategic management foundations are located based on managers' understanding of their rival companies, markets, prices, raw material suppliers, distributors, government, creditors, shareholders, and customers in all over the world [4]. Today, many institutions supply a high percentage of their resources from external sources and economic and commercial enterprises and institutions. These limited resources and incentives to attract top students have created a competitive market for these institutions. In today's knowledge based economy,

higher education institutions as development center for human resources play an important role in the growth and development of countries.

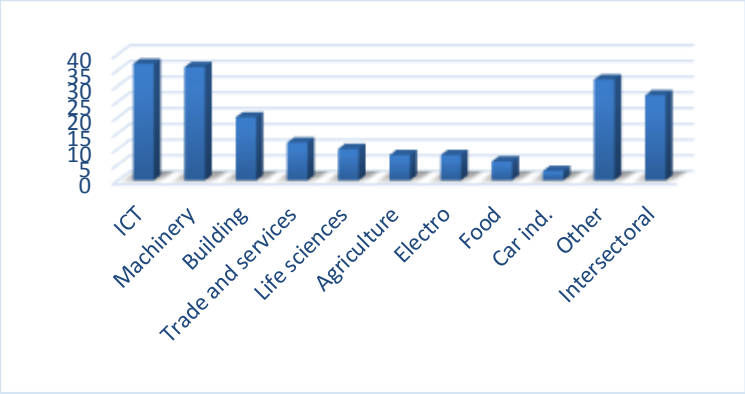

Fig. 2. A Sectorial orientation of applicants of Open innovation session model

The largest number of companies which used Open innovation session model as a tool of strategic management were mostly focused on machinery and ICT field.

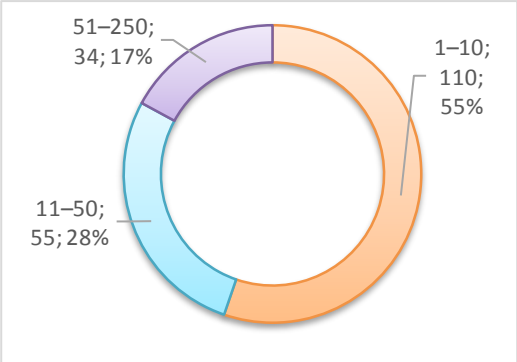

Fig. 3. Size of applicants of Open innovation session model (acc. number of employees)

More than half of all applicants were companies with number of employees up 51 to 250.More than half of applicants have never worked on project with university before. Here we can see the main impact of Open innovation session model.

4 Conclusion

Identify new collaboration opportunities; knowledge of regional, as well as Czech national ecosystem will allow companies to tap into the pool of expertise and talent of start-ups, SMEs, as well as academic institutions in South Moravia, or across the

Czech Republic. Regional strategy is partnership of South Moravian companies, local scientists, public authorities and other parties connected to development in the region. Working together innovation strategy has managed to create hundreds of skilled jobs in dozens of new high - tech companies. One of the target is to reach successful cooperation between industry and universities. One of the very important tool, which was implemented is model of Open innovation session as a tool of strategic management. The main benefits of Open innovation session model are: Simplify work and save time for the company only explain its challenge once, and facilitators take over the tedious job of pre-selection and routine communication with potential partners and multiply your offer to the relevant partners across the region/country. Interactive format may generate more ideas - the design of the Open innovation session model allows several participants to interact during the session which increases the chances of coming up with unexpected solutions to the identified challenges.

The tool perspective: Opening up the innovation process requires a set of instruments. Those tools, for example, enable customers to create or configure their own product with tools kits or enable companies to integrate external problem solvers or idea creators via websites. Especially the low degree of interconnection of the corporate and academic sectors, which prevents the full use of the knowledge base of the region to create the foundations of the long-term prosperity of the local economy. The mission of the program is to initiate the creation of new relationships between companies and researchers from the South Moravian Region, while it is expected that some of them will gradually develop into long-term collaboration. The primary objective is the initiation of new collaboration, defined as collaboration that continues even after the end of the project, while there was no collaboration between the two parties before entry into the program. Initiate the creation of new collaboration reducing transaction costs associated with the commencement of collaboration. Contribute to entrepreneurs' and researchers' understanding of each other, especially in the very different contexts of the objectives and conditions of collaboration [12]. Increase demand within research institutes for greater functionality of internal procedures and rules regarding collaboration of researchers and companies. Build trust in local public administration. Improve the image among companies and researchers. Reinforce the perception of City Brno and the south Moravian region as leader in the knowledge economy promotion in Europe. Bring symbolic value to foreign investors. Demonstrate the interest of the local government to create conditions for the development of knowledge-intensive operations of transnational corporations (Honeywell, Microsoft, ON Semiconductors, etc.). Besides the "technical" objectives of the model, it is also necessary to emphasize its marketing objectives, though some of them came into existence only during the program. The implications and trends that underpin open innovation are actively discussed in terms of strategic, organizational, behavioral, knowledge, legal and business perspectives and could be seen as a part of strategic management of an organization's resources to achieve its goals and objectives. The model can be applied towards improving the very low trust in public administration. It also contributes to the development of the image of Brno as a Centre where the knowledge economy is smartly supported. Two-

thirds of supported companies had their partner from the research sector solve a specific technical problem for them. More than two-thirds of companies found a researcher who was able and willing to help them.
Therefore, this is a purely subjective perception of the benefit by the respondents. The objective of the Open innovation session model was also to contribute to the greater understanding of each other between entrepreneurs and researchers, especially in the very different context of objectives and conditions with which the parties approach collaboration. In 68% of cases the main reason of cooperation by companies side were knowledge of specific researcher´s team.

The data show that participation in the program Open innovation session led to a shift in the perception of the objectives, needs and conditions of the business and academic world. Participants in the program are now more aware of the potential hidden in collaboration and at the same time are better prepared to organize this collaboration. After the end of the project, companies continuing in collaboration with new partners from the local research sector. And one of the very important tool, which was implemented is model of Open innovation session as a tool of strategic management.

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An Empirical Study of Modernity in Agricultural Cooperatives in Poland

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Abstract. Application of new and contemporary information and communication technologies for rural and agricultural development has been advancing quite rapidly over the last decade. Modern agriculture is a promising pathway to increase the sustainability of farming by increasing farm profitability, reducing manual labour, and reducing environmental impact. The paper discusses an approach to modernity and its influence on profitability in agricultural cooperatives in Poland. Precisely, its purpose is to investigate the links between the income and the level of value and modernity of machinery and equipment, as well as the propensity to monitor and implement technological innovations in Polish agricultural cooperatives. The analysis is based on data collected by survey method from 28 APC operating in the opolskie voivodship – the south-western region of Poland. It reveals a moderate willingness of Polish cooperatives to invest in agricultural machinery and equipment and to monitor and implement technological innovations. Simultaneously, it shows that the cooperative income does not depend on this willingness or on the cooperative members' opinion about modernity of machines used by them. However, it proves the existence of high positive correlation between the value of machinery and equipment and the income in cooperatives.

Keywords: Agricultural Cooperatives, Modern Agriculture, Correlation Analysis.

1 Introduction

The current trend of automation and data exchange in manufacturing technologies, named as Industry 4.0, has been extending to all areas of human life. This also applies to agriculture. Agricultural production management is entering into a new era where every day farmer's decisions are supported by highly sophisticated Farm Management Information Systems [12]. Application of new and contemporary information and communication technologies for rural and agricultural development has been advancing quite rapidly over the last decade. So-called "smart farming" or "farming 4.0" seems to meet the requirements of "producing more with less", of rising demand for bigger yields and higher environmental protection. Modern agriculture is a

promising pathway to increase the sustainability of farming by increasing farm profitability, reducing manual labour, and reducing environmental impact.

In modern agricultural systems farmers, unlikely traditional farmers, believe they have much more central roles and are eager to apply technology and information to control most components of the system [10]. They are aware of the benefits that modern agriculture already offers, including – among others – greater production and income. Particularly modern machinery has been found to contribute to sector efficiency and growth.

According to the data of JRC (The European Commission's in-house science service – the Joint Research Centre), obtained from a survey among 780 farm-households in 6 EU countries, the new agricultural machinery is the top target for investments by farmers in Europe [8]. The research showed that up to 2020 40.3% of farmers are planning to invest in machinery, far exceeding the willingness to invest in land (21.0%), buildings (20.3%) or trainings (16.2%). The main benefits expected from new machinery are:

- improved working conditions on the farm,
- cost reduction,
- increase in yields of production,
- increase in quality of production.

Farmers believe investments in new machinery and equipment will respectively contribute 52%, 27%, 26% and 24% to achieve these goals.

Decision about the machinery and equipment in farms are very important and often difficult to take. Though, after land, machinery is the second biggest asset category on most farms [7]. On the other hand, newer equipment may be more efficient, which could help profitability. The recent Ibendahl's research confirm this statement. It turns out that most profitable farms own either the most equipment or the newest equipment. Moreover, they have the highest levels of machinery investments, as well as machinery expenses. However, the most profitable farms have also the lowest levels of machinery costs as a percentage of total costs. Total costs in Ibendahl's research include machinery and land costs. While the most profitable farms have the greatest amounts of machinery, in the bigger picture of total crop expenses, their machinery expenses are actually the lowest. Ibendahl also points out that farmers, attempt to lower taxable income by purchasing more equipment. In his research the most productive farms purchased more machinery to help lower taxes.

Not only individual farmers decide about the size, the form of use (own or rented) and the level of modernity of agricultural machinery and equipment. This refers also to agricultural cooperatives which aim is to provide benefits for members as well as for local community. According to the literature, cooperatives do not only seek to maximize profits, but they also seek to satisfy the interests of their members by increasing the prices of their products as much as possible [5, 6, 13, 14]. However, the access to modern, efficient and work facilitating machines and devices could also be the one these benefits.

A higher level of modernization in cooperatives is related to a higher value of fixed assets, including machinery. The studies on American agricultural cooperatives show

the positive link between the value of assets with cooperatives' performance [2, 9]. Also, the empirical evidence obtained in the study in Spain provides information about the positive impact of size, measured by total assets among others, on the efficiency of agricultural cooperatives [1]. Therefore, the advantages associated with greater size – economies of scale, greater negotiating power and ease of access to different resources, such as technological ones, imply a competitive advantage that translates into increased performance.

But how do the cooperatives deal with providing funds for their modernization? It turns out, that most agricultural cooperatives have moved with much of the rest agriculture down a trajectory dependent on large capital-intensive production units and technology, with heavy reliance on external sources of energy and credit [4]. The recent report of support for farmers' cooperatives confirms using external funds to modernize buildings and invest in new facilities and equipment by for example German or Spanish cooperatives [3]. Also in Bulgarian case the support measures enabled cooperative leaders to modernize the equipment and machinery and, in this way, have not only stabilized the structure of agricultural production cooperatives but also the villages' economy and the safety net for the poor and elderly people. Thus, modernization in cooperatives could affect not only profits for cooperatives, but it also benefits to the local community.

In the light of such tangible and intangible results of modernization in agricultural production this paper discusses an approach to modernity and its influence on profitability in agricultural cooperatives in Poland. Precisely, its purpose is to investigate the links between the income and the level of value and modernity of machinery and equipment, as well as the propensity to monitor and implement technological innovations in Polish agricultural cooperatives.

2 Methodology of research

The analysis is based on data collected by survey method from 28 agricultural production cooperatives (APC) operating in the opolskie voivodship – the south-western region of Poland. The research was conducted in 2011. The survey was sent to all of the operating cooperatives in this region (approximately 100). However, the responses were obtained only from the 33 APC, from which additionally five was eliminated due to incompleteness of data.

All surveyed ACP conduct crop production, especially the cultivation of wheat, canola, barley and corn. More than half of them in the analyzed period also led livestock production, mainly pigs. The basic characteristics of the research sample is presented in Table 1.

Based on the respondent's opinion the survey allowed to determine in each cooperative the following factors:

- the level of modernity of machinery and equipment,
- the emphasis on tracking new technologies,
- striving for implementation of product and technological innovation.

Table 1. Basic characteristics of the research sample.

Item	Total income* (PLN)	Assets (PLN)	Value of machinery (PLN)	Agricultural land (ha)	No. of members	No. of employees
min	201 650	1 142 333	41 333	98	5	6
average	824 141	5 231 605	887 987	616	19	20
max	4 068 963	24 075 093	3 763 486	3 500	65	72

* net profit + membership fee

The analysis should bring the answer to the question if the above factors influence income in APC. A correlation analysis, which shows the degree to which two variables are related [15], was used to verify this influence. The hypotheses were the following:

- null hypothesis H0: no relation between variables,
- alternative hypothesis H1: the occurrence of the relation between variables.

The process of verifying hypotheses was to reject the null hypothesis in favour of the adoption of the alternative hypothesis, taking into account the level of significance $\alpha = 0.05$. Analysis of relationship was based mainly on the calculation of the values of the selected coefficients and their interpretation [11].

In case of quantitative variables (income and value of machinery and transport equipment) the Kendall's τ coefficient was calculated. This indicator determines the correlation between the variables in the characteristics measured by at least an ordinal scale. It accepts values from -1 to 1 showing not only the strength of correlation, but also its direction.

Due to the fact that some of analyzed factors are the qualitative variables, the chi-square test was also used. In examining the relationship between variables using this parameter, it is necessary to indicate the significance level p, which determines the probability of the correlation. If the investigated group includes not less than 20 and no more than 40 units, and any of the expected numbers is less than five, the chi-square with Yates correction shall apply. To evaluate how strong is the possible correlation, the Φ Yule's coefficient was also determined.

Moreover, the above coefficients require the division of the analyzed units into two groups that differ from each other. This relates in particular such quantitative variables as income and value of machinery and transport equipment. The formula of the division was the following:

- group A – units with income below the average,
- group B – units with income above the average,
- group X – units with value of machinery and transport equipment below the average,
- group Y– units with value of machinery and transport equipment above the average.

3 Research results

It turns out, that cooperatives are constantly trying to modernize their machine park (see Fig. 1.). In the last three years preceding the survey almost all of them made the purchase of equipment, more than half expanded their farmland and nearly 40% modernized machines and buildings.

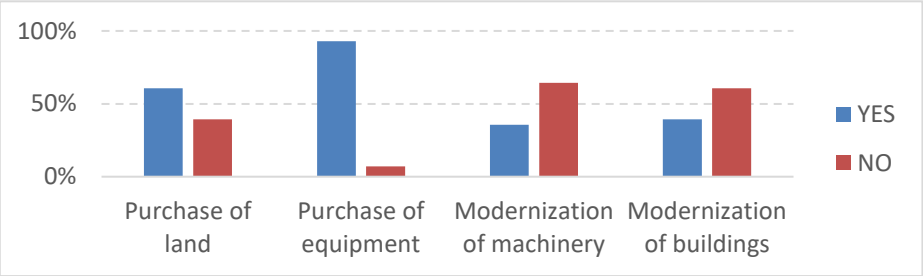


Fig. 1. Investment over the past three years in surveyed cooperatives.

Respondents have a positive opinion about the technical condition of fixed assets (see Fig. 2.). The vast majority (68%) defines it as "medium", a quarter as "strong" and 4% as "leading". Also, only 4% of them claims about the level of modern their machinery and equipment.

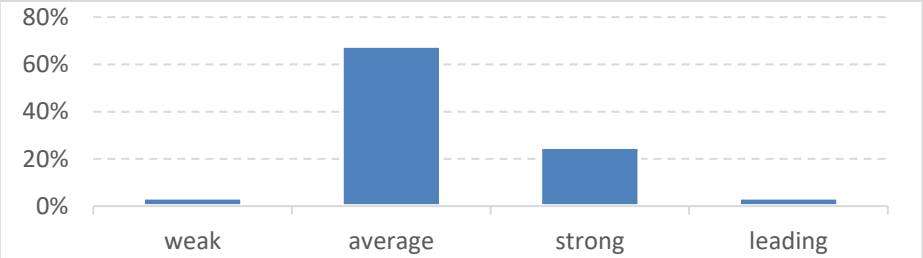


Fig. 2. The level of modernity of machinery and equipment in surveyed cooperatives.

Although APC seem to be interested in monitoring technological innovation (96% in total), only 19% of them declare a strong willingness to implement them in their work. Slightly more than half of respondents "rather" try to follow and implement modern production methods. On the other hand, for a quarter of respondents (27% in total), innovation does not have much significance. The data presented in Fig. 3. reflect the APC approach to tracking and implementing innovative solutions in their agriculture production.

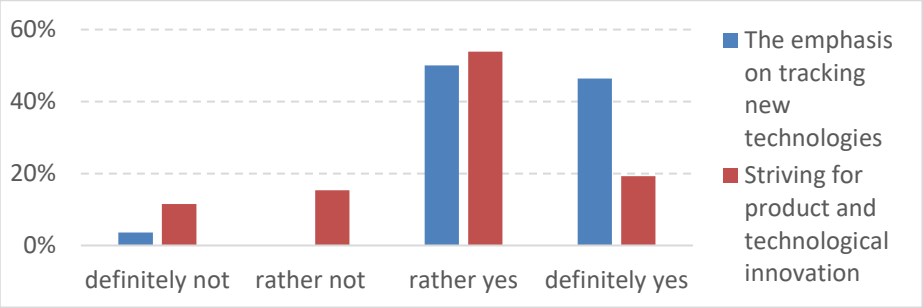
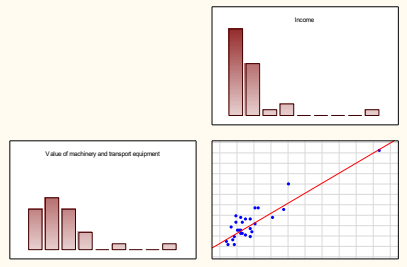
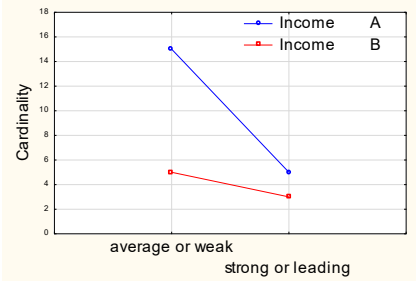
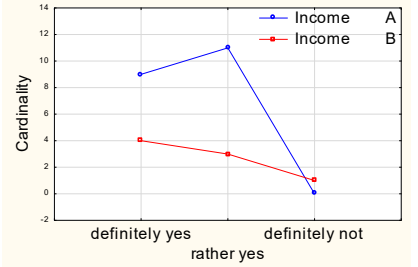
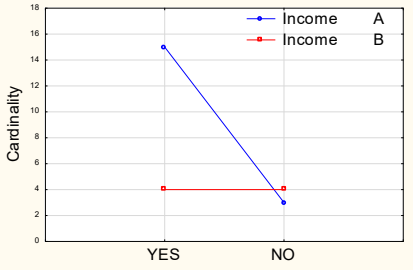


Fig. 3. Respondents' answers to questions on the propensity to monitor and introduce technological innovations in agricultural production.

When analyzing the impact of the above factors on income of cooperatives, the results seem not to be so fascinating (see Table 2.). It turns out, that neither the level of modernity of machinery and equipment, nor the propensity of monitoring or implementing technological innovations influences the profitability of cooperatives. In these cases, the p value over $\alpha = 0.05$ indicates that the relationship is not statistically significant. However, we can observe the positive link between income and value of machinery and transport equipment. This is confirmed by the Kendall's τ coefficient, chi-square test and Φ Yule's. Moreover, the correlation between these variables is relatively high ($\tau = 0.51$), which shows that the value of machinery and transport equipment essentially influences the income in cooperatives. Besides, the positive relation indicates that the value of one variable increases with the increase of the other. So, one can say that the more equipment the cooperative has or the more expensive it is, the more it earns.

Table 2. The correlation coefficients of income and selected factors in surveyed cooperatives.

Item	Kendall's τ	χ^2	Yates's correction of χ^2	Φ Yule's	Graphs
Value of machinery and transport equipment	0.51, $p<0.05$	4.73, $p=0.03$	3.07, $p=0.08$	-0.41	

The level of modernity of machinery and equipment	not applicable	0.44, p=0.51	0.04, p=0.84	0.13	
The emphasis on tracking new technologies	not applicable	2.88, p=0.24	not applicable	0.32	
Striving for product and technological innovation	not applicable	3.13, p=0.08	1.66, p=0.20	0.35	

4 Discussion

The analysis revealed a moderate willingness of Polish cooperatives to invest in agricultural machinery and equipment and to monitor and implement technological innovations. Simultaneously, it showed that the cooperative income did not depend on this willingness or on the cooperative members' opinion about modernity of machines used by them. However, it proved the existence of high positive correlation between the value of machinery and equipment and the income in cooperatives. When cooperatives invest in equipment increasing its value, they decrease taxes and in the same time increase net income. This explains the correlation and confirms the above-mentioned Ibendahl's findings.

On the other hand, higher value means more expensive machinery and/or newest machinery. This in turn goes hand in hand with higher depreciation costs. The greater depreciation is, the lower should be the income. Ibendahl also found this unexpected that the most profitable farms have the greatest depreciation. He explains that this is due to the fact that the most profitable farms own either the most equipment or the

newest equipment. Moreover, the benefits of having newer equipment can simply outweigh the cost of depreciation.

5 Conclusion

Much has been written lately on modern agriculture [4]. Considerable focus is given on describing its various characteristics, such as: international competition, global sourcing and selling, industrialization, differentiation of products, food safety, environment protection, high technology, biotechnology, information technology. To be competitive cooperatives must keep up with the progress in agriculture and they have to meet increasingly stringent requirements related to agricultural production.

Continuous technical and technological progress in agriculture in general leads to the possibility of increasing the efficiency of farming. However, it is not enough to be just a passive observer of the situation around. Cooperatives, in order to improve their efficiency, should try their best to use modern, more efficient machinery and equipment as well as methods of agricultural production.

Although the research presented in this article provides a view on the modernity level in cooperatives, one has to remember that the findings were obtained only from 28 entities. This represents only 4% of a total population of Polish APC and is concentrated on only one region of Poland, where the agriculture is well-developed. Therefore, the research should be extended to ensure the representativeness of the data. Moreover, the respondents' opinion on the level of modernity and their declarations of propensity to monitor and implementing technological innovations showed no relation to the income of APC. It is suggested to replace these qualitative variables with quantitative ones to allow the use of more powerful statistical tests. As it was mentioned in the article, technological progress in agricultural cooperatives is an important issue and therefore it should be continued in both research and practice.

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Digital Transparency and Performance Evaluation in Public Administration

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Abstract. Social media has opened up new opportunities for public involvement in public administration. Unlike other EU countries, the Czech Republic still faces the effects of the failure to complete the 1999 public administration reform concept. The above-mentioned public administration reform was based on: 1. reform of territorial public administration; 2. reform of the central state administration; 3. modernising and improving the efficiency of public administration. The implementation of the first and partly the second point created a system for public administration in the Czech Republic, based on a combined model of state administration performance. The combined model is characterised by the transfer of a part of the state's power to a lower level, closer to the citizens, for example through local authorities. The efficiency of Czech public administration in many areas lags behind the public administration performance in other EU member states. The aim of this paper is to examine the possibilities of measuring effectiveness in public administration and to discuss its advantages and limitations. The paper also seeks the answer to the following research question: Q1. Is digital transparency an important part of the evaluation of public administration performance? Our paper shows that the variables analysed are positively associated with digital transparency.

Keywords: Digital transparency, E-government, Internet Disclosure, Local Government.

1 Introduction

There are a number of approaches with regard to the conceptualisation of transparency. Some definitions are descriptive and others are of a more standard nature. A common denominator of some of those definitions is a belief in information as an essential condition of transparency. In a modern society, interlinked concepts related to transparency and governance have been defined: public-sector transparency, government transparency or organisational transparency. [10] Here, transparency is therefore considered as an essential part of rationality, progress and good governance and also "*as a conduct of public affairs in the open or otherwise subject to public scrutiny*". Birkinshaw [3] and Piotrowski & Van Ryzin [14] stress the role of transparency. Prat [15] stresses the control aspects of transparency in organisations using the principal – agent model. In this case, transparency is an instrument in the

hands of a principal where it's used to ensure that the agent is acting in line with principal through the delegation of power. Within the specified model transparency is an instrument in the hands of the principal, who can use it to ensure that the agent – acting on the principal's behalf via the delegation of the power – doesn't promote their own interests instead of those belonging to the principal. When information asymmetry is to the agent's advantage, it's possible for it to lead to governance abuse and failures. Such problems are considered to be remedied by transparency. [5] Some family resemblance concepts are also related to transparency – such as openness, insight or clarity. [13] However, links between transparency, openness and information are sometimes a little vague and unclear. One way of describing the relations is provided by Christensen and Cornelissen [6], when he states that organisational openness may be a precondition for transparency, and information accessibility is seen as a precondition for openness and transparency. [6, 10]

Several moderating effects such as administrative culture, accounting regime, measure impacts used on determining variables and the level of government have been considered and analysed for their influence on the level of correlation between the determinants as well as the disclosure of public financial information in both information disclosure modes. [1]

It's certainly evident that as the institutional framework is developed and the government transparency mechanisms and tools were strengthened, the perception of corruption became slightly less widespread. Prior research has shown that information transparency within governments depends on institutional and environmental factors. In spite of this, previous studies show heterogeneity in the results and academic researchers can't make any consistent conclusions. It makes it difficult to know the behaviour of governments regarding their information policies. [9]

2 Theoretical Foundations of the Research

The Czech public administration doesn't currently have a conceptual document that would set the direction for its development for the next period (after the implementation of the Smart Administration Strategy in 2015). As a reaction to the present situation, the Strategic Framework for Public Administration Development in the Czech Republic for the period 2014-2020 (hereinafter referred to as the Strategic Framework or SF) has also been developed. The purpose of this document is, in particular: to provide the continuity and implementation of other necessary steps in the public administration development area, to set further direction of the development and investment in selected areas of public administration in 2014-2020 programming period, to secure the fulfilment of the preconditions set by the European Commission as the prerequisities for making the European Structural and Investment Funds (ESIF) available to be drawn. [7]

The question of public administration development must also be perceived in the context of the development of thinking of public administration on an international level. The New Public Management concept, which dominated the professional debate at the turn of the century, is under increasing criticism, the OECD: Public

Governance and Territorial Development Public Management Committee. [12] However, at the same time, there isn't a strong consensus on the further development and the current period can be characterised as a period of a search for new ways. The Strategic Framework for Public Administration Development in the Czech Republic for the period of 2014-2020 [11] was developed with the knowledge of this development in the global context and during its development into implementation documents, the latest international experience and the applicability of the latest ideas in public administration will be considered. [4, 16]

2.1 Definition of the concept of public administration

Public administration (PA) can generally be defined as the management of public affairs carried out by PA entities or through their bodies with citizens' active participation and for their benefit. [8] Despite the PA, public tasks and PA are assured and the PA creates the prerequisites for their implementation and implements them at the same time.

2.2 3E Principles (Economy, Efficiency, Effectiveness)

Economy - the use of public funds where the objectives and tasks are achieved with the least possible use of resources. A condition for minimising the resources used is that these objectives and tasks are met provided the quality is maintained. The indicator of economy is to minimise the cost of inputs and providing the objective is met. Achieving the set goal and therefore maintaining the appropriate quality is crucial for the economy criterion, as this is often neglected. In the event that the corresponding quality isn't met, there is an economically ineffective use of resources as the target parameters are not met.
Efficiency - productivity, or cost effectiveness. Productivity means the use of public resources to achieve the highest possible scale, the quality and benefit of performed tasks compared to the volume of resources spent on their performance (i.e. the most productive one is the one with the largest outputs achieved - the essence of benchmarking). Cost-effectiveness means cost for a neutral unit of output (e.g. cost per one citizen who is provided with services, etc.). The most cost-effective unit is the unit that achieves the lowest cost of a neutral unit of output (provided of the preservation of the given quality).
Effectiveness – effectiveness is such use of public funds to ensure an optimum level of achievement of the objectives set in the fulfilment of the assigned tasks. This is the highest type of performance criterion, both in terms of economy as well as efficiency and it examines the economic rationality of the resources used. The most common effectiveness indicator is the percentage fulfilment of the set objectives - comparison of the objectives set with the achieved results. In PA, this criterion is perceived as the most problematic, since the objectives are often not defined at all or only ambiguously or not measurable, they're not regularly evaluated, no rewards or sanctions are associated with their fulfilment or non-fulfilment.

3 Methodology and Data

The paper used a method of describing the current state of public administration performance evaluation with a focus on digital transparency according to the **List of Data Sets published as open data** under Government Regulation No. 425/2016. [11] Furthermore, the method of comparison of the results obtained in order to answer the research question asking whether:

Q1 Is digital transparency an important part of the evaluation of public administration performance? In the course of the study, domestic and foreign specialised literary sources were used, including a reflection on the Strategic Framework for Public Administration Development in the Czech Republic for the Period 2014 – 2020.

The measurement is built on two key indicators Open Data Readiness and Portal Maturity, thereby covering the national activities development levels that promote Open Data and also the national portals development levels. This data explores the Open Data Maturity level in the EU28 as well as Norway, Switzerland and Liechtenstein – referred to as EU28+. There was a 28.6% increase in 2016 in comparison to 2015, whereby the EU28+ countries completed over 55% of their Open Data journey which showed that by 2016, the majority of EU28+ countries had developed a basic approach to address Open Data successfully. The Portal Maturity level showed an increase of 22.6 percentage points from 41.7% to 64.3%, this is thanks to the development of more advanced features on country data portals. The overall Open Data Maturity groups countries into different clusters: Beginners, Followers, Fast Trackers and Trend Setters. [7]

The first key indicator, Open Data Readiness, assesses to what extent countries have an Open Data policy in place, licencing standards and also the extent of national coordination with regard to the guidelines and setting common approaches. The transposition of the PSI Directive revision is also taken into account. As well as the presence of an Open Data policy, there is also an assessment of the use made from the Open Data available and the estimated political, social and economic impact of Open Data.

The second key indicator, Portal Maturity, explores the portal's usability with regard to the availability of functionalities, the overall data re-usability such as machine readability and accessibility of data sets, for example, as well as the spread of data across domains. The two key indicators as well as the sub-indicators can be seen in the following table:

Table 1. Open Data Maturity indicators. [7]

Open Data Maturity Assessment							
Open Data Readiness					**Portal maturity**		
1. Presence of Open Data Policy	2. Licensing Norms	3. Extent of coordination at national level	4. Use of Data	5. Impact of Open Data	6. Usability of the Portal	7. Reusability of data	8. Spread of data cross domains

4 Discussion and Results

In 2017, the impact on increasing transparency and accountability is estimated to be high by 13 countries 26 of the EU28+; an increase of five countries compared to 2015. In spite of that, there are large discrepancies across countries that do have a portal. The results of individual countries can be seen in the table below.

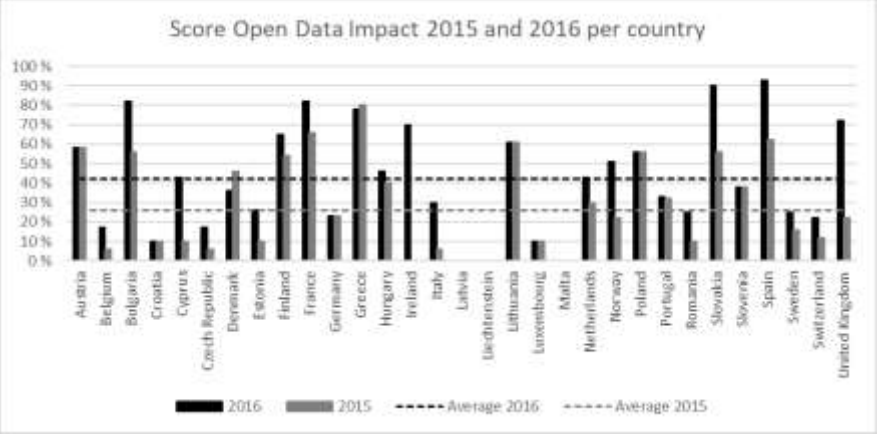

Fig. 1. Score Open Data Impact per country in 2015 and 2016, with averages 2015 and 2016. [7]

Figure 1 above represents the overall scores for individual countries and to the same extent provides the EU average scores for 2015 and 2016. Overall, the average score amongst EU28+ countries shows an increase from 72 points in 2015 to 128 points in 2016. Most countries have increased as they have launched activities to promote their Open Data policies and portals, as well as developing additional means to monitor their users. Among the most progressive countries on this indicator is Luxembourg. The launch of their national Open Data portal in the spring of 2016 can explain this increase. A few countries have a reduced score on Use of Open Data.

This is partially down to the fact that, in 2016, the number of unique visitors was scored in relation to the number of inhabitants in a given country. However, this calculation adjustment has favoured smaller countries and not proven to be too much of a disadvantage for larger countries.

Open Data impact measurements are important because they provide a clear overview of where countries planned to reap – or are reaping – the benefits from their Open Data policy. By measuring this impact on an annual basis, it's possible to find out which countries are deepening their understanding of the Open Data impact.

Some effects of releasing Open Data are visible, but an estimation of the impact created by releasing data remains a challenge to precisely identify. The main recorded impacts have been grouped into three categories: political, social and economic. The 2015 scores were used as a baseline and updated based on data collected in 2016. This approach was chosen because the impact isn't necessarily measured by default on a yearly basis.

From the above-mentioned international results comparison, it's clear that digital transparency is an important part of the evaluation of public administration performance and they work together as combined vessels and confirm the Q1 research question.

5 Conclusion and recommendations

Meaning of performance measurement by public administration as a benefit

Performance information can be used to describe the current state of public administration functioning and its individual components, which is very valuable information, but very often also stimulating reflections and attempts to improve the state of functioning. This can clearly be seen as an advantage. Behn [2] also counts with this in his categorisation and defines eight possible uses of measured data and information obtained, especially within the management processes in the PA. It's the improvement which is an eighth way to use performance information that understands it as a goal superior to all other goals. These goals include:

1. Evaluate - How well is my public agency performing?
2. Control - How can I make sure that my subordinates are doing the right thing?
3. Budget - On what programmes, people or projects should my agency spend public money?
4. Motivate - How can I motivate my line staff, middle management, non-profit and for-profit associates, stakeholders and citizens to do the necessary things to improve performance?
5. Promote - How can I convince political superiors, stakeholders, legislators, journalists and also citizens that my agency does a good job?
6. Celebrate - What achievements are worthy of the important organisational ritual of celebrating success?

7. Learn - Why is something working or not?
8. Improve – Who should do exactly should what differently to improve performance?

For example, the EFQM Excellence Model, the Balance Scorecard, ISO standards, benchmarking, as well as newly developed methods can be used directly for public authorities as a CAF model, local Agenda 21 or tools engaging citizenship in the management, such as a citizens' charters or community planning.

To upturn performance, public managers are required to understand how they can influence the behaviour of the people inside their agency (and its associates), who produce their outputs and also how they can influence the citizens‘ behaviour, who convert these outputs into outcomes. They have to know what is going on inside their organisation— this includes the broader organisation that consists of everything and everyone whose behaviour can have an affect these outputs and outcomes. They have to know what is going on inside their entire, operational black box. [2]

Administrative difficulty, non-compliance with methodology or misinterpretation of results can be considered as restrictions.

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The Correlation of Government Expenditure on Information and Knowledge Systems with Unemployment

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Abstract. Most of today's automated systems have become completely dependent on the use of computer technology and its applications. It is very difficult, if not impossible, to measure how much a government spends on automation. But it is possible to find out about the part of government expenditure that is connected the most with automation, and that is government expenditure on information and knowledge systems. In this paper an article about the influence of banking automation on unemployment was chosen and analyzed as a case study. Analysis showed that there is a correlation between the government expenditure on information and knowledge systems with unemployment. The government expenditure on information and knowledge systems can be considered as a contributing factor to the unemployment rate, as the study showed that banking automation increased the disguised unemployment by 17%. It is possible to "estimate" how much government expenditure on information and knowledge systems increases the unemployment rate, but to do so larger and more reliable data is needed.

Keywords: Automation, Unemployment, Developing Countries.

1 Introduction

Unemployment has always been a problem in the economy of countries. In advanced countries population growth is at a very small rate, if not negative, and room for improvements and advancement is smaller comparing to developing countries; therefore unemployment is better controlled, and the growth rate is better balanced. This phenomenon is especially problematic in developing countries where the population is increasing rapidly, and there is a lot to improve.

It is very difficult for governments to maintain a good balance between the determinants of better and higher standards of living. Developing countries have a bigger battle to fight against unemployment, so it would be wise not to take actions that add to the existing unemployment problem that they are facing in the first place. Using modern technologies and systems leads to a better economic growth, however they must be used carefully so they wouldn't have unwanted negative outcomes such as unemployment.

For example, Iran's population has increased from approximately 32 million inhabitants in 1975 to about 79 million in 2015 [6], more than double in only 4 decades. The median age in Iran is currently 29.4 years old. [7] From these basic measures it is obvious that the labor force was increased significantly, and therefore many jobs must have been created (it does not necessary mean that they have) to avoid high levels of unemployment. In the other hand as Iran is considered among developing countries they have been investing a lot in the use of information and knowledge systems and automation. A question that asks itself here is that does automation contribute to the unemployment problem?

Not so far ago when we had to go to a bank, it was something unpleasant to do because banks were very crowded and we had to wait in a long queue for a very long time. This situation was because for every single bank operation we had to go to the bank and an employee had to help us with simple day to day operations like depositing and withdrawal of cash, paying bills, and many other services.

These days when we go to a bank, assuming that there is the need for it, we can easily see that there are not as many operators as before and similarly not many people waiting their turns. This is because banks automated a lot of their banking operations; thus, and many day to day operations could be done personally throw internet banking, where it uses information and knowledge systems. So, there is no need for employees for some of these operations, and as for some other more complicated operations a few employees are more than enough.

The aim of this paper is to review a study made in Syria about the measure of the influence banking automation has on the unemployment, in order to understand the case better, and to find out the relation between the use of information and knowledge systems with unemployment; and in a larger scale, to find out whether or not the government expenditures on information and knowledge systems is correlated with unemployment in general. Furthermore, to generalize this concept if possible.

2 Methodology and data

In this paper literature review, data analysis and synthesis, methods of description, comparison, and induction and deduction reasoning approaches are applied.

In social sciences one of the basic methods used for qualitative research is Case study. A case study is focused on capturing the complexity of the case to describe the relationships of the subject a whole by collecting and evaluating a large amount of data about one or a few cases. [2]

A case study is an empirical inquiry that explores a contemporary phenomenon deeply within its real world context, especially when there are no clear boundaries visible between the phenomenon and the context. Investigators prefer case studies as a research strategy when they are dealing with "Why" and "How" questions and have little or no control over events. [8]

The main goal of a case study is to understand the context of the whole case, and it is believed that by an accurate examination of a case, it would be possible to understand other similar cases. [2]

The most commonly used sources for collecting evidence for a case study are: documentation, interviews, archival records, direct observations, participant-observation, and physical artifacts. [8]

As one of the sources, an article was chosen be the case for this paper. This article was published in 2014, and it is about the influence of banking automation on unemployment.

In relation to the topic of this paper the following research questions were formulated:

- Does the application of information and knowledge systems cost jobs?
- Could the government expenditure on information and knowledge systems considered as a contributing factor to the unemployment rate?
- And if yes, is it possible to calculate this affect?

Finding answers to these questions satisfies the goal of the research, which is to analyze the case and to generalize conclusions made in the case.

Using the mentioned methods, it is important to clarify a few issues. First of all, unemployment is a broad topic and generally there are many factors contributing to the unemployment rate of a country. Secondly, the unemployment rate is not an exact measurement. In the other hand, there is no way to measure how much a government spends on automation. But we can settle for the next best thing, the part of government expenditure that is connected the most with automation, and that is government expenditure on information and knowledge systems. Nevertheless, the focus of this paper is mainly to understand the context of the case as whole to find the possibility to generalize the acquired knowledge.

Sources used for this paper were selected from publicly available books and articles, as unfortunately some much appreciated data and information we needed were not available.

3 Theoretical background

3.1 Economics

Unemployment is one of obvious determinants of the country's standard of living. People who cannot find jobs or lost their jobs are not contributing to the country's production of goods and services. When a country keeps its workers as fully employed as possible, it would have a higher GDP and growth rate. [4]

The economy of a country is a very large and complex system, with millions of firms and workers, so some degree of unemployment is inevitable. That's why politicians campaigning for office address unemployment and their proposed policies to help create jobs and reducing the unemployment rate. Unemployment is considered in short-run and in long run and have a few different forms, types and reasons, but first let's see how it is measured.

The labor force is the total number of workers in the country, categorized as employed and unemployed. People who have jobs, are called employed and those

who don't, unemployed. But of course, there are other people in the country, which don't fit neither one of the categories mentioned above (for example homemakers, retirees, and full-time students), these are considered as Not in the labor force. Unemployment rate is the percentage of the labor force that is unemployed. So, measuring the unemployment rate is basically the number of unemployed over the labor force multiplied by 100. [4]

Natural rate of unemployment is the normal rate where the unemployment rate fluctuates around, and cyclical unemployment is the deviation between unemployment from its natural form. It is hard to measure unemployment for a few reasons. One reason is that it is sometimes hard to distinguish between someone who is unemployed and someone who is not in the labor force. Another reason is that many of unemployed people are young and just entered the labor force, looking for their first job. Furthermore, there are those people in the labor force that call themselves unemployed to get financial assists from the government, where in fact they are working and getting paid under the table to avoid paying taxes. Another case is those people who are reported as out of the labor force but the want to work, they actually tried to find a job but finally gave up due to unsuccessful search, they are called discouraged workers. [4]

The rate of unemployment never falls to zero but it actually fluctuates around the natural rate of unemployment. One reason behind this is that it actually takes time for workers to find a suitable job. The type of unemployment that is caused from the process of matching workers and jobs is called frictional unemployment and its effect is mostly in the short run. In the long run, in most of cases the unemployment is as a result of insufficient number of jobs in the labor market for everyone who is in the labor force and wants to have a job, in other words, the quantity of labor supplied is more than the quantity demanded. This type of unemployment is called structural unemployment and often explains the longer spells of unemployment. [4]

Other reasons why there is always some unemployment in the economy are the minimum-wage law, market power of the unions, and the theory of efficiency wages. What these three have in common is the fact that they try to push the wage of workers above the equilibrium level and this leads to a surplus of labor and consequently, unemployment. [4]

There are two other terms, which we need to understand as well, underemployment and disguised unemployment.

Disguised unemployment is when a part of the labor force is left without work or is working in such manner that the productivity of the worker is basically zero. Disguised unemployment is very common in the developing countries because they have a surplus in their labor force due to their large and fast growing populations. Disguised or hidden unemployment can refer to any part of a country's population that is not employed at the full capacity, in other words, people working below their capabilities whose work positions contribute less value in terms of productivity, and those groups who are able to perform valuable work but they are not looking for work. [1]

Underemployment is a form of disguised unemployment where a worker works part-time job when he/she is able and willing to have a full-time job. It also includes those workers who accepted employment that is below their set of skills. [1]

3.2 Automation

Automation evolves from the Greek word “automatos”, which means: acting by itself, or spontaneously. Automation is generally acting, operating, or self-regulating with no human intervention. [5] Automation could be defined as the cancellation of human intervention partially or entirely in the implementation of industrial, administrative, scientific, or household tasks. [1] It could be as simple as regulating the temperature in an oven, or as complex as management of automated banking institution. The word automation has been used since 1930s to express all the processes that human could exploit mechanical machines to replace to the work of human force. [1]

Generally before 1950s the most common form of automation was mechanization. Advantages and distinctions of automation became clear later on in the 1950s when modern automation was introduced by adding automatic control to mechanization as an intelligence feature. [5] The use of automation expanded to the point where it reflected on all production processes which require the use of theories and arbitrary sophisticated methods without direct human intervention for its completion such as Chemical, petrochemical, medical, and other engineering purposes. The spread and evolution of automation accelerated because of the invention of the computer and the development of electronic technology to the point where most of today's automated systems have become completely dependent on the use of computer technology and its applications. [1]

There are two fields in automation: Process automation and Manufacturing automation. The field of process automation is based on mostly analogue devices, for example hydraulic or electric devices. Recently these devices are very dominating, particularly in information processing, because of their change from analogue to digital. In manufacturing automation, devices were mostly electrical and digital since the beginning. [3]

4 Results and discussion

An analytical study on Syrian banks was conducted in 2014 to measure the influence of banking automation on unemployment. More specifically, to find out if banking automation has any effects on the size of disguised unemployment and structural disguised unemployment in Syrian banks. The study was conducted using data from the questionnaires distributed to 191 bank employees. From this number, 154 people were employees of state owned banks and 37 people were employees of privet banks. For their study they had the following hypothesis:

- Automation in the banking business would have no impact on the disguised unemployment.

- There would be no significant difference in the amount of disguised employment between banks in the public sector and banks in the private sector, in Syria.
- Automation in the banking business would have no impact on the structural disguised unemployment.
- There would not be significant differences in the amount of average employee training between banks in the public and private sectors. [1]

They reached the following conclusions:

- There is an effect of banking automation in Syria on disguised unemployment apparently, increasing this kind of unemployment as much as about 17% of full time clocks.
- There were significant differences in the size of disguised unemployment due to the sector's type that the bank belongs to, and this size of disguised unemployment was larger in the public sector banks.
- There is an effect of banking automation in Syria as structural disguised unemployment being at the rate of 12%. In Syrian Banks, most of the officials never had convenient qualification to deal with automating systems; just about 45% of them have rather convenient qualification to deal with this kind of systems. Therefore, they found that the unemployment is partially "technological disguised unemployment" in Syrian banks due to those unqualified officials.
- There was a significant difference in the amount of average employee training between the sector's type that the bank belongs to, and this amount was larger in the private banks. [1]

Table 1 illustrates a part of the results they have collected from their questionnaire, participants had to answer how proportionate is the amount of work with the number of employees before and after using computers.

Table 1 – partial results of the questionnaire. [1, own elaboration]

The ratio between the number of employees and the volume of work in the bank	Before using computers	After using computers
Less proportionate	59 (30.9%)	19 (9.9%)
Proportionate	66 (34.6%)	99 (51.8%)
More proportionate	35 (18.3%)	64 (33.5%)
The question does not apply to the respondent	29 (15.2%)	0 (0%)
No answer	2 (1%)	9 (4.7%)

As we can see in table 1, before using computers, 59 (30.9%) participants believed that the amount of work is less proportionate with the number of employees, in other words, not enough employees for the amount of work. 66 (34.6%) participants believed that the amount of work is proportionate, and 35 (18.3%) participants believed that the amount of work is more proportionate, meaning the number of employees exceeds the amount of work. After using computers we can see that the number of participants who believed there is not enough employees for the amount of

work, decreased to 19 (9.9%); Number of participants who believed that the amount of work is proportionate to the number of employees increased to 99 (51.8%), and number of participants who believed that the number of employees exceeds the amount of work increased to 64 (33.5%). From these numbers it is evident that there is underemployment in the Syrian banks caused by the use of information technologies.

Based on the results and conclusions mad by the before mentioned case, it is safe to say that applying automation to the banking system increases the unemployment rate. As mentioned in the literature review, automation is currently almost completely dependent on the use of computer technologies and their applications, in other words information and knowledge systems. So, using information and knowledge systems can increase the unemployment rate it terms of underemployment, disguised unemployment, and technological disguised unemployment.

Another interesting detail in the article was the fact that most of the people (154 of 191) who participated in their research were employees of state owed banks. Hence, the cost of upgrading and applying automation in these banks could be considered to be government expenditure, and particularly, government expenditure on information and knowledge systems. We can say the same thing about all the government subordinates (for example all the ministries, organizations, and government projects), that are upgrading their technologies and applying automation. Therefore, there is a correlation between the government expenditure on information and knowledge systems with unemployment.

To measure the correlation between the government expenditure on information and knowledge systems with unemployment, some statistical methods and tools such as test of correlation could be used, but in order to do so larger amount of data is needed with a higher quality.

5 Conclusions

Before 1950s automation was in the form of mechanization, but later on it evolved into the modern type by adding automatic control as an intelligence feature. Nowadays automation is significantly dependent on the information technologies and the use of information and knowledge systems.

Using information and knowledge systems and subsequently automation increases the productivity and profitability of companies and firms, decreases their costs, saves them a lot of time and energy, and in the case of dangerous and hazardous jobs, could save some lives. Nevertheless, automation could potentially cause unemployment.

By the application of the information and knowledge system and automatizing some of bank's everyday operations and processes, which were done by the bank employees, we witnessed that the disguised unemployment was increased, and perhaps some of the bank employees lost their jobs. Now the bank case is just an example, but there are many other fields that are the same, all letting some employees go and subsequently increasing the unemployment.

Even in the best cases, if those people who lost their jobs would be able to find another job shortly after, the economy of the country still would be affected as an increase in the frictional unemployment.

In macroeconomic level, it's true that unemployment has many factors contributing to it significantly, but it looks like that automation could be considered as a factor as well. This affects the economy system of a country as a whole. Unemployment is a very important part of the economy of a country that must be kept as low as possible. This would be a larger problem in developing countries where unemployment is often high due to large and growing population.

Increased level of unemployment causes a lot of negative and counterproductive social, economical, and political effects. When the rate of unemployment is high, the economy of the country is not working with its full potential, which means lower GDP. Socially, in better cases it causes a lower standard o living, anxiety about the future, and a lower self-esteem, and in the worse cases it could increase and promote crime.

Learning from the bank case and some other similar cases we generalize and state that the use of information and knowledge systems could be a contributing factor to the unemployment of a country and could have unwanted consequences, of course these negative consequences would be in a larger scale in the developing countries.

To measure the extent of that the use of such systems and automation could influence the unemployment is not an easy task as the measures of unemployment are considered to be imperfect in the first place.

However, the effect of information and knowledge systems on unemployment could be estimated and interpreted by the use of multi regression models and analysis, by assuming the government expenditure on information and knowledge systems as an individual independent variable among other independent variables in the regression analysis, and the unemployment as the dependent value. Multi regression analysis also shows to which degree an independent variable could affect the dependent value assuming the other independent variables would be constant. This could be especially be helpful in the decision making of policy makers to provide them have a better idea of what could happen to the unemployment rate by counting expenditure on information and knowledge systems as a factor.

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Direction of Changes on the Milk Markets in Poland, the Czech Republic and Slovakia in Comparison with the Biggest Milk Producers in EU (2005-2016)

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Abstract. Milk production is one of the main items in livestock production and more broadly in agricultural production. It is characterized by specific economic and organizational characteristics. The aim of the study is to determine the changes in the purchase and sale prices of milk in three selected countries, which joined the European Union in 2004 in Poland, the Czech Republic and Slovakia in comparison with the largest milk producers in the European Union. In particular, the subject of the study was an analysis of trends of changes, seasonal cyclical fluctuations for purchase prices and the volume of milk purchased in the analyzed countries. In the paper a multiplicative model of time series analysis was used. The analyzed data covered the years 2005-2016.

Keywords: Milk Market, Production, Seasonal Variation.

1 Introduction

Milk production is one of the main items in livestock production and more broadly in agricultural production. It is characterized by specific economic and organizational characteristics. In particular, it is distinguished from other agricultural activities by high labor intensity and capital intensity, a strong link between milk production and plant production on the farm, difficult to obtain, the desired hygienic quality of milk and the necessity of cooperation between the producer and the processing plant. The condition for the development of production is that these traits are compensated for by the price of the product or subsidies to the farmers involved in the production of milk. [13] Owing to the above mentioned characteristics, changes in the structure of production on the farm usually require time, with the greatest influence on the decisions made are the profitability of the production and the possibility of selling the products [7].

The market for agricultural raw materials operates in line with market economy principles but is characterized by higher volatility than other markets. The prices, according to the law of demand and supply, act as regulators of market processes

[12]. The supply situation in this market was influenced by the milk quota resulting from the CAP, which was finally lifted in 2015/2016.

In previous years, the amount of milk quotas for the following marketing years was determined by Council Regulation (EC) [1, 11]. Under these regulations, the national amounts were increased by 1% in subsequent quota years up to the 2013/2014 quota year. From the year 2004/2005 until the end of the milk quotas period, the milk quota for the newly admitted countries grew slightly more than for the majority of the so called "Old members" and for the Czech Republic this increase was 9.4%, Poland - 12.2%, Slovakia - 10.1% and Germany and France - 8.8%, [10].

Following the expiry of milk production quotas by the end of 2015, the European Commission decided to solve a possible imbalance between the supply and demand of milk aimed at reducing milk production in 2016 and 2017. Its aim was to maximize the drop in milk prices that could have been caused by its increased production. The European Commission earmarked EUR 150 million for this scheme. This amount reduced a milk production in the European Union of approximately 1.07 million tonnes. The amount of aid per 100 kg of milk, which is not delivered to the market, was 14 euros [5]. From November 2016 to January 2017, 48 288 milk producers reached a total production reduction of 860 907 tonnes of milk. [2]

This scheme caused stop decreasing trend of purchase price of milk and, together with rising demand, started increasing trend of its prices from EUR 29/100 kg in 2016 to EUR 35/100 kg in 2017. [3, 9]

The milk market (supply and demand) is constantly expanding and increasing. However, the increasing milk production in the EU is due not only to the end of quota in 2015 but also to increasingly popular automated milking systems for cows. [14]. For example, in Latvia during the last ten years farms involved in commercial milk production often had substantial modernization, the farmers are motivated to improve cows keeping and feeding. Thereby average milk yield per cow during the ten years has increased by 42% and the average milk price in has increased by 60% with variation during the seasons. [8] The growing demand is related, among other things, to a change in consumer behaviour caused by change in the social and economic factors affecting individual demand for milk [4]. Market of milk is a highly regulated market, which limited the increase in production and the possibility of exploiting the competitive advantages of individual countries.

2 Methods and sources of materials

The aim of the study is to determine the changes in the purchase and sale prices of milk in three selected countries, which joined the European Union in 2004 in Poland, the Czech Republic and Slovakia in comparison with the largest milk producers in the European Union. In particular, the subject of the study was an analysis of trends of changes, seasonal cyclical fluctuations for purchase prices and the volume of milk purchased in the analyzed countries.

In the paper a multiplicative model of time series analysis was used. The analyzed data covered the years 2005-2016. The study was mainly based on statistical data from Eurostat. Analysis was based on monthly data.

3 Results and discussion

The main producer of milk in the European Union is Germany. Their share in the years 2005-2016 was 20-21%. France had slightly lower and at the same time much more fluctuating share (16-20%). The United Kingdom was also the leading milk producer in the Union. In fourth place, but with a variable share not exceeding 9% was Poland. The Czech Republic share of milk production in the Union was quite stable and did not exceed 2%. Slovakia was in a distant position, with a declining share of about 1% of EU production to around 0.6% at the end of the analysis period. In Germany, France and Poland, the buying volume was characterized by a distinct upward trend, with the highest increase in Poland (by 26.2% in 2016 compared to 2005) (fig.1.2). In the Czech Republic there was a slight increase in purchases, but it was noted that apart from the last year of the analyzed period, the volume of purchases was lower in all years than in 2005. Of the analyzed countries only Slovakia had a negative trend in milk purchase volume, per year, on average of 13 thousand tonnes per year. As a result, in 2016, the purchase of raw milk for processing accounted for 85% of the purchase volume in 2005.

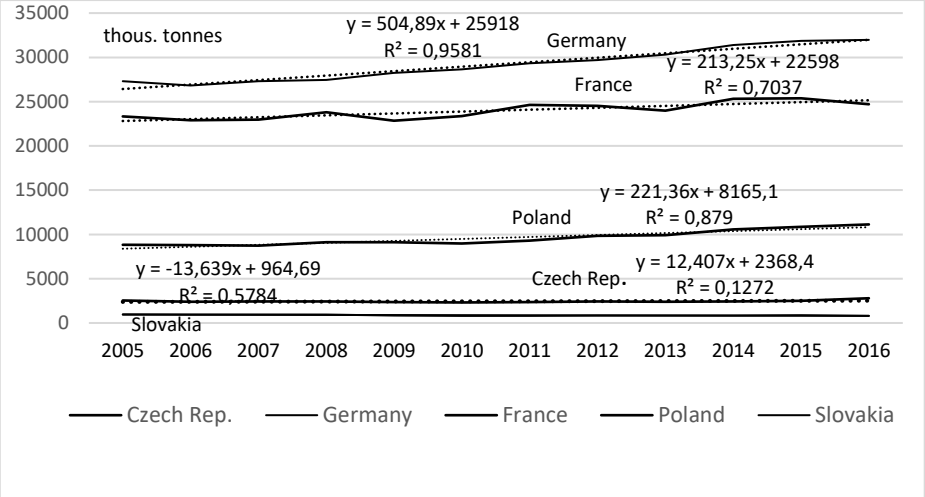

Fig. 1. Purchase of milk in selected countries in EU in 2005-2016 (thousand tonnes). [3,10]

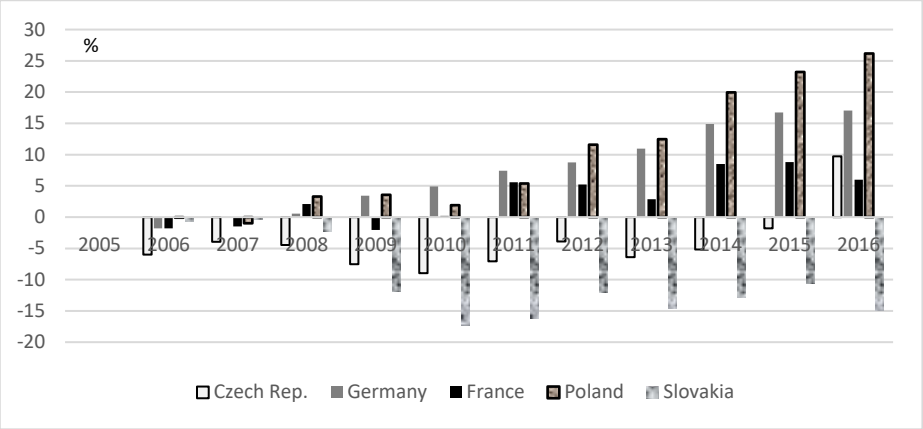

Fig. 2. Dynamics of changes in the volume of milk purchase in selected countries in EU in 2005-2016 (2005 =100%). [3,10]

Data analysis showed that there were no significant cyclical fluctuations in the purchase volume. A bit more variation of this type took place only on the French market. However seasonal fluctuations in the market are characteristic for this market. They are associated, to a large extent, with seasonal calving (periods of cows' reproduction), climatic conditions (diet change during spring and summer), herd level for multiple dairy farms and cow parity [6] (fig 3).

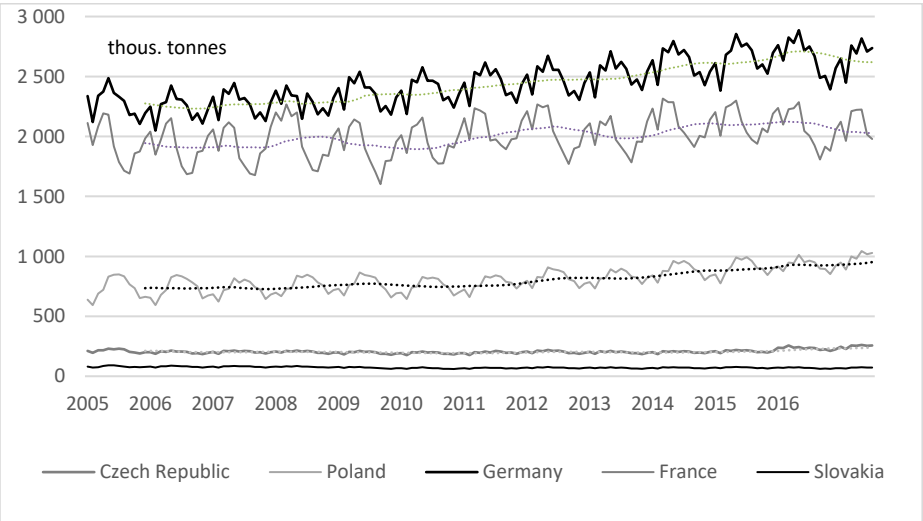

Fig. 3. Monthly milk volume changes in selected EU countries in 2005-2016 (thousand tonnes). [3]

Fig. 4 shows the average seasonality indexes for individual months for the whole 2005-2016 period. The obtained results indicate that in the analyzed countries the

distribution of the volume of purchases per year was similar. In most countries purchase volume above the monthly average was noted from March to August. In most countries, except Poland, higher than average purchases were also in January. In the remaining months of the year, to different extent, purchases were lower than the average. The scale of fluctuations in purchase volume in particular months of the year was usually in the range of +/- 10%. Higher fluctuations in particular months were recorded in Poland and France. Seasonality in the purchase of milk is a normal phenomenon, processing plants are prepared for these fluctuations. However, the smaller they are, the better the processing plants can function. There is no problem with periodic failures or excess of raw material, there is no need to create excessive stocks of finished products in the form of eg powdered milk.

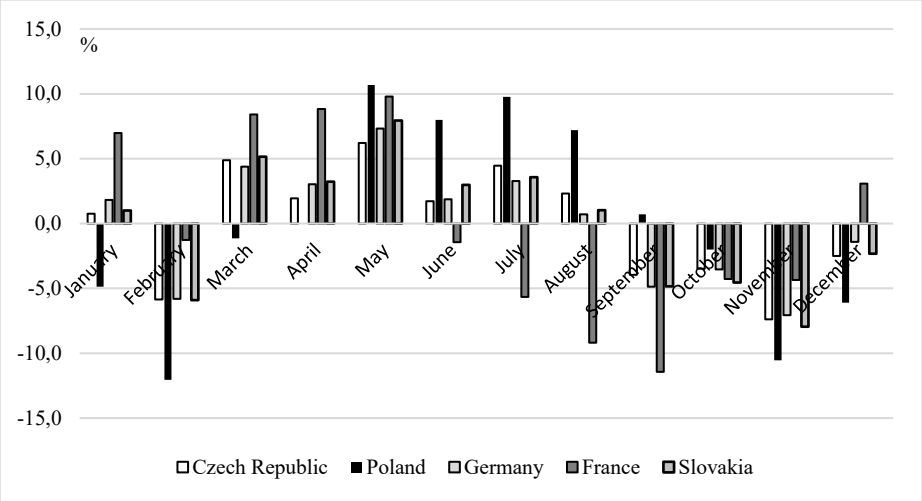

Fig. 4. Seasonal variation in milk purchase volume in particular months of the year in selected EU countries (2005-2016 average,%). [3]

The average seasonality values calculated for the following years show differences in variation between countries (fig. 5). (Due to the construction of this indicator and the lack of data on the purchase in 2004, it was not possible to calculate it for 2005). In most of the analyzed years, the purchases in Poland and France were slightly more volatile, with the value of these coefficients decreasing in the following years . Stable diversification in annual sales, at the level of about 4%, occurred in subsequent years in Germany. In the subsequent years, the seasonal increase of the milk purchase in the Czech Republic increased slightly from below 4% in 2006-2014 to around 5% in the years 2015-2016.

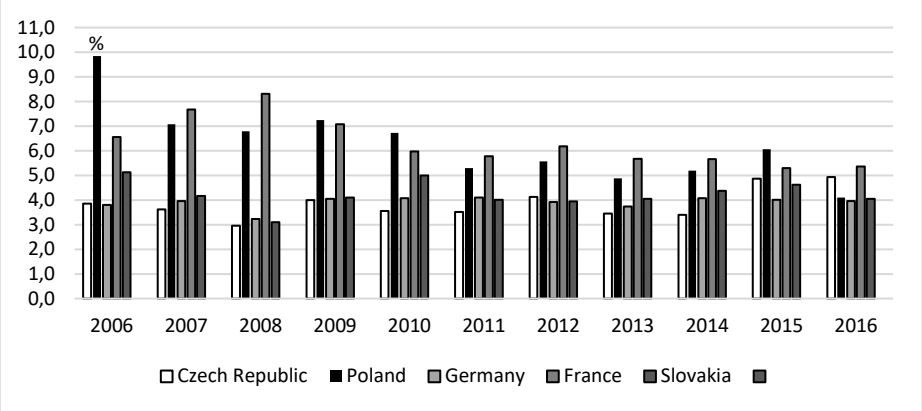

Fig. 5. Seasonality coefficients of milk purchase volume for particular years 2005-2016 (%). [3]

Compared to relatively small changes in the volume of milk purchased in subsequent years, significant price fluctuations were observed (fig. 6). However, in each month there was a clear tendency for them to be leveled between the analyzed countries. In the most analyzed months, prices for milk producers were favorable in Germany and France and the least favorable in Poland. This was true of both high and low prices. By mid-2007, ie in the first years after the enlargement of the Union, milk prices fluctuated to a relatively small extent. Very large price increases in all analyzed countries took place in the second half of 2007. After a short period of price hikes, they fell sharply to EUR 20-25 / 100 kg. For example, in Germany, the average monthly purchase price for October-December 2007 was around € 41/100 kg, and in July-September 2009 it was around € 22 / 100kg. After this period the milk market was very unstable in the months following, despite the regulations in force in this market.

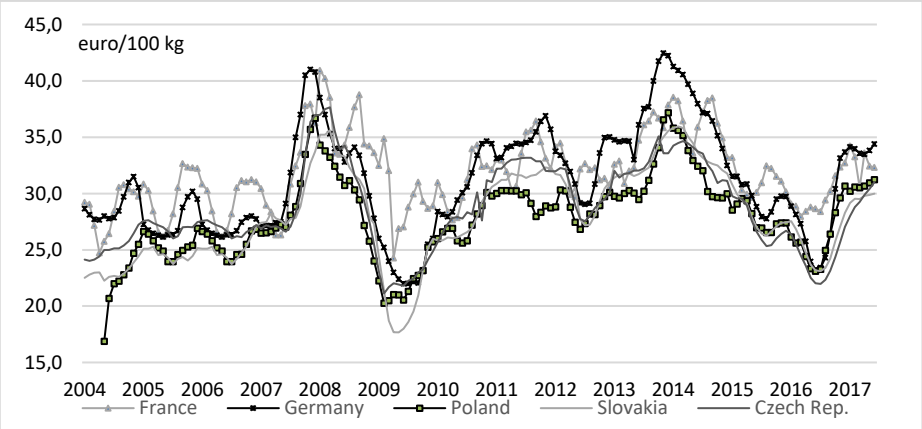

Fig. 6. Monthly milk purchase prices in selected EU countries for 2005-2016 (%). [3, 9]

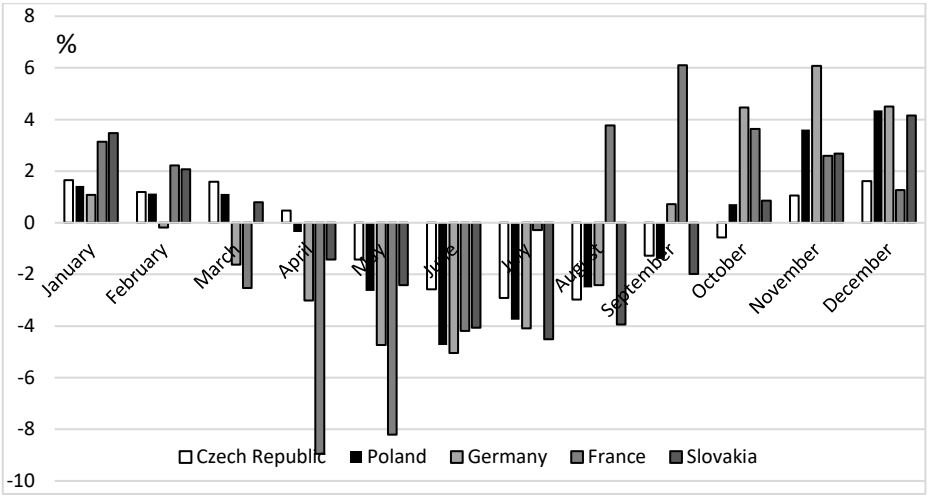

Fig. 7. Seasonality of milk purchase price changes in individual months of the year in selected EU countries (2005-2016 average,%). [3, 9]

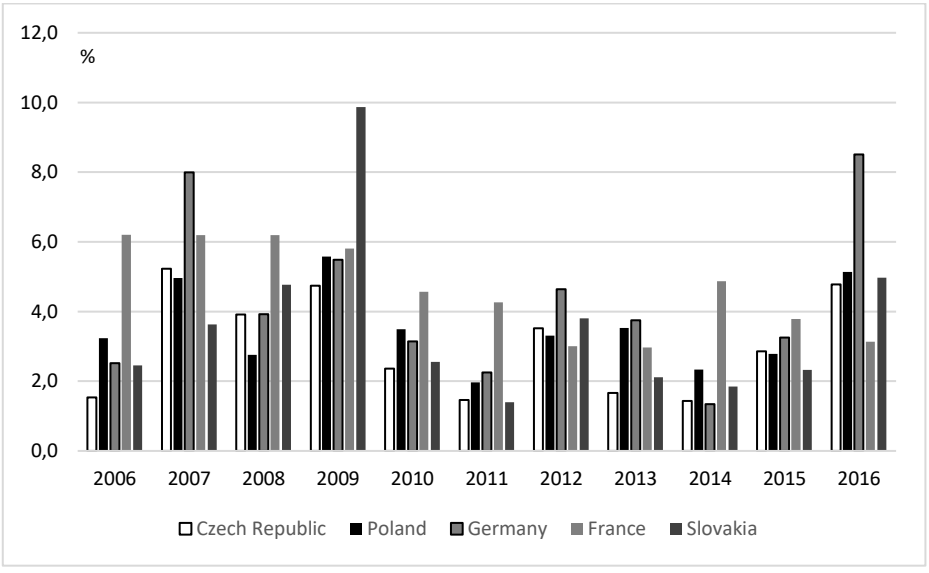

Fig. 8. Seasonality coefficients of milk purchase prices for individual years 2005-2016 (%). [3, 9]

The data on average seasonality indexes of buying and selling prices by month in the analyzed countries allow us to formulate a number of detailed conclusions (in order to facilitate comparisons, all figures are used in the same scale) (fig. 9).

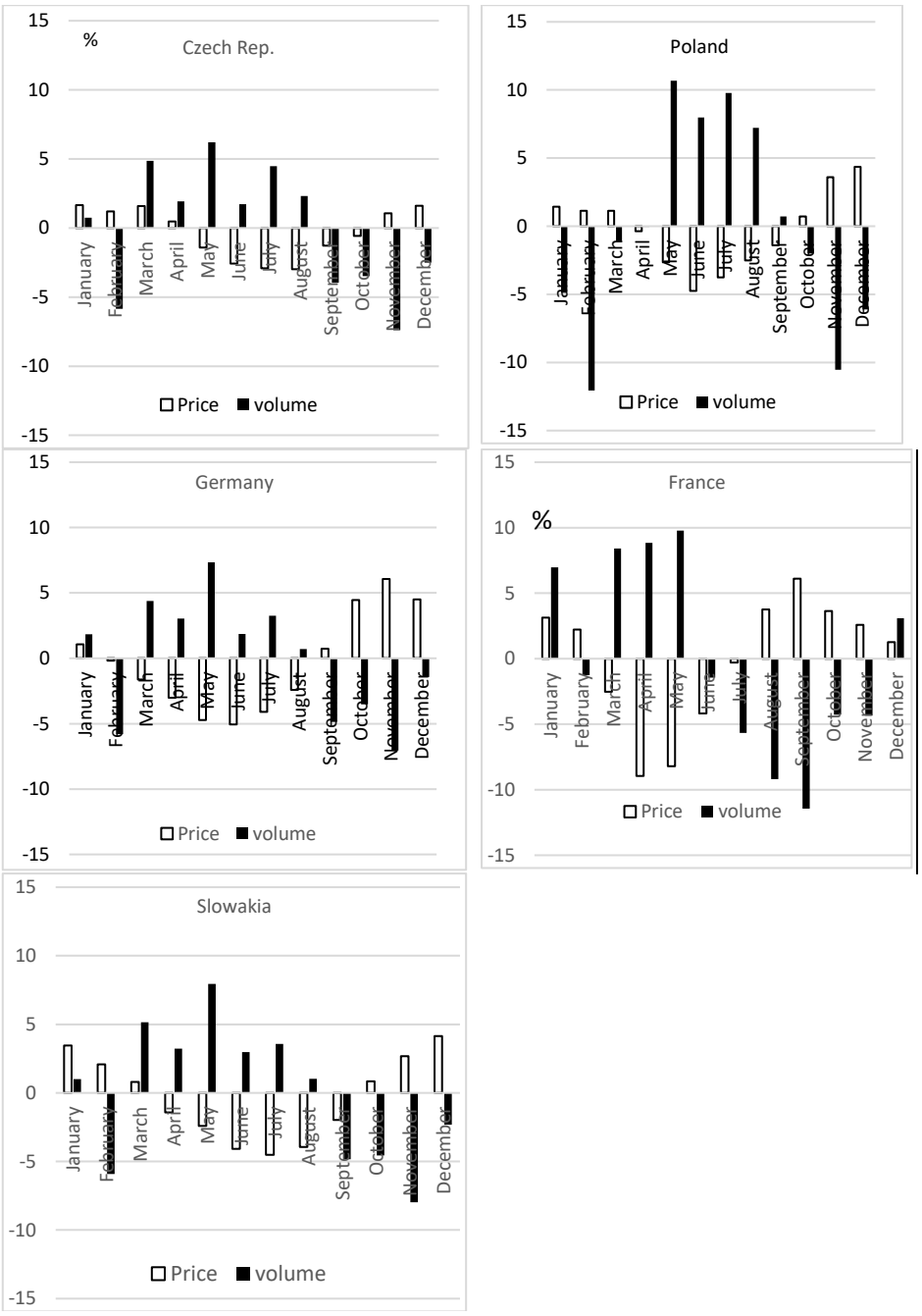

Fig. 9. Average seasonality coefficients of milk and milk seasonality in individual countries in 2005-2016 (%). [3, 9, 10]

- In all countries there were close links between buying prices and buying volumes. This demonstrates the regularity of the changes in the scale of the year and the rapid reactions of the market to changes in raw material supply.
- In each of the countries surveyed, seasonality rates for purchase prices for individual months are generally lower than the corresponding purchasing rates. This is probably the result of regulations in force in most of the analyzed years.
- Based on the fluctuations, these countries can be divided into two groups. Milk markets in the Czech Republic, Germany and Slovakia were more stable compared to the Polish and French markets.
- Seasonal changes in the French market are different from those in the other analyzed countries.

4 Conclusions

The milk market in the EU is a specific market due to its existing conditions resulting from the Common Agricultural Policy. The supply situation in this market was influenced by the quotation of its output, which was finally lifted in 2015/2016.

The main milk producers in the EU are Germany, France and the United Kingdom. Poland was in fourth position in the analyzed years but its shares were much lower than Germany's and did not exceed 9%. The shares of the Czech Republic and Slovakia were much smaller. Germany, France and Poland's share in total milk production in the EU increased, while in the Czech Republic and Slovakia they were characterized by stagnation or decline.

The milk market is characterized by seasonal fluctuations in the volume of purchases in particular months of the year. In most of the countries analyzed, the distribution of annual sales was similar. Significant differences were observed in France. More important differences occurred in the case of the scale of these fluctuations. Larger scale fluctuations were observed in Poland and France, but in subsequent years there was a tendency to decrease their scale. In the Czech Republic, there was a slight uptick in the subsequent years to increase the diversification of buying in the coming months. The most stable and predictable fluctuations occurred throughout the analyzed period on the German market.

Compared to the relatively small changes in the monthly milk purchase volume in the following analyzed years there were significant fluctuations in the price of its purchase. At the same time there was a tendency to level the price between individual countries. In most of the analyzed months, prices were slightly higher for milk producers in Germany and France. However, significant price changes in subsequent years are not favorable for both milk producers and processors, and may favor decisions to withdraw producers from this direction.

By analyzing the average values of the seasonality coefficients of purchase prices compared to the corresponding indexes for the volume of purchases, it can be concluded that in the case of buying volume in most analyzed countries there was a slight tendency to decrease them in subsequent years. The average values of seasonality coefficients of purchase prices of the analyzed countries significantly

decreased between 2010 and 2015. In 2016, there was a resurgence of their size in most of the analyzed countries, except for France.

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Trends in Financial Management of Municipalities in Conditions of the Slovak Republic

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Abstract. Changes in the socio-economic conditions of countries initiate modifications in the management of its economic and social processes, which are also followed by conversions in the public administration. At the same time, they are also looking for the concepts of rational organization and effective management of the public administration. The public administration of the Slovak Republic is created by local self-government and regional self-government. Municipalities represent the local self-government bodies. The effective conditions of the municipalities are creating the effective setting of its financing. Until 2004 the financing of municipalities was determined annually by the state budget act and for the municipalities distributed from the state budget a share of the tax of personal income, which consisted of three taxes: tax of personal income, tax of the corporation income and road tax. In 2005 the fiscal decentralization took place in Slovakia as a part of the consolidation of public finances, resulting in a new way of financing municipalities. The basis of the new financing system of municipalities was to determine the tax of personal income as a single share tax, in particular, because the dynamics of the income of this tax was expected to grow even in the medium term. The objective of the paper is to evaluate changes and trends in the financial management of municipalities based on selected fiscal indicators within the period 1993 – 2015.

Keywords: Financial Management, Municipalities, Fiscal Decentralization, Polynomial Trends.

1 Introduction

Public organizations are confronted with an increasing number of problems, facing increased pressure how to efficient respond for complicated complex social, economic and political challenges [3]. The changes that took place in the public administration, especially since the 1970s in Europe, progressively brought the application of new governance principles for the public administration. This was accompanied by the more demanding conditions of economic development in the member states of the European Community. A well - functioning public sector is considered to be

necessary for the economic and democratic performance of countries. Recent public sector reforms have been attempted in each countries to achieve a better performing public sector [18]. The public administration had to cope with the limited financial resources available to it from state budgets. The idea of building a local public administration on a self-governing basis was crucial in terms of strengthening the citizen's political status in the development of democracy [5]. The first democratic elections to the self-governing bodies, which took place on 23 and 24 November 1990 in Slovakia, created a new space and conditions for the restoration of civic activities and the development of local democracy. The Law No. 369/1990 Coll. about the municipal establishment defined self-governing functions of the municipality, which started to act as a legal person. Instead of the centralist principle and the top-level directives, it has begun to apply the principle of subsidiarity. Under this principle, it is necessary to manage public affairs and conduct them at the level closest to the tasks and the problem.

The period 1989-1990 was important for the local self - government in Slovakia and brought to municipalities greater opportunities to influence their socio-economic development of their area. Before 1989, in Slovakia there was applied the central model of public administration; in the current period it is a dual model. In practice this meant the establishment of self - governing bodies at the local level and then at the regional level. Municipalities as representatives of the local self - government bodies in the process of the reform of public administration received from 1990 to the present about 4,000 competencies that are required to perform in relation for the inhabitants. The first competencies were the registers that the municipalities and towns gained to competence in 2001. The following year, municipalities and towns gained to competences in the regional education. Municipalities started to use the possibility of entrusting the municipal property to managing administrators in the process of reform of public administration, because one of outcomes was the transfer competencies from the state administration to local self - government in the selected services [e.g. education, health, social affairs, etc.], which have a direct impact on the quality of life in towns and municipalities. The civic and technical facilities, including the availability of basic goods and services, are currently one of the basic functions of the municipalities [in addition to the function of residential, work, protection and environment, recreational, etc.] which determine the future direction and development of municipalities [2]. But technical progress is not only simply a matter of investing into the physical or human capital, but it is also determined by its institutional environment [13]. In general, technical innovations are expected to bring higher economic effects than non-technical ones [21].

The significant milestone in the development of financing of the municipalities in Slovak Republic was the fiscal decentralization. The fiscal function of taxes is very important all over the world [19]. Fiscal decentralization represent the process of assigning tax and spending competences to various levels of government to achieve their relative autonomy and self-sufficiency [20]. Since 2004 in Slovakia has been decentralized the tax system, thereby enhancing the competencies in tax collection and tax collection for towns and municipalities [12]. Fiscal decentralization in the world [14] is seen as strengthening self-government revenues through their power to

determine the amount of taxes (in the form of local taxes or tax mark – up), while at the same time it is essential to ensure the territorial principle of these taxes (e.g. the self - government becomes the tax recipient where residents pay the tax).

Although, in the years 2002-2004 were handed into municipalities and higher territorial units important competences from the state and also the property, until since January 1, 2005, the system of financing of the local and regional self-government has fundamentally changed. Until December 31, 2004 have been paid to the municipal budget from the state yield from three taxes - tax of the personal income, corporate income tax and road tax. Corporate income tax currently represents the highest percentage of the total state budget incomes [4]. Since 1st January 2005 these three taxes replaced for one tax, namely the tax of personal income. The new municipal billing system as part of the reform of the public finance management will allow financial comparisons of public administration entities in the Slovak Republic with public administration entities that already use international standards.

2 Material and Methods

The main objective of the paper is to evaluate changes and trends in the financial management of municipalities based on selected fiscal indicators. We decided to analyze the time period 1993 - 2015 and divided years in two main parts: 1st period includes years 1993 - 2004 and 2nd period consists of years 2005 - 2015. Years of the first period are before the fiscal decentralization, when the municipalities received revenues from three taxes from the state budget: the tax of personal income, corporation tax and road tax. The second period [years 2005 - 2015] is after the fiscal decentralization and a single share tax for municipalities became the tax of personal income.

Financing of the tasks of the local self - government is a combination of own incomes and transfers. Their ratio depends on the ratio of the original competencies and the transfer competences from the state administration [10]. Financing of original [self-government] tasks is mainly realized from own resources. The costs of the transfer competences from the state administration are fully repaid by the state. The municipalities, as separate economic and legal entities, have the opportunity to perform their tasks over the framework of their competences if they have the means and the necessary level of professional and active human potential [1]. Municipalities' own financial resources are primarily tax incomes, which are made up of two basic components - income from the share tax, which is made from the tax of the personal income and incomes from local taxes. Municipalities use the income from the tax of the personal income primarily to ensure the original competences and since the volume of funds from this tax is closely related to the development of the economy at the state level. We use selected indicators and evaluate the effects of changes of the economy in the Slovak Republic and their impact on the financing of municipalities. Via regression methods we express non-linear modeling functions which are applied for evaluation of the development of selected financial indicators. The obtained statistical data will be processed by computational and graphic tools of MS Excel. In

graphs we modified the scale on the y-axis for better illustration. The figure for the observed particular data parameter contains the equation of the trend line and the determination index.

According to the shape of the modeling function $y = f(x)$, depending on parameter x, the regression functions can be divided into linear and nonlinear type. Frequently, a linear estimate function is used in data analysis. But there are a lot of cases where non-linear estimates are required. In our case the examination of trends is based on the non-linear estimates and functions created by tools of MS Excel known as "trend lines". In data modeling we apply polynomial trends with the most appropriate grade of a polynomial. Polynomial functions are based around the formula

$$y = ax^n + bx^{n-1} + cx^{n-2} + \cdots + m, \quad (1)$$

where dependent variable *y* is expressed by independent variable *x*, *n* means the grade of a polynomial function and $a, b, c, \ldots, m$ are coefficients of a polynomial.

The verification of the correctness of the created regression model results in the calculation of the numerical characteristics, which in an exact form describe the quality of the calculated models. We use a determination index to verify the accuracy of the estimated non-linear function. The determination index is used to explain the regression quality, how much the regression of the actually measured value registers. The determination index has the following mathematics expression:

$$I_{YX}^2 = \frac{S_M}{S_C} = 1 - \frac{S_R}{S_C}, \quad (2)$$

where S_M represents the theoretical sum of squares, S_C is the total sum of squares and S_R is the residual sum of squares. The determinations index can take values from 0 to 1. As the index value approaches 1, the larger part of the total variability is explained by the model [y depends on x]. Conversely, if the determination index is close to 0, the lesser the total variability is explained by the model. The determination index is often used as a criterion of the choice of a particular regression function.

3 Results and Discussion

Gross domestic product, unemployment, inflation etc. (as the basic macroeconomic indicators) are used to measuring and comparing the performance of national economies. Their development is determined by other macroeconomic indicators and they are significantly interlinked. Unlike gross domestic product, unemployment or inflation presents a social phenomenon which, in addition to many negative social consequences, causes economically quantifiable losses. [17]. In the assessment of development of GDP, it is possible to see an annual increase in the period 1993 - 2008, the economic crisis was reflected in Slovakia's conditions by slowing economic growth in 2009 (GDP decline in this year compared to the previous year was 6.52%, which represents 4468.5 mil. €). Since 2010 GDP growth is increasing year on year (Fig.1). Year 1993 was the important time point of the recession in the Slovak

economy due to changes in the transforming economy but also to the consequences resulting from the division of the former Czech-Slovak federation. The following years 1994 - 1995 were the years of economic recovery and macroeconomic stabilization of the country with relatively rapid economic growth, which was not linked to deepening macroeconomic imbalances.

The year 1996 represented continuing positive trends of the basic macroeconomic indicators (economic growth, inflation, unemployment). Despite the fact that 1997 and 1998 were characterized by an increase in the rate of inflation and an increase the pressures in the economy, in this period, economic growth was maintained mainly at the cost of a rapid growth in the debt of the Slovak economy and the deficit financing of public expenditures.

Developments in the main economic areas in 2000 indicated a tendency to improve the performance of the economy compared to 1999, which was mainly reflected in increasing the dynamics of GDP growth, favorable developments in inflation and improving developments in external economic relations. In the next two years, the growth of the Slovak economy continued to increase despite the slowdown in the global economy. The economic development in 2003 was marked by the preparation of major economic reforms and the implementation of several partial changes, particularly in the health and social system. Despite the light performance of the EU economy, Slovakia's economic growth remained at a comparable level with 2002. The main objective of the fiscal policy of the Government of the Slovak Republic in 2004 was to ensure that implementation of the budget in 2004 was another major step towards target the Maastricht criteria for joining the Euro area. The implementation of the Euro currency was the most important theme in Slovak country. At the end of the year 2007, only 14% of Slovak companies were prepared in the terms of the Euro adaptation in information systems. Also in 2004 the positive macroeconomic development continued, which was supported by structural reforms in the area of public finances [6].

Any intervention of the government has its effects, whether intended or non-intended. The government may decide upon the optimal form and way of intervention if it is aware of the individual effects of the decision, e.g. financial, economic, political, legal, social or health-related, etc. [15]. The growth of the Slovak economy in 2005 again increased despite lightly recovery of the EU economy and reached the highest value since 1996. In 2005, could manifest direct or indirect repercussions of the reforms implemented in particular in 2003 and 2004. These are mainly the effects of the tax reform applied since January 1st, 2004 and then the pension reform applied from January 1st, 2005, social and labor market reforms public administration reforms with fiscal decentralization and public finance management reforms, which brought the introduction of severe budgetary constraints, the operation of the Treasury and the Agency for Debt and Liquidity Management. In 2006 Slovakia recorded the most dynamic growth among Central European countries. A similar scenario is repeated over the next two years. In 2009, as a result of the economic crisis, GDP fell by 4.7%. This development reflects the impact of the economic crisis, which brought a significant weakening of foreign demand of our most important trading partners, which caused the declining dynamics of Slovak exports and industrial production,

declining dynamics of the labor market and total domestic demand. The strong euro caused that Slovak exporters annually lost a few millions euros threated their employment and competitiveness [16]. As a result of the revival of the German economy, year 2010 marked a significant recovery in economic growth for the Slovak economy compared to the previous year. Economic growth continued in the next two years. In 2013 GDP growth slowed compared to the previous period. The change occurred in the following year, when GDP growth accelerated to 2.4%. Higher growth was driven mainly by a recovery in domestic demand.

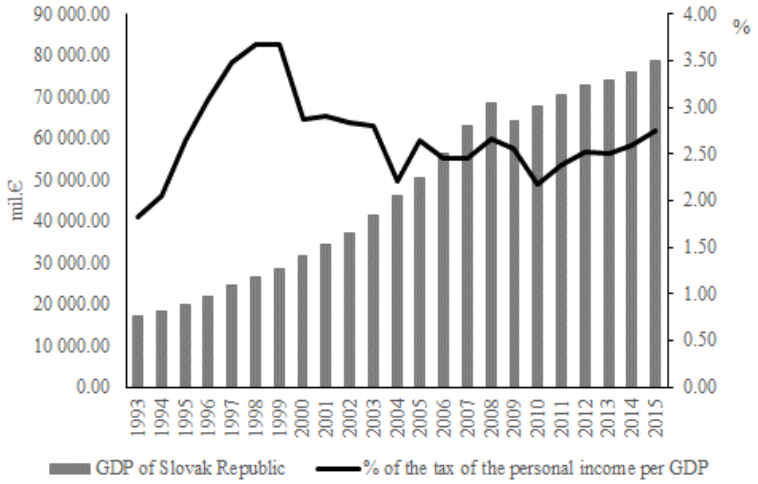

Fig. 1. Development of the GDP and the share of the tax of the personal income per GDP in the Slovak Republic in the period 1993 – 2015.

The volume of selected funds received through the tax of the personal income changed during the monitored period. In the period 1993 - 1999, we recorded an annual increase in the total volume of this tax, which was also reflected in the annual increase of this tax of the share of GDP. The change occurred in 2000, when the yield from the tax of the personal income dropped by 142.6 mil. €, which is representing a decrease of 0.81% (Fig.1). This decline was due to the adoption of Law No. 366/1999 Coll. about the income tax with effect from 1st January 2000, which reduced the tax of the personal income and tax of the corporate income (from 40% to 29%). The reduction in the tax burden on both natural and legal persons was reflected in the reduction of the budgeted and also achieved revenues of these taxes. Over the next three years, it is possible to track the growth again of the tax of the personal income. The change occurred in 2004, when, following the amendment of Law No. 595/2003 Coll. [9] on income tax which replaced the law No. 366/1999 Coll. [7, 8], which brought a tax reform that substantially changed the tax system in the country and resulted in the transfer of the tax burden from direct taxes on indirect taxes and the introduction of a uniform 19% tax rate for both individual and legal persons. The introduction of a uniform tax rate also involved a change in the method of calculating

non-taxable parts of the tax base. In 2005, compared with the previous year, the volume of funding from tax of the personal income increased, mainly as a result of wage base growth. The Ministry of Finance of the Slovak Republic states that in the same year the wage base grew to 11.2%. In the next three years (2006, 2007 and 2008), the amount of funding received from the tax of the personal income increased each year. The above-mentioned annual growth was mainly driven by positive macroeconomic developments accompanied by a rise in the wage base. In 2008 to the introduction of a gradually decreasing non-taxable share of the taxpayer's base for 2007, which was fully demonstrated in the tax returns in 2008. Changes in the development of the tax of the personal income occurred in 2009 and 2010, when the tax of the personal income declined, in accordance with lowering household incomes due to the deterioration of macroeconomic developments caused by the global economic crisis. In 2011 the situation changed again; there was an increase income from the tax of the personal income due to the gradual improvement of macroeconomic developments. In spite of the revival of the world economy after the crisis, its impacts in the conditions of Slovakia came with a certain time delay, caused mainly by the economic orientation of the country. In 2012 labor market developments worsened and GDP growth slowed as compared to forecasts, resulting in a slight decline income from the tax of the personal income. In the period 2013 - 2015 it is possible to monitor the annual increase income of the tax of the personal income, which is the result of the growing economy of Slovakia. In the period of financial and economic crisis municipalities have only limited possibilities for autonomous control of the income amount by their own tax and financial policy. Even though, this method is intensively used by many municipalities.

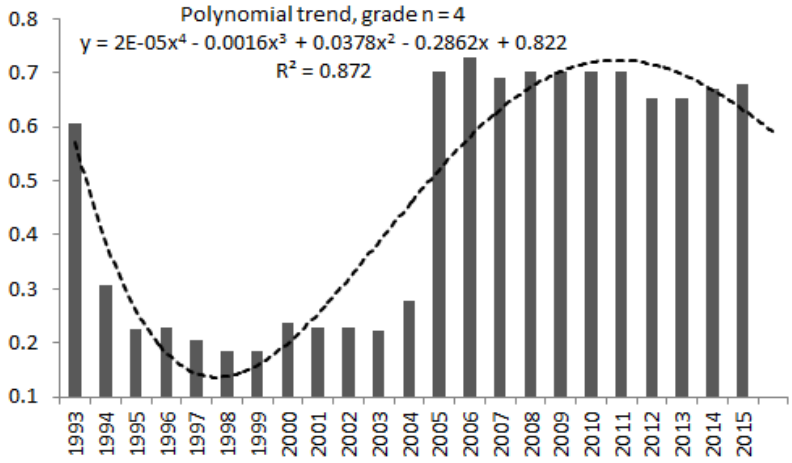

Fig. 2. Development of the Ratio indicator (municipal income from the tax of the personal income / yield of the tax of the personal income) in the period 1993 – 2015.

Changes realized in the context of fiscal decentralization also reflect development of the Ratio indicator on the Fig. 2. The evolution of the coefficient can be divided into

2 stages. The first stage consists of the years 1993 - 2004, it means before fiscal decentralization and the second stage consists of years 2005 - 2015, after fiscal decentralization. The ratio indicator is modeled via the polynomial trend of the 4th degree, where the coefficient of determination is 0.872 (it expresses the suitability of the used trend model). Based on this, we can predict that there will be a decline the Ratio indicator in the coming period.

Financing of municipalities was determined annually from 2004 by the State Budget Act. Since 2005, about dividing income tax on personal income between municipalities is not decided the parliament, but the Government by the regulation. The positive aspect of this process was also the underflow of the municipalities, which to fear that they would receive less funding than before fiscal decentralization. Already in the first year municipal income from this tax increased more than three times compared to 2004. In this case, we can state that the choice of the tax of the personal income as a single share tax was correct. We can see an increase in income from this tax until 2008, which was also a result of the economic growth of the Slovak economy. Despite the fact that in 2009 the financial crisis took place and the total volume of selected funds from the tax of the personal income was reduced, there was no reduction of the coefficient in relation to municipalities. However, for the sustainability of the system, the Government has reduced the volume of funds distributed in the form of a share tax to municipalities in 2012. As a result of the improvement of the economic situation of Slovakia in 2014 and 2015, the coefficient was increased. The last change in the redistribution of the yield of the tax of the personal income occurred on January 1st, 2016, when 70% was reallocated to municipalities, 23.1% to HTU and 6.5% to the state.

From the analyses resulting, that the implemented fiscal decentralization brought on the one hand the increase of the financial autonomy of the municipalities and created a space for obtaining financial resources from own revenues. On the other hand, it contributed to the increase of the municipalities' dependence on the incomes from the state budget. While in 2005 the tax of the personal income made 34.8% of total municipal incomes and 57.2% of tax income, in the following year the tax of the personal income made more than 80% of tax income. This share is in the long run ranging from 70% to 80%.

Despite the fact, that the state has distributed three types of taxes from the state budget to the municipalities because of fiscal decentralization, at that time the largest share was income from the tax of the personal income (in 1993 it was 94.55%). Until 2005, the share of the tax of the personal income had a fluctuating trend and a year before when realized the fiscal decentralization the share reached 42.89% (Fig. 3).

Since 2005, the share of the tax of the personal income has increased significantly on the tax incomes of municipalities. One of the reasons why realized the fiscal decentralization was also the increase of the municipal autonomy and the creation the space for obtaining financial resources from own incomes. However, fiscal decentralization on the one hand brought more funds to their budgets but, on the other hand, contributed to the increase of the municipalities' dependence on the incomes from the state budget. While in 2005 the incomes of municipalities from the tax of the

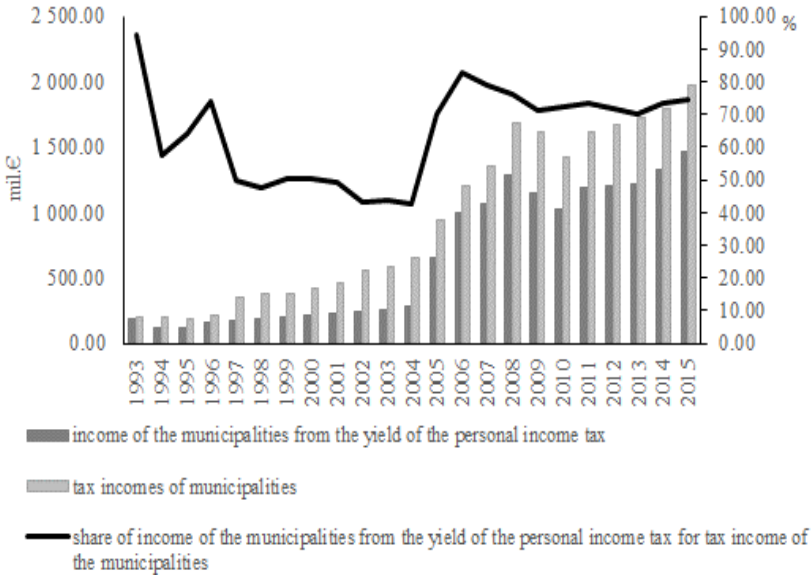

Fig. 3. Development of selected financial indicators of municipalities in the period 1993 – 2015.

personal income constituted 69.98% of tax incomes of municipalities, in the following year the income from the tax of the personal income created on tax incomes of the municipalities 82.78%. This high dependence of municipalities on the yield of the income from the tax of the personal income causes problems for municipalities when change the share of the tax of the personal income. Therefore, as a result of the implementation of consolidation measures, municipalities also require the state to return to 70.3% share of the tax of the personal income. However, the last adjustment of the coefficient valid since January 1st, 2016 has reached 70% share of the tax of the personal income for municipalities.

Taxes incomes of municipalities be creating by the share tax and the local taxes. The system of the local taxes also changed in the process of fiscal decentralization. Both these changes positively influenced the total amount of tax incomes, which increased 1.8 times in 2006 in comparison with the previous year. Taxes incomes of municipalities represent the significant share of total current income. The lowest share of tax incomes was in 1995 and 1996. The first extreme (local maximum) was recorded in 2001 (about 51%) and then is followed by a significant decline. After 2005, we see an increase of the share until for the next extreme (local maximum) in 2008 (about 61%). In years 2009 – 2015 the development of indicators can be considered as balanced in the range 53 – 58% (Fig. 4).

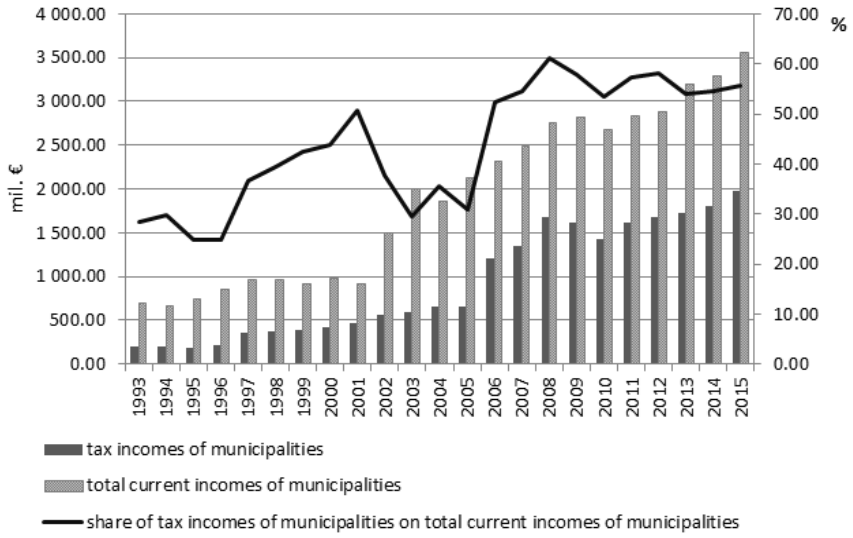

Fig. 4. Development of selected financial indicators of municipalities in the period 1993 – 2015.

4 Conclusion

The basic objectives of the fiscal decentralization presented by the Ministry of Finance of the Slovak Republic [11] in the introduction of the fiscal decentralization into practice were: autonomy, accountability, justice and transparency. These four important phenomena should lead to the fulfillment of the essence of the fiscal decentralization, namely increasing the financial autonomy of municipalities. The principle of autonomy was that municipal authorities realized autonomous decision-making about using of their own incomes. This objective has been fulfilled because municipalities decide on the use of funds for their activities, except for purpose-bound financial resources that come from the state budget for the transferred state competences, respectively purpose-bound subsidies. Fair and responsible decision-making about the direction of public finances at the municipal level is in the hands of elected representatives of municipalities, who are not only involved in budgeting process but they also control the subsequent use of all funds, in order to ensure efficiency and also to improve the quality of life of inhabitants in the area.

The goal of transparency should be achieved through fiscal decentralization with the objective statistical indicators used to redistribute funds from the state budget. The set criteria for the calculation of the distribution of the share tax respects the competences of the self-government, taking into account their weights and the specifics of the individual territorial units (altitude, size of municipalities, presence of schools and school facilities in the municipality, etc.). However, the most important criterion for reallocation of this tax at municipal level is the number of inhabitants with permanent residence in the municipality, which suggests that municipalities can

roughly predict the amount of the funds they receive in the form of the tax of the personal income. From this point of view, fiscal decentralization fulfilled its basic objectives because local self-government, through its elected representatives decides about the using of public funds independently, responsibly, fairly and transparently.

However, on the other hand, fiscal decentralization did not meet expectations in the area of financial autonomy of municipalities. The yield of the tax of the personal income share constituted 74.52% of the total tax income of the municipalities in 2015 and accounted for 41.46% of the total current incomes. As it is income that is closely linked to economic development, any negative developments at the macro level can cause a decline in yield, which negatively affects the overall financial performance of local self - governments. Such a negative example was also the economic crisis, which caused almost collapse in small municipalities, if the state did not help financially. It is therefore questionable whether the redistribution of only one tax on the part of the state represents the path to sustainable financial management, and whether it would not to be appropriate to consider other options which, in the event of adverse macroeconomic developments, would not have such a huge impact on the economies of municipalities. One of the options for a sustainable funding system is the idea of a mix of multiple taxes that emerged right in the years of the crisis.

The reform of the public administration in Slovakia has not been finished yet. At present in Slovakia the state administration reform is undergoing with the name ESO (Effective – Secure – Open State Government). Resulting of this reform will be restructuring, improvement and optimization of services provided by the state administration to inhabitants. Upon completion of the state administration reform, it is assumed that the reform will continue at the self-government. Since 2004, there has been a debate on municipal reform, which should result in the consolidation of the settlement structure of the municipalities. In the case if the consolidation of the settlement structure was realized, it would be probably followed by the change of the financing of local self-government.

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Social Responsibility Business as a Modern form of Business Ethics

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Abstract. Corporate social responsibility (CSR) only recently found its foothold in the businesses, therefore there is not a single definition that would describe what the business social responsibility really is. That is why the authors choose to illustrate the numerous definitions of this notion that are present in subject literature. In the light of the growing importance of corporate social responsibility many organizations and institutions, both on national and international level, took measures to promote this idea. Further section of the paper is devoted to those initiatives. In summary: the authors discuss the topic of CSR development in Poland. The origin of this idea in our country dates back to 2001, to the Global Compact initiative. Ever since then there are actions aiming at developing this idea, both on governmental and NGO levels, as we have since witnessed the creation of NGOs promoting the CSR idea in our country. What is also worth stressing is the presence of one of world's few RESPECT stock exchange indexes, which indicate corporate involvement in CSR. The paper aims to explain business social responsibility. The study uses the descriptive methods. It consists of isolating and describing the respective approaches to business social responsibility.

Keywords: Corporate Social Responsibility, Index RESPECT, ISO 26000, Stakeholder.

1 The development of corporate social responsibility

The origins of corporate social responsibility (CSR) date back to the 1930s. Then, in the United States of America for the first time people considered that business in addition to their goals should be also responsible for what is happening in its environment. About 20 years later, in the 1950s, there has been a further thought on the features of companies in today contemporary economy. Then there is Howard R. Bowen has defined "social responsibility" as „the obligations of businessmen to pursue those policies, to make those decisions, or to follow those lines of action which are desirable in terms of the objectives and values of our society" [1]. Spreading this idea in business had to wait yet another 40 years and only since the

1990s companies have increasingly noted its role both as a basic element of the economic system, as well as promoting social development in all its aspects. The action of this scope took place first in the United States of America, Western Europe and Japan, and then, with the development of the process of globalization, has started to spread to other countries. Corporations from those countries share their ways of doing business, including the idea of corporate social responsibility, to other areas. In this way also the CSR was transferred to companies in Poland.

The company's socially responsible are mainly companies that comply with applicable law. Of course, this is not a sufficient condition, because the law is required by legitimate organizations. In addition, socially responsible organizations voluntarily take into account in its activities the societal interests, protect the environment and maintain good relations with all stakeholders. Stakeholder is the one on whom the organization of their activities affected, as well as whoever the activities of the organization affected. Responsibility as effective management strategy is based on social dialogue at the local level, contributes to the growth of competitiveness at the global level and at the same time shapes the conditions for sustainable social and economic development [5].

In 1991, Carroll presented his CSR model (see fig. 1) as a pyramid and suggested that, although the components are not mutually exclusive, the manager should see that the different types of obligations are in constant tension with one another. Carroll suggested a model that contains the following four categories of corporate responsibility in decreasing order of importance: economic - being profitable, legal - obeying the law, ethical doing what is right and fair and avoiding harm, discretional / philanthropic being a good corporate citizen.

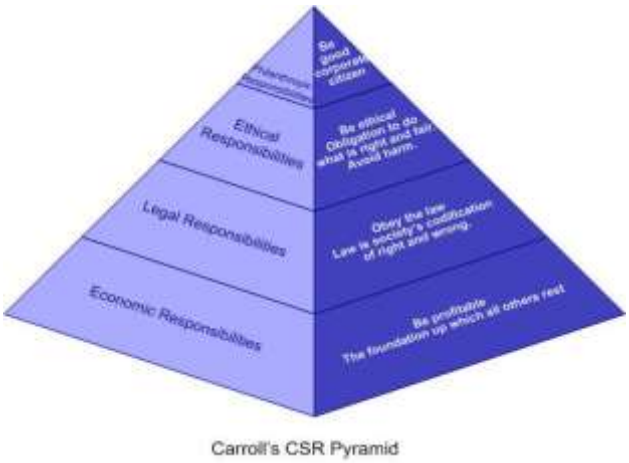

Fig. 1. Carroll's CSR Pyramid [3].

In the literature there are two dimensions of corporate social responsibility. The first one is internal and covers:

- the management of human resources (equality of workers, workers participation, that is, employee involvement in decision-making, the development and improvement of qualifications, fair wages, supporting employees in balancing family responsibilities with work),
- the ethical programs for employees (e.g. ethics, ethics training, the appointment of the Ombudsman, affairs ethics, procedures in the event of a breach of the code of ethics),
- health and safety at work, quite often defined as safety in the workplace (e.g. in addition to the required by law – safety work in the enterprise, various forms of health care for employees),
- the ability to adapt to change (e.g. to taking into account the interests of all the parties in the case of restructuring, so as to minimize its negative effects, employment flexibility, the policy of releasing employees – for example: outplacement),
- environmental management (e.g. reducing consumption of energy, water, waste management procedures which allows the systematic reduction of negative company's impact on the environment); principles of corporate governance (e.g. transparency of information, the ways of the appointment and remuneration of supervisory board members).

The second, external, is covering:

- the local community, often referred to as the impact on local society (e.g. principles of cooperation with non-governmental organizations and other local partners, employee volunteer work, commitment to the chemteam, civic engagement, social investment),
- relationships with suppliers and customers, e.g. compliance with the timeliness of delivery and payment to suppliers, [19] monitoring quality, efficiently responding to customer complaints, and other partners, specifying the requirements associated with the use of systems of corporate social responsibility by suppliers or subcontractors, taking into account social and environmental aspects of commercial decisions, providing products and services of safer for the environment and people, anti-corruption); human rights, e.g. the commitment of companies to respect human rights no child labour, forced labour, non-compliance creating equal opportunities, fair trade policy); global environmental problems or the environment, for example: the greenhouse effect, climate change, technology to reduce the consumption of non-renewable resources [12].

2 The concept of corporate social responsibility - review of the definition

So far there is over one definition of that concept. Literature provides many different definitions of the concept of corporate social responsibility. International organizations or national institutions emerging in order to promote CSR and international initiatives are stated in their definitions. So you can read that "corporate social responsibility is a concept which holds that the company is responsible to the social environment for the consequences of their actions. Social environment includes all persons, groups of persons, organizations that receive directly the effects of enterprise activities or indirectly are interested in them" [11]. According to another definition social responsibility is described as the moral responsibility and obligation to account for its activities before the public [22]. Speaking of corporate social responsibility it can also be stated that this is "philosophy, which says that the company is a creation of society and as such should be involved in the initiatives of its local community; the company management should undertake such decisions and actions that contribute to both care for the interest of their own (as profit), as well as protection and to increase is social welfare" [5].

Canadian Commission for democracy and Responsibility corporate social responsibility defines as "the whole business relationship with all relevant stakeholders. This includes customers, employees, community groups, suppliers, owners/investors and competition" [2].

The World Business Council. Sustainable Development considers social responsibility for ethical behaviour, which is contributing to the economic development, which will be accompanied by improving the quality of life for workers and their families, the local community and society as a whole. It defines the social responsibility of business as a "continuous commitment of business to the ethical behaviour and contribute to economic development, while improving the quality of life of the workforce and their families, as well as the local community and society as a General" [20].

The European Commission, which has played a big role in the promotion of CSR in the European Union, considers social responsibility as a process in which companies manage their relationships with stakeholders, who can have an impact on their success in business [20]. What's more, the European Commission defines CSR as a concept according to which "the company voluntarily takes account of social and environmental issues in their business operations and relationships with stakeholders" [13]. It thus identified CSR as "the responsibility of enterprises for their impact on society". This impact is of the multidimensional nature and manifests itself not only in the business care environment, employees and working conditions. The role of CSR in today's economy for is to operate on the basis of similar value, seeing people in the processes of production, distribution and consumption and the implementation of the principles of corporate social responsibility in all areas of operation of the company [8]. One of the categories of CSR is the environment in which the company should engage in activities such as: reducing emissions, waste

management, wastewater management, limiting the consumption of energy and water consumption, etc.

Very important also the CRS definition determined by the standard quality, the ISO 26000. ISO 26000 is the international standard containing guidance on liability for the consequences of its activities visible in the society and the environment. This standard specifies that companies should take into account their activities, the Organization governance, human rights, worker rights, environmental issues, fair operating practices (e.g. fair competition or anti-corruption), consumer issues and social commitment and the development of the local community. ISO 26000 approved on 1st November 2010, indicates that "the strategy in terms of responsible influence on actions and decisions (products, services, processes) on society and the environment, through transparent and ethical behaviours that contribute to the development of sustainable prosperity, health, taking into account the expectations of stakeholders, law, consistency with the organisation [9].

Corporate social responsibility, ISO 26000, the commitment "of the Organization for the inclusion of social and environmental aspects in the process of making decisions and taking responsibility for the impact on decisions and activities on society and the environment. This means the behaviour of transparency and ethics, contributing to sustainable development, in accordance with applicable law and consistent with international standards. In other words, corporate social responsibility is built into the structure of your organization, practiced in its activities and takes into account the expectations of stakeholders" [4]. ISO 26000 is not a corporate social responsibility, but is kind of a guide how to make CSR.

The common element in all definitions is a broad category of stakeholders, that is, all those that in any way affects the activity of the company (that is, not only shareholders, but also the natural environment or the local community) and taking into account the interests of stakeholders by the socially responsible in their activities and reconciliation of sometimes conflicting interests of individual groups.

Regardless of different definitions and approaches it is assume that the corporate social responsibility means business socially credible, transparent, taking into account ethics and right, in the sense of responsibility for society, customer, environment, employee and investor. Caring for the natural environment takes a very important place in these ideas. With the implementation of CSR principles it is possible to build a positive image of the company and gain the trust and loyalty of its stakeholders, i.e. employees, customers, partners.

Initiatives to promote CSR

The increase in the role of corporate social responsibility gave rise to many international and national organizations to promote this idea. The first initiative in this area was the round table in Caux (1989). It’s made up of leading business representatives from Europe, the USA and Japan. The merit of this initiative was the adoption of a global policy in business, which involved running a business based on

ethical, with due respect for the rules in force in the countries of conducting business [15]. The Codex included general rules:

- "Responsibility: from liability to shareholders towards the concept of accountability to the stakeholders.
- Economical and socially responsible business impact: towards innovation, justice and the community.
- Business behaviour: going beyond the letter of the law to the spirit of trust
- Respect for the rules of law.
- Support for multilateral trade.
- Respect for the environment.
- Avoiding activities contrary to the law" [15].

In addition, the code also includes detailed rules that describe the basic obligations to stakeholders of the company.

A significant role in the promotion and implementation of CSR in the world was created by another initiative, which was taken in 1999 at the World Business Forum in Davos-UN Secretary-General Kofi Annan. It was named the Global Compact. You can join the initiative voluntarily by submitting your business to the Secretary-General of the UNITED NATIONS without having to prove that the company meets certain conditions. GC policies include 4 areas:

- Human rights: business should support and protect internationally recognized human rights, it shouldn't break (or not have) human rights;
- Labour standards: business should support freedom of Association and allow Right to negotiate collective agreements, eliminate all forms of forced labour, work towards the abolition of child labour, eliminate discrimination in employment and work;
- Protection of the environment: business should support preventive actions for the protection of the environment, take action to promote environmental responsibility, encourage the development and spreading of environmentally friendly technologies;
- The fight against corruption: business should work against all forms of corruption [10].

Currently, the GC is the world's largest voluntary initiative (with over 3 thousand companies from more than 100 countries) [14]. With belonging to the GC comes the obligation to develop the "annual report on the progress in the implementation of the ten principle of the Global Compact Initiative for stakeholders). GC includes 74 entities from Poland, the first of which joined the GC in 2001.

In 2000, the Global Resources Initiative (GRI) published guidelines that defined the indicators of compliance with the principles of responsible business (GRI Sustainable Reporting Guidelines. They have been updated in a year: 2004, 2006 and 2014. GRI include environmental, economic and social indicators. As in the case of the GC there is no way verifying now procedures comply with these guidelines [10].

Promotion of CSR was backed by the European Commission, who in 2001 published a green paper [6] on corporate social responsibility, which were guidelines for GC. The green paper defines the social responsibility of business as a "concept whereby companies voluntarily shall take into account the social and environmental aspects in its activities and in their relations with their stakeholders. Corporate social responsibility is a process by which companies manage relationships with various stakeholders who can have a real impact on the consent to their activities. (…) Thus, CSR should be treated as an investment, not a cost, as well as quality management. Companies can approach to CSR in a financial, commercial and social development, leading to a long-term strategy to limit the risks associated with uncertainty. Companies should carry out its social responsibility, both in Europe and internationally; including in the it supply chains your entire" [6].

What's more, the European Commission in the same year published the white paper "European Governance" (governance in Europe), in which it stressed the need to inform the public about the activities of the company and "green paper on consumer protection in the EU". In the following year (2002) programme actions were taken for the promotion of social responsibility (Corporate Social Responsibility: A Business Contribution to Sustainable Development) [10]. In March 2006, a message was posted under the title: "implementation of the partnership for growth and jobs: making Europe a leader in corporate social responsibility". In 2010, the EC stated that companies are beginning to implement CSR as a way to improve their image [144].

Overview of the most important international initiatives for the promotion of corporate social responsibility is presented in table 1.

Table 1. . Overview of the most important international initiatives for the promotion of corporate social responsibility [16]

Initiative	The main assumptions
Agenda 21	Agenda is a global action programme for the environment and development, adopted at the Earth Summit in Rio de Janeiro in 1992, this Program shows how to balance economic and social development with respect for the environment. A key role in the process of implementation of Agenda 21, the local authorities have to play.
Declaration of Rio Janeiro	Rio Declaration is a collection of 27 fundamental principles of sustainable development, which define and determine the rights and obligations of States and citizens to the environment and poverty. Records Declaration, referring to adopted w1982, the world of nature and the Brundtland Report Card from 1987, included e.g. 6 policy action programmes of the European Union

	and the European network of cities for sustainable development, and in Poland in the new Constitution (article 5), the statutory definition of sustainable development and in the basic strategic documents and, in particular, in the first (1991) and the second environmental policy (2000).
Business card for sustainable development	Business card for sustainable development is a set of 16 principles for creating environmental management systems in enterprises.
The OECD guidelines for multinational enterprises	The guidelines were developed in order to promote the idea that multinationals have acted in accordance with the policies of the countries in which they operate. Include many aspects of business, such as: transparency of information, competition, employment and employment, environmental protection, the fight against corruption and the protection of consumer interests.
The business rules adopted during the deliberations of the round table of Caux	The round table initiative from Caux presents social responsibility in the context of changes in the social, political and economic worldwide. Presents a set of rules based on the fundamental ethical values and defines the basic responsibilities of business in relation to stakeholders such as owners and investors, customers, suppliers, employees, and local communities.
Global Compact	The Global Compact is an initiative of the UN Secretary-General Kofi Annan, which is the call to the business world, to its business, led the 10 fundamental principles from the scope of labour rights, environmental protection and anti-corruption. Provides a unique forum for dialogue and learning. The initiative is not a regulatory instrument or a legally binding code of conduct, but the value of the platform created to promote knowledge about corporate social responsibility. The idea of a Global Compact is expressed in the 10 fundamental principles arising from the Universal Declaration of human rights, the Charter of fundamental legal principles of the International Labour Organization and the Earth Summit in Rio de Janeiro. 10 principles of the Global Compact: Human rights: the promotion of and respect for human rights, adopted by the international community; elimination of all violations of human rights by the company; Labour standards: respect for freedom of association, elimination of all forms of forced labour, abolition of child labour, effectively tackling discrimination in respect of employment; Environment: precautionary approach to environment, implement initiatives to promote environmental responsibility, attitudes the use and dissemination of environmentally sound technologies Anti-corruption: anti-corruption in all its forms, including extortion and bribery
Global Sullivan	Global Sullivan Principles are a set of rules aimed at ensuring that

Principles	the company will support the economic, social and political justice in the markets in which they operate. Are based mainly on human rights and the promotion of equal opportunities in relation to members of the communities in which the company actively functioning.
European Campaign 2005	Has the task of implementation of the Lisbon strategy of the EU in order to implement the agenda for corporate social responsibility business by launching the European campaign 2005 in the area of corporate social responsibility. The goal of the campaign is to 2005 500 thousand. Enterprises and partners for action to promote the idea of corporate social responsibility. It is of particular importance for the new EU Member States. It also provides access to solutions in the sphere of management of social responsibility and creates a set of practical instruments needed to use the full potential of the companies related to activities with the principles of corporate social responsibility.
Green Paper	Is a document synthesis the concept of corporate social responsibility at European level? The document defines corporate social responsibility as a concept, which the company voluntarily builds strategies based also on factors taking into account the social interests and the protection of the environment, and relations with stakeholders. The document also stresses the fact that corporate social responsibility can have direct economic importance. Stresses on internal and external dimension corporate social responsibility and the impact on social management and reporting system.
A renewed EU strategy for 2011-2014 concerning corporate social responsibility	As a result of the call, the Council and the European Parliament resulting from the Europe 2020 strategy, the European Commission has developed a new policy on CSR. The starting point is a strategic approach to corporate social responsibility and to propose, in this connection, the new definition of CSR by KE. This document as a main task, adopt: (1) to improve the visibility of the CSR and dissemination of good practices; (2) improving and monitoring the level of confidence in enterprises; (3) the improvement of processes in the field of self-regulation and co-regulation; (4) expansion of solutions, which can compensate for the enterprises to their responsible attitude; (5) improvement of social and environmental issues; (6) giving greater importance of CSR in the context of education, training and research; (7) stressing the importance of national and regional policies in the field of CSR; (8) a better adaptation of European and global approach to CSR.

Corporate Social Responsibility in Poland

In Poland, the first initiative on corporate social responsibility took place in 2001, during the first meeting of the Global Compact initiative. The development of CSR becomes especially visible after 2009, when the securities exchange index included RESPECT (it concerns companies with CSR strategies). The index RESPECT was created in November 2009 on Securities, one of the few in Europe and the world index of socially responsible companies. It was designed to increase interest in companies traded honours a commitment to CSR. Companies in the index are examined according to the definition of social responsibility. It is more stable than the other indexes on the stock exchange. The corporate social responsibility (CSR) team was established as a subsidiary body of the President of the Council of Ministers. As a result, the Steering Committee was formed, which incorporated Polish and international companies. This team had the task of promoting CSR, creating better communication and sharing best practices of corporate social responsibility in business and the development of the vision of sustainable development for Polish firms to 2050 [14], also environmental partnership Foundation [20]. In the year 2001 the Forum of responsible business, was held which at the moment is the largest non-governmental organization in Poland dedicated to promoting the idea of CSR.

It should be pointed out that Poland very actively was involved in the implementation of the idea of corporate social responsibility, as was the formation of agencies, Global Compact and Caux Round Table and creation of industry codes of ethics. The concept of CSR appeared in Poland together with international corporations that have moved their operating principles of the native countries to Poland.

The research made in 2011 by PwC shows that less than 40 percent polish enterprises engaged in CSR activities and only the 100 biggest companies created a management structure, implemented ethical codes and informed the environment of their activities in the field of CSR [18]. The solutions used the most frequently by the Polish companies at the begging on the twenty-first century are presented in the table 2.

Table 2. Solutions used by companies as part of CSR principles [18]

Solutions used by companies	Percentage of surveyed companies
Actions undertaken in the interest of customers, such as safety and quality of goods and services	88
Activities for local communities	85
Internal form employee evaluation system	80
Written code of business conduct	60
Specific priorities for the company associated with the CSR	67
Implemented environment protection management system	62
Report showing business management and implementation of	60

corporate strategy with regard to socially activities	
A position created specifically in order to coordinate CSR requirements	50

In a study undertaken by KPMG among top executives and employees responsible for CSR respondent as the most important challenges that should engage the company pointed out the problems related to the environment (99% of the identified recycling and proper waste management, 97% in General, protection of the environment). The response to a question about the most significant challenge from the point of view of the company (50% indicated protection of the environment) is similar. It is important first of all to distinguish between industrial companies, among which such indications amounted to 56% and companies from the service sector, where such indications were also the highest and significant and amounted to 38% [7]. Additionally, the authors of the study note that activities in the field of CSR shall take the larges and very large companies with participation of foreign capital. As for as activity of the companies is concerned, most companies encourage not the area that they see as most important, but local communities. The environment is in the second place with a little lower percentage (89% of the local communities, 85% support area: environment). Local communities were in the opinion of respondents on the second place in the ranking of validity [7].

Polish companies listed holding CSR strategies take action in this area primarily because of the desire to reduce the impact of its business on the environment (in a scale of 1 to 5 motivation was 4.7). Among the benefits of external benefits of CSR for the company, so improvement of the environment took the highest place (4.2) [17].

Conclusions

Given the above, it is concluded that consumers attach increasing importance to the responsible conduct of business by the company; increasing the pressure of public opinion, NGOs and civil initiatives enforces respect for the principles of sustainable development through the business; now, with such a wide development of CSR, questioning social responsibility by companies is not likely. Interest in CSR is "fashionable" particularly in the United States of America, as well as in Western Europe, and also it is increasingly present in Poland.

Polish enterprises still do not fully appreciate the importance of CSR. They focus mainly on achieving short-term market goal without a long-term strategic vision. CSR are the long-term strategy, which brings benefits in a long-term perspective. A little different look has a big enterprise, which uses CSR as a strategy to give advantages on the market.

It is worth to add that in Poland a great number of institutions and organizations involved in promoting CSR. This makes the idea of CSR is becoming more and more

known and popular also among companies in Poland. The implementation of this idea has still been in progress.

The basic issues like environment, ethics, responsibility to stakeholders, by the Polish society and companies are not sufficiently appreciated. It is an important task for the State institutions, non-governmental organizations to popularize this idea.

Currently Corporate Social Responsibility is in Poland so important, so to a large extent affect its functioning, that the representatives of the companies in the vast majority agree as to its further development. CSR has an impact on the operation of the business in Poland, especially in the area of operation of companies, the protection of the environment and the relationship with the community. The involvement of business in solving social problems in Poland over 15 years is a practical acknowledgement of understanding that his duty in addition to generating profit is to build value for all stakeholders.

Progress in the implementation of CSR could be carried out mainly by international corporations, which by opening their headquarters can, at the same time, transfer their international standards. Important for the development of the industry were also increasing demand of more informed business partners and consumers. The biggest barrier to the development of CSR in the past 15 years became a lack of understanding of CSR ideas by firm's managers.

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Vehicle Routing Problem with External Carrier

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Abstract. The Vehicle routing problem with private (internal) and common (external) carrier is a modification of classic logistic problem. The following contribution studies this problem, assuming that primary carrier secures transport to customers by utilizing its own vehicles, whose capacities and costs per 1km of transport are given and is the same for all vehicles. Also, there is given the matrix of the shortest distances between nodes (depot and customers). On the other hand, external carrier´s costs depend only on transported quantity measured by weight of goods or by the number of containers/pallets. External carrier´s costs do not depend on the vehicle´s type, traveled distance etc. A mathematical model designed in this article is reformulated to a VRP model, where the routes may not contain all nodes. As following, there is a description of the original heuristics, which can be modified differently and three of those modifications are suggested. The results of numerical experiments for tasks of various size are presented at the end of the article. There are results of three heuristic modifications as well as results of the model solution, which due to NP difficulty and size of tasks could not be completed (the calculation was interrupted or collapsed after some time).

Keywords: Vehicle Routing Problem, Heuristics, Integer Programming.

1 Introduction

Many companies use services of logistics companies to transport goods to customers as an addition to transport by their own vehicles. In that case, transport is provided by internal (primary, private) carrier as well as by external (common) carrier. Primary carrier uses its own vehicles and costs are derived from traveled kilometers, i.e. the length of the vehicle´s route. As for an external carrier, which secures a transport of goods for different subjects, costs are calculated differently. Mostly, it depends only on the volume of transported goods, which is measured by weight, or by the number of pallets/containers needed for transport. This dependence also may be non-linear, and the price of the transported unit may depend on the total volume of goods alternatively on the distance between the customer and the depot.

This article studies a problem with optimization of total costs consisted of external and internal carrier costs (vehicle routing problem with private and common carrier VRPPC). Demand of customers, i.e. quantity of goods which has to be transported

from depot to customers, is given as well as costs matrix for transport between nodes (customers and depot, further graph nodes).

Suppose an internal carrier´s homogeneous rolling stock with a constant cost per 1 km of vehicle´s ride. For an external carrier, cost per unit of goods is constant and freight cost will be linearly dependent on quantity.

The problem is NP hard because classical vehicle routing problem can be reduced to this problem. Tabu search heuristic is published in [2] for the problem with non-split demand. A heuristic proposed in [4] selects customers according to the distance from the depot, customers who are close to the depot are assigned to the private carrier, the others to common carriers. A modification of the Clarke and Wrights savings algorithm is used in [1] to solve so-called truckload and less-than-truckload problem, where private carrier uses less-than-truckload vehicles while an outside carrier uses trucks.

A modified insert heuristic for VRPPC is presented in [3]. Routes of private vehicle is gradually created by inserting node in a route. Node has to meet condition, that the private carrier's costs increase is lower than the common carrier's costs for the transport goods to this node.

2 Mathematical model

VRPPC with non-split demand in nodes can be formulated as integer programming problem. Let $G = \{V; E\}$ be undirected complete graph, $V = \{1, 2, \ldots, n\}$, node 1 is the depot, nodes 2, 3, …, n are customers.

Parameters of the model are:

- d_{ij} cost of transport from the node i to the node j,
- q_i demand at the node i,
- w capacity of primal carrier's vehicle,
- c_c, costs of the transport of unit of goods by the common carrier.

Variables of the model are:

- x_{ij} binary, equals 1 if the vehicle travels from the node i to the node j,
- z_i binary, equals 1 if common carrier assures whole demand q_i at the node i,
- u_i variables in anti-cyclic constraints.

Mathematical model of VRPPC.

$$f(x,z) = \sum_{i=1}^{n}\sum_{j=1}^{n} d_{ij}\, x_{ij} + c_c \sum_{i=1}^{n} q_i z_i \rightarrow \ min \qquad (1)$$

$$\sum_{i=1}^{n} x_{ij} = \sum_{i=1}^{n} x_{ji} \ , \quad j = 1,2,\ldots,n \qquad (2)$$

$$\sum_{i=1}^{n} x_{ij} + z_i = 1, \ \ i = 1,2,\ldots,n \qquad (3)$$

$$u_i + q_j - w\left(1 - x_{ij}\right) \leq u_j, \ \ i = 1,2,\ldots,n, j = 2,3,\ldots,n, i \neq j \qquad (4)$$

$$u_j \leq w,\ j = 1,2,\dots,n \quad (5)$$

$$x_{ij,}\quad z_{i,}\quad binary, i,j = 1,2,\dots,n,\ \ i \neq j \quad (6)$$

The objective function (1) minimizes the sum of travel costs of private carrier´s vehicles and common carrier´s costs. Constraint (2) states that the vehicle must enter and leave node. Equation (3) means that node which is not served by the common carrier needs to be served by private carrier´s vehicle. Anti-cyclic conditions and defining load u_i of the vehicle which is entering node i are in (4). Inequality (5) assures that vehicle´s capacity is not exceeded.

Theorem. Model (1)–(6) can be reformulated as vehicle routing problem with no obligation enter all nodes in the form (1'), (2), (3'), (4), (5), (6), where $d'_{ij} = d_{ij} - 1/2q_i - 1/2q_j$ and:

$$f'(x) = \sum_{i=1}^{n}\sum_{j=1}^{n} d'_{ij}\, x_{ij} \rightarrow\ min \quad (1')$$

$$\sum_{i=1}^{n} x_{ij} \leq 1,\ \ i = 1,2,\dots,n \quad (3')$$

Proof. The object function (1') is:

$$f'(x) = \sum_{i=1}^{n}\sum_{j=1}^{n} d'_{ij}\, x_{ij} = \quad (7)$$

$$= \sum_{i=1}^{n}\sum_{j=1}^{n} d_{ij} - 1/2q_i - 1/2q_j)\, x_{ij} = \quad (8)$$

$$= \sum_{i=1}^{n}\sum_{j=1}^{n} d_{ij}x_{ij} - 1/2c_c(\sum_{i=1}^{n} q_i \sum_{j=1}^{n} x_{ij} + \sum_{j=1}^{n} q_j \sum_{i=1}^{n} x_{ij}) = \quad (9)$$

$$= \sum_{i=1}^{n}\ \sum_{j=1}^{n} d_{ij}x_{ij} - \ c_c \sum_{i=1}^{n} q_i \sum_{j=1}^{n} x_{ij} \quad (10)$$

If we put $z_i = 1 - \sum_{j=1}^{n} x_{ij}$ or $\sum_{j=1}^{n} x_{ij} = 1 - z_i$, we have:

$$f'(x) = \sum_{i=1}^{n}\sum_{j=1}^{n} d_{ij}x_{ij} - \ c_c \sum_{i=1}^{n} q_i\ \sum_{j=1}^{n} x_{ij} = \quad (11)$$

$$= \sum_{i=1}^{n}\sum_{j=1}^{n} d_{ij}x_{ij} + \ c_c \sum_{i=1}^{n} q_i\ z_i\ - \ c_c \sum_{i=1}^{n} q_i = \quad (12)$$

$$= f(x,z) \ - \ \ c_c \sum_{i=1}^{n} q_i\ = f(x,z) + const. \quad (13)$$

3 Node subset heuristic

VRPPC with non-split demand at nodes means that the set of nodes V is divided into two subsets, subset V' and subset V-V'. The first subset V' contains nodes which are served by the primal carrier. Common carrier transports goods from the depot to the nodes contained in the second subset V-V'. In the optimal solution of VRPPC, there is an optimal subset of nodes V' and optimal routes of vehicles of the primal carrier on the subset V'. If a subset of nodes V' is created, we have to optimize transport costs of the primal carrier, but costs of the common carrier for nodes from subset V-V' are constant.

VRPPC consists of two sub-problems:

- Finding the optimal subset of nodes V' (point a),

- Solving the vehicle routing problem on this subset of nodes V' (point b).

Proposed heuristic consists of two heuristics: a heuristic for point a) and a heuristic for point b).

We can utilize standard heuristics (for example insert heuristic, nearest neighborhood heuristic, savings heuristic, …) for the problem b). For the problem a) we have to choose a subset V' from all subsets of the set V. Because the number of all subsets of V is roughly 2^n, it is not possible in polynomial time to go through all possible subsets and choose the subset with the lowest costs (sum of costs of the primal and common carrier).

3.1 The algorithm of node subset heuristic:

Step 1. Sort the node set V by increasing value of certain criterion (it will be proposed later). The sorted node set is in the form $V= (v_1, v_2, \ldots, v_n)$, put f^*:= -infinity.

Step 2. Repeat for k = 2, 3, …, n: Let's take $V'=\{v_1,v_2,\ldots,v_k\}$ and solve a vehicle routing problem for this subset of nodes (using a mathematical model or some heuristic), denote the value of costs f_1.

Calculate costs of external carrier according to the formula

$$f_2 = c_c \sum_{i=k+1}^{n} q_{v_i}, \qquad (14)$$

if $f_1 + f_2 < f^*$, put $f^* := f_1 + f_2$ and $V'^* := V'$.

The result of the heuristic is the value of total costs f^*, subsets of nodes V'* and the solution of the vehicle routing problem for this subset of nodes.

Sorting criterions. The following criterions can be proposed for the heuristic formulated above:

- **K1**: nodes are sorted by the value d_{1i}, that is by costs of transfer from the depot to each node.
- **K2**: nodes are sorted by the value of sum costs d_{1i} plus m values costs d_{ij} for nodes j for which d_{ij} are lowest for j different of i. Parameter m is chosen, we can put for example m = 1, 2, … .
- **K3**: nodes are sorted by the value $dif_i = d_{1i}-c_c q_i$, which is the difference between costs from the depot to node i and costs of a common carrier for delivering demand q_i.

We have to solve vehicle routing problem for the subset of nodes V' in Step 2: point 1), which is NP hard problem. The problem can be solved by the mathematical model using the branch and bound method. The optimal solution will be obtained in reasonable computational time only for a small number of nodes. If the computation is interrupted after the certain time limit, we can take it as suboptimal solution.

The second possibility is to use heuristics. For numerical experiments shown in the next chapter were used two heuristics: insert heuristic and savings heuristic.

Comment. There is a possibility to reduce the total costs of the solution if we use the following method for routes of primal carrier's vehicle. If the route R of primal carrier's vehicle in the form $v_1 \rightarrow v_2 \rightarrow \ldots \rightarrow v_{s-1}$ meets the condition $d_{v_{k-1}v_k} + d_{v_k v_{k+1}} - d_{v_{k-1}v_{k+1}} > c_c q_k$ for some $k = 2, 3, \ldots, s - 1$, then by deleting the node v_k from route R total costs decrease.

4 Numerical experiments

For comparing results of heuristics and the result of the mathematical model solution, examples which are published in http://www.uv.es/ belengue/carp.html were used. Results are shown in Table 1. The heuristic is written in VBA language. The model is solved using CPLEX 12.0 on PC (IntelCore2Quad, 2,83GHz).

The best values of object function, which were obtained when using mathematical model are shown in Table 1 (row "Model"), however, these results are not optimal. The gap of object function is placed under the value of total costs (in % of the lower bound). Next rows show total costs of the solution obtained by using proposed node subsets heuristics with criterion K1, K2, and K3.

The result of the model is better than the result of heuristic in case of problems P24 and P31 which have a small number of nodes. As for the problem P77, it is the opposite.

Table 1. Results of numerical experiments.

Total costs	***P24* (24 nodes)**	***P31* (31 nodes)**	***P77* (77 nodes)**
Model	1,200	2,540	138,020
Gap	18%	14%	71%
Computational time	2 hours	2 hours	20 minutes computation was aborted
K1	1,340	2,950	136,520
K2	1,270 *(3)*[*)]	2,630 *(2)*[*)]	125,740 *(5)*[*)]
K3	1,310	1,310	127,360

[*)] m is number of neighboring nodes in criterion *K2*.

5 Conclusion

An interesting modification for vehicle routing problem is studied, the mathematical model of the problem is presented and new heuristic method is proposed. As to solve the mathematical model for the real problem is very difficult (problem is NP hard), the proposed heuristic method provides us a good solution in polynomial time.

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Influence of Selected Cluster on the Financial Performance of Member Business Entities

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Abstract. The paper addresses the issue of cluster performance evaluation. Under the conditions existing in the Czech Republic, the phenomenon of clusters is still new, which is why this issue deserves close attention. Despite all the benefits offered by cluster groupings, this concept is still rather new under the conditions existing in the Czech Republic and the impact of the concept of clusters on member entities' performance has not been quantified fully objectively. The aim of the present paper is to present the results of a case study focusing on the application of the EVA method to evaluate the financial performance of members of a selected cluster and to verify the assumption that business entities' membership in the cluster is reflected in increasing their financial performance in a time series. The research sample included a cluster with at least a 5-year history – given the availability of financial statements, the 2009–2014 period has been selected. This case study was prepared for the cluster entitled Clutex – Cluster of Technical Textiles that meets the above condition. The results of the research show that the expected positive effect of business entities' membership in the Clutex cluster on their financial performance has not been confirmed. The conclusion discusses possible causes of this finding.

Keywords: Cluster, Financial Performance, Economic Value Added.

1 Introduction

The growing importance of globalisation in today's world gives a new perspective on the development of networks and clusters. Clusters start to be perceived in a different dimension [3]. Cluster groupings are not only spontaneous grouping of companies, but rather a solid, organised structure whose basic economic effect lies in its impact on the competitiveness of businesses, regions and states [7, 5]. In the global competitive environment, only the most competitive businesses profit in the long term. According [2], companies' competitiveness is determined by their ability to innovate their products, technologies and services. Clusters could be a powerful catalyst in the innovation process and may act as interconnected territorial centres [18]. The very existence of a cluster drives competition through increasing productivity and providing an impetus for innovation and, in turn, supports future productivity growth. The cluster concept has become widely used and recognised as

an integral part of regional development strategy and policy making in many countries [12].

Currently, the establishment and development of cluster groupings is one of the trends in national economies that offer a wide range of benefits to all stakeholders. These mainly include improved efficiency and productivity and the development of innovation activities, which contributes to improving performance and competitiveness. Within this approach, the essential hypothesis is that sufficient resources and the ability to achieve critical mass in a geographical location will provide a sustainable competitive advantage over other locations in a given economic activity. Porter argued that clusters have the potential to distort competition by increasing the productivity of companies in a cluster thanks to the driving force underpinning innovation in this area [17].

2 Literature Review

Networking and clustering is basically nothing new [11]. Clusters and industrial specialisations have been the focus of scientists since as early as the 19th century. However, the use of the term "cluster" in economic literature is relatively new. The development of cluster groupings did not begin until the early 1990s, when Michael Eugen Porter's ground-breaking book entitled "The Competitive Advantage of Nations" was published. In recent decades we have witnessed the use of clusters as a tool to improve competitiveness at regional and national level [6]. Clusters are perceived as an 'accelerator' of progress and competitiveness. In EU countries, stimulating cluster development has become an important element of policy. However, the choice of appropriate tools that support cluster development is a serious problem [11]. Other key questions are: what are the positive effects of cluster policy, what are the implications of clusters for economic policy makers and, last but not least, for entrepreneurs [6].

Röttmer [15] defines clusters as a regional agglomeration of companies focusing on the same technology areas that are supported by a dedicated infrastructure. The protagonists are interconnected by vertical, horizontal and lateral ties. Rugman and Verbeke [16] define a cluster as a set of interconnected organisations that are characterised by co-evolution and the associated impacts of spill-over effects. According to [18], clusters represent a higher form of cooperation between companies and other actors that can contribute to increasing the performance of a particular sector, region and state.

At present, every business is trying to achieve the highest performance possible [10]. It is generally recognised that the geographical co-location of companies has a positive effect on the economic performance of companies in a cluster. However, performance as such is not dependent on geographical proximity. Frequent exchange of knowledge and findings between businesses within a single cluster is also very important. Even though businesses within the same cluster have better opportunities to carry out this exchange than enterprises outside the cluster, these opportunities cannot be exploited without mutual trust between the various businesses [13].

These reasons raise the question of whether businesses in a cluster have better economic performance than businesses outside the cluster. In order to answer this question, it is necessary to examine the relationship between the performance of a cluster and the specific framework conditions. This will allow for a better understanding of the key factors of the best performing clusters [1].

Most studies in the field of economics and management assume that businesses within the same cluster are homogeneous and achieve a similar level of performance. However, in reality, businesses within a cluster show varying degrees of success. This raises an interesting question namely which factors underlie the different degree of success of companies within one cluster [13].

It is necessary to create a mechanism that will make it possible to comprehensively evaluate the performance of a business in all key areas of its activities. Cluster performance can be managed and measured in various ways and professional literature suggests a relatively large number of methods. However, to date, none of them has been identified as the most suitable. Different models are emerging within clusters and national policies. Experts' opinions on the use of performance management and measurement concepts also vary [9].

One of the concepts of performance measurement and management, namely the EVA concept, can also be used to identify the links between the benefits and performance of a business. The EVA concept can be considered as a significant criterion in business performance assessment [14]. If the EVA value is positive, the business can be considered successful because its operational activities lead to real appreciation of capital. By contrast, if the resulting value of the EVA indicator is negative, it means that the value is being destroyed by the business, as the capital invested does not cover the respective cost of that capital [8].

3 Methods of Research

As at 1 August 2017, there were 92 clusters and cluster organisations in the Czech Republic, of which 15 are inactive (i.e. passively awaiting their opportunity) and 5 are in liquidation (the phrase "in liquidation" is indicated after the name of the cluster).

The following section is dedicated to the case study of the cluster entitled Clutex – Cluster of Technical Textiles (hereinafter Clutex). The Clutex cluster was selected because of the TUL's membership in this cluster.

3.1 Analysis of the Clutex cluster and creation of a list of evaluated companies

The Clutex cluster is located in the Liberec Region, the Czech Republic, and the cluster has its registered offices in the city of Liberec. Clutex was formed as an association in March 2006. In the same year, it received the "Cluster of the Year" award and it was recognised as a successful project within the Clusters programme under OPIE [4].

The mission of the Clutex cluster is to ensure coordination of and cooperation on activities of textile and apparel companies, research and development organisations, universities and other entities in order to create optimal conditions for technology transfer, innovation and business development in the research, development and production of technical textiles, including materials and semi-finished products used in their production [4].

In the first step of the analysis, all information available on the cluster's website was investigated. Clutex currently has 29 members (see Tab. 1). Cluster members are legal entities, namely 23 businesses, 4 research organisations, 1 university, and 1 trade union and employers' organisation. Clutex brings together legal entities operating in the textile industry and other related services, universities and secondary schools and research organisations specialising in textile technologies. The aim of this association is mainly research, development and innovation as well as cooperation with universities, secondary schools and research institutions. The Clutex cluster's main activity is to provide services for its members and develop business opportunities.

The entities participating in the cluster are based in the Pardubice, Liberec and Hradec Králové Regions. These three self-governing regions make up the Northeast NUTS 2 Cohesion Region.

Table 1 lists cluster members, including selected basic characteristics (type of organisation, legal form and average number of employees). The information below was obtained from the statutes of each cluster and on the website of the Commercial Register of the Ministry of Justice of the Czech Republic, other sources of information included and the Register of Economic Entities maintained by the Czech Statistical Office, the Access to Registers of Economic Subjects / Entities maintained by the Ministry of Finance of the Czech Republic, and the website of CzechInvest – Investment and Business Development Agency.

The following table 1 lists all members of the Clutex cluster according to the statistical legal form. There are limited liability companies (112), share companies (121), university (601), state enterprise (301), and labor union and employers' organization (703).

Table 1. Members of the Clutex cluster.

Members	Type	Statistical legal form	Average number of employees
Argun s.r.o.	Business entity	112	17
Atok	Association	703	8
Elas s.r.o.	Business entity	112	84
GF Machinery s.r.o.	Research organizations	112	7
Hedva, a.s.	Business entity	121	140
Inotex spol. s.r.o.	Business entity	112	48
Intercolor, a.s.	Business entity	121	119

Koh-i-noor a.s.	Business entity	121	148
Koutný spol. s.r.o.	Business entity	112	82
Martilla s.r.o.	Business entity	112	6
Nová Mosilana, a.s.	Business entity	121	886
Nyklíček a spol. s.r.o.	Business entity	112	96
Odetka a.s.	Business entity	121	41
Papillons a.s.	Business entity	121	46
Retex a.s.	Business entity	121	195
S.P.M. Liberec s.r.o.	Business entity	112	68
Silk & Progress, spol. s.r.o.	Business entity	112	67
Sintex, a.s.	Business entity	121	118
Stap a.s.	Business entity	121	251
Svitap J. H. J. spol. s r. o.	Business entity	112	535
Technical University of Liberec	Universities and high schools	601	1034
Textile Testing Institute, s. p.	Research organizations	301	24
Texsr, s.r.o.	Business entity	112	16
Vakuform s.r.o.	Business entity	112	7
Veba, textile plants a.s.	Business entity	121	1166
VÚB a.s.	Research organizations	121	70
VÚTS, a.s.	Research organizations	121	176
Wico B.G.M., a.s.	Business entity	121	92
Zitex s.r.o.	Business entity	112	11

The following companies belong to the category of business entities: Sintex, Nyklíček, Retex, Elas, Inotex, Argun, Intercolor, S.P.M. Liberec, Hedva, Silk & Progress, Zitex, Stap, Veba, Koutný, Svitap J. H. J., Odetka, Nová Mosilana, Papillons, Texsr, Vakuform, Wico B.G.M., Koh-i-noor and Martilla.

Other entities of the Clutex cluster are entities that don't belong to the business entities: VÚB, VÚTS, Textile Testing Institute, Technical University of Liberec (Faculty of Textile Engineering), GF Machinery and Atok.

3.2 Data collection from financial statements

Since the research focused on evaluating the financial performance of cluster members, the trends in the selected EVA financial indicator were only examined for business entities within the cluster. The research does not include the performance of universities, research institutes or other "non-profit" organisations, even though they are members of this cluster. It can be concluded that business entities have a general understanding of the trends in basic financial indicators (profit, sales) and, in order to obtain accurate data, it was necessary to analyse the financial statements of these selected companies. One problem was the differences in reporting between the

different legal forms of businesses. Individual members joined the cluster gradually over time, which is why only 'stable' members of the cluster were included in the study sample, i.e. business entities that had been cluster members for at least 5 years (see Table 2). Due to relatively poor availability of financial statements, financial statements for 2009–2014 were selected. In total, financial statements were successfully obtained for 20 companies.

3.3 Evaluation of the performance of the Clutex cluster using the EVA method

The Economic Value Added (EVA) indicator was used to evaluate economic performance, according to the methodology of the Ministry of Industry and Trade (hereinafter MIT). The MIT calculates the EVA indicator using an equity-based approach (1) where EVA is defined as the product of equity and 'spread' (return on equity minus alternative cost of equity):

$$EVA = spread \cdot E = (ROE - r_e) \cdot E \qquad (1)$$

ROE is return on equity, *E* is the carrying amount of equity, r_e is an alternative cost of equity.

The indicator can only be calculated for companies with a positive equity value. Therefore, companies with zero or negative equity had to be excluded from the sample. Given the above, one business was excluded from the research.

4 Results of the Research

The resulting value of the EVA indicator for each business calculated for the 2009–2014 period (see Table 2).

Table 2. EVA in 2009–2014.

Company	EVA09	EVA10	EVA11	EVA12	EVA13	EVA14
Sintex	-29,481.67	-8,892.29	-22,362.46	-8,140.79	-10,922.09	-9,028.63
Nykliček	-6,696.11	-3,710.32	-3,847.05	-4,579.67	-7,552.01	-9,569.46
Retex	-20,953.53	-26,725.60	-40,599.77	-29,468.79	-57,849.59	-37,760.90
Elas	-12,897.85	-5,200.02	-5,807.02	-11,343.64	-5,220.72	-5,919.43
Inotex	-11,185.98	-11,847.52	-4,201.44	-3,546.24	-1,499.85	-3,294.78
Argun	-65.53	-23.52	-740.58	-85.37	-72,828.48	61,874.99
Intercolor	-38,605.37	-34,596.44	-31,081.42	-32,750.59	-23,979.00	-7,401.53
S.P.M. Liberec	18,702.75	-49,604.75	-15,926.79	-10,661.56	-7.97	-11,325.14
Hedva	no data	no data	no data	-45,071.47	-16,869.96	-1,635.94
Silk & Progress	-3.71	2,264.67	3,900.25	4,525.90	2,147.46	906.08
Zitex	-1,077.13	-702.15	-665.30	-492.56	-505.16	1,497.29

Stap	-29,609.61	-10,863.18	-7,691.44	-14,450.57	-50,509.90	17,597.05
Veba	-53,541.78	-26,391.95	40,209.87	158,694.31	136,817.62	5,608.17
Koutný	-4,297.27	724.07	2,076.42	-4,949.16	2,517.03	-3,021.05
Svitap J. H. J.	-61,733.05	-35,836.03	-44,627.54	-47,428.30	-31,752.34	-28,334.43
Odetka	-6,575.77	-5,350.30	-5,687.47	-5,362.74	-4,256.31	-4,785.44
Nová Mosilana	-69,134.47	30,331.54	54,326.99	20,160.10	-11,395.89	-19,087.37
Papillons	-625.21	815.06	15,545.88	920.41	-3,422.87	-2,242.54
Texsr	556.30	-123.76	-220.36	-1,253.76	no data	no data

Figure 1 shows the level of economic value added for each limited liability company (s.r.o.) operating within the cluster.

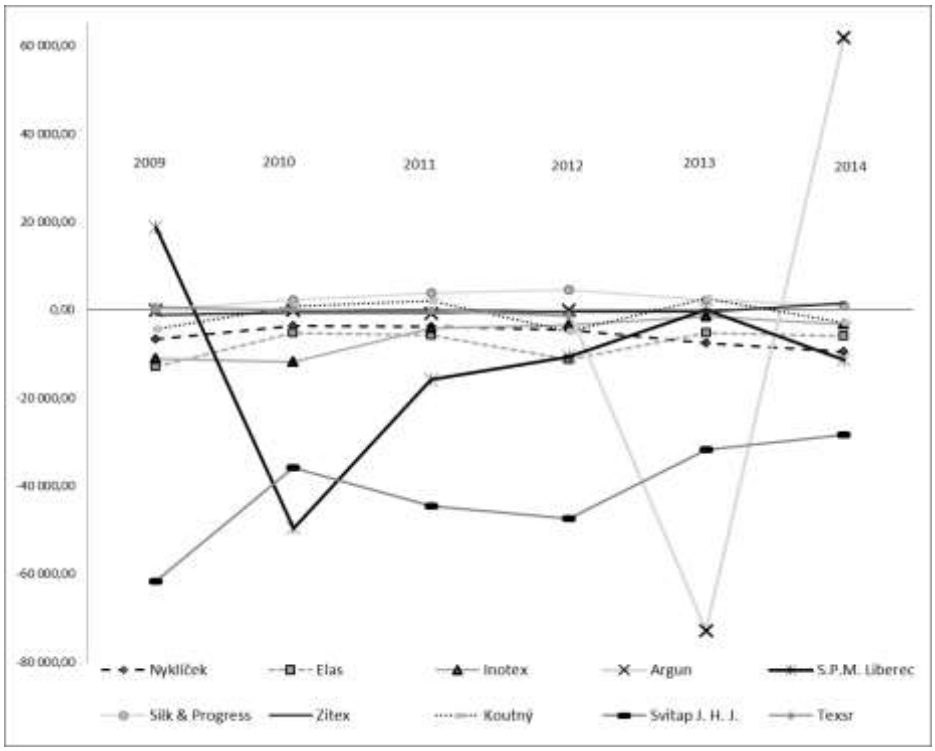

Fig. 1. EVA of limited liability companies (s.r.o.) in 2009–2014.

In the case of limited liability companies, only a few businesses generate economic value added. From 2010 to 2014, a positive value of the EVA indicator was reported by Silk & Progress, where the value kept increasing until 2013. Since 2013, EVA has been slowly declining, but it still remains positive. Koutný achieved a positive value for the EVA indicator in 2010 and 2011. However, a year later, EVA fell to negative values. In 2013, the indicator was positive again, and a year later it dropped below a

zero level yet again. Over the period under review, the remaining businesses consistently reported negative values, with the exception of several "shocks".

The first "shock" occurred at S.P.M Liberec in 2010, when the EVA indicator plummeted from a positive value of 18,702.75 to a negative value of -49,604.75. In that year, insolvency proceedings were filed against the company. Since this major slump, the company's performance – in terms of the EVA indicator – peaked in 2013, when the company also received an award at the IDET 2013 trade fair and the owner of the company was recognised as the 2013 Manager of the Year.

The second "shock" was the massive decline in the indicator value experienced at Argun in 2013: from -85.37 to as low as -72,828.48. A year later, the indicator reached a positive value of 61,874.99. It can be concluded that, over the period under review, the worst performing company – in terms of the EVA indicator – was Svitap J. H. J, whose EVA indicator value averaged -40,000.

Figure 2 shows the level of economic value added for each share company (a.s.) operating within the cluster.

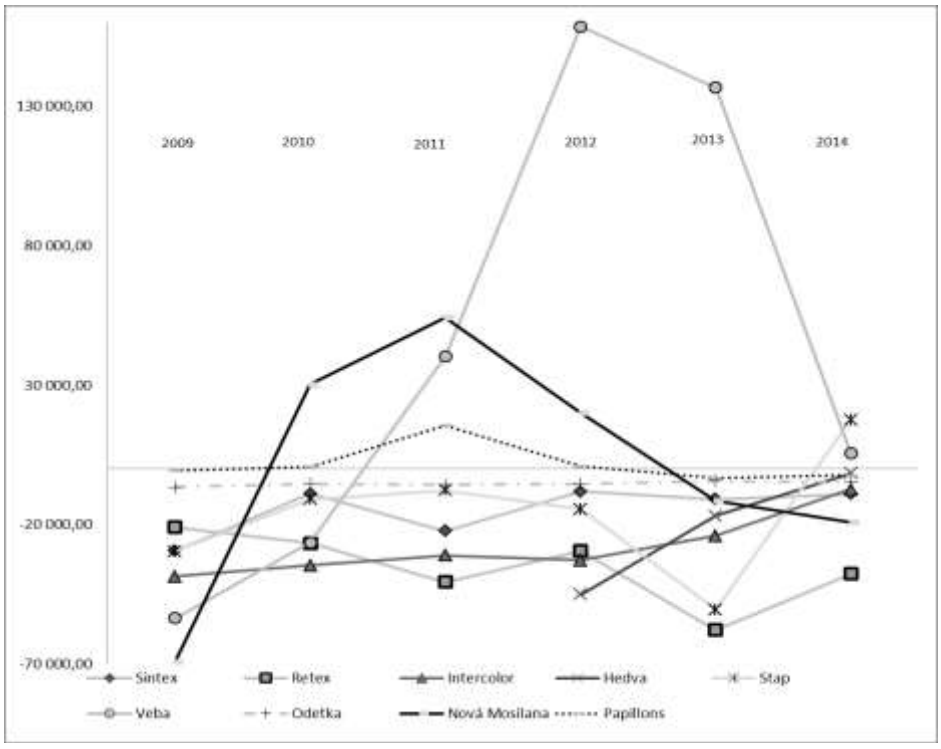

Fig. 2. EVA of share companies (a.s.) in 2009–2014.

In the case of share companies, only a few businesses generate economic value added as well. Chart 2 indicates that the values of the EVA indicator have been consistently negative for Sintex, Retex, Intercolor, Hedva and Odetka. In addition, Stap reported negative EVA indicator values until 2013. Starting in 2014, Stap's EVA reached a

positive value for the first time. Nová Mosilana and Papillons reported positive values of the EVA indicator in 2010–2012. For both of these businesses, EVA peaked in 2012. Veba reported positive indicator values in 2011–2014, with a peak in 2012 (158,694.31). Since that year, Veba's EVA has been declining. The most significant decline was recorded in 2014 when the value of the EVA indicator decreased by 131,209.45 compared to the previous year. From 2010, Veba was taking on new employees and generating hundreds of millions in profits and record sales. Its success was mainly due to flourishing exports of brocades to Africa, which accounted for 90% of the company's sales. The fall that was experienced in 2014 was caused by the on-going crisis in the African market. The company's sales fell and, at the end of 2014, the company started to downsize in order to reduce costs. While the chart does not show developments in the subsequent years, it is useful to note that, according to the company's management, the crisis factors ceased to exist and the volume of orders (especially cotton brocade for West African markets) started to increase in the second half of 2016. For 2017, the company's management is planning for an increase in sales of 40 to 50 per cent.

5 Discussion

Based on the analysis performed, it has not been confirmed that the businesses' participation in the Clutex cluster had a significant impact on the financial performance of each of them. Both charts above indicate that economic value added is only generated by a few businesses (and only in some years). Based on the effect of cluster participation on financial performance, the assumption was that EVA indicator values would increase in a time series due to the entity's participation in the cluster, which was not confirmed in this case. Rather, the trend in the values showed mainly sudden one-off fluctuations.

The results of this research show that the expected positive effect of business entities' membership in the Clutex cluster on their financial performance has not been confirmed. There may be several causes. It may be a specific issue of the Clutex cluster and the textile industry. It is possible that the textile sector is specific and the benefits are not proven in it. Clutex is also specific because it associates rather medium and large businesses. Other clusters have a larger share of small and medium-sized businesses.

It is interesting to see the development of EVA indicator values of all monitored businesses with respect to the global financial crisis that spread throughout the world in 2009 and caused a worldwide recession. There was no reaction showed within the development of EVA indicator values of almost all monitored business entities in the cluster. These questions can initiate further research in this area.

6 Conclusion

The paper dealt with examining the impact of business entities' membership in the Clutex cluster on their financial performance. Financial performance was quantified by EVA indicator.

The Clutex cluster operates in the Northeast Cohesion Region and represents the textile and clothing manufacturers from most textile and clothing industry, representatives of suppliers and customers, and research institutions.

The research, which was conducted on the 2009–2014 data, did not confirm the assumption that its financial performance would gradually increase in a time series as a result of business entities' membership in the Clutex cluster. Possible causes of this result can be discussed. It is therefore desirable to carry out research according to the same methodology on business entities that are members of other clusters in other sectors.

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The Value of Public Safety in Jelenia Góra, Poland

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Abstract. The aim of article was to answer the research question: did people in Jelenia Góra fear migrants more and value the public safety higher before Warsaw NATO Summit 2016 and 31st World Youth Day than after those events? We have formulated the hypothesis: people in Jelenia Góra feared migrants more and valued higher public safety before Warsaw NATO Summit 2016 and 31st World Youth Day than after those events. To its verification and to answer the research question, we estimated the value of public safety. We used the contingent valuation method. We collected questionnaires during the field work and in the Internet. We conducted first survey on 28 June – 7 July 2016 and second one 15-20 November 2016. We did first research before the NATO Summit and the 31st World Youth Day and the next survey after the mentioned events. We selected the Jelenia Góra city because its proximity to the German border which is one of the targets of migration, and to the border with the Czech Republic which is situated close to migration route through Turkey, the Aegean Sea and Greece. The answer to research question is affirmative. The hypothesis was positively verified because the value of public safety in Jelenia Góra before the NATO Summit and the WYD amounted to USD 44 895 284, and after those events: USD 41 981 969.

Keywords: Value of Public Safety, WTP, Jelenia Góra.

1 Introduction

One of EU Eurostat's Quality of life indicators is 'Economic and physical safety'. One of its sub-factors is 'Physical safety' [33]. According Eurostat, a physical safety refers to 'being protected from any situation that puts a person's physical security at risk, such as crime, accidents or natural disasters' [16].

Since beginning of the 21st Century series of terrorist attacks took place in Europe. Some of them were connected with an Islamic state [22, 27]. At the end of 2015, US authorities warned that Isis could print authentic-looking Syrian passports. UK mainstream media warned that i.e. hundreds of migrants arrived in Norway and had mobile phones with images with Isis flags, victims of war and terrorism but pictures could be on phones for innocent reasons [9, 10, 35].

22 March of 2016, in suicide bombing in Brussels, Belgium, more than 30 people were killed and over 300 injured. The attack was confessed to the Islamic state [30].

Shortly thereafter, two major events took place in Poland. On 8-9 July 2016, the NATO Summit took place in Warsaw. In the event attended over 60 countries and international organizations and approx. 2500 delegates, about 1500 media representatives and approx. 500 representatives of scientific and research centres in the field of foreign and security policy. On June 26-31, 2016, the 31st World Youth Day (WYD) was held in the Małopolska Province. In the event participated the Pope Francis, representatives of the Polish Episcopate, the Polish government and the President of the Republic of Poland. Before the NATO Summit and the WYD, in Polish government were fears that terrorist attacks might occur during these events. After the bombing in Brussels, various speculations appeared in Polish media. According to the GCS, fears had the whole of Poland, not only the inhabitants of Warsaw and the Małopolska Province. Thus, the GCS has developed a safety net for the NATO Summit and the WYD [1].

Moreover – Poland, Hungary and the Czech Republic – countries of the Visegrad Group refused EU-imposed refugees. The European Union Commission commenced legal action against Poland over refugees. According to Polish Government Centre for Security (GCS), in the last years the main direction of migrating refugees who left unstable terrains became the route through Turkey, the Aegean Sea and Greece and then further into the territory of the European Union. An important challenge for the migration services has been the lack of verification of the identity of refugees. Most of them had not documents. Even with the strengthening of the Greek services by the Frontex, the verification of the actual basis for granting the protection to the migrants within the European Union has been a constant problem. This involved the risk of using the existing gaps in the system by the emissaries of radical Islamist groups arriving to create the organizational units in Europe, conducting the ideological indoctrination and trainings for terrorists [38].

Above mentioned issues resulted in, that we decided to answer the research question: did people in Jelenia Góra fear migrants more and value the public safety higher before Warsaw NATO Summit 2016 and 31st World Youth Day than after those events? We have formulated the hypothesis: people in Jelenia Góra feared migrants more and valued higher public safety before Warsaw NATO Summit 2016 and 31st World Youth Day than after those events.

For computing, we used the contingent valuation method. We conducted 2 surveys. First was done before the NATO Summit and the WYD and the second one – after the mentioned events. For the research, we have chosen the Jelenia Góra city because of its location near the German border which is one of targets of migration, and with the Czech Republic which is located close to the migration route through Turkey, the Aegean Sea and Greece.

2 Literature review

In the end of the 20th century, valuations of public safety values were made by M. Johanesson, P.-O. Johansson, R. M. O'Conor and, later, by H. Andersson, M.

Svensson and M. Vredin Johansson. They compared the value of public and private safety [2, 23, 39].

After 11/9/2001, Virginia A. Chanley indicated that shift in public focus from domestic to international concerns was an important factor in the decline in cynicism that occurred after 9/11, and that public support for expending resources to address issues such as homeland security will be greater if increased trust in government can be sustained [11]. S. Sinclair and A. LoCicero indicated that both general terrorism fears and the impact of terror alerts specifically, are statistically significant predictors of trust in government in the tested sample [37].

During the fieldwork period of the European Social Survey occurred the terror attack in Bali on October 12, 2002. Usting this fact, J. Legewie applied a quasi-experimental research design to examine the effect of terrorist events on the perception of immigrants across 65 regions in nine European countries. He revealed the temporal effect [26].

Before and after the Islamic terrorist attacks against railways in Madrid (11 March 2004), A. Echebarria-Echabe and E. Fernandez-Guede did a quasi-experimental study on the effects of terrorism on racial prejudice and ideological orientation. They showed that terrorist attacks provoked changes in a reactionary and conservative direction: stronger prejudices not only against the target group (Arabs), but against another uninvolved group (Jewish); an increase in authoritarianism; stronger attachment to traditional conservative values, and a reduction in the attachment to liberal values. The results are interpreted in terms of the System-Justification Theory, the Motivated Social Cognition model of Conservatism and the Right-Wing Authoritarianism [14].

C. Bozzoli and C. Müller wrote the first paper that uses a terrorist attack, that in the London 7/7/2005, as an exogenous source of variation to study the dynamics of risk perception and the effect on the readiness to trade off civil liberties for enhanced security. They indicated that willingness to trade off security for liberties is dramatically affected by changes in individual risk assessments due to a terrorist attack. We document the extent of persistence of changed attitudes [7]. B. S. Frey, S. Luechinger and A. Stutzer used data from the Euro-Barometer Survey Series to propose the Life Satisfaction Approach. They based on combined cross-section time-series data and estimated costs of terrorism for France and the British Isles. They estimated costs of terrorism for France and the British Isles [20].

T. Dragu developed a game-theoretic model of an interaction between an anti-terrorist agency and aterrorist organization to analyze how the probability of a terrorist attack varies when the level of privacy protections changes. He derived two implications. 1. privacy and security from terrorism need not be in conflict: when accounting for strategic interactions, reducing privacy protections does not necessarily increase security from terrorism. 2. the anti-terrorist agency will always want less privacy [12].

K. Drakos and C. Müller pointed that the observed risk perception variation is significantly explained by the long term terrorism countries face, while the cyclical part of terrorism activity does not affect risk perception [13].

S. B. Blomberg, G. D. Hessand and D. Y.J. Tan developed a novel and rich dataset spanning 179 countries from 1968 to 2007 using associated community, social, cultural, political, and economic factors from the World Values Survey and international terrorism incidence data from ITERATE. They proved that terrorism has a negative and statistically significant impact on individual income [6].

T. Brück, F. Llussá and J. A. Tavareset draw on data from the Adult Population Surveys, collected by the Global Entrepreneurship Monitor (GEM) with detailed information on individuals from 43 countries. They found that natural disasters and terrorist attacks influence individual perceptions of the rewards to entrepreneurship. The first ones influence negatively and the last ones positively. More surprisingly, extreme events affect entrepreneurship rates positively in a robust and significant way [8].

H. Finseraas and O. Listhaug identified the causal effect of the Mumbai attacks on public opinion. They exploited the fact that the fourth round of the European Social Survey was conducted in several West European countries at the time of the 2008 terror attacks [18].

A. Economou and C. Kollias used the Eurobarometer Surveys for twelve European Union countries. They employed Ordered Probit models for the period 1985-2010. They used over 230 thousand observations in the estimations. They pointed a shift in respondents' self-positioning towards the right of the political spectrum [15].

P. Arvanitidis, A. Economou and C. Kollias used data drawn from European Social Surveys for the years 2004, 2012 and 2014. They pointed that major terrorist events have the potential to exert significant influence on citizens' risk-perceptions, security sentiments, values and behavioral attitudes towards state institutions and their fellow citizens. They indicated that terrorist incidents can trigger social dynamics that affect trust attitudes; however, these effects are short-lived and dissipate rapidly [3].

3 Methodology and researched area

The public safety as a good is one of the non-market goods. To determine the value of the public safety we selected the contingent valuation method (CVM) because it is used in situations where market information is limited. In this method, people's opinions about their needs for a given good are collected, assuming that the consumer himself knows what is most rational for him. The questionnaires specify the amount that the individuals are able to pay for access to this good, or assess the amount compensating the loss of using this good. In this way, a hypothetical market is created which determines the willingness of the respondents to pay for the service or good, or the attainment of the purpose, or the compensation for the loss [5, 19, 36].

There are two variants of the CVM: willingness to pay (WTP) and willingness to accept (WTA). The WTP is the maximum amount that consumers can spend on a good, instead of giving up. The WTA concerns cases when people agree to lose a good. They receive a certain amount of money on the assumption that an individual will retain the same level of welfare that he/she would retain in case of holding the good and not receiving the money. The WTA and WTP notions are the value

measures of non-market and market goods, or the prosperity of an individual [17, 31, 41].

The CVM is a direct method because it does not use the prices of substitute goods and provides the estimated values of non-marketable environmental goods. It also provides an opportunity to measure a value of the environment, such as the value of existence or use. Its applications are very versatile. These features are considered as the main advantages of this method [21].

For the first time, the CVM was used in the early 1960s. R. Davis used it to calculate the recreational value of the Maine forests in the north-eastern United States. The method developed very dynamically in the 1970s and 1980s. It was used to valuate losses of natural environment caused by executions of various undertakings or by disasters [42]. In Poland, the CVM was first applied in 1993. It was used to estimate the damage caused by the eutrophication of the Baltic Sea. Later, the CVM was used in studies on the protection of the Biebrza Marshes, on the limitation of the car traffic in Kraków, or on the availability of the Oligocene water in Warsaw. In Wroclaw, the research was carried out on the introduction of a newer generation of the municipal waste management system [5].

To response to our research question and to verify our thesis, we selected to estimate the WTP. We have determined how much an inhabitant is able to pay in the form of an annual tax to improve the safety level which determines the value of public safety in the investigated area.

First, we did the literature studies and constructed a survey questionnaire. At the beginning of the survey, we defined safety and public safety. The next step was to ask if the respondent was willing to pay. In the case of an affirmative response, the auction was conducted with the respondent as to the amount that he would be able to pay. Next, we placed a request for a maximum amount. The respondents were also asked about the justification of their choices concerning their willingness to make or not to pay. We also asked them to provide their personal information.

It is worth noting that we have prepared two variants of the survey questionnaire. In variant 1 (before the NATO Summit and the WYD), we pointed out the possible threat of acts of terror during these events. In variant 2 (after the mentioned events) there was not such information. Surveys are available on a request.

Then, we collected questionnaires during the field work and in the Internet. Each of the respondents was informed about the anonymity and confidentiality of the data. We conducted first survey on 28 June – 7 July (before the NATO Summit and the WYD) and the second one 15-20 November 2016 (after the mentioned events) [25].

We conducted the surveys in the area of Jelenia Gora. We have chosen this city for research because of its proximity to the German border which is one of the targets of migration, and to the border with the Czech Republic which is situated close to the migration route through Turkey, the Aegean Sea and Greece.

It is worth noting that Jelenia Góra has the status of a city with the district rights after the administrative reforms. It is located in south-western Poland, in the Lower Silesian Province. It lies on the Bóbr river in the Jeleniogórska Valley. The city is also the Polish capital of the Euroregion of Nysa, as well as the seat of the Jelenia Góra

district and the management of the Karkonosze National Park. The city was also the capital of the Jelenia Góra Voivodeship between 1975 and 1998 [34].

The city's area is 109.22 sq. km. The settlement system of the Jelenia Góra city has developed in the form of an elongated strip along the Kamienna, Bóbr and Wrzosówka watercourses [32] in wind less beneficial and unbeneficial zone with temperate climate [24].

In 2016, Jelenia Góra had 80 524 inhabitants. The population density in Jelenia Góra is 741 persons per sq. km. The largest number of inhabitants in Jelenia Góra was recorded in 1998 which, according to GUS data, was 93 901 inhabitants [4].

The road infrastructure in Jelenia Góra is extensive. There are many roads crossing the city. Main roads are the E65, originating in Chania in Greece, through i.e. the Czech Republic, ending in Scandinavia, and the national road no. 30, connecting Jelenia Gora with Zgorzelec and the Germany. Apart from car routes, there are also railway lines, which communicate the city in directions from i.e. Zgorzelec and Wrocław [40].

In the study, we assumed a confidence level of 95%, a maximum error of 8%, a fraction of 0.5. With these assumptions the minimum sample size for each sample is 150 people for 80 524 inhabitants of Jelenia Gora. The interest rate was set at the reference rate of the NBP, ie 1.5% [29]. The US dollar-Polish złoty exchange rate was established on the level 3.778 zł per 1 USD [28].

$$WTP = (\frac{W_{WTP}}{n}) \cdot L \quad (1)$$

where: WTP – the willingness to pay (WTP), WWTP – global value of the WTP, n – sample size, L – number of inhabitants of the examined area.

WTP was calculated from the equation 1. Next, WTP was inserted to equation 2 for the perpetual annuity in the place of the installment amount.

$$PV = \frac{A}{i} \quad (2)$$

where: PV – the present value of the perpetuity at the end of a given period, A - the amount of the installment, the value of the previously calculated public safety (WTP).

4 Results and discussion

As we can see in the table 1, we contacted two independent samples. We collected 150 questionnaires prior to the NATO Summit and the 31st World Youth Day.

Table 1. Summary of survey results.

Feature	Survey in the period 28/6-7/7/2016	Survey in the period 15-20/11/2016
Gender	Female - 87 persons (58%), male - 63 persons (42%)	Female - 90 persons (60%), male - 60 persons (40%)
Age	0-24 yrs. - 50 persons (33%),	0-24 yrs. 66 - persons (44%),

	25-32 yrs. - 47 persons (31%)	25-32 yrs. - 43 persons (29%)
	35-44 yrs. - 28 persons (19%)	35-44 yrs. - 30 persons (20%)
	45-54 yrs. - 12 persons (8%)	45-54 yrs. - 7 persons (5%)
	55-64 yrs. - 6 persons (4%)	55-64 yrs. - 1 person (1%)
	64 yrs. and above - 7 persons (5%)	64 yrs. and above - 3 persons (2%)
Occupation	110 persons (73%) - Jelenia Góra	104 persons (69%) - Jelenia Góra
	40 persons (27%) - outside JG	46 persons (31%) - outside Jelenia Góra
Employment	Unemployed - 15 persons (10%)	Unemployed - 13 persons (9%)
	Pensioner/annuitant - 14 persons (9%)	Pensioner/annuitant - 6 persons (4%)
	Student/pupil - 37 persons (25%)	Student/pupil - 49 persons (33%)
	Employed - 76 persons (51%)	Employed - 77 persons (51%)
	Own business - 8 persons (5%)	Own business - 4 persons (3%)
	Maternity allowance - 0 person (0%)	Maternity allowance - 1 person (1%)
Monthly income	Below 750 zł - 25 persons (17%)	Below 750 zł - 21 persons (14%)
	750 zł-1249 zł - 34 persons (23%)	750 zł-1249 zł - 35 persons (23%)
	1250 zł-1749 zł - 26 persons (17%)	1250 zł-1749 zł - 30 persons (20%)
	1750 zł-2249 zł - 25 persons (17%)	1750 zł-2249 zł - 29 persons (19%)
	Above 2500 - 40 persons (27%)	Above 2500 - 35 persons (23%)
Tax support	94 persons (63%)	77 persons (51%)
WTP	5 zł - 3 persons (2%)	1 zł - 2 persons (1%)
	10 zł - 28 persons (19%)	10 zł - 22 persons (15%)
	15 zł - 10 persons (7%)	15 zł - 9 persons (6%)
	20 zł - 19 persons (13%)	18 zł - 1 person (1%)
	25 zł - 5 persons (3%)	20 zł - 17 persons (11%)
	30 zł - 3 persons (2%)	25 zł - 3 persons (2%)
	40 zł - 1 person (1%)	30 zł - 7 persons (5%)
	50 zł - 12 persons (8%)	40 zł - 1 person (1%)
	60 zł - 2 persons (1%)	50 zł - 7 persons (5%)
	100 zł - 9 persons (6%)	60 zł - 1 person (1%)

120 zł - 1 person (1%)	75 zł - 1 person (1%)
150 zł - 1 person (1%)	100 zł - 4 persons (3%)
	120 zł - 1 person (1%)
	200 zł - 1 person (1%)

Considering the table 2, we can see that out of all answers, only 94 people expressed their willingness to pay for the good that the public safety is. The remaining 37% did not endorse the payment of any fees. The highest value, which was indicated by respondents level-led at 150 zł (USD 39.7). The lowest value amounted to 5 zł (1.323 USD). The most frequent answer was 10 zł (USD 2.65).

Table 2. The results of the research before the NATO Summit and the 31st World Youth Day.

Feature	Data
Number of valid responses	94 persons
Global value	2 970 zł
Average	31.6 zł
Maximum value	150 zł
Minimum value	5 zł
Lower quartile	10 zł
Top quartile	50 zł
Median	20 zł
Dominant	10 zł
Standard deviation	31.18 zł

The global value amounted to 2 970 zł (USD 786.16). The WTP value was 31.6 zł (8.36 USD) per person. After multiplying this amount by the number of all inhabitants of the investigated area, the WTP value totaled 2 544 216 zł (USD 673 439.3).

Next, we calculated the value of public safety. It equaled 169 614 383 zł (44 895 284 USD).

After the NATO Summit and the 31st World Youth Day, we collected next 150 questionnaires. Considering the table 3, we can see that in this case 49% of respondents did not want to pay for the good. 77 people would like to pay. The maximum amount raised up 200 zł (52.94 US). The lowest amount leveled down to 1 zł (USD 0.26). The most often indicated amount in the second survey also was 10 zł (USD 2.65).

Table 3. The results of the research after the NATO Summit and the 31st World Youth Day.

Feature	Data
Number of valid responses	77 persons
Global value	2 275 zł
Average	29.55 zł

Maximum value	200 zł
Minimum value	1.00 zł
Lower quartile	10 zł
Top quartile	30 zł
Median	20 zł
Dominant	10 zł
Standard deviation	33.07 zł

The global value equaled 2275 zł (USD 602.17). The WTP value achieved 29.55 zł (USD 7.82) per person. After multiplying this amount by the number of all inhabitants of the examined area, the WTP value totaled 2 379 118 zł (USD 629 729.5).

Next, we computed the value of public safety. It equaled 158 607 879 zł (USD 41 981 969).

We noted that the difference between the WTP value before the the NATO Summit and 31st World Youth Day and after those equaled 2.05 zł (USD 0.54) per person. The extension in public safety values exceeded 11 million zł (USD 2 913 315). The gap between the number of people who expressed their willingness to pay was 17. The WTP and the public safety value were higher before the NATO Summit and the WYD. Similarly situation proved to be with the number what would pay the hypothetical tax. Before mentioned events, 63% of people expressed their payment preferences, and after the events, their number dropped by more than 11 percentage points.

Our research differs in contrast to studies conducted by M. Johanesson, P.-O. Johansson, R. M. O'Conor, H. Andersson, M. Svensson and M. Vredin Johansson [2, 23, 39] because we have focused only on the public safety.

Our research is complementary to studies of V. A. Chanley, S. Sinclair and A. LoCiceroJ. Legewie, A. Echebarria-Echabe and E. Fernandez-Guede, C. Bozzoli and C. Müller, B. S. Frey, S. Luechinger and A. Stutzer, T. Dragu, K. Drakos and C. Müller, S. B. Blomberg, G. D. Hessand and D. Y.J. Tan, T. Brück, F. Llussá and J. A. Tavareset, H. Finseraas and O. Listhaug, A. Economou and C. Kollias, P. Arvanitidis, A. Economou and C. Kollias [3, 6, 7, 8, 11, 12, 13, 14, 15, 18, 20, 22, 26, 37].

5 Conclusion

The aim of the article was to answer the research question: did people in Jelenia Góra fear migrants more and value the public safety higher before Warsaw NATO Summit 2016 and 31st World Youth Day than after those events? Thus, we have formulated the hypothesis: people in Jelenia Góra feared migrants more and valued higher public safety before Warsaw NATO Summit 2016 and 31st World Youth Day than after those events. To answer the research question and verify the thesis, we estimated the value of public safety.

After conducted analysis, we can draw the following conclusions. The hypothesis was positively verified because the value of public safety in Jelenia Góra before the NATO Summit and 31st World Youth Day amounted to 169 614 383 (USD 44 895 284), and after those events – 158 607 879 zł (USD 41 981 969). Thus, the answer to the research question is affirmative.

The perception and the value of the public safety by the respondents depends on public perception of emergency situations. In the case of the terrorism hazard, people are able to spend more money to be secured and level up the safety.

It is worth noting that the results presented in this study are estimated and hypothetical. The valuation has made it possible to indicate the importance of the public safety for the respondents and varying its value depending on the situation in which were the examined people.

In the future, we shall do the next research to compare the public safety value for Poland, Hungary and the Czech Republic with costs of not accepting by these countries the refugees as part of a program to relocate asylum seekers residing in camps located in Greece and Italy.

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Role of Research and Development in Smart Specialisation of EU regions and its Effect on Labour Productivity

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Abstract. Regional development and its role in the context of economic growth of the country has been gaining more attention in the last decades. European Union has been shifting its attention towards regional development which reflects in the new strategy called Smart Specialisation. One of the important driving forces of regional growth is research and development. Higher education institutions play important role in this area as well as in the development of human capital in the region. We firstly compared NUTS 2 regions in the Czech Republic and Slovakia and according to selected indicators of research and development. We also applied cluster analysis in order to classify similar regions into same clusters. The main aim of our research is to test potential link between intensity of research and development within the concept of smart specialisation of the region and labour productivity in the region. We used factor analysis and regression analysis based on the data cross-sectional data for all NUTS 2 regions in the EU. Our results suggest that focus on research and development within the region is positively correlated with higher labour productivity. More scientific publications and patents are positively linked to higher productivity in the region.

Keywords: Research & Development, EU regions, Labour Productivity, Smart Specialisation, Higher education.

1 Introduction

Research and development are becoming more important and gaining more attention in the light of globalization and effort to increase economic performance and competitiveness. The intensity of research and development could be seen as one of the most important factors supporting the innovation performance of the region or whole country. We can further say that innovation are a driving force that helps increase labour productivity in the business and public sector. Thus, it is likely that research and development activities within the region could be beneficial for regional economy and its citizens in several ways. Potential increase in labour productivity due to the innovation may result in further economic growth and in turn help improve lives of the citizens. The importance of innovation and R&D is reflected in policies of individual countries as well as transnational unions such as European Union, which

are shifting their focus towards policies aimed at research and development and support of innovation at regional and national level. Smart specialisation of the regions is one of the EU regional strategies which are closely related to support of innovation at regional level.
Our paper aims to test potential link between intensity of research and development within the concept of smart specialisation of the region and labour productivity in the region. We assume that EU regions are specialised more on services and especially those with more intensive research and technology activities have higher labour productivity. Moreover, we examine several indicators related to regional smart specialisation and classify NUTS 2 in the Czech Republic and Slovakia based on these indicators into clusters. In the next section we describe the concept of smart specialisation with the focus on research and development. In further sections we describe the methodology of research and present the most important results.

2 Literature review

In the last decades, there have been numerous publications and policy outlines that stress the importance of knowledge and innovation policy for the European Union. There is no doubt about the importance of technology, knowledge and innovation for the competitiveness and economic power of a country. [12] Research and innovation provide us with the knowledge and solutions to deal with urgent problems as well as long-term societal challenges. [7] This rationale is shown in Europe 2020 strategy established by European Commission focused on smart, sustainable and inclusive growth in the EU countries. The Europe 2020 has five main goals including employment, climate change and energy, education, poverty and social exclusion and research and development. As can be seen from the priorities of European Commission, research and development are one of the important elements of sustaining growth. There are many projects and concepts focused on supporting innovation, research and development on national or transnational levels. However, focusing on research and development on regional level is equally important as has been proven by various studies. Project KIT (Knowledge – Innovation – Territory), which involved participation of many important universities, proved that „one-size-fits-all“ approach is not suitable for constructing innovation policies. KIT studies show that it is important to view innovation policy in wider context than support of research as well as the fact that individual regions have different needs related to innovation policy.
One of the concepts designed to support innovation, research and development in EU countries on regional level is new concept of European Commission called Smart specialisation. The main aim of the smart specialisation is to increase innovation performance of EU countries. This concept is partly based to advance on understanding of relationships between economic geography, technology and institutions [14]. Smart specialisation is a place-based approach characterised by the identification of strategic areas for intervention based on the analysis of the strengths and potential of the economy and on an Entrepreneurial Discovery Process (EDP). Smart specialisation strategies are based on „bottom-up“ approach considering defining priorities rather than traditional industrial policies. Other elements of smart

specialisation strategies are transparency (including evaluation and monitoring) and flexibility.

National/Regional Research and Innovation Strategies for Smart Specialisation focus on five points:

- the focus of policy support and investment is on key national/regional priorities, challenges and needs for knowledge-based development,
- strategies are based on each country/region's strengths, competitive advantages and potential poor excellence,
- support is divided between technological and practice-based innovation and aimed at stimulation of private sector investment,
- stakeholders are fully involved and innovation and experimentation is encouraged,
- strategies are evidence-based and include sound monitoring and evaluation systems. [6]

Key elements of smart specialisation are reflected in these principles:

- smart specialisation is a place based approach, it builds on the assets available to regions and on their specific socio-economic challenges,
- member states and regions should support only a limited number of priorities for knowledge-based investments/clusters,
- setting priories should not be a top-down process, it should be inclusive process of stakeholders' involvement centred on entrepreneurial discovery,
- strategy should take into account broad view of innovation, meaning it should support both technological and practice based and social innovation,
- strategy should include good monitoring and evaluation system. [8]

Considering limited public resources, it seems to be very important to focus support of public resources to R&D areas that contribute to economic growth of the country or areas that have potential. [3] The spatial distribution of R&D expenditures among the regions has been examined so far in the EU countries [13] as well as in other countries such as for example in China. [15], [17] Zachariadis [16] argued that R&D expenditure is mostly reflected in the number of patents and patents have a positive effect on the development of technologies, which raises economic growth.

Performance of countries as well as regions is closely linked to labour productivity. There have been many studies directed at finding link between innovation, R&D and productivity. There was established correlation and plausible causality between innovation policies and labour productivity growth. [1] Some studies were also focused on impact of research and development and innovation policies on labour productivity on sectoral level. [4] It was proven that R&D and ICT contribute to innovation to a different extent with R&D being the most relevant input for innovation. Furthermore, universities appear to play very important role in creating high-tech innovation in the region. [2]

It was also shown that both R&D and ICT individually appear to have large impacts on productivity. [10] Privately financed industrial R&D was proved to have significant effects on productivity growth of manufacturing industries with industries directly conducting the privately financed R&D having larger effect than industries indirectly purchasing capital from industries conducting privately financed R&D. [11] The study investigating long-term effects of various types of R&D on multi-factor

productivity growth showed that increase of 1 per cent in business R&D generated 0.13 per cent in productivity growth with effect being larger in countries with intensive business R&D and lower share of defence-related government spending. [9] Research studying relationship between total factor productivity, R&D, human capital and public infrastructure showed that regional productivity is positively affected by R&D activity and public infrastructure of neighbouring regions. [5]

3 Methodology and data

As stated in the introduction, the main aim of the paper is to test potential link between intensity of research and development within the concept of smart specialisation of the region and labour productivity in the region. In our analysis we used data from Eurostat database. The dataset consists of 276 cross-sectional observations for each NUTS 2 region in the EU. Most of the observations are valid for the year 2015. All variables used in the analysis are described in more detail in Table 1.

Table 1. Description of variables used in the analysis

Variable	Short description
Labour productivity	Wage adjusted labour productivity It is defined as value added divided by personnel costs which is subsequently adjusted by the share of paid employees in the total number of persons employed, or more simply, apparent labour productivity divided by average personnel costs (expressed as a ratio in %).
Factor 1	Factor 1 get from the factor analysis of employment structure by type of the economic activity
Factor 2	Factor 2 get from the factor analysis of employment structure by type of the economic activity
Population with tertiary education	Population aged 25-64 with higher educational attainment (ISCED 5-8). NUTS 2 regions (%)
Scientific publications	Publications per million inhabitants. ScienceMetrix calculations, based on Scopus data
GDP per capita	GDP per capita based on purchasing power parity (PPP). It is gross domestic product converted to international dollars using purchasing power parity rates.
Employment in technology and knowledge-intensive	Employment in technology and knowledge-intensive sectors by NUTS 2 (high-technology manufacturing and knowledge-intensive high-technology services) % of total employment
Patent applications	Number of patent applications to the EPO per million inhabitants
Creativity class employment	Core Creativity Class employment % of population aged 15-64

Access to Internet	Households with access to the Internet at home (% of total households)
Motorways	Population living in surrounding regions weighted by travel time along motorways
Corruption	Corruption is a major problem (% of respondents)
HR in Science and technology	Persons with tertiary education and employed in science and technology % of active population
GERD total	Gross domestic expenditure on R&D (GERD) (Euro per inhabitant)
GERD higher education	Gross domestic expenditure on R&D (GERD) financed by higher education (Euro per inhabitant)

Source: Authors based on the data from Eurostat (European Commission, 2017).

We strategically chose especially variables related to research and development. Firstly, we examined selected indicators related to smart specialization focused on research and development in the NUTS 2 regions of the Czech Republic and Slovakia. We analysed six indicators (GERD by High education, Patents, Scientific publications, access to internet, creative class employment and employment in technology and knowledge-intensive industry) transformed to the same scale and compared the regions in Slovakia and the Czech Republic separately. Moreover, based on these indicators we performed cluster analysis in order to classify regions in the Czech Republic and Slovakia to the clusters according to similarity in smart specialization in science and technology. We used group average distance between clusters and the Ward method of clustering.

Next, we focused our attention on the classification of employment by economic activity in EU (NUTS 2) regions. This could be also used as the proxy for specialization of region. We decided to perform factor analysis based on these indicators to identify potential hidden factors that could be reported as specialization of the region. We got two main factors based on this method which were further used in regression analysis as independent variables together with other variables described in Table 1. On the other hand, indicator capturing the labour productivity was used as dependent variable in all regression models. Regression models have been tested for autocorrelation and data have been tested for multicolinearity. Standard errors have been estimated with standard errors corrected for heteroscedasticity.

4 Results

Smart specialization of the region could be aimed on increasing the intensity of research and development within the region in order to increase innovation potential. We analysed six selected indicators transformed to same scale. All indicators are related to research and development activities within regions in the Czech Republic and Slovakia. The performance of NUTS 2 regions of Czech Republic is shown in Figure 1. As we can see the region Prague is performing the best in five out of six dimensions. However, the region Střední Čechy is virtually at the same level in almost every indicator except GERD by higher education sector, which is

significantly lower in Střední Čechy. On the other hand, region Severozápad seems to be significantly lagging behind other regions in almost every aspect.

We also perform similar analysis for NUTS 2 regions in Slovakia. Results are graphically illustrated in Figure 2. Similarly as in the case of the Czech Republic, the metropolitan area of capital town is performing the best in most indicators. Furthermore, in this case other regions are lagging even more behind top performing region. Internet access is the only one dimension where region Východné Slovensko slightly outperforms Bratislavský kraj. All three regions except Bratislavský kraj are at similar level in all other five dimensions.

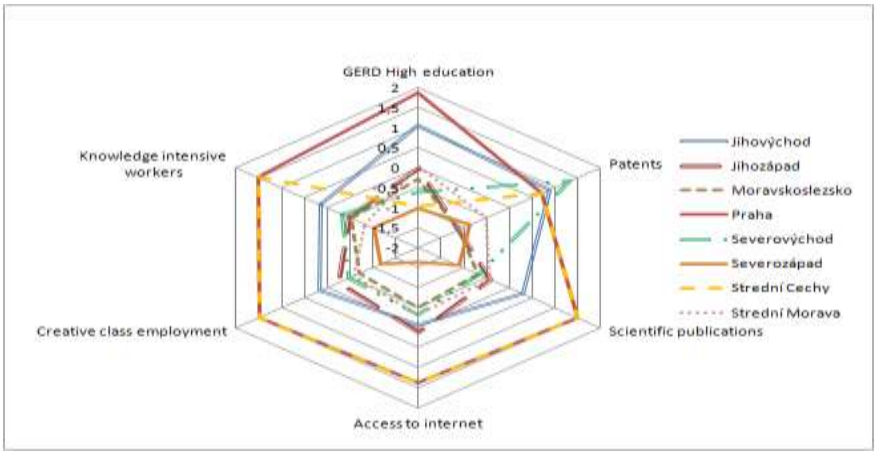

Fig. 1. Indicators of research and development in NUTS 2 in the Czech Republic

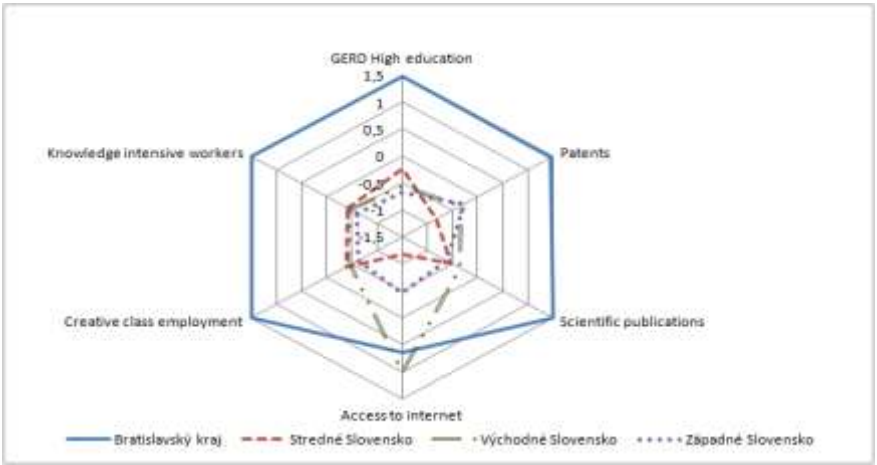

Fig. 2. Selected indicators of research and development in NUTS 2 in Slovakia

Furthermore, we used cluster analysis in order to classify all NUTS2 regions according to the six indicators mentioned above. We applied Ward method of clustering. As it can be seen in the Dendrogam (Figure 3) regions Praha and Bratislavský kraj are in the same cluster. Moreover, region Stredni Čechy is also similar to these. All three regions are the best performing ones with respect to research and development activities. Other three regions from Slovakia are classified in the same cluster. On one hand, regions Moravskoslezko, Střední Morava and Jihozápad are in one cluster and regions Jihovýchod a Severovýchod can be classified in another cluster.

In the next part of the analysis we focus our attention on the structure of the employment according to the different economic activities. We assume that the type of the regional specialisation could be reflected by the employment structure. We further used factor analysis, in order to reduce this information to one or two variables as well as to capture unobserved factor which in this case could mean regional specialisation.

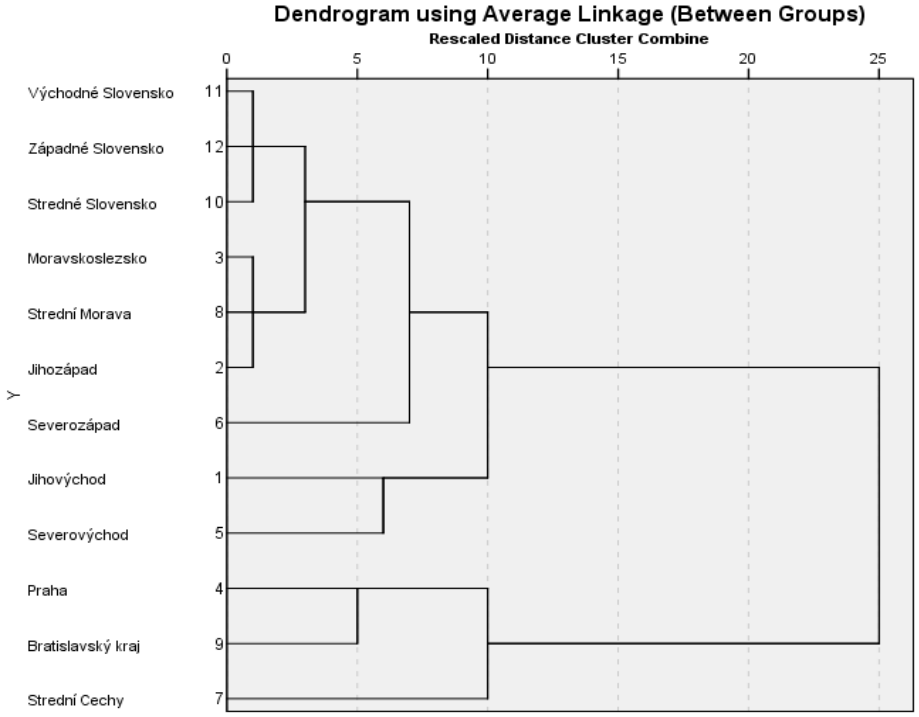

Fig. 3. Dendrogram of NUTS 2 regions based on selected indicators of research and development

Using the factor analysis based on the share of employment in ten different economic activities we get two main factors. These two factors have been chosen according to the eigenvalue higher than 1 as we can see in Figure 4. Both factors capture together more than 95% of the variability of previous 10 variables.

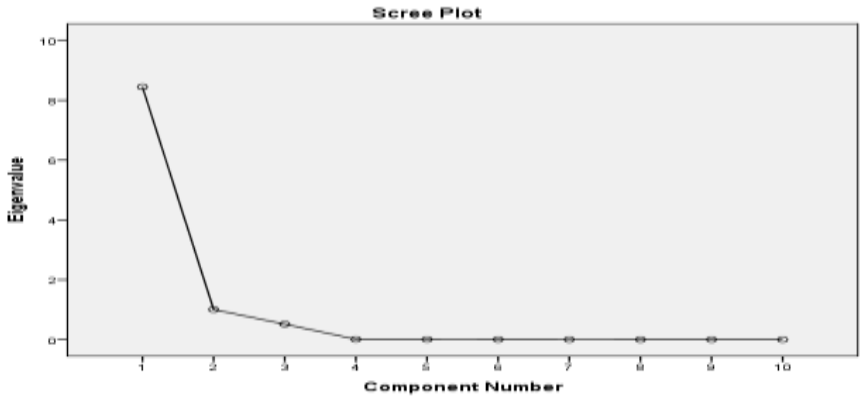

Fig. 4. Scree plot of factors from factor analysis based on eigenvalues
Source: Authors.

Table 2 shows the results of factor analysis in the form of rotated component matrix. Factor 1 is positively correlated with employment in services and manufacturing. This could also very likely mean better environment for further smart specialization and innovation. On the other hand Factor 2 represents mostly regional specialization on agriculture.

Table 2. Rotated Component Matrix from factor analysis

Employment by economic activity:	Component	
	Factor 1	Factor 2
1. Agriculture, forestry and fishing	,001	,998
2. Mining and quarrying	,749	,087
3. Manufacturing	,991	,008
4. Wholesale and retail trade	,997	,011
5. Information and storage	,990	-,012
6. Financial and insurance activities	,991	-,030
7. Real estate activities	,988	,004
8. Professional, scientific and technical activities	,992	-,024
9. Public administration	,996	-,024
10. Art, entertainment and recreation	,994	-,024

Note: We used Factor analysis with Principal Component Analysis extraction method and Varimax rotation with Kaiser Normalization.

Both factors regarding the type of regional specialization that we got from factor analysis have been further used in the regression analysis as independent variables. Hence, we want to examine whether regional specialization and research and development activities located within the region could have some positive

consequences on labour productivity in the region. The results of regression models are summarized in Table 3.

Table 3. Results of panel regression models of „Labour productivity“

	1.1	**1.2**	**1.3**	**1.4**	**1.5**
C	23.98				
	(0.79)				
Factor 1	4.46***	4.41**			
	(2.93)	(2.06)			
Factor 2	-4.51**	6.50**			
	(-2.02)	(14.31)			
Log(GDP per capita)	4.15	6.50***	2.34	2.93*	4.25***
	(1.37)	(14.31)	(1.2)	(1.72)	(5.47)
Population with tertiary education	0.37**	0.38**	0.45***	0.25	0.73***
	(1.99)	(2.06)	(2.15)	(1.22)	(3.99)
Scientific publications	0.01***	0.01***	0.01***	0.01**	
	(3.69)	(3.54)	(3.40)	(2.44)	
Patent applications	0.03***	0.035***			
	(3.69)	(3.36)			
Corruption	0.18	0.11			
	(0.11)	(0.07)			
Motorways	0.09***	0.10***	0.11***	0.10**	0.13***
	(5.71)	(5.76)	(3.75)	(2.59)	(8.60)
Access to internet			0.48*	0.45*	
			(1.80)	(1.75)	
GERD higher education			0.01**		
			(2.22)		
GERD total				0.01	
				(1.42)	
R^2	0.53	0.53	0.44	0.47	0.44
Adjusted R^2	0.52	0.52	0.42	0.45	0.43
DW stat	1.90	1.89	2.08	1.56	1.83
Akaike crit.	8.71	8.70	8.98	9.03	8.89
Observations	261	261	173	162	265

Note: Labour productivity in the regions has been used as dependent variable in all models. Standard errors have been corrected for heteroscedasticity. (.) denotes t-statistics, */**/*** mean significance at the 10%/5%/1% levels of significance.

We used several independent variables related to research and development such as Gross domestic expenditure on R&D and the number of scientific publications and patent applications per capita. Furthermore, we also used several control variables such as GDP per capita, proxy for the quality of institutional environment (corruption) as well as proxies for quality of infrastructure. The share of tertiary educated people

could be seen on one hand as the indicator related to higher education and research but on the other hand it could be also used as the proxy for human capital in the region. We applied together five models with different independent variables in order to check for robustness of the results and to eliminate potential correlations between variables.

Based on the results we can say that specialisation of the region on services and manufacturing is positively related to higher labour productivity. On contrary, regions with more employees in agriculture, forestry and fishing resulted in average lower labour productivity. The result is expected and it stems from the very nature of these activities.

The results strongly suggest that especially scientific publications, patent applications and gross domestic expenditure on R&D (GERD) financed by higher education could have positive effect on labour productivity in the region. These results are complementary to findings of several previous studies [10].

Inputs of research as well as outputs of the research could be seen as important part of smart specialisation. Furthermore, there is another way of how universities and higher education institutions could increase labour productivity. Higher education institutions play prominent role in increasing educational level in the region, which in turn could positively influence the labour productivity. This assumption has been supported by our results. The share of population with tertiary education seems to positively correlate with labour productivity. This variable has been significant at least at 5% level in four out of five models. Moreover, we also found relatively strong evidence that the quality of infrastructure in the region could play very important role in increasing labour productivity which is mostly in line with previous studies [5].

Conclusion

The implementation of regional smart specialisation could be important step in order to improve regional development in the EU. Research and development should play important role in this process. Base on the theory and previous empirical research we can assume that regions with more focus on research and development activities could be awarded by higher labour productivity and potential higher economic growth. In our research we have indentified factors with potential effect on labour productivity based on the data for NUTS 2 regions in EU. Our results strongly suggest that research activities as well as appropriate infrastructure could both play important role in increasing labour productivity in the region. More scientific publications as well as more patent applications are positively correlated with higher labour productivity. The same is true for gross domestic expenditure on R&D (GERD) financed by higher education. Thus, we can say that better research performance at higher education institutions or research institutions in the region could increase labour productivity. Moreover, higher education institutions could have positive effect on labour productivity also by increasing the education level in the region. This assumption has been also supported by our results.

We also examined selected indicators related to research and development in NUTS 2 in the Czech Republic and Slovakia. As expected regions, Praha,

Bratislavský kraj and Střední Čechy significantly outperform outer regions in most of the indicators. These three regions have been also classified together in the same cluster based on the results of cluster analysis. While regions in Slovakia significantly lag behind the leading region in almost every dimension this difference is rather smaller in the Czech Republic.

Our results could have several important implications for EU regional policy and public support of higher education and research education at national and supranational level. The support of research and development at regional level seems to be important in order to further increase labour productivity and maintain regional economic growth. Hence, universities and other higher education institutions are one of the most important subjects in these terms. The potential of these institutions for improving regional development is very high. This represents one of the main challenges for national and the EU regional development policy. However, when talking about this support it is inevitable to distinguish those regions that performing very well in this filed from those that are significantly lagging behind. The differences between regions seem to be still very significant.

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Opportunities and Barriers to the Development of Agriculture 4.0 in the Context of Low Carbon Agriculture in Poland

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Abstract. Agriculture 4.0, as a vision of agricultural development, has great potential for limiting undesirable and harmful pollution of the natural environment resulting from agricultural activity. The multidimensional and cumulative nature of negative phenomena, mainly related to the chemization of agriculture, raises challenges, related to, among others, to the development of information and communication technologies. The aim of this paper is to provide knowledge about Agriculture 4.0 in Poland, including current opportunities and barriers to its development. The background for the presented issues is the development of a low carbon economy. In Poland, there are Information and communication technologies as well as robotics available, which can provide the basis for solving ecological problems in agricultural production. However, according to analyses, farmers constitute the largest social group in Poland without access to computers and the Internet.

Keywords: Agriculture 4.0, Precision Agriculture, ICT, Pesticides, Poland

1 Introduction

Contemporary agriculture in order to consciously and deliberately control the biological processes of plants and animals, taking into account the issues of environmental protection, requires much greater knowledge of farmers than it used to do a dozen or so years ago. Agricultural producers operate in an increasingly complex, competitive economic realm and must have knowledge not only in technology and production techniques in agriculture, but also in such fields as economics, law and ecology [20]. In this context, computerization of production and management processes in agriculture is more and more often indicated as a future direction of change. The concept of digital transformation of agriculture is defined in the literature of the subject and the development programs of many institutions and organizations (e.g. European Agricultural Machinery) as Agriculture 4.0 [8]. Similarly to the concept of Industry 4.0, the transformation process in Agriculture 4.0 aimed at increasing competitiveness is also implemented through the use of modern information technology [18].

2 Methods and sources of materials

The main objective of the work is to provide knowledge about modern trends related to Agriculture 4.0 in Poland, including current opportunities and barriers to its development. These issues were discussed in the context of the development of low carbon agriculture in Poland on the example of plant protection activities. The article presents statistics on the use of information and communication technologies in rural areas in Poland. The literature analysis of the subject was used to identify the status and technical capabilities of ICT in the subject matter studied.

3 Opportunities of using information and communication technologies in plant protection

As it was mentioned above, modern information technologies are used in all sectors of the economy. In agriculture, information technologies have been used in both plant and animal production. As Mueller et al. point out, nowadays it is not difficult to indicate possible applications of ICT in agriculture [16]. Information technologies provide users with the tools by which they can acquire, select, analyse, process, and even manage information (Figure 1).

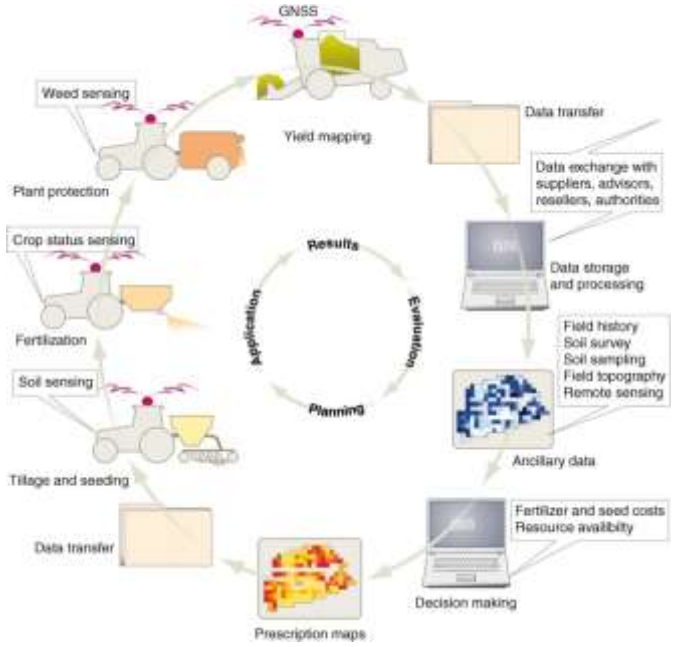

Fig. 1. Precision agriculture information flow in crop production [5].

Agricultural producers have the opportunity to use modern decision-making tools, including those regarding fertilization, plant protection and livestock feed. A number

of examples of advanced information technology used in agriculture can be found in precision agriculture. Thanks to information and communication technologies, a farmer can acquire and expand knowledge, make contacts with other producers, promote his products and services, order necessary means of production, and handle official affairs [6].

Significant, from the point of view of the subject of this paper, is the use of ICT in the aspect of low-carbon agriculture, i.e. high-yielding agricultural practices that maximally limit threats for natural environment [19]. It is acknowledged that the use of digital techniques is one of the most effective and necessary approaches to the implementation of resource efficient and low carbon agriculture [23]. Innovative ICT solutions enable the most current data to be used in real-time and tailored to the needs of the user [4].

On farms, decision-making processes in the field of chemical plant protection in Poland are often supported by tools in the form of computer systems and applications. In the most elaborate form, these are decision support systems (DSS), i.e. information systems for collecting, processing and providing information to the end user in order to facilitate accurate decision making [21]. A plant health decision support system is a set of procedures and instructions to help a farmer (or an adviser) make the right decision to protect the plantation (Figure 2). There are separate systems for individual pests/crops. For example, one of the best known systems supporting decision-making in potato protection against *P. infestans* in Poland is NegFry [13].

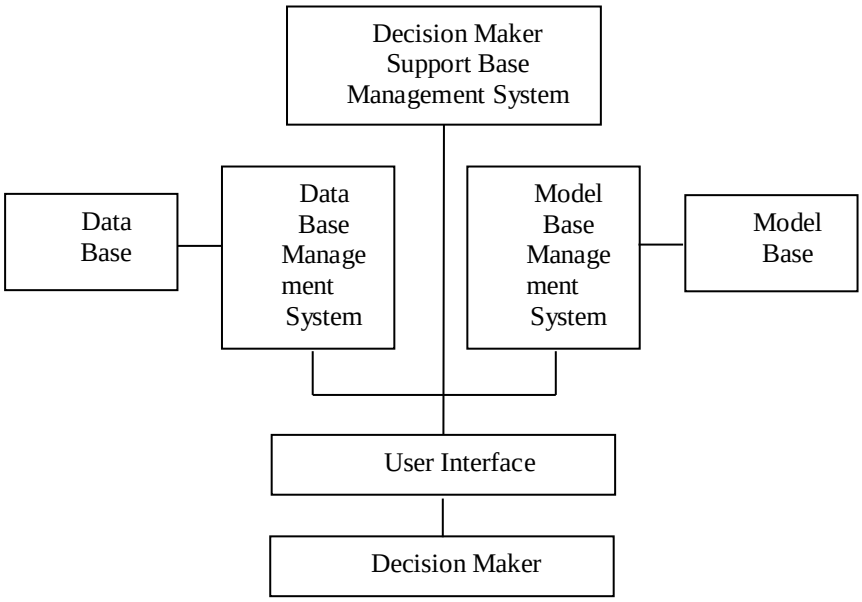

Fig. 2. Typical Decision Support System [12].

A typical decision support system comprises from the following elements:

- The Database and the Database Management System;
- The Model Base and the Model Base Management System (MBMS);
- The Dialog Generation and Management System [12].

It is worth emphasizing that the development of decision support systems is also one of the tools to facilitate the implementation of the principles of integrated crop protection. The first works on the development of the "Internet Decision Support System for Integrated Plant Protection" were launched in Poland in 2001. The work was carried out in collaboration with the Danish Institute of Agricultural Sciences, which provided prototypes of disease models [17]. Currently, under mandatory since January 1, 2014 introduction of integrated plant protection system in Poland, state institutions provide farmers with access to information and monitoring of harmful organisms and making appropriate decisions regarding the use of plant protection products. The Plant Protection Institute conducts signalling of pests' occurrence (access via the website http://www.agrofagi.com.pl/). The farmer, on the basis of the descriptions of morphology, biology and control of pests, which are available on the Institute's website, can independently determine the threat to his crops and make an appropriate decision regarding plant protection. The Main Inspectorate of Plant Health and Seed Inspection (www.piorin.gov.pl) also operates an online signalling system based on short-term prognoses of disease and pest development. It provides assistance to the farmer in deciding about the need for plant protection.

Agricultural producers in Poland have also increasingly wide choice of computer software to support farm management. Professional handling of a farm with plant production may be supported with such programmes as AgroNet, Agridata, Elmid, Agronom i FarmWork. Advanced programs enable GPS monitoring with data analysis, route, location and speed recording, planning of services and farming treatments. On Polish market there are also available numerous computer programs to support the management of animal production in farms. The use of these types of programs can greatly help to keep the farm running while simultaneously contributing to its faster development, optimizing production costs while reducing excessive pollution of the natural environment.

In recent years, the market of mobile applications, aimed at facilitating pest control in agricultural, vegetable and fruit crops, is also dynamically developing in Poland, An example of this type of application is "e-pole". In the application you can read the description of plant protection products, the list of diseases, weeds and pests controlled, the recommendations on doses and crop rotation. It is also possible to read the label of each product. The application is available for Android, iOS and Windows. There are also applications available for amateur and hobbyist plant growing, such as the "Doktor Kwiatek" application (Figure 3).

Fig. 3. Dr Kwiatek - Android Apps on Google Play (screenshot) [7].

The "Doktor Kwiatek" application contains an illustrated database of the most common diseases and plant pests. With the application, there is an option to consult the advisor (by taking a photo of the problem with a description and sending it to the Plant ER). The application contains the most important information about plant protection products such as: product names, their purpose or preharvest interval. The application may be downloaded at no additional cost and its proper functioning requires only a smartphone with Android 4.0 or its higher versions.

In the context of Agriculture 4.0, in addition to systems, programs and applications, an important issue are modern methods and techniques of data collection. Currently, there is a real revolution taking place in the way information about crops for precision farming is obtained from the air, mainly due to small, relatively inexpensive unmanned aerial vehicles - drones with mounted multispectral cameras [15]. Obviously, in this case, it is also necessary to use appropriate software for proper interpretation. Drones can also be potentially used as robots to perform protective procedures. Undoubtedly, the advantages of using drones as agricultural machines include the lack of influence on the soil structure (e.g. soil compacting in the case of traditional terrestrial treatments) and the possibility of reaching places inaccessible for field sprayers [1,9].

4 Current status and barriers of use of Agriculture 4.0 in Poland

In literature, there is no comprehensive study on the availability and the use of ICT in Polish agriculture. There are fragmentary studies, and their conclusions often point

out that computer techniques are rapidly entering the farms in Poland, although their use is still relatively low. The results of empirical research obtained by other authors show that a small number of farmers in Poland use specialized computer programs on their farms [2,11].

The development of ICTs in rural areas is linked to many conditions - both technological (computer access, internet, etc.) as well as economic and socio-demographic ones. In Poland, the residents of rural areas are still listed among the social groups most vulnerable to digital exclusion [10], although access to modern information media has become much better in recent years. The analyses on the use of information and communication technologies in rural areas and on farms in Poland are presented in tables 1 and 2 and figures 4 and 5.

In 2016, 80.1% of Poles had access to a computer, and in rural areas - 77% (Table 1). Significant improvements have been noted given the time range of the study. In 2016, 60.5% of the population of rural areas in Poland regularly used computers, i.e. by 13.2 percentage points more than in 2010.

Table 1. Table captions should be placed above the tables [22].

Specification		**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
					[%]			
Households posessing a computer	rural areas	63.7	67.1	69.4	71.7	73.6	75.0	77.0
	total	69.0	71.3	73.4	74.7	77.1	77.9	80.1
Regular computer users	rural areas	47.3	49.8	50.2	51.4	54.8	56.0	60.5
	total	57.7	60.0	60.2	60.8	63.5	64.8	69.1
Households with Internet access	rural areas	56.2	61.2	66.1	67.8	71.5	72.0	77.8
	total	63.4	66.6	70.5	71.9	74.8	75.8	80.4
Households with broadband Internet access	rural areas	46.9	53.4	60.5	63.0	66.7	64.7	71.3
	total	56.8	61.1	67.0	68.8	71.1	71.0	75.7

Farmers in Poland are reluctant to use cloud computing services - disk space on the Internet (Figure 4).

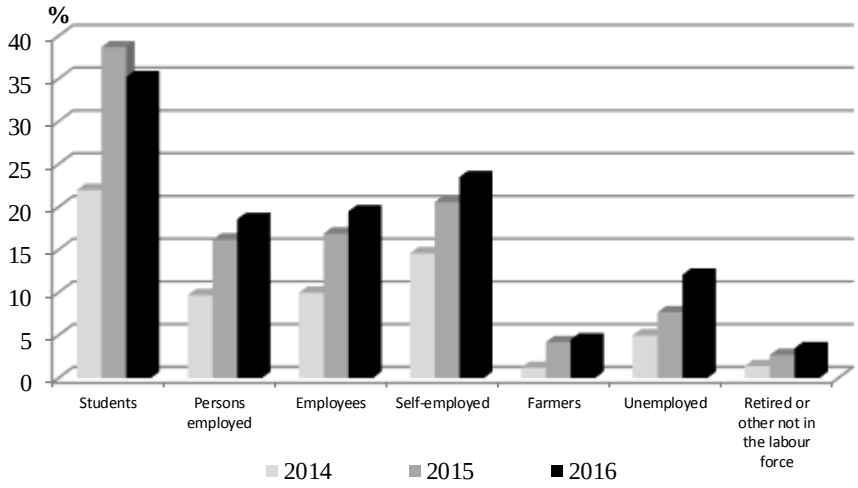

Fig. 4. Individuals who use cloud computing services to store files [22].

In 2016, Poland recorded a significant variation in the use of storage space on the Internet for file saving, taking into account the type of professional activity of the users. Cloud services were used by 35.2% of students, compared to 4.5% of farmers and 3.5% of retired and professionally inactive people. In each of the groups in terms of professional activity, an increase in the examined indicator was noted in the years 2014-2016.

As mentioned earlier, more and more useful information technology programs for farmers are available in the mobile version. The percentage of people using and not using mobile devices to connect to the Internet in 2016, regarding the type of professional activity, is shown in Table 2.

Table 2. Individuals using and not using mobile devices to access the Internet in 2016 [22].

Specification	Individuals using mobile devices [%]	Individuals not using mobile devices
Students	83.4	15.4
Persons employed	34.9	50.1
Employees	37.2	50.5
Self-employed	39.0	50.1
Farmers	10.4	46.3
Unemployed	26.6	42.3
Retired or other not in the labour force	8.9	31.6

Agricultural producers in Poland are a professional group that makes little use of portable devices. A detailed analysis of the data showed that for the purpose of Internet connecting outside home and place of work, in 2016 farmers more frequently used mobile phones or smartphones rather than portable computers, such as laptops and tablets (Figure 5).

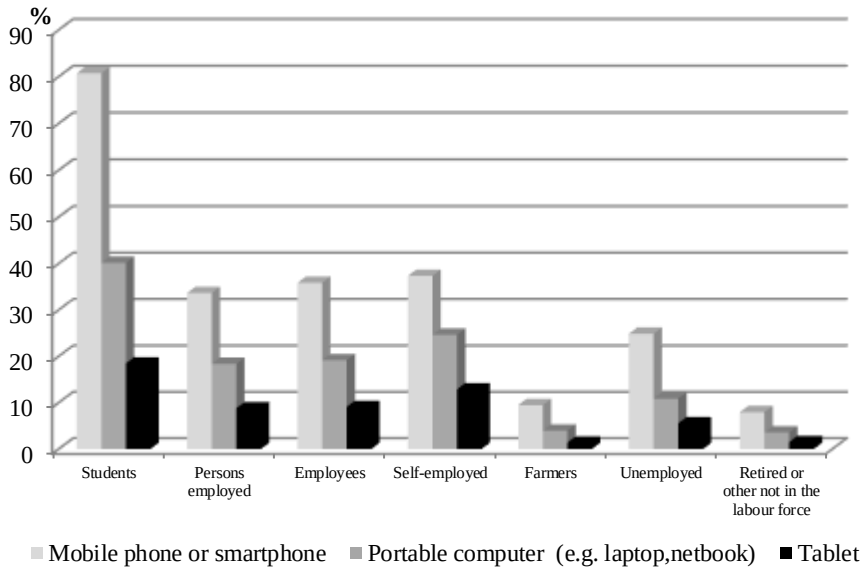

Fig. 5. Individuals using mobile devices to access the Internet by types of device in 2016 [22].

Access to modern ICT tools in agriculture is an important element in determining the proper and efficient operation of farms in the ecological sense. In this context, the results of research on the use of mobile devices for connecting to the Internet by farmers against other professional activities are not optimistic.

It is also worth mentioning about another factor limiting the use of ICT in Polish agriculture. Based on the research conducted by Borusewicz et al. [2] the relationship between farm size, the education and the age of respondents and the development of precision agriculture may be noted. Precision farming technology is better known among farmers up to the age of 40 who have higher education and large farms. The level of use of information and communication technologies is also significantly related to the level of development of the commune [14].

Conclusion

Information and communication technologies are a very important element, the use of which may be important in agricultural holdings from the point of view of developing low carbon agriculture. Teleinformatic techniques, geolocation systems, sensors, etc. allow for the application of varied doses of fertilizers, plant protection agents, seeds

and other means of production, resulting from locally varied needs. This limits not only economic losses, but also a potential threat to the natural environment. Agriculture 4.0 can lead to faster and more flexible solutions for the organization of plant and animal production while limiting chemization of agriculture.

According to the information presented in this paper, agricultural producers in Poland have access to technologically advanced systems, programs and applications in the field of plant protection. By using information and communication technology, a farmer can gain and broaden his knowledge of this field, which should result in optimal decisions in given organizational and natural conditions. In Poland, despite improvements in recent years, there is still a problem of access to computers and the Internet in rural areas. Two basic prerequisites must be fulfilled for ICT to be used: universal access to ICT devices and appropriate skills to use then (knowledge and competence). There is also a problem of low degree of integrity of available databases and information systems in the field of plant health in Poland.

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Human Resources Management in the Industrial Revolution 4.0: General and Polish Perspective

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Abstract. The purpose of the article is to present the challenges faced by human resources management (HRM) in the context of changes regarding the Industrial Revolution 4.0. The holistic approach to this problem was used i.e. technology perceived from the perspective of two stakeholder groups. These are HR departments and the general body of employees. The paper is based on analysis of relevant literature studies in combination with scientific reflection. It discusses global changes as well as the nature of Polish market.

Keywords: Industrial Revolution 4.0, Human Resources Management, HR department.

1 Introduction

A thesis can be put forward that for the last decades the level of interest in the way people function in their workplaces has been increasing continuously. Therefore, managing people (human resources management, HRM) can be considered the key management area. As J. Latham [13] says, organizational systems do not exist without humans.

A dynamic era of change in the world of work will introduce the Industrial Revolution 4.0 (also referred to as the Cyber Revolution), which will be influenced by a range of new technologies and innovations resulting in driverless cars, smart robots, virtual reality, connected devices, artificial intelligence etc. The term Industry 4.0 refers to the Fourth Industrial Revolution and a German development program aimed at connecting people and machines to simplify all processes through digitalization [31]. The Industry 4.0 has four main characteristics, i.e. vertical networking with individualized production, horizontal integration across countries and continents, through-engineering and acceleration via exponential technologies [9]. The Industry 4.0 will bring new opportunities for work and have the potential of connecting billions more people in the web as well as drastically improving business efficiency [7]. These new technologies exert impact not only on work performance and efficiency, but also on people's attitudes and HRM processes. The new concept of e-HRM (electronic human resources management) and HRM 4.0 does appear. E-HRM is defined as "the way of implementing HR strategies, policies and practices in organizations through a conscious and directed support of and/or with the full use of

web-technology-based channels" [25]. In turn, adding the number "4.0" to the term of HRM means the digitalization of all HR processes [30].

The problems and influence of the Fourth Industrial Revolution are being touched up on in the subject literature. The existing publications usually focus only on some aspects of technological changes. Among them there are either labor market impacts or opportunities for IT tools implementation in HR processes [20]. The second case covers the following applications of modern technologies, referring to work-flow improvements (e.g. holiday applications processing), recruitment, training (e-learning) or employer-employee communication (via the Intranet). The issue of e-HRM is also mentioned. The purpose of this paper is to combine these two aspects of the Industrial Revolution 4.0, while anticipating new challenges for all the parties involved. The problem was discussed in more detail by means of answering the following research questions:

1) What are the implications of the Cyber Revolution for the employees?

2) What is the role of HR departments in the new digital world?

The analyzed problem was approached holistically, i.e. technology perceived from the perspective of two stakeholder groups. These are HR departments and the general body of employees. In order to provide answers for research questions the literature studies were conducted in combination with scientific reflection.

The first part of the paper discusses the effects of technological changes in terms of employees. These effects mainly result in the need for specific competencies and continuous professional development. The second part is focused on the influence of modern technologies on HR departments' work specificity, including the possibility of creating value-added services. The paper discusses both global changes and the nature of Polish market. Such factors as approx. 30 years lasting Polish free-market economy, the fall of central planning and restructuring of industry resulted in the adaptation of Western solutions in Polish HRM. The influx of foreign capital and the development of local IT systems supporting HR administration and salary accounting had their impact as well. One of Polish popular HR IT systems celebrated its 30th anniversary in 2017 [29]. New technologies were created simultaneously with the HR sector in Poland and have always had a real impact on its development.

2 Implications of the Fourth Revolution for employees

The beginning of all industrial revolutions took place within industry sector. In the Industrial Revolution 4.0 the commencement of a transformation process is not driven directly by the industry itself. The invention of social networks and intelligent devices used by employees should be considered as the main driving force. Today the development of these mutual interrelations functions as the driving force for the production sector development [26]. In the current economic reality, a model of "minute competitiveness" started to dominate offering prosperity opportunities only to these companies that faster and more efficiently collect and analyze streams of business information [12]. The production of material goods is accompanied by services based on communication with customers. Technological consulting is an

example of such service. Success in selling services requires employees with advanced social skills.

The dynamic development of technology implies that employees have to deal with increasingly shorter product life cycles. The shelf life of specific technological knowledge becomes increasingly shorter. Such situation results in the need to unlearn some specific methods of performing tasks and to learn the new ones. Specialists from Boston Consulting Group say that by 2025 there will be about 350,000 new professions on the job market [16].

The implementation of Internet technology has also led to organizational changes towards virtualization. There are more and more organizations that occupy a small office space in relation to the number of employees and do not assign a desk to a specific person. Employees spend most of the week working on-line from home. As J.D. Lilly and D.W. Durr [15] say, many people now engage in work with few human interactions but there is an increased possibility of frustration with new, complex technology.

According to the authors of the report "Future work skills 2020", the main factors affecting the change of requirements for employees include e.g. increased usage of machines performing repetitive routine activities, the world moving towards programmable systems and the environment of new media. Based on the above characterized factors, it has been stated that employees will not be able to perform in the future as many repetitive tasks as they do now. Moreover, the list of ten competencies required from employees to "find themselves" in the future job market were identified. The list includes e.g.: transdisciplinary, novel and adaptive thinking, new media literacy, computational thinking and virtual collaboration [6]. In turn, the Association of Internet Industry Employers IAB Polska among the competencies related to the 4.0 revolution lists such features as: technological and IT skills or ability to acquire and analyze information [11].

According to the opinion presented in the subject literature by the year 2033 half of the existing professions will disappear. First of all, it will refer to such business areas as transport and logistics. Some of the professions related to office administration, insurance and finance services, or call center area are also “destined to extinction” [5]. The German Institute for Labor Market Research (Institut für Arbeitsmarkt- und Berufsforschung) states that the above described changes will increase the demand for high skilled employees along with reducing jobs for people with lower qualifications [28, 31]. The OECD conducted comparative studies of changes in the labor market between the USA and the 28 countries of the European Union. These studies show that both the size of the medium-skilled jobs reduction and the increase of demand for higher qualifications are higher in the USA than in the European countries [28].

Based on the above statements it can be concluded that an employee of the future is a person involved in continuous learning. Modern technologies also influence learning methods. At this point it should be mentioned that the concept of “Learning 4.0” already exists and refers to the process of lifelong learning (from early childhood till retirement) with the help of modern technologies. Not only young people need to follow the changes. Low supply of new workforce in certain market areas produces

the need for maintaining or even extending workforce by hiring the retirees. They also need to be able to work with modern IT tools.

3 The role of HR department in the new digital world

Subject literature presents various classifications of roles played by HR departments. It emphasizes that a general change of its role is observed nowadays, from a strictly administrative, through a development oriented one and even to a business partner function. The new role is determined by the previously mentioned, ongoing transformations in an enterprise milieu. The new needs of HR services' addressees keep emerging. Both the internal enterprise units and the external labor market ones represent the beneficiaries of activities carried out by HR specialists. The internal stakeholders of HR services are represented by an employer (management board), line and project managers and their subordinates [22].

Businesses must be alert to the changing environment and adapt their workforce planning as well as development strategies to ensure alignment with the future skill requirements. Strategic HR professionals might reconsider traditional methods for identifying critical skills along with selecting and developing talents. The workforce strategy for sustaining business goals should remain one of the most critical products of HR department work [6].

An external labor market can be the source for talent acquisition. Locating the right individuals and verifying their competencies will be a challenging task for HR specialists. IT tools have become indispensable in recruitment and selection (R&S) process and facilitate the creation of a modern employer image [20]. The labor market participants – generation Y representatives – are fluent in modern technologies. The next generation – so called WWW – actively influences the content of commonly accessed Internet sites. This results in even greater expectations on an employer's part regarding modern technologies. Presently it is possible to conduct the entire R&S process using virtual methods. The tools dedicated to on-line testing can be used to assess employees' competencies. This includes IQ as well as psychological testing. E-learning tools can also be applied at this point to test the level of candidates' proficiency [21].

Talents can be or even should be developed and nurtured internally, within the companies. The recently conducted research (April 2017) by IAB Polska in collaboration with Association of Marketing Communication (SAR) and Public Relations Enterprise Association shows that Poland lacks a unified and internally cohesive educational model. Polish universities are also not equipped to address the constant changes in communication methods in relation to new media development and the digital reality. Considering how important information technologies are for the quality of work, the practical educational model becomes absolute necessity [17]. HR departments are responsible for this model implementation inside companies. It is of great importance not only to enhance employees' development, but also to provide managers with the ongoing stream of technological news and their adoption benefits. Studies carried out by Ican Institute and published in 2017 show, that about 20% of

managers from manufacturing companies in Poland have never heard of the Industry 4.0 idea and they are strictly focused on current operational tasks [10]. For such – busy – people knowledge should be supplied in a condensed form to access it in the time which is suitable for them. In such situation it is worth using e-learning tools. Nowadays mobile devices offer extensive opportunities to learners, allowing them to improve their knowledge at all times, with no boundaries for education. HR departments should be aware that the trainings of the future do not apply to e-learning only (learning utilizing electronic technologies), but also m-learning (distant learning based on wireless technology) [18].

It is worth mentioning the need to invest in older employees. The research conducted by T. Broady, A. Chan and P. Caputi [3] has shown that negative stereotypes about older people being avoidant of technology and incapable of its usage are outdated. With proper encouragement, clear explanation of personal benefits and an appropriate time schedule, older people certainly have the potential to become equally effective in using technology on par with younger age groups. In the face of technological changes, it is also important to monitor staff satisfaction with the tools they are actually using - for example, by asking relevant questions in an annual employee opinion survey. Although the expectations of system users are collected during an IT project realization, the project itself and the role of IT department come to an end when the tool is implemented. HR department, in turn, is responsible for internal communication (including collecting feedback on possible system improvements).

As it has been mentioned before, modern technologies also influence the ways of how HR departments can work. E-HRM speeds up transaction processing, reduces information errors and advances the tracking and control of HR actions. It limits the repetitive paperwork, which HR specialists have to perform and also improves service delivery. By using e-HRM web-based technologies supervisors and personnel are made responsible for fulfilling the activities of HR role and thus a new HR architecture is created. M.L. Lengnick-Hall and S. Moritz [14, 27] identified three different levels of e-HRM, developed over time, which consist in one-way communication from organization to employees or managers through web-based channels. The second higher-level involves automation of transactions, workflow and even supply-chain integration, where paperwork is replaced by electronic input. Managers and employees can access databases, update information, search for the needed information and make decisions. The third and the highest level is focused on HR system transformation. The relevant levels are referred to as operational, relational and transformational [24] (see table 1).

Table 1. Three types of e-HRM

Type of e-HRM	Focus	Examples of processes
Operational	Administrative functions	Payroll, personnel data
Relational	Supporting business processes by means of "soft" HR activities	Training, performance management
Transformational	Strategic HR activities	Knowledge management

At this point it is worth emphasizing the limitations of operational digitalization work performed by HR departments resulting from the existing law in Poland. The procedure for keeping employee's personal records is determined by the resolution of the Minister of Labor and Social Policy dated 28th May 1996 on the scope of documentation kept by employers concerning matters related to employment relationship and the procedure for keeping personal records of employees (Journal of Laws of 1996, No. 62, item 286 as amended). The existing regulations do not provide for the possibility of keeping personal files in an electronic form. This requires from HR departments to collect and store documents in the traditional paper form. An amendment to the law is currently being in consultations. Despite announcements, the draft of amendments was not implemented in June 2017 (and even in December 2017) [32].

According to the latest forecasts, the global HR software market is expected to grow in the years to come by 2.4% annually and reach the value of $ 9.2 billion by 2020 [17]. The so-called intelligent services, based on machine learning methodology, recognized as the higher generation of self-service solutions for employees and their supervisors are of extensive significance for the development of new HR processes' architecture. HR application, equipped with such functionality, is capable of taking appropriate steps in another module automatically by means of links between functional areas, based on a single transaction carried out in one place [4]. For example, when an employee's holiday is approved, during his/her absence, the system can automatically redirect his/her tasks to other employees within workflow processes, inform co-workers of the need to change dates of meetings with his/her participation, or postpone training reservations. All this happens within a system in a smart way, without the need for manual intervention, which greatly improves internal HR processes.

Social and mobile technologies offer numerous opportunities for HR to remain relevant and can reinvigorate personalized HR services. Over time, the relentless push for efficiency and economies of scale tended to make HR services less personal. Technology, however, keeps helping to reverse this trend by enabling HR’s customers to develop actual relationships with real people in a virtual community, in a highly personal and interactive way. HR service centers can evolve into communities and HR portals can morph into social platforms. Social media capabilities enable employees to interact with HR and other parts of their organization, as well as with external vendors, alumni and colleges. Mobile devices help deliver on-demand service through easy-to-use apps [8].

It has been noted in the subject literature that the HR business partners’ role is to create value for companies. Value creation takes place when organizations develop new ways of performing operations, using new methods [23]. R. Amit and C. Zott [1, 25] observe that in e-business new value can be created by the ways in which transactions are enabled. Organizations that invest in e-HRM aim at renewing their methods for implementing HR policies and practices, hoping for benefits such as improved efficiency and effectiveness. These benefits represent value-creating factors. C. Bowman and V. Ambrosini [2, 25] differentiate between two types of value creation at an organizational level: use value and exchange value. The first type

refers to the specific aspect of a new job, product, or service in connection with users' requirements. It can be seen in the transformational functions of e-HRM usage. The second type, exchange value, is defined as the monetary amount realized after the exchange of a new task, service, or product. This type of value may arise from e-HRM, mainly through cost reduction. At this point it is worth noting that the reduction of costs does not mean the reduction of jobs in HR departments. Parry [19] examined the hypothesis, which states that organizations with a lower ratio of HR staff to total employees would be more likely to use e-HRM. In fact, the use of e-HRM does not lead to cost savings suggested by past literature in this field, not through the HR staff reduction.

4 Conclusions

The fourth industrial revolution changes the business model of companies. Modern industry is characterized by a high level of flexibility, optimization of production processes and better use of resources. These are the characteristics of enterprises that will determine their competitive advantage in the market. At the same time, the indicated changes affect the way employees perform their tasks. This, in turn, implies activities in the area of human resources management.

The subject literature provides a number of descriptions of the new reality, addressing various aspects of the incoming changes. This article highlights not only the possibilities for development of a new architecture of HR processes using IT tools and thus positioning HR departments as business partners, but also underlines impacts of changes on employees and the role of HR departments affected by these changes.

What new developments does the future hold? Undoubtedly, there is an ongoing need for employees' development, shaping their "skills of the future". The challenges for HR department entail attempts to keep up with the new trends while training managers. Additionally, new generations of employees are comming. They have enormous expectations when it comes to the company on line presence and people's responsiveness. The implementation of modern technologies under such conditions becomes a necessity.

Concluding the presented discussion it is worth emphasizing that the traditional forms of HR service delivery are still needed. It is most important to adjust work execution methods to the needs of stakeholders, i.e. employees. In some cases, employees can have limited access to IT tools, in some other cases they may prefer the old ways of communicating.

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Nonlinear Cournot Duopoly Game

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Abstract. The study of structure of different markets haven't been finished yet. Even such a well-known concept as oligopoly can be described by different models with different assumptions and with different values of parameters. The aim of this paper is to consider a nonlinear inverse demand function in Cournot duopoly model. Provided there is a sufficiently large proportion between costs of the two firm it is possible to observe nonlinear phenomena such as bifurcation of limit values of production or deterministic chaos. To prove a sensitive dependence on initial condition, that accompanies deterministic chaos, the concept of Lyapunov exponent is used. We also discuss that the particular values of parameters are not important for the discussion about the mentioned nonlinear phenomena but that their possible presence is worth to know.

Keywords: Bifurcation, Cournot Duopoly, Lyapunov Exponent, Nonlinear Model, Oligopoly.

1 Introduction

One of the effects of globalization is that there emerge very rich and powerful corporations in the economic world. Such, usually multinational, companies of considerable size can have sufficiently influence to determine prices at a particular market. In consequence of this structure a trade can be completely controlled by several firms. This is the reason why oligopoly structure markets and their different models are studied and modified again, [2, 9, 11, 7, 8]. It is well known that oligopoly markets consider a few producers that produce the same good or goods that are perfect substitutes. Each company must consider not only the demand of market, but also the actions of the competitors, the property that is known as interdependence. In this paper we restrict to the case of market with two companies that is called duopoly, [3]. In contrast of the classical Cournot duopoly game it is considered a nonlinear inverse demand function. These problems are studied at [10] and [6]. In this paper we consider similar properties as in [9].

2 Model

First we briefly remind a classical model of oligopoly, [5, 12], and in particular we present Cournot duopoly assumptions, [3]. Then we introduce a special nonlinear

demand function, [10], that allows us to present some complex phenomena of duopoly game.

2.1 Fundamental Principles of Cournot Oligopoly Model

Let $n, n \in N_0$, be the number of companies at the given market. Denote $D = \{1,2,\dots,n\}$ a finite set and let C_i, $i \in D$, be the company that produce the homogeneous output $q_i(t)$ at the given time period t, $t \in N_0$. All companies make plans for their production $q_i(t+1)$ in the next time period in order to maximize their expected profit P_i or expected utility. Profit of each companies depends on the price $p(t+1)$ at which the good is sold in period $t+1$ and this price depends on the total supply $Q(t) = \sum_{j \in D} q_j(t)$ according to a given inverse demand function

$$p(t+1) = p_D[Q(t)]. \tag{1}$$

To simplify the further consideration we introduce the following notation

$$Q_i(t) = \sum_{j \in D \setminus \{i\}} q_j(t) = Q(t) - q_i(t), \tag{2}$$

that represents the total output of the rest of the industry expect for the firm C_i at the period t. Notice, that the relation $Q(t) = q_i(t) + Q_i(t)$ is valid for all $i \in D$. The profit P_i of company C_i can be now expressed as

$$P_i\big(q_i(t), Q_i(t)\big) = q_i(t) \cdot p_D[q_i(t) + Q_i(t)] - c_i(t) \cdot \big(q_i(t), Q_i(t)\big), \tag{3}$$

where $c_i(\cdot)$ is the cost function of company C_i. Moreover the production for the next period $t+1$ of the company C_i can be found as a solution of the following optimization problem

$$q_i(t+1) = arg \max_{x \in X_i} P_i(x, Q_i^e(t+1)), \tag{4}$$

where $Q_i^e(t+1)$ represents the total output of the rest of the industry expected by firm C_i for the next time period $t+1$ and X_i, $X_i \subset [0, \infty)$, is the strategy set which is used for selection of the optimal production of the company C_i. The principal assumption of the model is how to represent particular expectations about production of other companies. The original Cournot assumption is a simple naive expectation

$$Q_i^e(t+1) = Q_i(t) \tag{5}$$

for all $i \in D$.

2.2 Dynamics of Cournot Model

Let all problems (4) have theirs unique solutions. If (5) is applied we can write

$$q_i(t+1) = R_i(Q_i(t)), \qquad i \in D, \tag{6}$$

where $R_i: \prod_{j=1,j\neq i}^{n} X_j \to X_i$ is the reaction function of company C_i or the best response or best reply mapping of firm C_i. To study this dynamical problem in more details a more specific forms of inverse demand functions and costs functions are necessary.

2.3 Nonlinear Model

Similarly as in [9] we consider that (a) the quantity demanded is reciprocal to price and (b) the firms operate under constant unit costs. Particularly we assume that (1) has a form

$$p(t+1) = \frac{1}{Q(t)}, \qquad t \in N_0, \tag{7}$$

and instead of (3) it is possible to write profit function in the form

$$P_i(x, Q_i(t)) = \frac{x}{x + Q_i(t)} - a_i x, \qquad i \in D, \tag{8}$$

where $a_i, a_i > 0$, is a constant unit costs of the firm C_i and x substitutes $q_i(t)$ for a specific value of period t. Now it is possible to solve profit maximum problem (4). The first order conditions of this problem are

$$P_i'\big(x, Q_i(t)\big) = \frac{Q_i}{\big(x + Q_i(t)\big)^2} - a_i = 0, \;\; i \in D. \tag{9}$$

As the numerator, residual demand, as well the unit cost a_i, are positive, we can find their roots, and solve (9) for the simple reaction function

$$x = \sqrt{\frac{Q_i}{a_i}} - Q_i, \quad i \in D. \tag{10}$$

The reaction x is positive provided that

$$Q_i(t) < \frac{1}{a_i}, \quad i \in D. \tag{11}$$

If not, then the negative outcome has to be replaced by sufficiently small and nonzero outcome $\varepsilon, \varepsilon > 0$, which allows us to construct the resulting reaction functions for dynamics (6). For all $i \in D$ we put

$$q_i(t+1) = R_i(Q_i(t)) = \begin{cases} \sqrt{\dfrac{Q_i}{a_i}} - Q_i, & Q_i(t) < \dfrac{1}{a_i}, \\ \varepsilon, & Q_i(t) \geq \dfrac{1}{a_i}. \end{cases} \tag{12}$$

This system of difference equations (12) stands for a particular dynamics (6) of the introduced nonlinear oligopoly model.

3 Results and Discussion

For the rest of this paper we will consider a special case of a duopoly game. In this case $n = 2$ and immediately from (2) we have

$$Q_i(t) = \begin{cases} q_2(t), & i = 1, \\ q_1(t), & i = 2. \end{cases} \tag{13}$$

If duopolists partially adjust their quantities towards the their best replies according to (6) and (13), the dynamical system is generated by the iteration of the map

$$F\colon (q_1(t+1), q_2(t+1)\,) = (R_1(q_2(t)), R_2\big(q_1(t)\big)\,), \tag{14}$$

where $R_1\colon X_2 \to X_1$ and $R_2\colon X_1 \to X_2$ are reaction functions of companies C_1 and C_2 given by (12). If the initial conditions $\big(q_1(0), q_2(0)\big) \in X_1 \times X_2$ are given, a trajectory

$$\{(q_1(t), q_2(t))\}_{t=0}^{\infty} = \{F^t(q_1(0), q_2(0))\}_{t=0}^{\infty}, \tag{15}$$

is generated by $t-$th iteration F^t, $t \in N_0$, of map (14) and it produces Cournot tatonnement, [6].

3.1 Equilibrium and its properties

If there is a fixed point (q_1°, q_2°) of the map (14) it is called Cournot-Nash equilibrium, [5]. This equilibrium can be found as a solution to the system of equations

$$(q_1^\circ, q_2^\circ) = F(q_1^\circ, q_2^\circ). \tag{16}$$

With the particular form of reaction functions (12) it is possible to find the following nonzero equilibrium

$$(q_1^\circ, q_2^\circ) = \left(\frac{a_2}{(a_1+a_2)^2}, \frac{a_1}{(a_1+a_2)^2}\right). \tag{16}$$

The stability of this stationary point can be determined from the Jacobian matrix of map (14) enumerated at the stationary point, [4]. It is possible to find

$$J(q_1, q_2) = \begin{pmatrix} 0 & \dfrac{1}{2\sqrt{a_1 q_2}} - 1 \\ \dfrac{1}{2\sqrt{a_2 q_1}} - 1 & 0 \end{pmatrix}, \tag{17}$$

which means that at stationary point (16) we have

$$J(q_1^\circ, q_2^\circ) = \begin{pmatrix} 0 & \frac{a_2 - a_1}{2a_1} \\ \frac{a_1 - a_2}{2a_2} & 0 \end{pmatrix}. \tag{18}$$

The eigenvalues of matrix (18) are imaginary as follows

$$\lambda_1 = -i\,\frac{|a_1 - a_2|}{2\sqrt{a_1 a_2}}, \quad \lambda_2 = i\,\frac{|a_1 - a_2|}{2\sqrt{a_1 a_2}}. \tag{19}$$

The stationary point (q_1°, q_2°) is asymptotically stable if $|\lambda| < 1$, [4]. Solving this problem we can observe that such situation happens when one of the following relation for the ratios a_1/a_2 or a_2/a_1 of unit costs is valid

$$3 - 2\sqrt{2} < \frac{a_1}{a_2} < 3 + 2\sqrt{2} \text{ or } 3 - 2\sqrt{2} < \frac{a_2}{a_1} < 3 + 2\sqrt{2}. \tag{20}$$

As soon as the ratios of the unit costs fall outside these intervals the stationary point is not stable.

3.2 Bifurcation diagram

To study periodical points of map (14) it is convenient to construct a bifurcation diagram. It shows the relationship between values of a parameter and values of fixed points or values of periodic orbits of the given dynamical system. More generally asymptotically stable stationary points and periodical points are special types of attractors that can be briefly characterized in two steps as follows: (i) a limit set of a point $q \in W$, where W is an open set in R^2, is the set of all points $a \in W$, such that there exists a sequence $t_i \to \infty$ and $\lim_{t_i \to \infty} F^{t_i}(q) = a$; (ii) a compact set $A \subset W$ is called attractor if there is a neighborhood U of A such that A is the limit set of all initial values $q(0) \in U$. Simply put an attractor is a set of all points to which trajectories starting at initial points from a neighborhood of the set will converge, [1].

Now it is possible to characterize the bifurcation diagram in more details: if $\lambda, \lambda \in R$, is a parameter of dynamical system (14) and A_λ is a set of all attracting points for the given value of $\lambda \in M$, where M is the parameter set of our interest, then the bifurcation diagram is the graph of the relation $\{(\lambda, A_\lambda) | \lambda \in M\}$. This figure shows the birth, evolution and extinction of attracting sets, [1]. Because (14) depends symmetrically on two parameters a_1 and a_2, corresponding cost prices of firms, we consider the price ratio $\lambda = a_1/a_2$ as a bifurcation parameter and we also set $a_2 = 1$, as a price unit.

The algorithm for plotting a bifurcation diagram is based on the direct application of definition of attractor – instead of computing exact limit points only points for sufficiently large number of iterations of map (14) are considered. The algorithm can be described as follows: (i) choose the initial value λ of the parameter of map (14); (ii) at random choose an initial value $(q_1(0), q_2(0))$ of map (14); (iii) calculate a few first iteration od (14) and ignore them; (iv) calculate a few next iterations of (14) and

plot them; (v) increment the value a of the parameter of map (14) and repeat above steps until you reach the end of the parameter sets. See also [1]. The given algorithm was implemented in Matlab and its result is reported at Fig. 1.

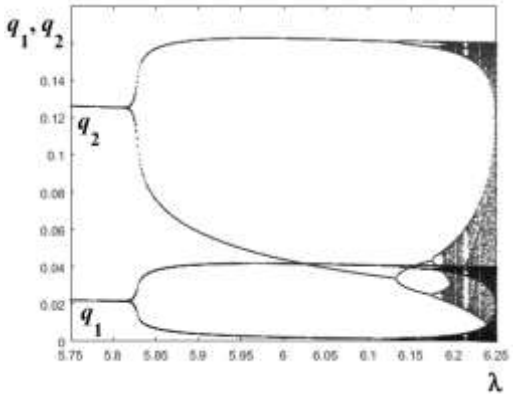

Fig. 1. Bifurcation diagram of map (14). The black diagram describes the dependence of limit points of variable q_1 on parameter λ and similarly the grey diagram describes limit points of variable q_2.

3.3 Lyapunov exponent

The bifurcation diagram can also point out to the phenomenon called deterministic chaos. In this case almost all intervals seem to be filled by the plot. Once, such a phenomenon is observed it is useful to compute Lyapunov exponents for special values of parameters. It is a method how to formally identify the sensitive dependence of the given system on initial conditions, which is one of the characteristic attribute of chaotic behavior. This exponent measures the exponential rate of separation of very close trajectories.

Here we give only a concise characterization based on [1]. Let F be a smooth map on R^2, similarly as in (14), and let $J_n = DF^n(v_0)$, where v_0 is an initial point and D is the first derivative of the map F. In other words J is a Jacobian of the map F. For $k \in \{1,2\}$ let r_k^n be the length of the k-th longest orthogonal axis of the ellipsoid $J_n N$, where N is the unit circle with the center v_0. It means that the value r_k^n measures the expansion or contraction in the neighborhood of the orbit starting at v_0 during n first iterations. If the following limit exists $L_k = \lim_{n\to\infty}(r_k^n)^{1/n}$ it is called the k-th Lyapunov number and moreover k-th Lyapunov exponent of v_0 is $h_k = \ln L_k$. If $L_k > 1$ then $h_k > 0$, which means that two initially close trajectories can move away to each other. On other side if $0 < L_k < 1$ then $h_k < 0$, which means that two initially close trajectories can stay close to each other.

The particular algorithm for computing Lyapunov exponents uses an indirect approach. It is based on Wolf's ideas given in [1, 13] and can be briefly described as follows: (i) we start with initial orthonormal basis $\{w_1^0, w_2^0\}$ of the space R^2, that sufficiently characterize the initial circle N and further compute the vectors $z_1 = Df(v_0)w_1^0$ and $z_1 = Df(v_0)w_1^0$, (ii) use vectors $\{z_1, z_2\}$ and Gramm-Schmidt

orthogonalization method to find orthogonal basis $\{y_1^1, y_2^1\}$, (iii) set $w_1^1 = y_1^1, w_2^1 = y_2^1$, (iii) repeat steps (i), (ii) and (iii) for sufficiently large number of steps n, (iv) the good approximation for total expansion r_k^n where $k \in \{1,2\}$ is $\|w_k^n\|^{1/n}$, where $\|.\|$ is the Euclidean norm at R^2.

Unfortunately the given algorithm is not a good one for a particular numerical computation. To avoid the computation with large and small numbers it is possible to notice that $r_k^n \approx \|y_k^n\| \cdot \ldots \cdot \|y_k^1\|$. If we take the logarithm of the latter formula we can summarize that the formula $n^{-1} \cdot \sum_{i=1}^{n} \ln y_k^i$ provide a good approximation of k-th largest Lyapunov exponent. The described algorithm for map (14) was implemented in Matlab. We have found that Lyapunov exponents for initial state $v_0 = (0.1, 0.1)$, parameter $\lambda = 6.25$ and parameter $\varepsilon = 2.2 \cdot 10^{-16}$ can be approximated by values $h_1 \approx 0.1616$ and $h_2 \approx 0.1605$ respectively. Since at least one value of Lyapunov exponent is positive we can conclude that for the given value of parameter of λ the map (14) is sensitive to initial conditions. It means that it is possible to consider that the given map shows features typical for deterministic chaos.

4 Conclusion

The paper introduced a nonlinear version of Cournot duopoly model. The essential assumption of the model is a nonlinear inverse demand function. In particular and similarly as in [9] the assumption that the quantity demanded is reciprocal to price was used. The equilibrium was found and conditions of its stability were established. Provided there is a sufficiently large proportion between costs of two firms in duopoly game it was shown that there exist nonlinear phenomena such as bifurcation of limit values of production or deterministic chaos. To prove a sensitive dependence on initial condition, that accompanies deterministic chaos, the concept of Lypunov exponent has been used.

In our future work we would like to improve and test the algorithm for computation of Lyapunov exponents. Its implementation in Matlab also deserves more tests and improvements.

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Employment Structure Transformations in Large Polish Cities

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Abstract. The article identifies and provides the assessment of changes occurring in the labour market structure of Polish voivodship cities. Bray-Curtis measure was used to analyse these transformations. The time span of the study covered the years 2005-2015.
The conducted analysis allowed identifying the groups of cities characterised by a similar range of changes in the labour market structure. It was also attempted to analyse the relationship between Bray-Curtis measure value and the level and rate of economic growth in the regions, the capitals of which are the analysed cities.

Keywords: Labour Market Structure, Polish Voivodship Cities.

1 Introduction

Labour market, representing the market for one of the production factors, was developed in the course of historical processes. In the national dimension (Poland) it is characterized by significant interregional differences, manifested by a different unemployment rate recorded in various areas and also by the diversified employment structure in particular economy sectors. Identifying the labour market situation remains the necessary component (stage) of the carried out economic policy, including the regional one. Moreover, since the market functions as a regulator of economic processes, its sustainability is important from the perspective of broader development processes taking place in economy. In order to assess development processes it seems reasonable to use the indicato-based assessment, which can effectively support local management processes [3].

After the administrative reform, which came into force on 1st January 1999 [cf. 8], sixteen new voivodships were established in Poland, and simultaneously eighteen cities started playing the function of their capitals – voivodship capital cities. Fourteen of them i.e. Białystok, Gdańsk, Katowice, Kielce, Kraków, Lublin, Łódź, Olsztyn, Opole, Poznań, Rzeszów, Szczecin, Warszawa and Wrocław are also the seats of the Voivode and local government authorities. These functions were separated in two voivodships. A different number of voivodships and voivodship capital cities prove the difficulty of delimiting regions in space [cf. 4]. In Kujawsko-Pomorskie voivodship the city of Bydgoszcz is the seat of the Voivode, whereas the city of

Toruń is the seat of the voivodship Parliament and the Marshal's Office. A similar situation occurs in Lubuskie voivodship: Gorzów Wielkopolski is the Voivode's seat, whereas Zielona Góra the seat of local government authorities [7, 11]. In spite of the fact that all the analysed cities, in accordance with the typological classification adopted in Poland [cf. 1] can be included in the group of at least large cities (more than 100 000 residents), there are significant differences in their size (Tab. 1) and internal socio-economic structure [15].

Table 1. Population number in Polish voivodship cities [5].

City	Population number in 2015
Opole	118931
Gorzów Wielkopolski	123762
Zielona Góra	138711
Olsztyn	173444
Rzeszów	185896
Kielce	198046
Toruń	202689
Białystok	295981
Katowice	299910
Lublin	340727
Bydgoszcz	355645
Szczecin	405657
Gdańsk	462249
Poznań	542348
Wrocław	635759
Łódź	700982
Kraków	761069
Warszawa	1744351

The purpose of the article is to identify and evaluate changes occurring in the years 2005-2015 on the labour market structure of Polish voivodship cities. This period, following Poland's accession to the EU, was characterized by a dynamic economic growth of the country. In 2015 Polish GDP amounted to PLN 1798302 million, which was nominally worth 1.8 times more than the value recorded for 2005. It seems that the ongoing development processes should be accompanied by adequate adaptation processes, taking place on the labour market. The study was carried out using Bray-Curtis measure. An attempt was also made to determine the relationship between the

level and rate of economic growth in the regions and the transformations occurring on this market.

2 Research method

For the purposes of the presented study it was adopted that the structure of employment is presented by employment percentage in 5 groups of NACE 2007 sections (Polish Statistical Classification of Economic Activities). Section A covers employment in agriculture, forestry, hunting and fishing and can be identified with the sector of agriculture. The group of B-F section includes industry and construction - the industrial sector. According to the Central Statistical Office's data collection method, the service sector was divided into three components. The group of G-J sections covers trade; repair of motor vehicles; transport and storage; accommodation and gastronomy; information and communication (Services I). Sections K-L represent financial and insurance activities; real estate services (Services II), and the group of M-U sections lists other services, including e.g. education, health care and social welfare, public administration and national defence; compulsory social security (Services III). It should be observed that in Polish context, the latter group is dominated by non-market services.

Bray-Curtis measure was applied to analyse transformations in employment structure in Polish voivodship cities.

If it is assumed that the numerical picture of employment structure in a given object, according to the groups of NACE 2007 sections, takes the form of a vector:

$$[a_{1k}^t, a_{2k}^t, a_{3k}^t, a_{4k}^t, a_{5k}^t] \qquad (1)$$

where:

a_{1k}^t – employment share in the first section grouping in t moment (years), in k-th object k =1,…, K,

a_{2k}^t – employment share in the second section grouping in t moment (years), in k-th object k =1,…, K,

a_{3k}^t – employment share in the third section grouping in t moment (years), in k-th object k =1,…, K,

a_{4k}^t – employment share in the fourth section grouping in t moment (years), in k-th object k =1,…, K,

a_{5k}^t – employment share in the fifth section grouping in t moment (years), in k-th object k =1,…, K,

which elements meet the dependence:

$$\sum_{i=1}^{5} a_{ik}^t = 1 \qquad a_{ik}^t \geq 0, \qquad (2)$$

then Bray-Curtis measure evaluating changes in the value of vector (1) elements in k-th object (city) in two different moments t = 1,2 takes the following form:

$$p_k = \frac{\sum_{i=1}^{5}|a_{ik}^1 - a_{ik}^2|}{\sum_{i=1}^{5}(a_{ik}^1 + a_{ik}^2)}; \quad (3)$$

then:

$$p_k \in [0; 1]. \quad (4)$$

Almost zero values of Bray-Curtis measure can be estimated as slight changes in employment structure in the grouped NACE 2007 sections in a given object, in two comparable periods (years). Approximate to unity measure values mean significant changes in employment structure [6].

The groups of cities, characterized by a similar nature of transformations occurring in employment structure, were identified using hierarchical cluster analysis by applying the furthest neighbour method, in accordance with the size of Bray-Curtis measure.

Using Spearman's rank correlation coefficient, the relationship between Bray-Curtis measure and GDP per capita in 2015 was analysed in these regions the capitals of which are the studied cities. The relationship between the value of the characterized measure and the level of economic growth in these regions in the time relationship 2005 - 2015 was also analysed. In addition, the relationship between the measure value and the city size, defined based on population number, was also analysed.

3 Research results

Tables 2 and 3 show employment shares in the groups of NACE 2007 sections in Polish voivodship cities in 2005-2015. It is noticeable that in both analysed years the service sector was definitely the dominating one in the studied cities [cf. 13, 12], with particular emphasis on Services III. It can be adopted that it results from the concentration of central type functions in regional capitals, i.e. the activities which also serve entities located in the city hinterland. In 2015 the employment share in the grouped M-U sections was the highest in all analysed cities (in 2005 Toruń was the exception). In the relationship of the years 2005-2015 Services I gained importance against the industry sector. In 2005 in 8 out of 18 cities Services I were dominated by the industry sector, in 2015 such situation was true for only 4 cities (Bydgoszcz, Gorzów Wlkp., Łódź, Kielce). K-L grouping supplemented the economic landscape of cities, however, did not gain major significance in any of the regional capitals. Its rank was most prominent in Warszawa, where in 2015 it surpassed the importance of the industry sector.

Table 2. Employment share in grouped NACE 2007 sections in Polish voivodship capitals in 2005 [5].

Territorial unit/ NACE 2007 sections	Agriculture, forestry, hunting and fishing (section A)	Industry and construction (sections B-F)	Services I (sections G-J)	Services II (sections K-L)	Services III (sections M-U)
POLAND	21.5	29.4	17.1	3.9	28.2
Wrocław	0.7	25.0	26.4	7.1	40.8
Bydgoszcz	0.6	34.2	24.7	5.4	35.0
Toruń	0.8	36.8	23.5	5.0	33.9
Lublin	1.7	20.8	25.2	6.5	45.8
Gorzów Wlkp.	2.1	33.1	21.4	4.7	38.7
Zielona Góra	0.4	23.2	27.8	6.9	41.7
Łódź	1.0	29.8	23.1	6.0	40.0
Kraków	0.9	25.6	26.2	5.3	41.9
Warszawa	0.5	16.6	32.6	11.1	39.1
Opole	1.4	25.8	26.4	4.9	41.4
Rzeszów	0.4	30.9	24.9	5.6	38.2
Białystok	1.6	24.4	26.3	5.2	42.5
Gdańsk	0.9	26.4	26.0	7.4	39.3
Katowice	0.3	28.2	27.7	6.5	37.3
Kielce	1.0	30.3	24.5	4.7	39.5
Olsztyn	0.7	26.0	27.9	6.3	39.1
Poznań	0.9	27.2	28.9	5.8	37.3
Szczecin	1.0	25.8	28.4	6.2	38.7

Table 3. Employment share in grouped NACE 2007 sections in Polish voivodship capitals in 2015 [5].

Territorial unit/ NACE 2007 sections	Agriculture, forestry, hunting and fishing (section A)	Industry and construction (sections B-F)	Services I (sections G-J)	Services II (sections K-L)	Services III (sections M-U)
POLAND	21.0	26.9	19.0	3.8	29.2
Wrocław	0.7	18.7	26.9	8.3	45.4
Bydgoszcz	0.7	30.9	24.1	6.7	37.7
Toruń	0.8	27.3	27.4	5.9	38.6

Lublin	4.0	17.9	25.1	7.2	45.8
Gorzów Wkp.	2.6	35.8	19.7	4.4	37.5
Zielona Góra	1.7	22.8	27.5	5.4	42.5
Łódź	0.9	25.1	24.6	6.7	42.8
Kraków	1.4	19.7	28.8	6.4	43.7
Warszawa	0.7	12.3	30.8	13.5	42.8
Opole	1.0	23.6	25.3	4.2	45.9
Rzeszów	3.9	24.5	25.0	4.4	42.1
Białystok	3.4	20.2	26.5	4.7	45.3
Gdańsk	0.8	21.1	28.7	7.9	41.5
Katowice	0.4	21.2	26.0	9.3	43.1
Kielce	1.8	26.7	24.5	3.7	43.3
Olsztyn	0.7	21.6	26.2	5.6	45.9
Poznań	0.8	20.7	27.8	6.3	44.4
Szczecin	1.3	19.9	29.9	5.5	43.4

Based on the data in Tables 2 and 3, using the formula no. 3 the measurement of changes occurring in employment structure, in the analysed cities, was conducted. The values of calculated Bray-Curtis measure are presented in Tab. 4. Next using the method of the furthest neighbour four groups of cities were identified, in which the nature of structural changes was similar (Tab. 5).

Table 4. Bray-Curtis measures for employment structure in Polish regional capitals in the relationship 2005-2015

POLSKA	Zielona Góra	Lublin	Gorzów Wielkopolski	Bydgoszcz	Opole	Kielce	Białystok	Łódź	Gdańsk	Kraków	Warszawa	Wrocław	Szczecin	Olsztyn	Rzeszów	Poznań	Katowice	Toruń
0.030	0.021	0.030	0.032	0.040	0.045	0.046	0.048	0.049	0.054	0.059	0.061	0.064	0.065	0.068	0.076	0.077	0.086	0.095

Table 5. The groups of cities identified using the furthest neighbour method in terms of Bray-Curtis measure value for employment structure in the years 2005-2015

Group	Cities	Standard deviation	Intra-group average	Variation coefficient
1	Zielona Góra Lublin Gorzów Wielkopolski	0.0047	0.0276	0.170
2	Bydgoszcz Opole Kielce Białystok Łódź Gdańsk Kraków Warszawa	0.0068	0.0503	0.135
3	Wrocław Szczecin Olsztyn Rzeszów Poznań	0.0054	0.0698	0.078
4	Katowice Toruń	0.0044	0.0905	0.049

It is worth noticing that the majority of voivodship capitals were characterised by higher value of Bray-Curtis measure and thus more dynamic transformations of labour market structure against the average country value (Tab. 4). In case of only 2 out of 18 cities (Zielona Góra and Lublin) this value was lower or equal the one characteristic for Poland. The following differentiation should be highlighted – the measure value for Zielona Góra was (0,021), whereas for Toruń it amounted to (0,095).

The first group covers the cities characterised by the smallest range of changes in employment structure, and along with the relatively low numbers (Zielona Góra, Lublin, Gorzów Wielkopolski) they feature high variability reaching 17%. Zielona Góra and Gorzów Wlkp. are the capitals of Lubuskie voivodship located in western Poland, by the German border. Lubelskie voivodship, with Lublin as its capital is situated in eastern Poland and borders with Byelorussia and Ukraine.

The second, most numerous group included 8 cities for which the average level of structural changes measure was higher than in the first group and amounted to 0,0503. Variation coefficient presented the level of 13,5%. The group covers units dispersed all over the country.

The next group – measure value ranging from 0,064 to 0,077, variability at the level of 7,8% – is made up of 5 cities (Wrocław, Szczecin, Olsztyn, Rzeszów, Poznań). The cities qualified for the third group were also dispersed all over the country and did not follow any clear territorial rule.

The separate, fourth group includes Katowice and Toruń. In the analysed years these cities experienced the most extensive changes in the form of analysed structures, moreover, this group is also characterized by the lowest intra-group diversification – variation at the level of 4,9%.

Using Spearman's correlation coefficient, the strength of the relationship was also analysed between Bray-Curtis measure value and: GDP per capita in 2015 in the regions which capitals are the studied cities (A); the level of economic growth in these regions in the time relationship 2005 - 2015 (B); measured by the city size based on its population number (C). This coefficient takes numerical values in the closed range from -1 to +1 [cf. 14]. Due to the fact that for A study rS= 0,286, B rS= 0,226, C rS= 0,265, it can be concluded that there occurs only a weak, positive relationship between these values. It should be observed that this conclusion refers only to the group of Polish large and the largest cities.

4 Conclusions

As it has already been mentioned in the introduction, administrative reform was implemented in Poland in 1999 and one of its long-term effects was the extension of the central functions' scope by the cities which maintained their voivodship capital status [cf. 8]. This was accompanied by appropriate adjustments on the labour market, predominantly in the area of non-market services. It was connected with changing the location of public institutions, which often moved from the cities which lost their status of regional centres to the existing regional centres. Furthermore, the newly established institutions and public administration offices were, on many occasions, also located in these centres. It was reflected in the increased importance (employment number share) in Services III in the analysed cities. This observation is in line with the findings of other authors, according to which depending on the economic development of a given country or region, the share of employment changes in different sections, however, along with economic development the importance of Sector I (agriculture) decreases in favour of Sector II and III (industry and services). Further economic development is accompanied by an ongoing increase of employment in Sector III (services)[2].

It is noteworthy that the vast majority of voivodship cities were characterized by higher value of Bray-Curtis measure, and thus more dynamic transformations of the labour market structure than the average value recorded for Poland. It should be added that these cities, at the background of regions in which they function as capitals, or the country-specific average values, are characterized by higher income levels of their residents and lower unemployment rate, currently often presenting the level of natural rate of unemployment. In 11 out of 18 analysed cities the

unemployment rate registered in 2016 was less than 5% and 9% in Białystok, as the worst in this respect [5].

It is interesting to note that no significant spatial pattern of cities with similar levels of Bray-Curtis measure was observed, thus a conclusion can be drawn that they are spatially dispersed. It is, however, noticeable that three of the four dual regional capitals, i.e. Gorzów, Zielona Góra, and Bydgoszcz are ranked at relatively low positions. It can be explained by the dispersion of growth factors potential into two centres. In retrospect, it is clear that the concept of administrative functions' division did not contribute to the development of the discussed cities [cf. 9]. Toruń, holding the position of the ranking leader, remains the exception. It should be emphasized that also in other studies, analysing the level of investment activity in voivodship cities its position was high too [cf. 10].

There occurs only a weak positive correlation between employment structure transformations in cities and the level and rate of regional economic growth. Thus, it can be adopted that these phenomena are interrelated, however, also the entire spectrum of other, diverse factors have impact on the transformations occurring in these structures, as well as the level and pace of economic development. It would be interesting to analyse the relationship between Bray-Curtis measure and the level and changes of GDP in cities, but unfortunately these data are generated at the regional level only.

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Transportation Fuel Taxes in Poland as Climate Policy Instruments

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Abstract. The aim of the article is to analyse taxes and charges levied on motor fuels in Poland by reviewing their design from the perspective of climate policy and carbon dioxide emissions reduction. The analysis includes levies that fall under the scope of the of 2003/96/EC Directive on energy taxation: an excise duty and a fuel charge levied on gasoline, diesel oil, liquefied petroleum gas and compressed natural gas. The value added, tax has been excluded from the analysis. The paper concludes that fuel taxes in Poland have not been designed for climate policy and are mostly revenue-generating taxes. Tax rules that contribute to carbon dioxide emissions reduction include lower tax rates for gaseous fuels and the use of fuel charge revenues to finance investments in railway infrastructure. Excise duty in Poland could be redesigned to better reflect climate policy objectives. The tax could be for example combined with a direct carbon tax based on carbon dioxide emissions. Such taxes are applied in some European countries, for example in Finland or Sweden.

Keywords: Climate Policy, Motor Fuels, Taxes

1 Introduction

Road transport is a significant source of carbon dioxide (CO_2) emissions, which result from fuel combustion in vehicle engines. Two of the most popular transport fuel types include gasoline and diesel oil. Some of the vehicles are fueled with gaseous fuels such as liquefied petroleum gas (LPG) or compressed natural gas (CNG). In general, burning fossil carbon-based fuels contributes not only to climate change, but also causes plenty of other environmental damage such as air pollution or noise.

One of the main instruments to provide incentives to change the behavior of vehicle users in order to reduce fuel consumption, greenhouse gas emissions and other external effects of road transport has been taxes levied on fuels. Taxes are incorporated into the price of the fuels and can be differentiated in order to enhance drivers to buy fuels with a low environmental impact.

The aim of the paper is to analyse taxes levied on transportation fuels in Poland by reviewing their design from the perspective of climate policy and carbon dioxide emissions reduction. The author also compares motor fuel taxes used in Poland to

taxes applied in the European Union countries. The value added, tax has been excluded from the analysis.

2 Fuel taxes as climate policy instruments

Fuel taxes are often in the form of typical excise duties. In general, excise duties are indirect taxes included in the price of certain consumer goods. Excise duties are mostly levied by central governments and are primarily directed towards raising revenues. However, experience of some countries suggests that excise duties (strictly tax differentiations) have contributed to correct some negative externalities of road transport. In the past, differences in tax rates accelerated the withdrawal of leaded gasoline and high sulphur diesel from the market [4].

Although many excise duties on fuels may not have been originally put in place for climate protection purposes they surely provide incentives to change the behavior of vehicle users in order to reduce greenhouse gas emissions [14]. The fifth IPCC report, released in 2014, includes fuel taxes in the group of policy instruments that have been implemented in practice to mitigate climate change. Other taxes on transport-related emission sources include vehicle taxes on the purchase or ownership of cars, road tolls and congestion charges for the use of the roads or for entering city centers by cars [14].

The OECD, the European Commission and Eurostat consider taxes levied on fuels as environmental taxes. Definition adopted by these institutions states that “an environmental tax is a tax whose base is a physical unit (or a proxy of a physical unit) of something that has a proven, specific negative impact on the environment [10]”. The tax base can be specified as a given amount of polluting emissions or as a proxy for emissions, which are difficult to measure. The use of motor fuels can be used as such a proxy [10]. The list of environmental tax bases established to identify environmental taxes includes inter alia “energy products for transport purposes”, such as petrol, diesel, LPG and natural gas [10]. Eurostat also defines transport fuel taxes, which are considered “taxes on energy products used for transport purposes only [11]”.

It should be noted that value added taxes are excluded from the scope of the OECD/Eurostat definition of environmental taxes. This is due the fact that VAT is levied on nearly all goods, is deductible for some producers (but not for individuals) and affects relative prices in other ways than environmental taxes [10].

Fuel taxes reduce greenhouse gas emissions by reducing travel demand (car use) and fuel use per kilometer, by encouraging consumers to buy more fuel-efficient vehicles and by making fuels with less carbon content more economically viable [37]. Taxes levied on fuels and differentiation in tax rates can also contribute to a reduction of other environmental impact of transport, such as noise and air pollution from nitrous oxides or particulates emissions.

Fuel taxes seem to be straightforward policy instrument to cut greenhouse gas emissions from the transport sector as there is a direct link between the use of carbon-based fuels and CO_2 emissions [29]. In theory, tax rates should reflect the social cost

of carbon from fuel use that is marginal damage generated by an additional tonne of carbon dioxide. The mean of published estimates of social cost of carbon is 53.5 dollars per tonne of CO_2, and the median is 36.8 dollars per tonne of CO_2 [33].

The effectiveness or ineffectiveness of excise duties as climate policy instruments depends on demand price elasticity of transport fuels [3]. Studies show that short-term elasticity of demand for motor fuels is low. This can be due that significant shift to alternative fuels is difficult [12]. In such a situation, the excise duties are pure revenue-generating taxes [1]. In the longer term, the price elasticities are higher and the taxes encourage motorists to reduce fuel use [32]. According to one meta-analysis short-term price elasticity of gasoline is -0.36 and a long-term elasticity is -0.81 [2].

Rates of environmentally related taxes should be adjusted for inflation to preserve incentive effect of the taxes. Furthermore, fuel tax rates should be gradually increased over time in order to reflect the rising marginal damage associated with rising CO_2 concentration in the Earth's atmosphere [13]. It should be noted that the extent of the damages caused by climate change does not depend on current emissions of warming gases, but on the atmospheric concentration of these gases, which is the result of past years' emissions [28]. In the period 1970-2014 the concentration of greenhouse gases increased by 37%. At the same time CO_2 concentration increased by 22% up to 397 ppm [9]. Most of the carbon dioxide emissions come from fuel combustion.

The structure of excise duties is harmonized across the European Union to a limited degree. The Directive 2008/118/EC concerning the general arrangements for excise duty defines excise duty as a tax levied directly or indirectly on the consumption of certain goods [7]. Excise goods include inter alia energy products (motor and heating fuels) covered by Directive 2003/96/EC [6]. A so-called Energy Directive establishes the minimum levels of taxation that Member States must apply to energy products and allows the Member States to grant specific tax exemptions or reductions. Level of taxation is the total charge levied in respect of excise duties and all other indirect taxes (excluding VAT) calculated directly or indirectly on the quantity of fuels at the time of release for consumption. The minimum level of taxation for gasoline and diesel is 359 and 330 euro per 1000 l respectively, for LPG – 125 euro per 1000 kg, and for CNG – 2.6 euro per GJ.

The establishment of minimum levels of taxation had to ensure the proper functioning of the internal market of the European Union but some environmental and climate concerns were also considered. One can assume that minimum tax rates also help to eliminate "tank tourism" when drivers are driving to neighboring countries to buy fuel with lower tax rates [20].

3 Fuel taxes in Poland

The fuel taxes in Poland comprise two kinds of levies: an excise duty and a fuel charge. Both kinds of levies fall under the scope of the Energy Directive.

Excise duty is governed by the 2008 Excise Duty Law, which entered into force on 1 March 2009 [36]. The tax is levied on motor and heating fuels, electricity, passenger cars, lubricating oils, alcohol and tobacco. The excise duty on transportation fuels is

paid by those who produce or process fuels (eg. refineries). Taxpayers pass the tax burden onto the consumers by including it in the fuels' price. The excise tax revenues are allocated to the general government budget. Revenues generated from excise duty on fuels account for about one tenth of the total budget tax revenue [19].

The introduction of fuels for propellant applications to the Polish market is also subject to the fuel charge, which is generally treated in the literature as a type of tax [23]. The charge revenues are extra-budgetary resources and are earmarked for the National Road Fund and the Railway Fund. The funds' resources are allocated to investments in road and railway infrastructure. The rates of the fuel charge are adjusted annually for inflation. This is not the case for excise duty. The 2008 Law on Excise Duty does not introduce any mechanism for adjusting tax rates with inflation.

Excise duty and fuel charge on fuels are originally levied according to volume (in the case of gasoline and diesel), weight or carbon content (in the case of LPG and CNG). The share of indirect taxes (excluding VAT) in average gasoline prices increased from 29% in 2012 to 38% in 2016. At the same time the share of taxes in average diesel prices grew from 25% to 35%. The rates of taxes are shown in Table 1.

Table 1. Excise duty and fuel tax rates on transportation fuels in Poland. [8, 36]

Specification	2009	2010	2011	2012	2013	2014	2015	2016	2017
Gasoline (1000 l)									
Excise (PLN)	1565	1565	1565	1565	1565	1565	1540	1540	1540
Fuel charge (PLN)	87	93	95	99	103	104	129	129	129
Indirect taxes (PLN)	1651	1658	1660	1664	1668	1669	1669	1669	1669
Indirect taxes (euro)	488	391	422	380	406	395	399	393	389
Diesel oil (1000 l)									
Excise (PLN)	1048	1048	1048	1196	1196	1196	1171	1171	1171
Fuel charge (PLN)	98	234	240	250	260	263	288	288	288
Indirect taxes (PLN)	1146	1282	1288	1446	1456	1459	1459	1459	1459
Indirect taxes (euro)	339	302	327	330	355	345	349	344	340
LPG (1000 kg)									
Excise (PLN)	695	695	695	695	695	695	670	670	670
Fuel charge (PLN)	116	120	123	128	133	134	160	160	160
Indirect taxes (PLN)	811	815	818	823	828	829	830	830	830
Indirect taxes (euro)	240	192	208	188	202	196	198	195	193
CNG (1 GJ)									
Excise (PLN)					11.0	10.5	10.5	10.5	11.0
Fuel charge (PLN)					3.1	3.7	3.7	3.7	3.1
Indirect taxes (PLN)					14.2	14.3	14.3	14.3	14.2
Indirect taxes (euro)					3.4	3.4	3.4	3.3	3.4

Table 1 shows that the excise duty rate on gasoline remained constant during 2009-2014. As of 1 January 2015, the rate on gasoline and tax rates applicable to diesel oil, biofuels and gaseous transportation fuels were slightly reduced [35]. The reduction of excise duty rates, were offset by increases in fuel charge rates, which were introduced in order to maintain fuel prices and to raise funds for railway infrastructure projects. It can be assumed that such a shift in energy taxation will contribute towards improving the competitiveness of railway transport [26]. The reduced excise duty rates apply until 2019.

The carbon content of liter of diesel oil is higher than that of gasoline, although CO_2 emissions are lower due to smaller fuel consumption per driven kilometer [17]. As one can see, in 2012 excise tax on diesel oil and biodiesel was significantly increased in order to maintain tax rates above the minimum levels of taxation set out in the Energy Directive. In the notes to the draft law, it was pointed out that diesel oil prices in Poland were much lower than in some neighboring countries.

The level of taxation on liquefied petroleum gas in Poland (rate of PLN 670 per tonne) is comparable to average European standards. In 10 European Union countries LPG is taxed at a higher rate [8]. Only in Belgium liquefied petroleum gas is fully exempted from the tax. It is allowed by the article 15 of the Energy Directive to grant total or partial exemptions or reductions in the level of taxation to LPG and natural gas used as propellants.

For some environmental reasons liquefied petroleum gas can be taxed at a lower rate than other fuels as LPG-powered vehicles have lower nitrogen oxides emissions than comparable diesel-engine cars. However, in terms of CO_2 emissions there is no significant difference between both [27].

As of 1 November 2013, compressed natural gas is subject to excise duty. Natural gas for vehicle use is important for environmental concerns as this fuel has the lowest carbon dioxide emissions per unit of energy among the carbon-based fuels and low particulate and sulphur dioxide emissions [15, 16]. The tax discourages public transport companies from buying CNG-powered buses and reduces the competitiveness of this fuel relative to diesel oil. In some EU countries (Belgium, Estonia, Greece, Luxemburg and Malta) CNG is fully exempted from the tax pursuant to the article 15 of the Energy Directive [8]. Such an exemption is also planned by the Polish Ministry of Finance.

As of 2011 excise and fuel levies on biofuels and fuels containing bio-components used as substitutes for gasoline and diesel are taxed by the same amount as conventional road-transport fuels. For hydrogen and bio-hydrogen zero excise tax rates are applied. Zero rates were intended to improve the competitiveness of alternative fuels relative to petroleum-based fuels and to address environmental concerns. However, the tax exemption for hydrogen and bio-hydrogen has no practical significance as there are only a few alternative fuel-powered cars currently in use and there are no hydrogen refuelling stations [23].

As illustrated in Figure 1, there appears to be some relationship between liquid fuel prices and liquid fuel use. From 2012 to 2016 average diesel and gasoline prices were decreased by a quarter. As of 2013 diesel consumption increased by 25% and gasoline use – by 13%. Revenues generated from excise duty paid from the use of liquid motor

fuels increased throughout the analysed period. In 2016 tax revenues and fuel consumption could be affected by important amendments in Excise Duty Law and Value Added Tax Law, which came into force in September of 2016. Legislative changes (known as a "fuel package") aimed at fighting tax fraud and preventing illegal fuel sale [25].

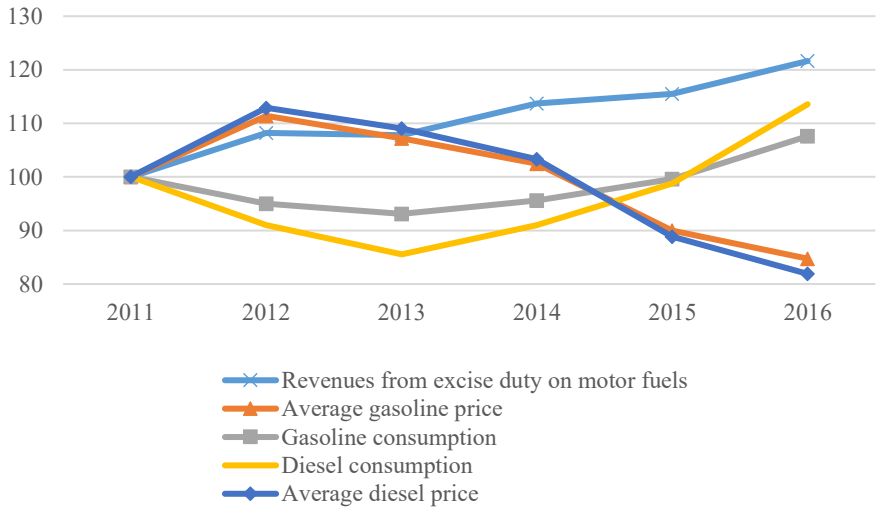

Fig. 1. Indices of average liquid fuel prices, liquid fuel consumption and liquid fuel tax revenues (2011=100). [19]

Research on the price elasticity of demand for gasoline in Poland shows that in 2003-2012 demand was weakly responsive to price changes. This elasticity was estimated to be slightly negative. Hence, the incentive effects of the excise duty on consumer demand were limited. The tax provided stronger incentives in 1999-2002 when demand was more responsive to price changes [1].

The excise duty and fuel tax rates for the different fuels in Poland are not proportional to their energy content (Table 2). The taxation scheme favours diesel oil over gasoline and LPG and CNG over conventional fuels. The latter can be due to the fact that gaseous fuels are considered cleaner and more environmental friendly compared to gasoline and diesel. Such tax differentiations also apply to fuel taxes in many other European Union countries. Minimum levels of taxation set out in Directive 2003/96/EC favour diesel over gasoline but tax rates on gaseous fuels in terms of energy and carbon content are the same.

In some of the European countries fuel taxation consists of excise duty and carbon tax (or CO_2 tax) levied on carbon content of a fuel or on the amount of carbon dioxide that a fuel emits when burned. Carbon taxes can be equalized across all types of fossil fuels used for transport and heating. This is not the case for traditional excise duties, which are often differentiated across fuels and sectors of the economy (for example,

Directive 2003/96/EC permits member states to apply reduced tax rates on the consumption of energy products in energy-intensive business) [34].

Table 2. Tax rates in terms of energy and carbon content (2017). [5, 8]

	Gasoline	Diesel	LPG	CNG
Tax rates in terms of energy content, euro per GJ				
Poland	11.1	9.5	4.2	3.3
EU-28 maximum level	24.6	18.6	9.9	11.6
Directive 2003/96/minimum levels	10.3	9.2	2.7	2.6
Implicit carbon taxes, euro per tonne of CO_2				
Poland	171.3	130.7	66.6	55.3
EU-28 maximum level	377.7	255.3	156.6	192.6
Directive 2003/96/minimum levels	158.1	126.9	43.1	43.3

Among the first countries worldwide that implemented carbon taxes were Finland and Sweden. In Finland, the tax is incorporated into fuel taxes, which consist of two other levies: an excise duty and a strategic stockpile fee imposed on imported fuels. In 2017 the share of carbon tax rate in the total tax rate level is 25% for gasoline and 38% for diesel oil (Table 3). Tax rates on bioethanol and biodiesel are reduced. In Sweden carbon tax rate on gasoline and diesel accounts for about 40% and 53-57% of the total tax rate respectively. In 2017 the rate of carbon tax in Sweden is about 120 euro per tonne. Excise tax rates are differentiated according to the environmental class of the fuel. Lower tax rates apply to fuels, which are less environmental harmful [31].

Table 3. Taxes on transportation fuels in Finland and Sweden (2017). [22, 30]

	Basic tax	Carbon tax	Other fees	Total
Gasoline (euro per 1000 litre)				
Finland	521.9	173.8	6.8	702.5
Sweden	404.5-407.6	273.1	–	677.6-680.7
Diesel oil (euro per 1000 litre)				
Finland	327.7	199.0	3.5	530.2
Sweden	259.6-305.4	337.7	–	597.3-642.1
LPG (euro per 1000 kg)				
Finland	90.1	175.3	1.1	266.5
Sweden	0	351.3	–	351.3

In Poland, there is no explicit carbon tax levied on motor fuels however one can assume that existing energy taxation imposes prices on CO_2 emissions and introduces

so called implicit carbon price (implicit carbon tax) [21]. Calculations of implicit carbon taxes are given in Table 2. The calculations are based on taxes that fall under the scope of the of 2003/96/EC Directive. As one can see, tax rates in terms of carbon content are not equalized.

It should be noted that fuels burned in vehicle engines are subject in Poland to emission charge, which is earmarked for environmental and water protection funds. The charge is paid by legal persons (households are excluded from the charge). The charge is levied on fuels used in passenger cars, trucks, buses and other vehicles. The rates of the charge are levied according to weight of the fuel and are calculated and are based on emissions of greenhouse gases such as carbon dioxide, methane and nitrous oxide and on other air pollutants (eg. sulphur dioxide, lead, carbon monoxide, nitrogen oxides, aliphatic hydrocarbons). The rates of the charge are differentiated according to fuel, engine and vehicle type, date of first registration or weight of the vehicle and are very modest. For example, in 2017 the rate of the emission charge was 1.36–63.01 euro per tonne of gasoline (about 1.81– 84.01 euro per 1000 l). The rate on diesel oil is 0.88–12.10 euro per tonne (about 1.17–16.13 euro per 1000 l) [18].

4 Conclusion

Fuel taxes in Poland have not been designed to take account of climate policy objectives. However, there are some tax rules that could contribute to CO_2 emissions reduction. It includes lower tax rates for gaseous fuels and the use of fuel charge revenues.

Excise duty in Poland could be redesigned to better reflect climate policy objectives and to speed up the transition from fossil fuels to alternative and non-polluting energy sources in road transport. Changes can consist of annual adjustment of tax rates (as there have been rather minor changes in the excise tax rates since 2009) and introduction of significant CO_2 component within the fuel taxation. The latter could replace the emission charge levied on fuels.

It should be kept in mind that the design of the motor fuels tax base, tax rates and exemptions are to a certain extent influenced by the EU law. Environmentally driven changes in the excise duties can be a result of tax harmonisation across the member states.

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The Growth Accounting for Industry and Services of Slovakia and Czechia

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Abstract. The last economic crisis has brought many questions and few answers. The crisis has shown how economies are internally vulnerable to external factors. Internal vulnerability is also attributed to the use of available resources in the economy. The aim of the article was to find out how the individual factors of industry and services contribute to total production and economic growth. We used the method of growth accounting: a dual approach that allowed us to track the contribution of individual inputs to production and economic growth. We wanted to prove that if one factor had at least a 5% greater share of overall growth than other factors for the whole economy, then this factor would be the main one for the individual sectors of the economy as well. Verification was carried out for two countries – Slovakia and Czechia in the crisis and the post-crisis period (2008-2016). We note that there was only one country whose main factor of economic growth was identical in both sectors (industry and services) and for the economy as a whole. It was Czechia and the factor was TFP.

Keywords: Growth Accounting, TFP, Capital.

1 Introduction

After the second wave of the economic crisis, the economies began to gradually recover from the consequences of a rapid but very intense crisis. Countries with the pre-crisis economic growth tried to return the economy to previous performance as quickly as possible. However, the crisis has highlighted a number of facts that need to be taken into account when designing an economic policy. Thanks to the implementation of modern technologies, the speed of process execution has increased. The economy must respond promptly also in areas where it is very difficult. This speed puts pressure on governments to devote more attention to the essence of their economic growth they want to achieve.

Our goal was to investigate if there is any the difference in main factors involved in production of overall economy and of the individual sectors. We used the methods of growth accounting: dual approach. We wanted to prove that if one factor had at least a 5% greater share of overall growth than other factors for the whole economy, then this factor would be the main one for the individual sectors of the economy as

well. In the previous analysis we found that in the Czech case the TFP was such an important factor (for the economy as a whole) throughout the monitored period. In the case of Slovakia, it was capital before the crisis and TFP was during and after the crisis. We wanted to find out if the same factors were decisive for industry and services. We followed development in two countries - The Czech Republic and Slovakia in the period 2008 – 2016.

In the second part we have compiled a brief overview of the literature from the field of our problems. In the third part we briefly describe the used methodology and the data we used. In the fourth part we observed the share of individual factors in the production of the industry and services sectors. In the 5th part we summarized the achieved results.

2 Literature Review and Research Background

Research on economic growth and country productivity has been one of the most popular topics in economics for decades. Many researchers analysed empirically the patterns of economic growth in the world. A major wave of the literature was inspired by the seminal works of many authors – Abramovitz, Barro, [1, 2, 3, 4, 5, 17, 18] The authors used different methods of analysis and quantification in their research. The growth accounting framework is one of the methods used. The pioneers of this method were [2] and [26]. Further adjustments brought [14, 15], or [19]. In these analyses we use a standard Cobb-Douglas production function approach (as in [8, 19, 20, 25]). We mainly follow the explanation provided by [12, 13, 15].

The aim of the article was to find out whether the economic growth is achieved in the same way in selected countries. At the same time, we want to find out whether the economic growth has been extensive or intensive. We selected two CEE countries (OECD term for 12 countries from Central and Eastern Europe). The Czech Republic and the Slovak Republic are countries of the former commonwealth - Czechoslovakia. Currently they are part of V4 countries. In 2004, they joined the EU and are also part of other groupings (OECD, NATO). Despite the common history, the economic development of the countries is not very similar. From the point of view of the unemployment rate, the average unemployment rate over the last 24 years was 6.5% (Czechia) and 14.2% (Slovakia) over the same period. Slovakia's inflation has an average of 4.6% over the last 24 years, in the Czech Republic it is 1% less.

Foreign direct investment is also one of the factors for future economic growth. As [10] mentioned the region of CEE is the fourth most attractive region in the world for investors. Authors [6] found that foreign investment has been an important factor in productivity growth of CEECs. There is a very visible impact of the crisis in this area. While in the pre-crisis era, Slovakia was a leader in the volume of FDI, after the crisis the situation changed. As [10] concluded, among the countries of the V4, the highest attractiveness for foreign investors is reported by the Czech Republic whose strength is the macroeconomic environment, and weakness is represented mainly by the bureaucratic delays. On the other hand, the least attractive country seems to be the Slovak Republic. [9]

As we mentioned, current rapid development forces the country to find effective solutions. It therefore focuses on the productivity of the economy and, in particular, of its components. It does not just focus on the input itself. As [11] state, an important source of economic growth is, besides labor and capital, the aggregate productivity of these factors. Growth of aggregate factor productivity is the result of qualitative changes, also referred to as intense growth factors. A similar view in their work was presented by [7,16,21], who expanded their exploration of another dimension in the form of human capital as another factor in the production of the economy. In this way they gained the dimension of the modern valuation of inputs into the production process.

In our research and testing, we have retained our original function, not spreading it about human capital. Our objective was to monitor the development of the share of factors from sector to sector.

3 Methodology and Data

3.1 Methodology

Suppose we use the basic form of the Cobb-Douglas production function. Aggregate output (Y) consists of consumption goods (C) and investment goods (I). These goods are produced from labour services (L) and capital (K). [19] Productivity is usually represented as a Hicks-neutral augmentation (A) of aggregate inputs:

$$Y_t\left(C_t, I_t\right) = A_t F\left(L_t K_t\right) \tag{1}$$

The first step is derivation of the equation. The next one in this derivation is to express the production function in growth rate form.

$$\frac{\hat{Y}_t}{Y_t} = \frac{\partial Y}{\partial K}\frac{K_t}{Y_t}\frac{\hat{K}_t}{K_t} + \frac{\partial Y}{\partial L}\frac{L_t}{Y_t}\frac{\hat{L}_t}{L_t} + \frac{\hat{A}_t}{A_t} \tag{2}$$

A “roof” over the variables is denoting time derivatives. The corresponding ratios are rates of change. This form of calculation means that the rate of output growth equals the growth rate of capital and labour weighted by their output elasticities plus the growth rate of the Hicksian shift parameter. These elasticities represent factor-income shares $s_{K_t}; s_{L_t}$ when inputs are paid the value of their marginal products:

$$\frac{\partial Y}{\partial K} = \frac{r}{p}; \frac{\partial Y}{\partial L} = \frac{w}{p} \tag{3}$$

Then:

$$TFP = \frac{\hat{Y}_t}{Y_t} - s_{K_t}\frac{\hat{K}_t}{K_t} - s_{L_t}\frac{\hat{L}_t}{L_t} = \frac{\hat{A}_t}{A_t} \tag{4}$$

TFP defines the „residual“ as the growth rate of output which is not explained by the share-weighted growth rates of the inputs. [15]

We want to examine the changes in the input prices so we use the dual approach provided by [13] or [12]. We start with:

$$Y = rK + wL \tag{5}$$

After the differentiation of (5) and dividing by Y we have

$$\dot{Y} = \dot{r}K + r\dot{K} + \dot{w}L + w\dot{L} \tag{6}$$

$$\frac{\dot{Y}}{Y} = \dot{r}\frac{K}{Y} + \frac{r}{Y}\dot{K} + \dot{w}\frac{L}{Y} + \frac{w}{Y}\dot{L} \tag{7}$$

$$\frac{\dot{Y}}{Y} = r\frac{K}{Y}\left(\frac{\dot{r}}{r} + \frac{\dot{K}}{K}\right) + w\frac{L}{Y}\left(\frac{\dot{w}}{w} + \frac{\dot{L}}{L}\right) \tag{8}$$

We use the substitution and it brings us:

$$\dot{Y} = s_K\left(\hat{r} + \hat{K}\right)' + s_L\left(\hat{w} + \hat{L}\right) \tag{9}$$

where the identities s_K and s_L represent the factor-income share and the sum of factor-shares is equal to unit

$$s_K + s_L = 1 \tag{10}$$

Variables “ $\hat{r}; \hat{w}; \hat{K}; \hat{L}$ ” represents growth rates. [12]

3.2 Data

All the necessary data for the calculation were available from one source: OECD. We used the data on an annual basis, sample period was from 2008 to 2016. The data we used to monitor the sectors was used in accordance with ISIC rev. 4th

In particular, the real interest rate used to measure the rental price of capital is represented by the 3-month nominal interbank offered rate deflated by CPI inflation. The real wage is calculated as the ratio of the nominal wage rate to the consumer price index. The aggregate output is represented by GDP. The labour share was calculated as a ratio of total labour costs and gross value added. (Table 1)

Table 1. Capital and Labour Shares.

Country	Czechia			Slovakia		
Sector	Economy	Industry	Services	Economy	Industry	Services
Labour share in % (2008-2016)	44.31	44.31	45.3	40.91	40.69	44.28
Capital share in % (2008-2016)	55.69	55.69	54.7	59.09	59.31	57.72

The values of both countries are comparable and similar. The Czech or Slovakian values are smaller than those of the United States (62%), G20 (61%), Japan (57%).

4 Development of individual factors and production in industry and services

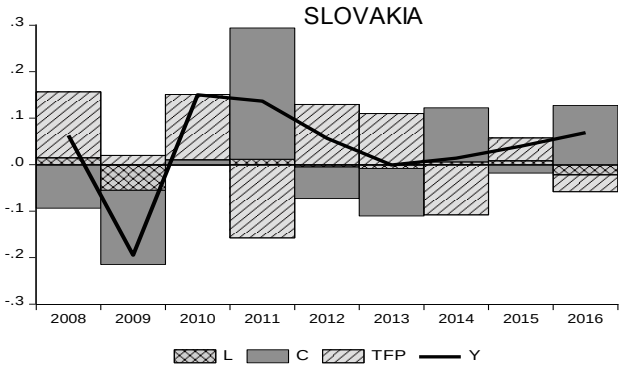
4.1 Industry - Crisis and post-crisis period (2008-2016)

In the crisis, the situation has changed mainly in the field of labour. In both countries, the number of hours worked decreased, but the labour share of economic growth increased significantly compared to the situation before the crisis. (Table 2)

Table 2. Industry - Average Changes and Shares 2008-2016.

	Czechia	**Slovakia**		**Czechia**	**Slovakia**
average share on GDP			**average change**		
Labour	0.0764	0.0582	Labour	(-0.0039)	(-0.0056)
Capital	0.3406	0.2376	Capital	0.0053	0.0106
TFP	0.583	0.7042	TFP	0.0248	0.0320
			Rental price of Capital	(-0.1618)	(-0.3583)
			Real Wage	0.015	0.0179

A significant change was brought about by the crisis in Slovakia, (Fig. 1) which started to benefit from reforms and investments already made, and the increase in production was mainly due to changes in the TFP. In Czechia, the situation has not changed significantly, but the share of capital has declined. (Table 2)



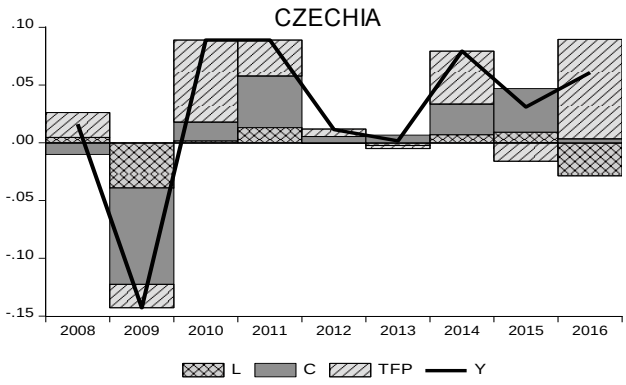


Fig. 1. Slovakia and Czechia - Industry - Input Shares on Output 2008-2016.

As stated in the OECD report [23], Slovakia has a rapidly growing economy and is expected to continue this trend for several years, but its industry is predominantly based on the automotive industry that is easily influenced by external factors. Besides, the population of Slovakia belongs to the fastest aging population among the OECD countries. Consistent with the fact that in Slovakia over the past few years almost 6% of the population emigrated, at least half of whom were people with a minimum of secondary education, the problem is whether there will be enough qualified labour. And even with increasing automation in industry.

Industry has been boosted by a rebound in the automotive sector, which has benefited from both demands from abroad and domestic orders in Czechia. (Fig. 1) Exports grew solidly in 2015, helped by stronger demand from trading partners. As the OECD notes [22], after reforming the tax system, the Czech Republic must undertake further structural reforms (especially in the social sphere, the pension system, ...) and complete the restructuring of state-owned enterprises in order to be competitive.

As our results showed, our assumption of the same main factor was confirmed in the case of both countries. (Table 2) Here TFP was the main factor.

4.2 Services - Crisis and post-crisis period (2008-2016)

The crisis has also changed the service sector. The share of this sector has declined by 10% on total output in the Czech Republic and Slovakia.

Table 3. Services - Average Changes and Shares 2008-2016.

	Czechia	**Slovakia**		**Czechia**	**Slovakia**
average share on GDP			**average change**		
Labour	0.096	0.046	Labour	0.0017	0.0039
Capital	0.335	0.6084	Capital	0.0090	0.0199
TFP	0.5691	0.3456	TFP	0.0188	0.0174
			Rental price of Capital	(-0.1544)	(-0.3819)
			Real Wage	0.0117	0.0177

As stated in the OECD report [24], productivity (TFP) increases in the service sector.

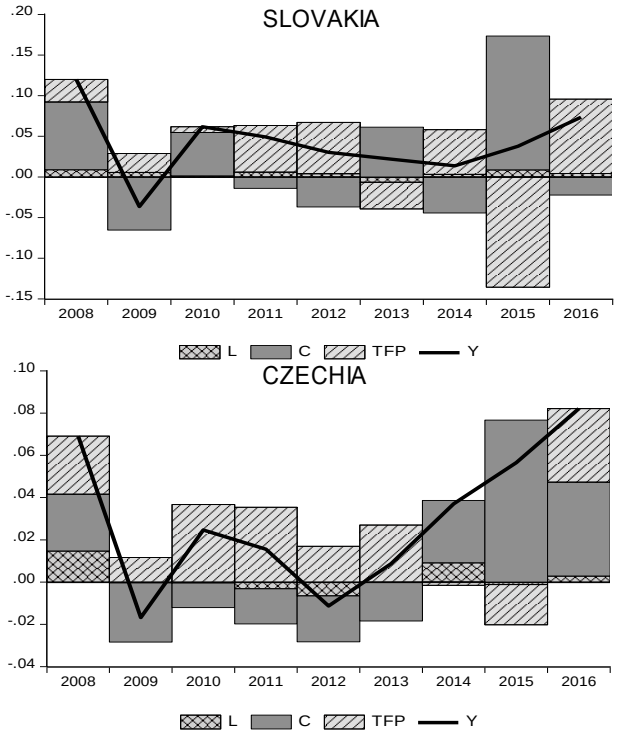


Fig. 2. Slovakia and Czechia - Services - Input Shares on Output, 2008-2016 (own calculations)

It is true that the average level of productivity is higher in manufacturing than in services, but modern services are rapidly catching up. From the perspective of our countries, the claim for an increase in the impact of the TFP is confirmed in the case of the Czech Republic. In the case of Slovakia, growth will continue to rise through the increase in capital. (Fig.2)

Our assumption has been met by one country. It is Czechia. The TFP is the main factor. (Table 3) Slovakia has had a development in the services sector mainly dependent on capital, but the whole economy relied on changes in the TFP.

5 Conclusions

The crisis has changed the share of individual inputs, contributing to the creation of economic growth in each country. A common feature of both countries is the relatively small share of labour on the growth of economic growth. The impact of labour is in fact negligible - both in terms of hours worked and in terms of wages. However, capital prices declined throughout the period. Prices have changed much

faster than the volume of capital has changed. The development of the real capital did not reflect the development of market prices.

Our assumption of the same major factor for the whole economy as well as the sectors has been only partially fulfilled. There was complete agreement - the whole economy + both sectors - only in case of Czechia. There has never been a case that the main factor has been labour.

However, we cannot fully explain the reasons that led to such results. We believe that in order to better understand the overall situation of these economies and their economic growth, it is necessary to further analyse the concrete contribution of individual sectors to economic growth. We believe that the sectoral analysis can find the necessary answers and at the same time it is possible to estimate the effective adjustment of the internal structure of economies. This can lead to a more effective use of fiscal and monetary policy instruments as well as a better functioning of global value chains. Therefore, this will be the subject of our further research.

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Problems and Opportunities for the Development of Smart Specializations in Lower Silesia Region

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Abstract. The presented study discusses problems related to smart specializations of Lower Silesia region, which represent one of the types of regional specializations. The introduction presents a short characteristic of Lower Silesia with particular emphasis on the regions' major advantages as well as crucial, unfavourable phenomena and processes occurring in the area. It is followed by characterizing Lower Silesian Smart Specializations (LSSS). The study was conducted using the subject literature query and the desk research methods. The purpose of the study is to present and analyse smart specializations in terms of potential problems, barriers and development opportunities. In conclusion it can be stated that one of the effects of projects implementation within the framework of LSSS areas should be the elimination of intraregional differences regarding the level of socio-economic development.

Keywords: Regional Development, Smart Specializations, Lower Silesia, Regional Specializations, Innovations.

1 Introduction

Lower Silesia region (Lower Silesian voivodship) represents one of the best economically developed areas of the country, significantly exceeding the country average regarding the gross domestic product value per capita in the regions and, moreover, it is highly ranked in terms of its investment attractiveness [22, 24].

The relatively well-developed transport infrastructure, favourable geographic location, extensive and diversified educational offer prepared by universities can be listed among the main strengths of the voivodship. Wrocław, the capital of the region, after Warsaw and Cracow, remains the largest academic centre in Poland regarding the number of students. The abundance of cultural potential, historical monuments, cultural events have to be highlighted too, since owing to them Wrocław was the European Capital of Culture in 2016. Moreover, it features exceptional natural values constituting the base for tourism sector development in Lower Silesian locations (e.g. Karpacz, Szklarska Poręba, Świeradów-Zdrój, Kudowa-Zdrój, Polanica-Zdrój). In addition, numerous economic sub-zones are functioning in the region, including the largest in Poland Wałbrzych Special Economic Zone "INVEST-PARK", offering additional development opportunities for investors.

Apart from its unquestionable strengths, Lower Silesia is also characterized by unfavourable phenomena and processes, among which there are disproportions in the socio-economic development occurring in its area. One of the indicators showing the aforementioned disproportion is the unemployment rate by counties. In Wroclaw (a city with county rights) it amounts to 2.6% and remains one of the lowest in the country [1]. The lowest unemployment rate in the country has been, for many years, recorded in Poznań City, currently at the level of 1.7%. The other extreme is represented by the Lower Silesian counties of Wałbrzych, Góra and Złotoryja (unemployment rate 15.8%, 15.9%, 16.6% respectively). Other problems include unevenness in the development of road infrastructure, housing stock, access to medical services, education. In addition, the region has to face the problem of population aging, labour emigration and delamination of remuneration structure. In the context of the above-mentioned characteristics, regional specializations should offer one of the methods for overcoming the existing weaknesses and threats as well as taking advantage of the emerging development opportunities. The activities carried out within the framework of regional specializations should be ultimately manifested in the life quality improvement of the local residents. Among the most important industrial sectors, in terms of production value, the following can be identified, according to the authors of the Strategic Framework ... [23] i.e. mining and quarrying, manufacturing automotive parts and accessories, manufacturing electronic products, manufacturing plastic and metal products and food production.

The concept of smart specializations became popular in the European terminology with regard to the programming process of the European cohesion policy in the 2014-2020 time horizon. The Europe 2020 strategy [2] is a pivotal document, representing a special developmental guide for the above-mentioned period. The more detailed presentation of problems related to smart specializations can be found in the Guide to Research and Innovation Strategies… (RIS 3) [15].

For the purposes of this paper it can be adopted that smart specializations represent one of the types of regional specializations which have much older origins and are firmly embedded in numerous theories and concepts related to the broadly understood regional development [6, 7, 13, 20, 21].

The main purpose of the study is to present and analyse Lower Silesian smart specializations in the context of potential problems and development opportunities. Within the framework of added value the recommendations for the future of smart specializations in the analysed region are included at the end of the study.

2 Smart specializations of Lower Silesia

Among the Lower Silesian Smart Specializations (LSSS) the following are included: chemical and pharmaceutical industries; spatial mobility; high quality food; natural and secondary raw materials; manufacturing of machinery and equipment, processing of materials; information and communication technologies. Moreover, each of the aforementioned specializations covers a broader thematic sub-area related to a particular category. One of the reasons for defining LSSS was the concern for taking

advantage of an opportunity to use the European funds, with particular reference to the Regional Operational Program of Lower Silesian Voivodship 2014-2020 [11], which, in turn, is one of the implementation tools for Lower Silesian Development Strategy 2020 [9]. The pragmatism of such approach is undisputable in the light of potential resources to be used, including the areas of innovation support (smart development, based on knowledge and innovation remains one of the priorities of the Europe 2020 strategy). It seems more founded to consider whether regional specializations, or rather their structure, should be limited to sectors, thematic areas, offering an occasional opportunity for obtaining public support. The number of selected LSSS does not differ significantly from the number of choices made in other voivodships, hence one can assume that it approximates the average. A solution to be considered in this situation is to develop the so-called "reserve list" including the specializations presenting a noticeable development potential, which are not critical at a given moment.

LSSS identification process was based on the recommendations presented in RIS 3, where the area of smart specializations is described with reference to two dimensions of the phenomena occurring in the region. Economic specialization is taken into account, which is manifested by the presence of sectors presenting above average results. Generally, it refers to manufacturing, employment rate, investments generating GVA, i.e. the value of all products and services produced by all regional entities less production costs, representing the increase in the value of goods over a given period. The second dimension is the scientific and technological specialization, analysed in terms of scientific and patent activity in specific fields and implementation potentials in technological areas. Smart specializations should represent a natural effect of these two dimensions penetration along with catalysing their competitive advantages.

3 Selected problems and opportunities for the development of Lower Silesian smart specializations

An attempt to characterize and highlight the main issues and opportunities affecting LSSS development in the coming years was made in the next part of the study. Knowledge of these issues will allow undertaking appropriate actions to take advantage of the emerging opportunities and also to minimize and overcome the existing barriers.

Table 1. Problems, barriers for the development of Lower Silesian smart specializations [5, 9, 10, 16, 23].

Problem, barrier	Justification
Increasing competition from other regions	Despite its undisputable strengths and development potentials, the region of Lower Silesia is exposed to competition from other territorial units, both domestic and foreign. The activities of competition, especially in terms of attracting new and

	maintaining the existing investors, is increasing. Among the other fields of competition the following can be listed: attracting tourists and hikers, gaining new residents or students. A separate category is competing for the European funds. Some of the funds allocated to Poland for the 2014-2020 programming period have been divided territorially (allocated to specific voivodships), nevertheless, there is still a significant pool to be applied for through national competitions or joint cross-border initiatives.
Increasing level of consumer awareness and requirements	The subareas of LSSS constitute the set of ambitious and innovative initiatives, largely geared towards innovative technologies. The advancing consumer awareness and their increasing requirements can turn out a potential problem in the way of their effective implementation. This applies, in particular, to chemical and pharmaceutical industries, high quality food as well as information and communication technologies. In order to keep up with rapidly changing preferences and quality requirements, the offer has to be continuously improved and upgraded. our offerings. Failure to do so may result in reduced production or market fallout.
High barriers of market entry	In order to compete in innovative technology sectors both high initial costs and high barriers of market entry have to to be expected. It is not just a coincidence that a significant part of Lower Silesian enterprises, also from innovative industries, operates on a subcontracting basis by supplying components for technologically advanced products. Leading on innovative markets is difficult, however, it does not mean that one has to give up trying. IT technology should offer a relatively high potential in this area.
Instability of legal regulations	From the very beginning of a free market economy after 1989 entrepreneurs have been identifying difficulties in running a business related to the instability of legal regulations. It should be observed that during the discussed period numerous attempts were made to simplify and facilitate due procedures. The balance of legal changes can be considered positive, nevertheless there are still areas requiring improvements to be made (e.g. interpretation of tax regulations, time needed to set up a business, protection of intellectual property).
Increasing labour costs in the region	For many years Polish regions, including Lower Silesia, have been competing for investors and often becoming successful through low labour costs and relatively satisfactory productivity supported by the quality of human capital. The period of LSSS functioning is a good moment to move towards product/service quality, advanced technologies or product brand based competition. The other side of the coin is the expected increase

	in wages in the region or, in a broader perspective, the increase in labour costs. This situation may have some impact on the competitiveness and functioning of the entities representing LSSS.
Fluctuations of economic conditions	The occurring crises and economic fluctuations are extremely difficult to predict. The best example of such situation is the latest global economic crisis dating back to 2007, having its origins, in simplified terms, in the US mortgage market. It can be adopted that a significant part of sectors identified in LSSS is quite sensitive to economic turbulences and business fluctuations. The best remedy for potential problems is to take into account potential crisis situations in the business plans of individual entities. Scenario oriented planning, developing alternative operating strategies, flexibility and fast reaction to changes occurring in the milieu can turn out helpful in such situation.
Processes of social stratification	The processes of social stratification can become an intermediary barrier in the development of LSSS. Despite the undeniable socio-economic development of the region, the stratification scale has not improved radically. Better life quality in cities is not followed by the proportional improvement of the existence standards in rural areas and small towns. The exception here are the EU subsidies dedicated to the agricultural sector, which resulted in real, positive changes. Similar phenomena can be observed in relation to differences in interregional development of the country. The social stratification itself results in a number of unfavourable consequences (e.g. social exclusion, poverty, pathologies, crime, inheriting unemployment, reduced social activity).
Resources depletion	The process of raw materials depletion mostly involves the LSSS area of natural and secondary raw materials. It constitutes a development barrier the consequences of which can be experienced in several or even a dozen or so years. At present it is justified to take up specific actions anticipating future threats. A long-term strategy of company development, the possibility of rebranding, supporting business activity by sector diversification represent the examples of proper directions in this field.
Moving business to countries with lower production costs	One of the manifestations of global economy is the ease of business activity relocation on an unprecedented scale. This phenomenon also refers to the region of Lower Silesia. Some entities, mostly the foreign ones, while initiating their activities in the region, assume in advance a certain period of operation, e.g. taking advantage of preferential conditions in the start-up period. This phenomenon cannot be completely eliminated, however, with respect to LSSS specific remedies, resulting from

	the regional conditions, can be taken. The entities entering LSSS areas, excluding manufacturing cost, report the demand for high quality human capital, expect political and legal stability, whereas some rely on a large sales market.
Outflow of qualified staff to other labour markets	Flexibility in approaching the workplace, changing it due to the desire for professional and personal development represent yet another sign of the times. The loss of valuable employees, especially for the industries operating in innovative areas is a certain development barrier. As a remedy, LSSS representing entities may offer attractive remuneration systems (material and non-material), a relatively high employment stability and indicate the development potential of both the industry and the region.
Digital exclusion of some part of the society (senior citizens)	This particular barrier applies primarily to the LSSS area of information and communication technologies (ICTs). The assumed, innovative solutions should be as extensive as possible. Apart from reducing the quality of regional human capital, the digital exclusion process will narrow down the potential market for innovative products and services. The effective education programs and training systems represent the key for improvement in this respect.
Deficiencies in establishing proper climate for entrepreneurship	The identified development barrier is of general nature and refers to all LSSS areas. The regional climate for business facilitates LSSS functioning as well as other actors contributing to the regional reality. Establishing such climate should be initiated in the early years of school education by attracting more attention to economic subjects, by pointing to good examples and success stories of entrepreneurial individuals.
Short life cycle of innovative products and services	It can be adopted that in today's competitive milieu the product life cycle is shortened. The simplest solution in such situation is launching a new product or introducing significant improvements to the existing ones. In both cases these are cost-generating activities. Developmental barriers may affect practically all LSSS areas.
Higher prices of technologically advanced products	Products and services, planned improvements within LSSS are based on advanced, innovative solutions. The final price offer may act as a development barrier (addressed to either a business or an individual client). The following factors are important: absorptiveness of the regional market, the level of regional community wealth, the allocation of production to either domestic or foreign markets.

The list of identified problems is relatively extensive and does not represent a closed catalogue. It can also become a source for discussion about the future of regional development and the functioning of LSSS. Not all of the listed barriers are of the

same significance. The most important ones are as follows: increased competition from other regions, the outflow of qualified personnel to other labour markets and the increasing labour costs in the region. The list of potential barriers and problems can change and evolve over time, therefore it is of great importance to carry out permanent monitoring of LSSS implementation and perform proper diagnosis of the trends occurring in the milieu. In addition, the opinions of entities operating within each sub-area can be used.

Table 2. Opportunities for the development of Lower Silesian smart specializations [3, 4, 8, 9, 10, 12, 14, 17, 18, 19, 23].

Opportunity	Justification
The EU funds from the new financial perspective	The significance of the EU funds for LSSS from 2014-2020 financial perspective has already been mentioned in the earlier part of the study. The Regional Operational Program for Lower Silesian Voivodship 2014-2020 is important, but also other national programs (e.g. Smart Development Operational Program) offer extensive possibilities. The effective use of available resources will be of crucial importance as well as funding projects of particular significance for the dynamics of LSSS development.
Adjusting university courses to labour market requirements	One of the important initiatives, within the framework of which the functioning of LSSS can be realistically supported, is meeting the expectations of entrepreneurs by pursuing specific courses at regional universities. The examples include: mathematics, chemistry, computer technology, biotechnology, design, construction, mechanics and machine construction, automation and robotics, mechatronics, materials engineering, environmental engineering.
Increasing demand for innovative products/services	The assumption can be adopted that, in general terms, the demand for innovative products and services is increasing. Consumers are curious of new solutions, look for offers which improve their functioning in both professional and personal environment. Implementing innovations (product, process, organization and marketing specific) by enterprises is one of the responses to dynamic changes taking place in the market environment. LSSS areas can serve as centres of innovation and advanced technologies provision in the region.
The development of environmentally friendly technologies	Projects related to the broadly understood environmental protection are important from the perspective of Lower Silesia region sustainable development. In the coming years, significant public resources, including the EU ones, e.g. the Infrastructure and Environment Operational Program, will be dedicated to the implementation of projects in this area (including projects covering Renewable Energy Sources).

	LSSS areas representing the potential beneficiaries and creators of environmentally-friendly solutions are as follows: spatial mobility, high quality food, natural and secondary resources, information and communication technologies (smart buildings and smart cities).
Increased wealth of part of the society (urban areas)	Innovative products, manufactured using advanced technologies are usually characterized by a higher price, at least in the initial stages of their marketing. The success of LSSS depends partly on the level of regional residents' wealth and the dynamics of internal demand. It should be observed that wages have been increasing steadily over the years, with particular emphasis on urban areas.
Population aging	The population aging process is essentially a negative phenomenon and also a progressive one in the predictable time horizon. It covers practically all regions of the country, including Lower Silesia. The Total Fertility Rate (TFR) in the region is currently at a very low level, oscillating around 1,3 (the replacement of generations occurs at the value of 2,1). This unfavourable phenomenon, however, simultaneously creates development opportunities for some of LSSS areas: chemical and pharmaceutical industries, high quality food, information and communication technologies (support for senior citizens).
Increased interest in local and regional products	The chance refers, in particular, to LSSS area of high quality food. Lower Silesia is truly abundant in local and regional products. Their proper exposure and promotion is the key to success. A local/regional product is understood as a product or service that the given area residents identify themselves with, which is produced in a non-mass and environmentally friendly way, from the locally/regionally available materials.
The emerging regional cluster initiatives	Cluster initiatives, assuming their endogenous nature, can have positive impact on LSSS functioning. Clusters are responsible for e.g. the development of a scientific infrastructure to be used by entrepreneurs, human capital quality strengthening, knowledge dissemination and generating innovations resulting from spatial proximity, attractive labour market development, creating innovation oriented culture and numerous benefits for entrepreneurs resulting from cooperation within the framework of a cluster.
The development of sector start-ups	Start-ups, i.e. in simplified terms, innovative business ventures are inherently highly risky. However, it is worth trying to organize them, as the selected initiatives can turn into serious businesses. Innovation is included in the start-up business model, thus being a natural support for the sectors cantered around LSSS. Another advantage of start-ups are large public

	funds allocated for their support and development.
The possibility of attracting specialists to the region	An attractive labour market created by LSSS actors is a natural magnet for both domestic and foreign experts. In addition, the region of Lower Silesia itself has many advantages, making it an interesting place to live. Apart from the purely occupational aspects, the opportunities for spending leisure time are also important. At this point one can refer to the so-called "manager's wife effect".
E-commerce development	The development of e-commerce in the region has an increasing tendency, just as in the entire country. Its continuously high growth potential represents its significant opportunity. The share of e-commerce in total trade transactions is definitely lower than the standards in this respect present in Western Europe or the United States. Just like e.g. in case of paying with credit cards. The following LSSS representatives should be most interested in the development of e-commerce: chemical and pharmaceutical industry, high quality food, information and communication technologies.
The promotion of healthy lifestyle	The trend focused on healthy and active lifestyle remains an opportunity for regional specialization related to high quality food. Promoting healthy lifestyle and physical condition improvement is already firmly rooted in media coverage, numerous organized events, regardless of the obvious support offered by the medical environment. Food, in this situation, represents an indispensable part of this phenomenon.
The implementation of interdisciplinary research projects	The development of interdisciplinary research projects cannot be referred to as the current fashion, such projects have existed since the beginning of science. Today, they are characterized by two key elements: their scale and greater opportunities in collecting funds for their implementation. Interdisciplinary character is beneficial for the development of all LSSS due to: a fresh look at research problems, the use of functional benchmarking, the transfer of knowledge and skills, the involvement of a wider group of researchers.
The functioning of Special Economic Zones	Conducting activities within Special Economic Zones is yet another development opportunity for LSSS. Three sub-zones are functioning in Lower Silesian Voivodship: Kamienna Góra Special Economic Zone of Small Entrepreneurship, Legnica Special Economic Zone and the largest in the country Wałbrzych Special Economic Zone. Preferential conditions for business activity refer, in particular, to the system of tax reliefs and operating in the specially prepared investment area.
Increased activity of NGO sector	The activity of non-governmental organizations can be beneficial for all LSSS areas. The effectiveness of NGOs is

	a manifestation of the desirable process aimed at higher involvement of regional communities. Moreover, NGOs can also remain partners in implementing joint, innovative projects. In the new financial perspective of the European Union they have broader opportunities in applying for aid.

Particular attention should be paid to the following of the listed opportunities: European funds from the new financial perspective, the growing demand for innovative products/services, the development of sector start-ups, or wider implementation of interdisciplinary research projects.

4 Summary and conclusion

In terms of barriers and opportunities, identified in the study and related to the development of smart specializations in Lower Silesia, the following conclusions and recommendations can be put forward:

- regional specific features should be supported within the framework of the conducted regional policy, specialization in a defined, narrow area offers possibilities for developing real competitive advantages. The ultimate number of specializations should not be over extensive. The diversification of activities in too many areas can lead to failure in achieving the intended effects in any of them,
- one of major effects resulting from projects' implementation within LSSS areas should be the reduction of intraregional differences in the level of socio-economic development,
- the presented problems and opportunities for LSSS development are intended as recommendations, they send out a signal for all persons and entities involved in the development of the region to undertake actions aimed at overcoming problems and taking advantage of the emerging opportunities,
- Lower Silesia region has many potentials and resources which can contribute to its development. The existing situation is far better than in case of most other regions in the country (e.g. so-called "Eastern Poland"). In this light, the choice of smart specializations represents an element of the new doctrine of regional development, coexisting with the new approach to the development of the European regional space. At the same time, it will be possible to analyse and assess the effects of this approach in the years to come.

Doing business, conducting science and technology activities within the Lower Silesian Smart Specializations can, indisputably, contribute to socio-economic development of the region in the coming years. The potential success is determined e.g. by the efficient use of the EU funds, closer co-operation between science and business, performing activities aimed at activating potentials and the creativity of regional community. The process of LSSS development stimulation should cover the largest possible number of users and creators of the regional space (e.g. entrepreneurs,

local authorities, universities, cultural institutions, business environment institutions, non-governmental organizations).

Smart specializations should be based on regional development potentials, mainly the innovative and economic ones. Meanwhile, it has to be remembered that developing competitive advantage in both national and international dimension should result from these specializations in the future.

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Quality Management in the Czech Republic and Poland - Comparative Analysis

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Abstract. The article compares two bordering countries i.e. the Czech Republic and Poland, in chosen aspects concerning broadly defined quality management. The analysis bases on the outcome of "World State of Quality" project, which, for the article was supplemented with additional calculations and information. The research proves that the Czech Republic is characterized by much higher development in the area of quality management. The Czech Republic recorded better results in 16 out of 21 indicators included in the research. In the ranking of European Union countries, which was prepared on the basis of combined value of those 21 indicators, the Czech Republic was 11th on the list while Poland was 20th. There was an additional analysis based on 4 indicators which are most significant for quality management : (1) number of ISO 9001 certified organizations, (2) number of organizations recognized by quality awards, (3) number of International Academy for Quality members (4) number of certified quality professionals. It appeared that Poland had not achieved better results than the Czech Republic in any of them.

Keywords: Quality Management, Comparative Analysis, the Czech Republic, Poland.

1 Introduction

Quality management can be defined as an approach to improving the effectiveness and flexibility of business as a whole, meeting customer's requirements both external and internal to the organization. It is essentially a way of organizing and involving the whole organization, every department, every single person at every level [8]. This approach, and in particular Total Quality Management (TQM), has been one of the most dominating and pervasive managerial approaches all over the world during the last three decades. In particular, from the late 1980s to the middle of the 1990s, the term TQM became more and more frequently used in the management literature as well as in the business world. However, during the first years of the new millennium, the term TQM seems to have lost its attractiveness in the industrialized parts of the world, and instead new terms like Business Excellence, Organizational Excellence,

Six-Sigma, and Lean seem to have overtaken the position of TQM even though the contents of these new terms are within the framework of quality management [5].

Currently, the quality management initiative is most widely used in the implementation of ISO standards (first of all ISO 9001) which are practically indispensible to compete in international markets. The standards represent a significant initial step for manufacturing organizations on the way to quality management since they involve a lower initial degree of commitment to their principles. However, another, less optimistic, vision argues that firms that implement ISO standards only aim at obtaining a certification which they can use to develop their business without really committing themselves to quality management [3].

Despite a vast scientific literature on quality management, few researches have been carried out to compare countries in the area and they can be divided into two groups.

The first includes researches on broadly defined quality which usually concern the quality of life and sustainable development such as for example: European quality of life examination [4] and the rankings of sustainable development [1]. The projects deal with the satisfaction with the quality of life of certain countries' inhabitants.

The second group of researches is of a quite different nature. They are limited to only one branch or a method of quality management etc. For example Sampaio with its partners evaluated chosen countries basing on the number of ISO 9001 certificates [7]. However such projects focus only on specific fraction of quality management so they do not provide a wider perspective.

The goal of the article is to compare two bordering countries i.e. the Czech Republic and Poland. The matters of a multidimensional analysis are chosen issues/indicators connected with quality management. The article exploits the outcome of "World State of Quality" project which is supplemented with additional calculations on observations prepared by the author of the article.

2 "World State of Quality" Project

2.1 Methodology

The research Project "World State of Quality" was conducted by a team of five representatives of University of Coimbra, University of Minho and National Observatory of Human Resources from Portugal [10].

Their work resulted with designing a 10 dimensional model in which the first half defines the potential while the latter describes the achievements. Every dimension consists of 2 (in one case 3) detailed indicators so the evaluation uses 21 such indicators in total. The dimensions and indicators used in the evaluation of the countries are presented in table 1.

Table 1. Dimensions and indicators used in"World State of Quality" project.

No	Dimension		Indicator
			-Enablers-
1	Organizations	1	Number of ISO 9001 Certified Organizations (i1)
		2	Number of Organizations Recognized by Quality Awards (i2)
2	Professionals	3	Number of International Academy for Quality Members (i3)
		4	Number of Certified Quality Professionals (i4)
3	Research	5	Number of Indexed Quality Paper Published (i5)
		6	Number of Universities in International Research Rankings (i6)
4	Education	7	OECD PISA Test Results (i7)
		8	Lifelong Learning (i8)
5	Health	9	Healthy Life Expectancy (i9)
		10	At Birth Mortality Rates (i10)
			-Results-
6	Competitiveness	11	Global Competitiveness Index (i11)
		12	Gross Domestic Product (i12)
7	Social cohesion	13	Gini Index (i13)
		14	People in Risk of Poverty and Social Exclusion (i14)
8	Sustainability	15	Environmental Wellbeing Results (i15)
		16	Ecological Footprint (i16)
9	Innovation and	17	Global Innovation Index (i17)
	entrepreneurship	18	Ease of Doing Business Results (i18)
10	Satisfaction	19	Quality of Life (i19)
		20	Job Satisfaction (i20)
		21	Unemployment Rate (i21)

2.2 Main Results

The indicators presented in the above table were used in the process of building the European countries ranking. The process of designing the ranking had three stages.

The first step was establishing indicators values for every of the 28 countries which provided 21 rankings as there were 21 indicators included. In every ranking the countries were given ranks reflecting their position in individual charts.

The second stage defined the weight of separate indicators which involved 19 additional experts in quality management. The group consisted among others of representatives of American Society for Quality, members of International Academy for Quality and representatives of European Organization for Quality. Their opinions were used to establish the weight of individual indicators and "Quality of life" was chosen as the most significant indicator. The weight of this indicator was 0.058 while the lowest weight (0.036) was given to the number of International Academy for Quality Members

The final stage included calculating the value of the aggregate indices of quality (Overall European Quality Scoreboard - OEQS) for every country in the project. The lower values of this indicator mean better evaluation of the situation in certain countries. Therefore, it can be claimed that OEQS is an indicator which bases on quality management and describes the level of a certain country's development. The ranking of countries created with this indicator is presented in table 2.

Table 2. Ranking of European Union countries.

No	Country	Overall European Quality Scoreboard
1	Finland	7.85
2	Austria	7.97
3	Sweden	8.33
4	Netherlands	8.45
5	Denmark	9.05
6	United Kingdom	10.20
7	Luxembourg	10.86
8	Germany	10.90
9	Ireland	11.18
10	Ireland	11.45
11	Slovenia	12.76
12	Czech Republic	12.99
13	Belgium	13.10
14	Spain	14.24
15	Portugal	14.40
16	Estonia	14.52
17	Malta	14.65
18	Italy	15.65
19	Slovakia	17.00
20	Poland	17.67
21	Hungary	17.72
22	Cyprus	17.83
23	Romania	18.03
24	Lithuania	18.61
25	Latvia	19.39
26	Croatia	19.65
27	Greece	19.96
28	Bulgaria	21.97

Best evaluations of development were given for the following countries: Finland, Austria, Sweden, the Netherlands and Denmark while Bulgaria, Greece, Croatia, Latvia and Lithuania were claimed to be at the lowest developmental level.

3 Comparative analysis

3.1 Overall European Quality Scoreboard

The value of the Overall European Quality Scoreboard for the Czech Republic was 12.76 providing the country the 11th position among 28 European Union countries in the ranking. Poland was worse at the 20th place with the Overall European Quality Scoreboard at 17.67 level. This observation supports the results of numerous researches available in scientific literature which indicate a higher level of development of the Czech Republic in comparison to Poland. For example A. Bluszcz compared European countries in the area of the sustainable development level. She prepared a ranking in which the Czech Republic was at the 14th place and Poland was 20th [2]. Also in one of the best known rankings of countries created on the basis of the value of Human Development Index, the Czech Republic is at the 28th while Poland at the 36th place (it is a ranking of a global nature which covers 188 countries)[6].

Analyzing the values of the detailed indicators for both countries (see Fig. 1) it is noticeable that only in 5 out of 21 indicators Poland was evaluated as better than the Czech Republic. The indicators are:

OECD PISA Test Results (i7). The indicator is the score obtained for mathematics in PISA (Programme for International Student Assessment) results, derived from a test aimed at evaluating the knowledge and skills of 15-year-old students. It is worth pointing out that it is the only indicator of potential (among 10) in which Poland had better results than the Czech Republic. In this case Poland was 4th and the Czech Republic was 11th.

- Environmental Wellbeing Results (i15). The indicator provides an aggregated evaluation of overall environmental performance (for example: undernourished people in total population and area for organic farming in total agricultural area) achieved at any given country [9]. In this ranking Poland was 16th and the Czech Republic 24th.
- Ecological Footprint (i16). The indicator is defined as the demand of nature regarding the amount of resources used by a given country. In this ranking Poland was 11th and the Czech Republic 15th.

  Ease of Doing Business Results (i18). The indicator scores the regulatory environment and bureaucracy in a given country according to several matrices that allow to measure efficiency in company creation and development. In this case Poland was 12th and the Czech Republic was 18th.

- Quality of Life (i19). The indicator is directly related to perceived life satisfaction, expressed by citizens from any given country. In this ranking Poland was 9th and the Czech Republic 17th.

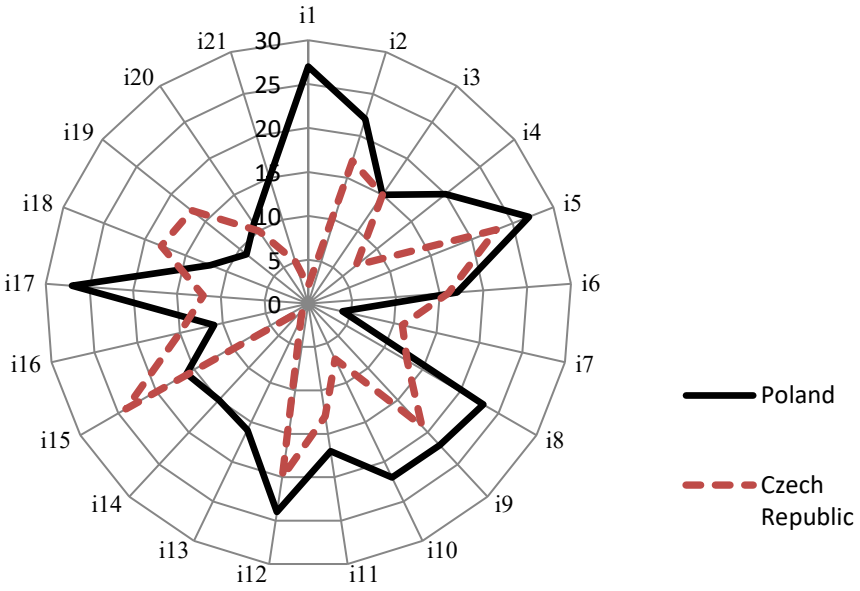

Fig. 1. Comparison of the places of Poland and the Czech Republic in the rankings.

The biggest diversity was noticed in the rankings prepared on the basis of the following indicators:

- Number of ISO 9001 Certified Organizations (i1). The indicator measure the number of ISO 9001 certificates that are issued by certification bodies in any given country. That number is divided by each country's total population. In this ranking Poland was 27h and the Czech Republic 2nd.
- Gini Index (i13). The indicator measures the degrees of inequality and dispersion of income across families and individuals at any given country. In this ranking Poland was 18th and the Czech Republic 12th.
- People in Risk of Poverty and Social Exclusion (i14). The indicator describes the percentage of people that are in risk of poverty and social exclusion according to a multidimensional approach that takes into account several dimensions (monetary poverty, material deprivation and low work intensity), for any given country. In this ranking Poland was 15h and the Czech Republic 1nd

3.2 Quality management

Among 21 indicators used in the"World State of Quality" project only 4 refer directly to quality management:

- Number of ISO 9001 Certified Organizations (i1), the description of this indicator is included in the previous chapter.
- Number of Organizations Recognized by Quality Awards (i2). The indicator measures the total number of organizations, in each country, that have an updated recognition according to the EFQM Model Excellence. The number is divided by each country's total population.
- Number of International Academy for Quality Members (i3). The indicator measures the total number of International Academy for Quality members in any given country. The number is divided by each country's total population.
- Number of Certified Quality Professionals (i4). The indicator measures the total number of certified quality professionals, in any given country according to the following organizations: International Register of Certified Auditors, American Society for Quality, European Organization for Quality and European Foundation for Quality Management. The number is divided by each country's total population.

If the analysis includes only these 4 indicators (applying the same method of calculating the aggregate indices which was used to calculate the OEQS) the Czech Republic will achieve 0.43425 while Poland 0.96875. It sets the Czech Republic at the 6th place among 28 European Union countries. In the same chart Poland is at the 27th place.

For 3 detailed rankings i.e. based on i1, i2 and i4 indicators, the Czech Republic was at a better than Poland place. In the ranking basing i3 indicator both the Czech Republic and Poland were at the 15th place. It is the result of the situation that only 14 countries in the ranking have their members in the International Academy for Quality. All remaining countries were given the 15th place.

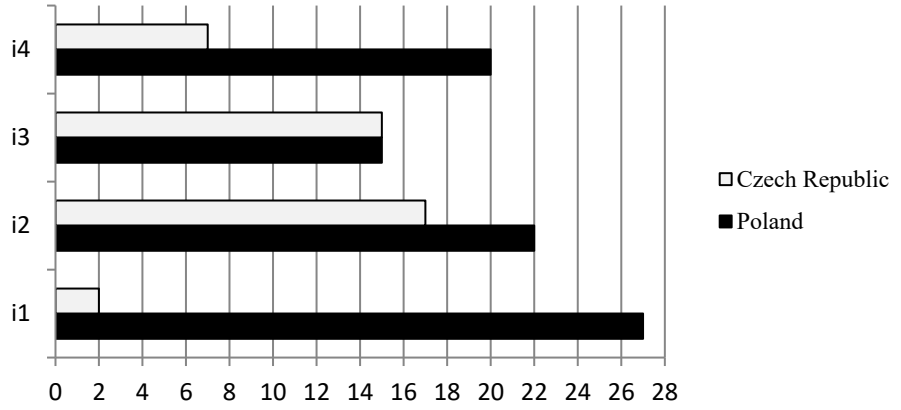

Fig. 2. The position of the Czech Republic and Poland in the rankings concerning quality management.

The countries at top positions in the ranking based on the aggregate indices concerning quality management are: Slovenia, Austria, Spain, Ireland and Germany. At the lowest positions beside Poland were: Lithuania, Latvia, Croatia and Denmark.

4 Conclusions

The paper compares the Czech Republic and Poland in the area of chosen aspects concerning both narrow and broad sense of quality management. In both cases the Czech Republic is ahead of Poland in the level of development. The research ought to be continued in order to establish the sources of the current situation.

The study has some limitations that need to be kept in mind. They concern first of all the methodology adopted for the needs of the "World State of Quality" project and later used for the preparation of this article. Including some of the indicators such as e.g. the number of International Academy for Quality members in the analysis can be also doubtful. At the same time there are many more significant indicators (related for example to Lean Management and TQM) which should have been included but were omitted due to the lack of available data. The method of calculating the aggregate indices can also be arguable as it was based on the positions in the rankings instead of using the values of detailed indicators.

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The Forecast of Economic Processes of Selected Agricultural Products in the Development of Bioenergy and Agritourism Activity in Poland

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Abstract. The article aims to present the forecast of economic processes in the development of bioenergy in Poland exemplified by rape and cereals. Biomass supply from food industry can be easily processed for heat and energy production purposes. For example, the rapeseed meal is a product that can be used as a source of bioenergy. The study highlights the use of these factors in agritourism activity. In agritourism, the energy sources can be obtained from the animal breeding or local plant production. Bioenergy can be also the factor that provides the right development of agritourism farms. The data contained in the article come from the Central Statistical Office of Poland from the period 2008 to 2015. The forecast covers the period 2016-2030. The cereal production in the analysed years will show a tendency to decrease, in the opposite to grain crops that growing trend was noticed. In addition, the information from a review of literature is taken into account.

Keywords: Forecasting, Economics, Rural Areas, Bio-energy, Rural Tourism Activity

1 Introduction

The concept of biomass characterises a biodegradable waste substance that is made in production processes in agriculture and forestry [1]. Biomass can be liquid or solid, and depending on the state of matter, it has different calorific value [11]. Food industry is one of the main sources of biomass that can be easily processed for the purpose of heat and energy production [13]. It can also be used in agritourism, e.g. to insulate buildings or as fodder (e.g. rapeseed meal) [15].

The paper lists industries that are the biggest sources of waste and match the government's action plan concerning renewable energy carriers' management. Due to that, the balance of management possibilities will refer to raw materials in the form of bran and rapeseed meal.

2 Objective, material and research methods

The article aims to present a forecast of economic processes in the development of bioenergy in Poland exemplified by rape and cereals. The paper draws attention to the use of these factors in agritourism. The data utilised in the article come from the Central Statistical Office of Poland in the period 2008-2015. The forecast is made for the period 2016-2030. In addition, the information from a review of literature is taken into account. The calculation is made with the use of Microsoft, Excel and Statistica programs. To provide a forecast for particular years the following formulas are used:

$$Y_t = \boldsymbol{f}(t, \varepsilon_t) \text{ for } t = 1, 2, \ldots, n, \quad (1)$$

$$\text{or } Y_t = \boldsymbol{f}(t, Y_{t-1}, Y_{t-2,\ldots,} Y_{t-i,} \varepsilon_t) \text{ for } t = i + 1, i + 2, \ldots n, i = 1, \ldots p < n. \quad (2)$$

where: ε is a random component (of random fluctuations).

The forecast of an explanatory variable Y in period T > n is calculated following the formula:

$$Y^*_T = \boldsymbol{f}(T) \text{ or } Y^*_T = \boldsymbol{f}(T, Y_{T-1}, Y_{T-2,\ldots,} Y_{T-i}). \quad (3)$$

3 Balance of particular types of biomass from food industry in Poland from 2008 to 2015 and a forecast for 2016-2030

The statistical analysis aims to estimate the amount of biomass [15]. Available from food industry in comparison to agricultural land used as basic cropland. The first part of the paper presents the acreage used for the production of cereals and rape and their crops in the period 2008-2015, and a forecast for 2016-2030. Table 1 presents selected data on cereal crops.

As Table 1 shows, the acreage of cereals in Poland in particular years was decreasing. One can see that cereal crops have a tendency to grow in particular years. Cereal grain production was different in Poland in particular years. There were small fluctuations in the average rape crops in Poland within the range of 27 cwt./ha. One can see a growing trend in the acreage of rape cultivation in Poland in particular years. A big decrease in the production of rape was recorded in Poland in the period 2011-2012.

The analysis of cereal production determines the potential resulting from the acreage used for sowing and the amount of crop. About 70% of seed allocated for food is subject to cereal processing.

Table 1. Selected data on agriculture in Poland [2].

Year	Acreage of land used for the cultivation of cereals [thousand	Average cereal crops [cwt./ha]	Cereal grain production [thousand t]	Rape cultivation acreage [thousand ha]	Average rape crops [cwt./ha	Rape production [thousand t]
2008	8604	33	27685	771	26.7	2105
2009	8583	35	29817	810	29.2	2496
2010	7646	36	27216	946	22.7	2228
2011	7803	35	26779	830	22.6	1862
2012	7704	38	28541	720	25.8	1866
2013	7479	38	28463	921	28.2	2678
2014	7478	38	28439	871	25.6	2257
2015	7301	38	27708	905	25.2	2307
2016	7170	38	27361	905	25.5	2316
2017	6993	39	27379	907	26.9	2462
2018	6914	39	26882	877	26.8	2385
2019	6753	40	26817	920	26.1	2415
2020	6707	40	26753	914	26.0	2374
2021	6647	40	26630	925	26.7	2462
2022	6494	40	26459	925	26.3	2455
2023	6416	40	25745	930	26.7	2480
2024	6338	41	25933	937	26.4	2471
2025	6134	41	25083	947	27.0	2511
2026	6106	41	24763	946	26.4	2508
2027	6038	40	24406	934	26.8	2497
2028	6015	41	24910	948	27.0	2530
2029	5909	41	24550	951	26.8	2530
2030	5830	42	24835	952	27.1	2543
Average	6916	39	26659	883	26.3	2380

The balance of cereal production takes into account estimates of equalizing amounts of needs and resources. The input values are initial stocks possessed, production and import of raw material. Demand takes into account consumption, sowing, industrial use, use for livestock feed, losses and shrinkage and export. Table 2 presents amounts characteristic of annual production of cereals in particular years.

Table 2. Balance of cereals production in Poland (mln t) [2].

Year	Initial stock	Production	Import	Resources in total	Consumption	Sowing	Industrial use	Livestock feed	Loss and shrinkage	Export	Final stock
2008	2.4	27.7	2.4	32.5	5.2	1.8	2.1	16.1	1.2	2.4	3.7
2010	5.0	27.2	2.2	34.4	5.2	1.7	2.9	17.1	1.2	2.0	4.3
2015	4.7	28.3	1.7	34.7	5.0	1.7	3.1	15.5	1.2	3.0	5.3
2020	7.8	27.9	1.7	37.4	5.0	1.6	3.1	14.9	1.1	2.8	8.8
2025	10.6	26.0	1.7	38.2	5.0	1.5	3.2	14.3	1.1	2.7	10.4
2030	9.4	25.4	1.6	36.4	5.0	1.4	3.3	13.6	1.0	2.6	9.4

Cereal such as wheat, oats and barley are mainly grown for consumption, however, waste resulting from milling, defined as bran, is used for energy production purposes. Calculation is to define detailed indicators characterising the percentage of particular by-products obtained from cereal cultivation. In conventional industry, 700-750 kg of flour and 250-300 kg of bran is made from one tonne, i.e. the rate is 25%.

The use of bran in energy production is limited by the use of the material to feed livestock, as a substrate in food concentrates and for direct sale in food processing industry. It has been decided that a small part, 5-10%, depending on demand and supply, in accordance with the European Union policy, can be used for energy production. Following the above-mentioned guidelines, average production was defined for whole Poland in the period from 2008, and a forecast was made until 2030. The production of bran in industrial milling and estimated energy potential is presented in Table 3.

Table 3. Production of bran in industrial milling and estimated energy potential in Poland in the period 2008-2030 (thousand t) [2].

Year	Bran production in industrial milling	Estimated energy potential 5-10%
2008	917.3762	68.80321
2010	1067.811	80.08583
2015	1323.003	99.22526
2020	2205.145	165.3859
2025	2595.921	194.6941
2030	2343.171	175.7378

Based on the presented calculation, one can assume that the forecasted potential for energy production may fluctuate around an average of 140 thousand tonnes annually. Rape is cultivated in a crop rotation system. It is dedicated for oil industry. Rapeseed

meal is a by-product of the extraction of oil from crushed and pre-conditioned rapeseed. During the process of extraction of one tonne of rapeseed, about 410-420 kg of oil is produced, i.e. the rate of rapeseed meal obtained is 0.58-0.59 t.

The balance of rapeseed production results from the amount of demand and supply. The input value includes possessed initial stock, production and import. The supply takes into account processing, loss and shrinkage and export. In case of rapeseed, the estimated value of the rate was 58%. Table 4 presents amounts characteristic of annual production of rapeseed in the period 2008-2030.

Table 4. Balance of rapeseed production and estimated energy potential of rapeseed meal in Poland in the period 2008-2030 (thousand t) [2].

Year	Initial stock	Production	Import	Resources in total	Processing	Loss and shrinkage	Export	Final stock	Estimated energy potential of bran
2008	0.0	2.1	0.4	2.5	2.0	0.1	0.2	0.2	0.1
2010	0.1	2.2	0.3	2.6	2.1	0.1	0.4	0.0	0.0
2015	0.2	2.3	0.4	2.9	2.1	0.1	0.2	0.4	0.2
2020	1.2	2.4	0.4	4.0	2.1	0.1	0.3	1.4	0.8
2025	2.3	2.5	0.3	5.1	2.1	0.1	0.3	2.6	1.5
2030	3.6	2.5	0.3	6.5	2.1	0.1	0.4	3.9	2.2

Constant demand for bio-components has led to intensive development and increase in demand for products from the production of biofuels in recent years. It is connected with the increase in the domestic production of rape, which translates into a growth of cultivation acreage. The 2009 was a record year with a big growth in comparison to 2008: rape supply was almost 2.5 thousands of tonnes in 2009 and 2.1 thousands of tonnes in 2008. This trend was accompanied by the increase in crops reaching even 31 cwt./ha in 2009. In the two successive years (2010 and 2011), there was a decrease in production directly connected with bad weather conditions. However, 2013 was a very successful year with rapeseed production reaching 2.6 thousands of tonnes.

4 Physical and chemical characteristic of biomass, its composition and energetic value

Cereals cultivation is widespread in the territory of Poland. Particular cereal types produce grain with high starch content and are broadly used in food industry. Cereal products include flour, groats, bread, pasta etc. The by-product of milling is bran, mostly the outer layer of cereal grain.

Bran contains grain, spore remnants and aleurone layers [6]. They contain high level of fibre, vitamins as well as macro and micro-elements [20]. Thanks to its nutrition value, it is also used as cattle and pig feed. Cereal bran is rich in vitamins from group B and D. The energetic value of cereal bran is 5.3 kJ·kg [12, 20]. Table 5 presents selected physical parameters of cereal bran.

Table 5. Physical parameters of cereal bran [14].

Parameters	Value
Oil content, %	max. 3
Moisture content, %	max. 12.5
Protein content, %	32 – 36
Raw fibre, °C	min. 11–12
Solvent content, ppm	max. 300
Bulk density, g/cm^3	0.550
Mineral pollution, %	2

Rapeseed meal is a by-product from the process of extracting fat from crushed and pre-conditioned rapeseed with the use of solvents [6]. The technology of oil pressing consists in initial extraction of rapeseed with the use of a screw press. The product obtained is called extra virgin oil and rapeseed pomace that is next processed with the use of solvents in order to obtain the remaining oil. The products may be classified as raw oil, post-extraction oil, rapeseed pomace and rapeseed meal. Table 6 presents selected physical parameters of rapeseed meal.

Table 6. Physical parameters of rapeseed meal [4].

Parameters	Unit	Value
Moisture content	%	12.5
Solvent content	ppm	300
Raw protein content	%	35
Fibre content	%	13
Bulk density	g/cm^3	0.550
Mineral pollution	%	2

5 Current prices of particular types of biomass and a price forecast until 2030

One can notice that the price of plant products depend on the season and the demand at the time. Domestic prices of cereal compared to world market in the season 2012/2013 maintained at a high level. It was reflected in the sales of cereal milling waste. The current price of rye bran is about 680 PLN/tonne and wheat bran: 800 PLN/t. In comparison: the price of rye is about 830 PLN/t and wheat about 1000 PLN/t on average (http://www.rolpetrol.com.pl). The forecast is that the future price of bran will be about 1000 PLN/t. The above-mentioned prices are net ones. Table 7 presents average purchase prices of cereal bran and a forecast until 2030.

Table 7. Cereal and bran purchase prices in Poland in the period 2008-2030 (PLN/t) [18, 19].

Year	Price of rye		Price of wheat		Price of rye bran		Price of wheat bran	
	net	gross	net	gross	net	gross	net	gross
2008	346	426	431	530	283	348	339	417
2010	350	431	470	579	287	352	370	455
2015	763	938	935	1150	624	767	736	905
2020	1096	1348	1331	1637	897	1103	1047	1288
2025	1430	1759	1728	2125	1170	1439	1359	1672
2030	1764	2169	2124	2612	1443	1775	1671	2055

Average price of rapeseed in Poland is at the level of 2000 PLN/t. The price usually depends on the place of purchase. Polish oil production market ensures the supply of rapeseed meal and pomace. The difference between the two raw materials consist in the fact that rapeseed pomace is made in the process of pressing and is mainly used as animal feed and rapeseed meal is made as a result of oil extraction with the use of solvents. The difference between the two raw materials is small and the price of both is 1.140 PLN/t on average.

6 Analysis of the use of biomass from food industry, including other sectors' demand for edible biomass

Food industry in Poland is a producer of considerable amount of waste in the form of biomass. As biomass, the waste can be used in many ways, e.g. as energy carriers. Thus, biomass for energy use may be obtained from oil production companies (rapeseed meal) and milling industry (cereal bran).

The main milling industry centres in Poland include mills in Bolesławiec, Jarosław, Kalisz, Stargard, Stoisław, Warsaw and Wrocław. The industry purchases cereals from local farmers and mills them for consumption purposes. There are about

140 milling companies with about 2.400 mills registered. The scale of production mainly depends on mills' production capacity and demand for a particular type of flour. Food industry uses cereal bran to produce fodder and as a raw material to produce concentrates. The demand for cereal to produce fodder may constitute competition for obtaining waste from milling of about 3 m. tonnes of cereals. Cereal is mainly used to produce pasta (ca. 100 thousand t.) and bread (ca. 3 million t.) and to store (ca. 2.5 million t.).

Oil industry is a substantial source of renewable energy. It is necessary to consider current and future possibilities of processing rapeseed and seed meal of other oil plants. At present, an increase in sowing rape is recorded, which is connected with the Act on biofuels in Poland, which regulates basic issues connected with the production and sale of biofuels. It regulates the introduction of bio-components and liquid biofuels [9]. The Council of Ministers established the National Indicative Target (NIT) in the regulation of 15 June 2007. It lays down an obligation to introduce a specified amount of bio-components called NIT and this way, starts a sale of bio-components and biofuels as well as agricultural raw materials used for their production. Poland should work out a strategy for biofuels development until 2020. The national road map to energy from renewable resources establishes that [10]. Therefore, in 2014, food industry will need about 1.5 million tonnes of rapeseed, which will provide ca. 875 thousand tonnes of bio-components. Table 8 presents estimated demand for rape and rape esters until 2020.

Table 8. Estimated demand for rape and rape esters and a forecast until 2020 [5].

Year		2014	2016	2018	2020
National Indicative Target	Energetic value %	8	8	9	10
Diesel fuel	tonne	8 9 80	8 9 80	8 9 80	8 9 80
Diesel fuel	thousand m^3	10 627	10 627	10 627	10 627
Demand for bio-components	thousand m^3	87 5	98 7	10 98	12 16
Demand for rape	thousand t	14 70	16 57	18 44	20 42

As the above data show, rape crops should increase considerably and culminate in 2020.

7 Competition for obtaining biomass

Every kind of waste obtained in cereal production should be looked at from the point of view of energy production. It is difficult to estimate the possibility of using grain for energy purposes. This results from unpredictable import (the European

Commission decision) – in case cereal crops are small, import increases. Whether conditions are also decisive (e.g. a curse of abundance and changes in planning cereal cultivation). Because of that it is difficult to forecast a stable policy of cereals use.

Most waste from cereals milling is used in fodder and food production. Cereal bran is used to produce livestock feed and many different concentrates.

Polish consumers' growing demand for vegetable fats is a key factor in the development of oil industry. Zakłady Tłuszczowe "Kruszwica" S.A. within Bunge Group is the major entity. It produces 80% of margarine and oil. It owns the biggest factories such as those in Kruszwica, Brzeg, Szopienice, Kobylniki and Warsaw. The factory in Brzeg processes seeds and refined oil and produces material for the biofuel sector. The factory in Kobylniki processes seeds and refined oil and the factory in Warsaw: oil, Kruszwica processes 1.5 thousands of tonnes of rape. High quality rapeseed oil may be a recipe for further development of biodiesel sector.

In 2008, a company in Kruszwica provided over 500 thousand tonnes of rapeseed meal. It signed an agreement with Energo Krak company to supply biomass in the form of post-extraction rapeseed meal. Seed meal was also sold abroad. Increased competition in energy production results from the fact that income from seed meal sales lower the cost of oil production. The biggest companies processing rapeseed oil are fat production factories and biofuel companies, including (http://www.farmer.pl): ZT Kruszwica (factories in Brzeg, Kruszwica and Warsaw), ADM Szamotuły Sp. z o.o. ZT Bodaczów, Elstar Oils S.A. Komagra Sp. z o.o. Tychy, Petroestry Sp. z o.o. (Greater Poland, Kuyavia-Pomerania, Western Pomerania Voivodeships), MOSSO Kwaśniewscy Sp. j. Mróz Oleje (Lower Silesia Voivodeship), Glencore (Elbląg, Kętrzyn, Pyrzyce, Czarnogłowy), ZCH Organika – Azot Jaworzno (Elewator Jarosław, Włodowice, Jaworzno, Zimno), Biomarol Sp. z o.o., Sieradz, Dalgety, Kamex (Lubus Voivodeship), Biopal (Greater Poland Voivodeship), PPHU Wilmar (Lower Silesia Voivodeship), Agro Corn, Bastik (Koźmin Wielkopolski), Agro-mat Ząbkowice, Agroproducts Wielkopolskie Składy Zbożowe Sp. z o.o. Lorgan Wejherowo, Chemirol (Grifice Nowy Staw, Gniezno, Wągrowiec, Orchowo, Samborowo, Bartoszyce, Kruszewiec, Siennica Rożana).

8 Seasonal cost of obtaining raw material per unit and a forecast

The cost of obtaining one unit of raw material depends on the cost of producing that material compared to the obtained income. Based on the database of Warmińsko-Mazurski Ośrodek Doradztwa Rolniczego, three technologies characterising particular crops are taken into account in the record sheet. The data are of September 2013 and all the amounts refer to one hectare.

The production cost of one cereal unit was 98.63 PLN/cwt. at a low intensity level, 83.28 PLN/cwt. at a medium intensity level and 69.68 PLN/cwt. at a high intensity level. One should add the cost of processing cereal to the cost of its production, because cereal bran is treated as waste. Sales of flour is the profit from the production. Figure 1 presents seasonal changes in cereal prices.

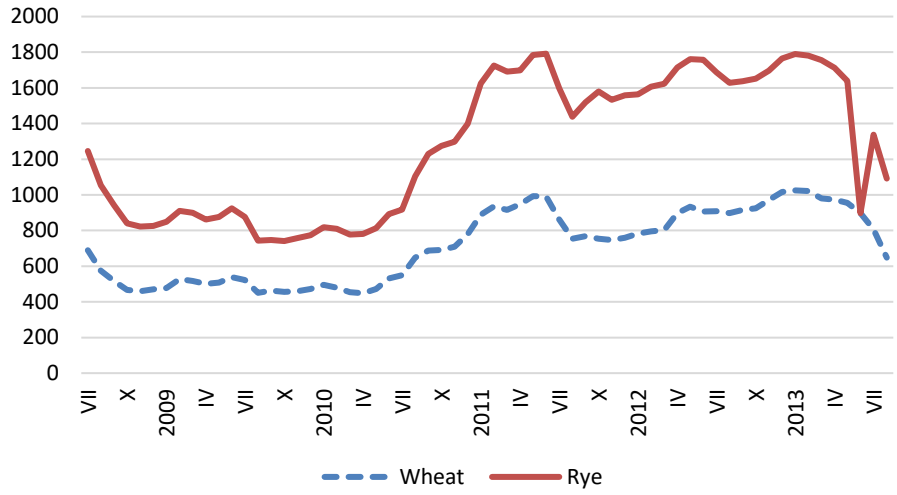

Fig. 1. Cost of cereal purchase in particular seasons (PLN/t) [2].

Cost of rape unit production was 229.94 PLN/cwt. at a low intensity level 181.89 PLN/cwt. at a medium intensity level, and 153 PLN/cwt. at a high intensity level. The total value of rape production is 3 279.02 at a low intensity level 4 057.52 at a medium level and 4 836.02 at a high level. The balance of cost of producing one unit of rape must take into account seasonal changes that are expressed in the forecast presented in the former part of the paper.

The total cost of rapeseed meal production should take into account the purchase of a screw press. As screw presses' specifications vary their prices may vary within the range of a few thousand.

9 Use of bioenergy in agriculture and agritourism

At present, we can observe the use of additional sources of energy in agriculture, including biomass. Vegetable oil may be obtained from rape, sunflower or soya beans. Bioethanol may be obtained from cereal and potatoes and biodiesel may be produced from rape, sunflower or soya.

The product mentioned earlier that may be used as a source of bioenergy is rapeseed meal obtained in the process of pressing oil from rapeseed. Because of a high content of protein, rapeseed meal constitutes a valuable component of farm animals feed. The product is mainly used as fodder for ruminants, pigs and poultry. Post-extraction rapeseed meal is a product from the extraction of oil from rapeseed. The use of rapeseed meal allows to reduce the cost of fodder. But rapeseed meal cannot be used to feed young animals. It is rich in sulphuric amino acids (methionine and cysteine), however the level of lysine is a little lower than in soya protein. That is why at least in the first period of animal fattening it is recommended that the level of

protein in fodder should be supplemented with two protein materials: rapeseed meal rich in sulphuric amino acids and soya meal with a considerable content of lysine. Other legumes that are rich in lysine may partly substitute for soya protein.

In agritourism, where animal (or plant) production is a very important factor it is essential to obtain additional sources of energy [17]. In this kind of business activity, renewable energy sources (bioenergy, photovoltaic batteries) are key elements. The use of renewable energy in rural areas may be an opportunity to compensate conditions of development in these areas. The diversity of resources in rural regions creates great opportunities for innovation renewable energy sources development (bioenergy) and non-agricultural business, inter alia, agritourism farms. The use of opportunities created by bioenergy may be the right direction in the pursuit of farm development including agritourism ones [3]. Agritourism has become one of the most popular forms of tourism recently [16].

10 Conclusions

Based on the presented analyses a few generalisations and conclusions are made. Food industry is one of the basic sources of biomass supply which can be easily processed for heat and energy production purposes.

Cereal production in the analysed years will show a tendency to decrease. There were small fluctuations in the average rape crops in Poland within the range of 27 cwt./ha.

We can see a growing trend in grain crops in the analysed years. Rapeseed meal is a product that can be used as a source of bioenergy. The use of rapeseed meal allows for a significant reduction of feed costs. It is a product produced in the process of extraction of rapeseed oil.

In agritourism, where animal (or plant) production is a key factor it is important to obtain additional energy sources. The use of opportunities created by bioenergy may be the right direction in the pursuit of farm development, including agritourism ones. Bioenergy is one of the innovations in agritourism.

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Influence of Managerial Communication to Performance of Small and Middle-sized Enterprises

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Abstract. A long-term effort of the management of an organization is permanent financial performance, which means profit. Any manager of small and medium-sized enterprises looks for suitable strategies that will enable them to succeed in a competitive environment. Most often, they focus on common reducing costs, increasing market share, introducing new products, strengthening relationships with customers and retaining talented staff in the organization. Some managers, however, still do not realize that communication is the most important tool for improving the organization's performance. Currently, the communication process is no longer only the exchange of information. It is the basis of influencing prosperity of the organization and its competitiveness. In any organization, communication of managers is both a factor that unites people who work in it and participate differently on its performance, and partly a factor that actively participate in all management processes. The communication is used to the goals set in the strategies for evaluation and monitoring, and particularly it is important in the field of human relations. Undoubtedly, it is the cornerstone of the success of any organization. Both the internal communication for operational decisions and the communication of strategic decisions are of great importance to improving the performance of SMEs and optimize their management. Effective communication link setup is not only important for the consistency of all work activities, but also for stimulating job performance, work behaviour, motivation and employee loyalty. The paper deals with the influence of managerial communication to the performance of 148 SMEs.

Keywords: Communication, Management, Performance, SMEs, Plan, Strategy.

1 Introduction

The communication belongs to the most difficult skills which are necessary for efficient performance of managerial functions. Internal communication is one of the most complex processes which must be kept on running, that is why it is necessary to make the information available for everybody in due time [24]. Clear, open communication between management and human resources lies in an understandable description of the current situation of the organization, in the exact determination of goals and ways to achieve them [23].

Concerning communication it is important to know how to: solve problems and develop new skills, deal with conflicts, emotions and anger, understand other people, adapt, change and grow [20]. Organizational researchers have suggested that communication is particularly important in organizational change processes [13, 30]. Within the communication, human communication almost always consists of verbal and nonverbal signals that are mutually supportive [7].

Today, communication is mostly understood in the sense of sharing and transferring information [27]. Communication is the process by which meanings are exchanged between people through the use of an agreed system of symbols [1]. It is a process of mutual transfer of information in social contact governed by certain rules [15]. Communication is a way by which changes can be achieved providing the welfare of an organization. It is important for the internal functioning of an enterprise as it integrates management functions [8]. Communicative interactions in the workplace serve to create and maintain work relationships among team and organizational member [18]. Success of a company is based on the knowledge how to treat the information [17].

Managerial communication contains of both interpersonal communication, communication between two or more persons, and communication within an organization, which covers all the models, networks and communication systems within the organization [21]. Managerial communication is the exchange of information between the executive and all stakeholders (especially employees and customers) [22]. It concerns exchanging information from top as well as from bottom, via formal and informal channels through which it is possible to reach objectives that manager designate [29].

Managerial communication performs in organizations at the initiative of the management team with the direct involvement of the management team, in order to achieve practical the strategic objectives [26]. Managerial communication includes all relevant forms and communication channels that the manager can choose for accomplishing his or her objectives [5]. Bell and Martin [4] define managerial communication as the downward, horizontal, or upward exchange of information and transmission of meaning through informal or formal channels that enables managers to achieve their goals. In practice these communication skills are required: competence in listening and answering, openness and sincerity, inquiry, empathy, negotiation and solving conflicts [16].

There are many reasons why we should deal with the managerial communication. A research of Watson Wyatt Worldwide, a multinational consulting company, from the last decade of North American companies confirmed that a well-functioning internal communication means measurable financial benefits and other quantifiable benefits for profit-oriented organizations [28]. Petříková et al. [19] notes, that according to this study, companies with efficiently organized internal communication financially win over companies that do not have this organization. The study results clearly demonstrate that communication is a key element in creating successful business dealings.

The ultimate goal of an organization is to maximize stakeholders value and profitability, which is accomplished by integrating strong leadership with formal and

informal communication networks [2]. In particular, communication that reveals shared values and reflects common commitments to organizational goals enables co-workers to forge and sustain productive relationships in organizations [10]. Communication can also have direct and indirect effects on team and organizational performance [9].

Effective communication has also been identified as a significant factor in helping employees understand the need for change, as well as the personal effects of a proposed change [3]. Quality and therefore effective communication improves employee efficiency, helps managing the flow of information, provides feedback to managers, develops a sense of belonging and the team spirit, and it is also good preparation for the crisis management [6]. Not accepting communication as authority can be a major obstacle to the improvement of organizational performance, innovation and change efforts [14].

A sign of a good functioning of the managerial communication is that the company employees´ information and motivation are well-integrated. Workers have sufficient information for their work; they know what is expected of them. One of the most important prerequisites for good functioning is regular feedback in both directions [11]. Overall, malfunctioning of the communication in an organization often results in the following:

- high rate of staff turnover, poor coordination of work processes and activities,
- staff disinterest in achieving the goals,
- determination inappropriate strategy based dysfunctional feedback,
- ineffective marketing management,
- inability of competing in the market [25].

Both general and specific measures of the assessment of efficiency of the communication can be found in three areas: loyalty and employee satisfaction, the overlap between formal and informal communication, customer satisfaction [12].

2 Methods

This text aims to assess the impact of managerial communication in small and medium-sized enterprises of the South Bohemian Region in Czech Republic for their performance and propose recommendations that would make the internal communication more effective.

Quantitative economic data was obtained from annual reports and income statements according to the identification number (ICO) of companies that were involved in the survey (interview with managers), which was implemented in 2013-2014 by the students of the Faculty of Economics at the University of South Bohemia in České Budějovice. The interview consisted of many questions, for the purposes of this paper, only two were selected (plan, strategy). To verify the influence of communication on the performance, the author of the text used the financial statements of the sample of 176 SMEs in South Bohemian region, which had been published on the Internet. From the group Organizations that recorded no data for the

indicators of the assessment (profit and performance/1 employee) were also eliminated. The final sample numbered 148 SMEs.

Information processing used the methods of descriptive statistic as the interval screening and a simple sorting of data. In the tables of frequencies, absolute frequency and relative frequency are set. The values of relative frequencies are reported as a percent of the total. Data were processed using statistical methods suitable for analysis of categorical data, which are a part of the Statistica program. Statistical evaluation of the survey results used programming environment that provides simple tabulations, graphs and procedures for data analysis. It was used for univariate analysis and qualitative characteristics of addiction.

Testing of the dependence of the impact of the communication on a sample of financial indicators

The first step in statistical testing is always a statistical hypothesis formulation, i.e. the formulation of research questions to form the null and the alternative statistical hypotheses that are placed when tested against each other. The null hypothesis H0 states that the communication indicators do not affect the performance (the financial indicators). This statement usually expresses no or zero difference between the test data sets. If the calculated p-value is less than the error probability of one kind α (0.05), then we reject the null hypothesis and accept the alternative hypothesis Ha, when we say that there is an effect on performance. The alternative hypothesis denies the validity of the H0 null hypothesis. Typically, it is expressed as the difference between the files or the existence of dependence between the variables.

3 Results

3.1 Planning in managerial communication and human resource management

The planning is one of the most important functions for the managers. It should result into a detailed plan of future activities in an organization. A plan is a written document that defines the objectives, strategies to achieve them, the need and the amount of resources, time schedule and responsibilities of the people involved. By the table 1, drawing up the plan in managerial communication does not address the absolute majority of examined SMEs in the Region of South Bohemia (51%). Smaller half of the managers establish communication goals and plans, but we do not know if the plans are written.

Table 1. Do the SMEs in the Region of South Bohemia set a plan?

Do you have plan?	n	%
Yes	72	48.65
No	76	51.35
Total	148	100

Worse condition was detected in human resources management process. Surprisingly (see table 2), more than 60% of SMEs in the Region of South Bohemia does not have a strategy. The remaining organizations can establish a long-term direction in this area. In this issue, the managers thus have considerable reserves. They should deal with future development and to prepare plans, objectives and strategies in the areas of human resources management and communication, in which the employees could be also involved. Written plans would increase the awareness of people in the workplace and thus increasing their workload.

Table 2. Do the SMEs in the Region of South Bohemia set a strategy for the HRM?

Do you have HRM strategy?	n	%
Yes	54	36.49
No	94	63.51
Total	148	100

Profit/loss is the accounting term for the difference between revenues and costs of the organization and represents the profit or loss for a given period or periods. For a more comprehensive comparison, the profit was calculated per one employee. Within the sample of 148 organizations, almost half of the SMEs reached a positive economic result, i.e. the profit per one employee in the interval from 0 to 100 thousand CZK (see table 3). On the contrary, more than a quarter of organizations showed a loss. Around 7% of SMEs reached the profit of more than 300 thousand CZK per one employee.

Table 3. The profit/loss per one employee in the SMEs of the Region of South Bohemia in CZK.

	n	%
-500000<x<=-100000	10	6.76
-100000<x<=0	25	16.89
0<x<=100000	74	47.97
100000<x<=200000	23	15.54
200000<x<=300000	8	5.41
over 300000	11	7.43
Total	148	100

Output means the products that an organization creates and manages to place them on the market or that are in various stages of production (unfinished, work in progress, semi-finished products) or other performances created in the custom mode for their own consumption. Around 2/5 of organizations (see table 4) reached the output per 1 employee up to 1 million CZK. Up to 2 million CZK was reached by other 1/3 organizations. The sample also revealed approximately 5% of the organizations with the output of more than 5 million CZK. Outputs in the SMEs in the Region of South Bohemia were below negative.

Table 4. The output per one employee in the SMEs of the Region of South Bohemia in CZK.

	n	%
0<x<=1000000	58	39.19
1000000<x<=2000000	54	36.49
2000000<x<=3000000	17	11.49
3000000<x<=4000000	11	7.43
over 4000000	8	5.41
Total	148	100

To test the dependence of categorical variables, the Statistica General Linear Model was used. It is a method of studying dependence of the explained variable to the explaining variables. At first, the explained variable was the profit calculated per one employee and the explaining variables were the existence of a strategy and communication plans. As reported by the table 5, the p-value of no variable was less than 0.05. We failed to prove dependence. We can therefore conclude that the variables do not affect the profit of organizations per one employee. The communication in an organization therefore does not have an important role.

Table 5. Univariate tests of significance for profit of organizations per one employee.

	F	p
Do you have a strategy?	0.000856	0.976702
Do you prepare plans?	1.909147	0.169228

In the second testing, the explained variable was the indicator of performance per one employee. There were the same explaining variables. By the table 6, the p-value was greater than the α level of significance. As we cannot reject the null hypothesis H0, so that we suppose it applies. There we failed to prove the dependence. For the variable of "Do you have an HRD Strategy?", the p-value was reported less than 0.05. In this single indicator, a dependence on the performance per one employee was proved. A strategy for human recourses has a significant effect on the performance.

Table 6. Univariate tests of significance for performance per employee.

	F	p
Do you have a strategy?	4.926130	0.028039
Do you prepare plans?	0.928392	0.336919

4 Discussion

4.1 Making plans, objectives and strategies

The process of human resource management and communication should be based on a detailed strategic plan. Unfortunately, creating strategies separately has been implemented by only in a small number of SMEs in South Bohemia Region so far.

In organizations that have a strategy in HRM dependence, and therefore its impact on the standard of performance, was statistically proven. As a part of the strategic planning of human resources management, the management of organizations should ask the following questions: What direction do they want to develop their organization and human resources? What goals should they determine? What are the strategies to achieve them? What is the strength or weakness of the process of HRM? What educational projects do they want to implement? How should they finance? What kind of subsidy should they apply for? How should they engage employees? What influences from outside is threatening? How should they effectively communicate with their employees? What should be the best way to participate in all activities?

To determine their weaknesses, it is appropriate to prepare a SWOT analysis and manage its activities in such a way that the weaknesses in human resources and particularly problematic communication with employees are gradually dismantled. All proposals should be a part of the strategic plan and should be tackled with the highest priority by the financial situation.

Each organization should compile and update their strategic plans, not only in the field of human resources management, but also in the communication process, and not to react to it after forced by competitors. Management of SMEs can therefore recommend the creation of a communication strategy and communication plan as part of a HRM strategic plan (such as meetings, consultations, conflict resolutions, teamwork principles, ways of exchanging information). The Strategy will define the information flow (who informs, who to inform, how and how often). The declaration and subsequent uniform enforcement in terms of management of the organization is vitally important.

Each plan should be updated every year, mainly on the basis of feedback from the previous annual operation. The feedback of employee is important such as to allow them to enter into the decision to develop an organization and themselves; and the feedback of managers, such as to continuously evaluate their subordinates, to commend them for a job well done. The management should conduct regular audits, which would measure the effectiveness of internal communication and continually educate and train the managers in communication, negotiation, assertiveness and conflict resolution, since the manager is the communication link which promotes plans and objectives of the organization to the work of each employee.

4.2 Transmission of information within the organization

Many SMEs try to achieve the full performance of both the organization and the human resources. It is possible to achieve this state only provided that workers are adequately informed and motivated, resulting in their identification with the organization and its goals. Employees need information to their proper and effective work. They need to know the goals of the organization and its strategy. They should be kept informed about what is successful and what is not. They should know their specific tasks and other duties. Determination of understandable objectives is an essential prerequisite for successful communication. The more people can identify

with the outlined goals and strategies of an organization, the closer they are to their actual fulfillment. Any management action should lead to the use of all available communication channels and opportunities for continuous exchange of information between managers and workers. Lack of information is not only of a negative impact on work performance when the employee does not have sufficient data for the job, but the information is also linked with the need for certainty. Therefore, all workers should be familiar enough with what is happening in the organization, what are its future goals and strategies. Concealment of information or their deficiency leads to communication noise.

The management of organizations can implement information tools, such as the periodic publication of newspapers, journals and newsletters or regular updates on the intranet. To have an effective communication within the organization, a regular feedback in both directions is also necessary. It is not just that workers receive proper and updated information about everything that affects them directly, but they should also be allowed to express their comments, opinions or possible dissatisfaction. Most often, they can do so through workshops or contacting their immediate supervisor. It is also possible to use a regular survey that investigates the needs and wishes of employees and their overall satisfaction with the work procedures, management, and communication. Using questionnaires should be tailored according to specific requirements of the organization. It is a relatively quick and affordable method for collecting data. Other improvements are the introduction of further means of internal communication in the form of anonymous boxes that contribute to better information management or hearing request, statements, questions and opinions of employees. It can also be a written communication of thinks that are difficult to be said such as being a witness of bullying in the workplace, sexual harassment or conflict with colleagues and direct superiors.

5 Conclusion

The ability of managers and employees, superiors and subordinates, communicate together openly and effectively is one of the critical success factors of organizations. The communication between these groups is a source of information that both need to operate efficiently and effectively. Any manager should focus primarily on the sufficient level of awareness of its employees about the company's goals, plans and prospects for further development. The manager deals with people successfully only if they can create an atmosphere of mutual trust, sense of belonging to the team, but also to explain and present the goals and objectives of the organization, to build a creative climate where everyone feels team member feels important and necessary for the successful operation the entire team and an organization in general.

Internal communication is a totally unnecessary weakness of most SMEs. The management underestimates its importance and often does not deal with the basic settings. Doing so, the correct setting of communication within an organization is a significant stabilizing factor in difficult times. So that management can effectively manage the organization needs faster and more accurate method of communication,

which in turn provides a better ground for cooperation in business a competitive advantage in bringing cost savings and increased revenues for the organization.

The management must work with internal communication as with an important strategic tool to get employees to meet objectives and to gain their loyalty. Only loyal employee can live their own strategies and expertise and contribute by their added value. Effective communication is the engine rather than the result of financial performance and greater employee involvement. Organizations with high levels of communication often have more committed employees and lower staff turnover compared to other organizations. Effective communication within an organization is a strong sign of the maturity of its internal culture and the daily levels of managerial work. Influence of the strategies on the performance of the SMEs was statistically proven in this text.

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Industrial Agglomeration and Energy Efficiency of Manufacturing Industry

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Abstract. This paper finds that, industry agglomeration cannot exert a positive influence on improving EI and CCR energy efficiency, and the promotion effect on EBM energy efficiency is not significant. Government intervention inhibits the energy conservation effect of industrial agglomeration.

Keywords: Energy Conservation, Industrial Agglomeration, Energy Efficiency.

1 Introduction

The rapid growth of China's industry is accompanied by a rising level of industrial agglomeration, and the agglomeration level of the industrial sectors in China has increased by 21.3% in 2015 compared with that in 1978. Industrial agglomeration has a profound impact on economic growth through externalities [4]. Based on this, a large number of studies have revealed the agglomeration effect under different perspectives. Krugman, Glaeser and Fujita pointed out that industrial agglomeration produces positive externalities to enterprises in the same region through technology spill-over and knowledge diffusion effects [1, 2, 3]. O'Sullivan found that the government could build agglomeration by increasing the supplies of local public service infrastructure and industrial infrastructure to attract the investment from manufacturers [5]. At the same time, it is not difficult to find that industrial agglomeration can improve energy efficiency by means of infrastructure sharing and technology spill-over. However, China's industrial development has brought about a sharp increase in energy consumption and environmental pollution. In 2012, energy consumption in the industrial sector accounted for 69.8% of China's total energy consumption, industrial sulphur dioxide emissions represent 83.9% for the total emissions, while industrial energy efficiency is much lower than other industries. Industrial agglomeration does not promote energy conservation.

To study the relationship between industrial agglomeration and energy conservation deeply, based on the measurement of energy efficiency of 26 industrial sectors in China from 1999 to 2015, this paper applies SYS-GMM to empirically analyze the relationship between absolute industry agglomeration, relative industrial agglomeration, and energy efficiency.

2 Methods

2.1 Econometrics model construction

Based on the analysis of the theoretical model, the authors analyze the relationship between industrial agglomeration and energy efficiency improvement and its mechanism, construct the following dynamic econometrics model considering the inertia of energy efficiency improvement:

$$EE_{i.t} = \alpha_0^1 + \alpha_1^1 EE_{i,t-1} + \alpha_2^1 Agg_{i,t} + \beta^1 X_{i,t} + \varepsilon_{i,t}^1 \quad (1)$$

Where i represents the industrial sector, t is the year, $\varepsilon_{i,t}$ is the random disturbance, $EE_{i.t}$ refers to the energy efficiency, $Agg_{i,t}$ is the industrial agglomeration variable, $X_{i,t}$ represents a set of control variables.

2.2 Variables and description of data

Energy Efficiency ($EE_{i.t}$). This paper applies EBM model to measure the single-factor energy efficiency and total-factor energy efficiency of 26 industrial sectors in China from 1999 to 2015. Additionally, considering that energy consumption is bound to produce environmental pollution, the DEA method is used to respectively measure the total-factor energy efficiency with and without the undesirable good - the environment pollution. This paper uses three kinds of energy efficiency: energy consumption per unit (EI), total-factor energy efficiency without environmental quality information (CCR), and total-factor energy efficiency with environmental quality information (EBM).

Industrial Agglomeration ($Agg_{i,t}$). The study of industrial agglomeration in the existing literature is relatively abundant, and there are many types of industrial agglomeration indexes. Since this paper examines the impact of spatial geography information of industrial agglomeration on energy efficiency, the index of absolute industrial agglomeration and relative industrial agglomeration is used [6]. The advantage of this index is that it captures the specific geographic concentration that measures the distribution of the industry. At first, the regional share index is defined as:

$$S_{j,t}^i = \frac{X_{j,t}^i}{\sum_j X_{j,t}^i}, S_j(t) = \frac{\sum_i X_{j,t}^i}{\sum_i \sum_j X_{j,t}^i} \quad (2)$$

$S_{j,t}^{i}$ represents the share of the output value of the i industry accounts for the national i industry in j region in the t year; $S_{j,t}$ represents the share of the output value of all industries accounts for the national industries in j region in the t year. Therefore, the absolute industrial agglomeration $AA_{i,t}$ and the relative industrial agglomeration $RA_{i,t}$ is:

$$AA_{i.t} = \sum_{i} (S_{j,t}^{i})^2 \text{ , } RA_{i,t} = \sum_{i} (S_{j,t}^{i} - S_{j,t})^2 \quad (3)$$

Other control variables. The actual energy price ($P_{i,t}$), is the ratio of Purchasing Price Index of Raw Material, Fuel and Power to the Producer Price Index for Industrial Products, and converted to constant price of 1999 as the proxy variable of the actual energy price; Proportion of Foreign Direct Investment ($FDI_{i,t}$), to measure the export-oriented level of economy. Economic openness will help improve the energy efficiency. In this paper, the proportion of foreign direct investment is represented as the proportion of the output value of industrial enterprises which include foreign-invested and Hong Kong-Macao-Taiwan invested, accounts for the total output value of the industry. Industry competition ($Com_{i,t}$), the higher the proportion of large and medium-sized enterprises in the industry, the stronger the market power, and the lower the degree of competition, which goes against the innovation and energy efficiency improvement. We use the difference between the ratio that the output value of large and medium-sized industrial enterprises to represent the total industry output value and 1 as the industry competition. Industrial scale ($Scale_{i,t}$), when there is a scale economy, the average cost of the enterprise decreases with the expansion of the scale, the average output energy conservation embedded in the cost may also decrease, and the energy efficiency is improved. The ratio of the actual output value of the industrial sector to the number of enterprises is the average scale of the industry. Energy conservation dummy variable is another index ($Dumy06$), and in 2006, the central government for the first time brought the goal of energy conservation and emission reduction into the outline of the national economic development plan. So, the energy conservation dummy variable is added in this model.

To avoid the potential endogeneity problem, this paper uses the system generalized matrix method (SYS-GMM) to empirically analyze the relationship between industrial agglomeration and industrial energy efficiency based on the econometric model (1).

3 Results

Equation 1 and 2 in Table 1 shows that the increase in the level of absolute industry agglomeration and relative industrial agglomeration is beneficial to the improvement of energy efficiency in the industrial sector, however, the impact of industrial

agglomeration does not pass the 10% of the significance test. To further include the control variables, as shown in Equation 3 and 4, the effect of absolute industry agglomeration and relative industry agglomeration on energy efficiency changes from positive to negative, but remains insignificant. SYS-GMM requires that there is no second-order autocorrelation AR(2) in difference equations, but allow the existence of first-order autocorrelation AR(1). And the AR test shows that equations 1 to 4 can reject the existence of the second order autocorrelation at the 10% of significance level, which meets the requirements. In addition, because the dynamic panel data uses several tool variables, we need to do an overidentifying (Sargan) test. Equations 1 to 4 accept the null hypothesis that "all tool variables are valid" and pass the Sargan test.

Equation 5 selects the CCR energy efficiency without environmental quality information as the explanatory variable, and Equation 6 selects the EBM energy efficiency with environmental quality information as the explanatory variable. Relative industrial agglomeration significantly reduces the CCR energy efficiency but will promote the improvement of the EBM energy efficiency, however, this does not pass a significant test. Because industrial agglomerations contain different information, the effect of industrial agglomeration on energy efficiency could have a difference. When the control variables are added, the industrial agglomeration cannot exert a positive effect on the EI and CCR energy efficiency improvement, and the promotion effect on EBM energy efficiency is not significant. Government intervention has inhibited the energy conservation effect of industrial agglomeration.

Table 1. Estimation Result.

Dependent Value $EE_{i.t}$	Equation1 EI	Equation2 EI	Equation3 EI	Equation4 EI	Equation 5 CCR	Equation6 EBM
$AC_{i,t}$	4.2262 （0.43）		-1.5289 （-0.75）			
$RC_{i,t}$		9.9943 （0.11）		-0.7666 （-0.31）	-0.3403*** （-3.79）	0.4255 （0.83）
$P_{i,t}$			0.7847*** （6.00）	0.7745*** （5.79）	0.0581*** （11.18）	0.085*** （7.84）
$SOE_{i,t}$			0.8885*** （3.31）	0.9425*** （3.66）	0.1649*** （8.35）	0.049*** （4.04）
$FDI_{i,t}$			0.8777** （2.15）	0.6753** （2.31）	0.1407*** （9.91）	0.071*** （2.78）
$RD_{i,t}$			2.6133*** （6.57）	2.5780*** （6.51）	0.1205*** （18.58）	-0.0139* （-1.67）
$Com_{i,t}$			-1.834*** （-5.56）	-1.853*** （-5.52）	0.0393*** （3.10）	0.0762*** （3.85）
$Scale_{i,t}$			0.0302*** （2.99）	0.0293*** （2.91）	-0.0027*** （-11.30）	-0.005*** （-7.76）
$Dumy06$			0.1028** （2.15）	0.1077*** （2.27）	-0.00007 （-0.07）	0.0096*** （5.20）
$EE_{i.t-1}$	1.085*** （31.8）	1.091*** （14.08）	0.8629*** （29.83）	0.8667*** （30.12）	0.7840*** （154.26）	0.8631*** （61.85）
Constant	-0.3941 （-0.37）	-0.3526 （-0.10）	-0.4073 （-1.19）	-0.4957 （-1.55）	-0.1183*** （-6.51）	-0.145*** （-4.98）
AR(1) P	0.0392	0.0431	0.1596	0.2633	0.0432	0.0690
AR(2) P	0.1951	0.4444	0.9424	0.9375	0.8662	0.5813
Sargan P	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

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Human Capital and Smart Growth in the EU Countries in 2010-2014

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Abstract. The purpose of the paper is to analyze the role of human capital in the processes of smart growth in EU countries in 2010-2014. Smart growth it is growth based on two driving forces: knowledge and innovation. The importance of human capital in the processes of growth and economic development has been broadly discussed in the literature, but the issue of smart growth and its factors, in particular human capital is a relatively new one. The study uses a soft modelling method, which enables to investigate relationships between unobserved variables (e.g. human capital, smart growth). Moreover this method makes it possible to estimate a synthetic measures of human capital and the level of smart growth as well as the to order and classify of the EU countries into typological groups.

Keywords: Smart Growth, Human Capital, Soft Modelling.

1 Introduction

Smart growth it is growth based on two driving forces: knowledge and innovation [6, pp. 8]. The issue of smart growth is a relatively new one, yet it has already been discussed by a few authors [1, 13, 14, 21]. Nevertheless, studies on this topic are scarce. Their authors unanimously agree that there is a need for detailed theoretical and empirical research. The pillars of smart growth, i.e. knowledge and innovation, have been broadly discussed in the literature. According to the definition coined by the OECD and the World Bank Institute, knowledge-base economy (KBE) is an economy where knowledge is created, acquired, transmitted and used effectively by enterprises, organizations, individuals and communities [15, pp. 3]. It is also assumed that KBE consists of four pillars [16, pp. 217]:

- human capital, in whom some knowledge is stored,
- innovation system with entrepreneurship, more focused on businesses but also on cooperation with science, which also creates new knowledge,
- teleinformation technologies, which facilitate knowledge exchange, also abroad,
- institutional and legal environment, which creates conditions for the development of the above-mentioned areas.

One of those four pillars is human capital. Human capital can be defined as a embodied in inhabitants stock of unobserved characteristics. It is increased through investment and it is an important factor of economic development [19, pp. 28]. The importance of human capital in the processes of growth and economic development has been broadly discussed in the literature [2, 11, 12, 18]. Human capital as a factor of economic growth occurs both in theoretical and empirical models. Hence, it seems reasonable to formulate a hypothesis that human capital influences positively on the level of smart growth in the EU countries.

The purpose of the paper is to analyze the relationship between human capital and the level of smart growth in EU countries in 2010-2014. This research uses the method of soft modelling which allows to examine links between variables which are not directly observable (latent variables).

2 Research Method

The soft modelling method (in the literature also referred to as PLS Path Modeling) was developed by H. Wold [22, 23]. The method makes it possible to investigate relations between variables which are not directly observable (latent variables). The values of such variables cannot be measured in a straightforward manner because of the lack of a widely accepted definition or a uniform method of their measurement. Examples of use of the soft modeling method in economic research (technology transfer, the level of innovation, human capital, knowledge-based economy) can be found in the following papers [5, 19, 20].

The soft model consists of two sub-models: an internal one (structural model) and an external one (measurement model). The internal sub-model depicts the relationships between the latent variables on the basis of the assumed theoretical description. The external sub-model defines latent variables by means of observable variables (indicators). Indicators allow for direct observation of latent variables and are selected according to the assumed theory or the intuition of the researcher. A latent variable can either be defined (with the use of indicators) inductively: the approach is based on the assumption that the indicators make up latent variables (formative indicators), or deductively: when it is assumed that indicators reflect the respective theoretical notions (reflective indicators). Under the deductive approach, the latent variable, as a theoretical notion, is a point of departure for a search of empirical data (the variable is primary to a given indicator). In the inductive approach, it is the indicators that are primary to the latent variable which they comprise. Both the approaches use latent variables that are estimated as the weighted sums of their indicators. However, depending on the definition, indicators should be characterized by different statistical properties (no correlation in the case of inductive definition and high correlation in the deductive one) [17, pp. 33-37].

The estimation of the parameters of the soft model is performed by means of the partial least squares method – PLS method (more in [8, 10]). The quality of the model is assessed with the use of determination coefficients (R^2), established for each equation. The significance of the parameters is checked by means of the standard

deviations calculated with the Tukey's range test ("2s" rule: a parameter significantly differs from zero if double standard deviation does not exceed the value of the estimator of this parameter) [9]. Besides, in the case of the external submodel, the estimators of factor loadings can be treated as the degree in which the indicators match the latent variable that they define. The prognostic property of model can be evaluated by means of the Stone-Geisser test [3], which measures the accuracy of the forecast obtained as a result of the model's application as compared with a trivial forecast. The test statistics take values from the range $<-\infty,1>$. In the ideal model, the value of the test equals 1 (the forecasts are perfectly accurate in comparison with trivial forecasts). When the value of the test equals zero, the quality of the model's forecast and the trivial forecast tend to be virtually identical. Negative values indicate a low quality of the model (its weak predictive usefulness compared with a trivial forecast).

Using the partial least squares method, it is possible to obtain the estimated values of latent variables, which can be regarded as the values of synthetic measures. They can be employed for linear ordering of the examined objects. These values depend not only on the external relationships, but also on the relationships between the latent variables which are assumed for the internal model. This means that the cognitive process hinges not merely on the definition of a given notion, but also on its theoretical description [17, pp. 37-38].

3 Specification of the Soft Model

The model used in the present paper to reach its aim of determining the influence of human capital on the level of smart growth contains the following equation

$$SG_t = \alpha_1 HC_t + \alpha_0 + \nu, \qquad (1)$$

where
SG – the level of smart growth,
HC – human capital,
α_0, α_1 – structural parameters of the model,
ν – random parameter,
t – year 2010 or 2014.

The latent variables HC and SG are defined by means of observable variables on the basis of the deductive approach, i.e. the latent variable, as a theoretical concept, serves as a starting point to identify empirical data. The statistical data come from the Eurostat and World Bank databases. The selection of the research period was determined by the availability of statistical data. The indicators for the model were selected based on criteria of substantive and statistical nature. The initial set of indicators was created on the basis of following methodology: Knowledge Assessment Methodology (KAM, see in [4]) and European Innovation Scoreboard Methodology (EIS, see in [7]). From the statistical point of view, the following considerations were taken into account: variability of indicator values (coefficient of variation above 10%) and analysis of the quality of the estimated model (*ex post*

analysis). The lacking data were supplemented through naive forecasting, which involves replacing the deficient figure with another, adjacent one.

Tables 1 and 2 contain a summary of the indicators after substantive and statistical verification. Three indicators qualified for the model are destimulants of *HC* latent variable, i.e. the higher the value of an indicator, the lower the level of the latent variable. The rest of indicators are stimulants of *HC* latent variable, i.e. the higher the value of an indicator, the higher the level of the latent variable. All the indicators qualified for the model are stimulants of *SG* latent variable.

Table 1. Indicators of *HC* latent variable qualified for the model

Symbol of indicator	Description of indicator	Source	Type
*HC*01	Percentage of population aged 15-64 having completed tertiary education (%).	Eurostat	Stimulant
*HC*02	Percentage of population aged 25-64 participating in education and training (%).	Eurostat	Stimulant
*HC*03	Percentage of employees aged 15-64 having completed tertiary education (%).	Eurostat	Stimulant
*HC*04	Percentage of employees aged 25-64 participating in education and training (%).	Eurostat	Stimulant
*HC*05	Early leavers from education and training, percentage of population aged 18-24 (%).	Eurostat	Destimulant
*HC*06	Graduates in tertiary education per 1000 of population aged 20-29 (person).	Eurostat	Stimulant
*HC*07	Graduates at doctoral level per 1000 of population aged 25-34 (person).	Eurostat	Stimulant
*HC*08	Percentage of population declaring their health status as very good and good (%).	Eurostat	Stimulant
*HC*09	Percentage of population declaring their health status as bad and very bad (%).	Eurostat	Destimulant
*HC*10	Average years of schooling of population aged 25+(years).	World Bank	Stimulant
*HC*11	Infant mortality rate (person).	World Bank	Destimulant

Table 2. Indicators of *SG* latent variable qualified for the model

Symbol of indicator	Description of indicator	Source	Type
*KNOW*01	Researchers as percentage of total employment (%).	Eurostat	Stimulant
*KNOW*02	Researchers in business enterprise sector as percentage of total employment (%).	Eurostat	Stimulant
*KNOW*03	Graduates in tertiary education, in science, mathematics, computing, engineering, manufacturing, construction per 1000 of population aged 20-29 (person).	Eurostat	Stimulant
*KNOW*04	Graduates at doctoral level, in science, mathematics, computing, engineering, manufacturing, construction per 1000 of population aged 25-34 (person).	Eurostat	Stimulant
*KNOW*05	Scientific and technical journal articles per 1 million inhabitants (number).	World Bank	Stimulant
*INNO*01	Patent applications to the EPO per 1 million inhabitants (number).	Eurostat	Stimulant
*INNO*02	Exports of high technology products as a share of total exports (%).	Eurostat	Stimulant
*INNO*03	Product and/or process innovative enterprises as percentage of total (%).	Eurostat	Stimulant
*INNO*04	Organization and/or marketing innovative enterprises as percentage of total (%).	Eurostat	Stimulant
*INNO*05	Total turnover of innovative enterprises as percentage of GDP (%).	Eurostat	Stimulant
*INNO*06	Charges for the use of intellectual property (receipts) as percentage of GDP (%).	World Bank	Stimulant

A diagram of the soft model, depicting both the internal and external relationships is shown in Figure 1. The solid line applies to the relationships in the internal model, while the dotted line - to those in the external model.

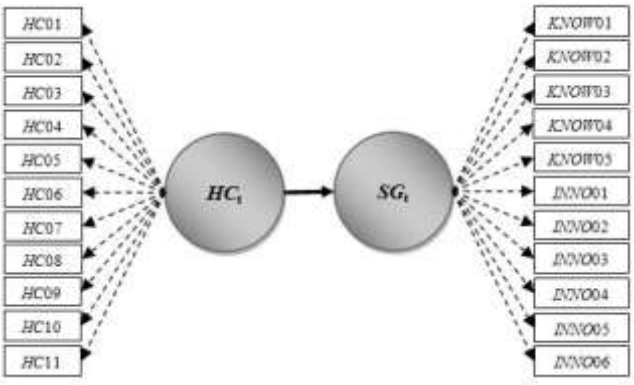

Fig. 1. Diagram of internal and external relationships in soft model

The model was estimated by means of the PLS method, which involves simultaneous estimation of the external model parameters (weights and factor loadings) and the internal model parameters (structural parameters). The estimation was conducted using the PLS software. The software was developed by J. Rogowski, PhD, professor at the Department of Economics and Management at University of Bialystok, and is available free of charge.

4 Estimation Results

Within the external model, the weights and factor loadings were estimated. A weight represents the relative share of a given indicator's value in the estimated value of a latent variable. A factor loading is a coefficient of the correlation between an indicator and the estimated values of a latent variable, thus it reveals the degree and direction in which the variability of a given indicator reflects the variability of the latent variable. Ordering of indicators according to their weights is done when the latent variable is defined inductively. Under the deductive approach, which is used in the present study, it is the factor loadings that are interpreted. The following interpretation of factor loading ξ was assumed:
$|\xi|<0.2$ – no correlation,
$0.2\leq|\xi|<0.4$ – weak correlation,
$0.4\leq|\xi|<0.7$ – moderate correlation,
$0.7\leq|\xi|<0.9$ – strong correlation,
$|\xi| \geq 0.9$ – very strong correlation.

Table 3 presents the estimates of factor loadings and standard deviations. The results are as expected – the estimates for stimulants are positive and for destimulants – negative. Some parameters are not statistically significant according to the "2s" rule. Indicators: *INNO*01, *INNO*02 and *INNO*04 are not statistically significant in the 2010 model. However, they were not removed from the model due to its importance

in reflecting innovative processes. The substantive criterion was more important than the statistical one. The 2014 model results also had an impact on this decision.

Table 3. Estimations of external relationships of soft model

Symbol of indicator	2010		2014	
	Factor loading	Standard deviation	Factor loading	Standard deviation
*HC*01	0.7087	0.0228	0.6757	0.0173
*HC*02	0.9095	0.0106	0.9020	0.0084
*HC*03	0.5251	0.0261	0.5101	0.0199
*HC*04	0.9058	0.0106	0.8913	0.0084
*HC*05	-0.1821	0.0269	-0.2512	0.0319
*HC*06	0.1564	0.0165	0.2939	0.0077
*HC*07	0.5770	0.0282	0.6265	0.0188
*HC*08	0.6019	0.0307	0.5490	0.0285
*HC*09	-0.6202	0.0309	-0.6398	0.0283
*HC*10	0.3168	0.0180	0.2482	0.0156
*HC*11	-0.4306	0.0208	-0.4808	0.0214
*KNOW*01	0.8854	0.0425	0.9397	0.0432
*KNOW*02	0.9018	0.0366	0.9521	0.0213
*KNOW*03	0.2958	0.0883	0.3347	0.0902
*KNOW*04	0.7407	0.0646	0.7897	0.0604
*KNOW*05	0.9110	0.0345	0.8698	0.0443
*INNO*01	0.0711	0.1146	0.8764	0.0350
*INNO*02	0.1568	0.1187	0.2798	0.0853
*INNO*03	0.6579	0.0352	0.5827	0.0651
*INNO*04	-0.0992	0.0619	0.3159	0.0345
*INNO*05	0.1563	0.0450	0.4178	0.0465
*INNO*06	0.3485	0.1022	0.4012	0.0879

The indicators reflect their latent variables with varying intensity. The *HC* latent variable is very strongly correlated with two indicators: “percentage of population aged 25-64 participating in education and training” (*HC*02) and “percentage of employees aged 25-64 participating in education and training” (*HC*04)”. The variable is strongly reflected by one indicator in the 2010 model – “percentage of population aged 15-64 having completed tertiary education” (*HC*01). Two indicators “early leavers from education and training, percentage of population aged 18-24” (*HC*05) and “graduates in tertiary education per 1000 of population aged 20-29” (*HC*06) do not manifest any correlation with the variable in 2010 but are weakly correlated in 2014. The results show that education and training were the most important factors of

human capital in EU countries in 2010-2014. An interesting result is also the significant impact of health indicators on *HC* variable (*HC*17 – moderate correlation and *HC*19 – weak correlation). In many studies, such indicators do not show a correlation with human capital.

Indicators of latent variable *SG* have better statistical properties in the 2014 model. In the 2014 model two indicators are very strongly, three strongly, three moderately and three weakly correlated with *SG* variable. Meanwhile in the 2010 model three indicators are not correlated with *SG* variable. The results of both estimations show that in the EU countries in 2010-2014 the level of knowledge was more important factor of smart growth than the level of innovation.

The estimates of the internal relationships parameters are illustrated with an equations (2) and (3). The standard deviations, calculated with the use of the Tukey's test, are given in brackets.

$$\hat{SG}_{2010} = \underset{(0.0343)}{0.8774} HC_{2010} + \underset{(0.2499)}{0.0109} \qquad (2)$$

$$R^2 = 0.77 \qquad \text{S-G} = 0.60$$

$$\hat{SG}_{2014} = \underset{(0.0260)}{0.9009} HC_{2014} + \underset{(0.1691)}{0.1763} \qquad (3)$$

$$R^2 = 0.81 \qquad \text{S-G} = 0.61$$

The structural parameters for the latent variable *HC* are statistically significant ("2s" rule). The value of the determination coefficient R^2 is high (0.77 in 2010 and 0.81 in 2014) and justifies the conclusion that the independent variable *HC* determines the variability of the dependent variable *SG*. The general value of the Stone-Geisser test is positive (0.60 in 2010 and 0.61 in 2014), which suggests a high predictive relevance of the model.

The results of the internal model estimation reveal a significant, positive relationship between human capital and the level of smart growth in the studied group of countries in 2010 as well as in 2014. Countries which had higher stock of human capital, had also higher level of smart growth. This results are consisted with expectation. There is no reason to reject hypothesis that was formulated at the beginning of the paper.

The employment of the PLS method for the estimation of the model's parameters makes it possible to calculate estimates of the values of latent variables (weighted sums of indicators). These values were then taken as the values of the synthetic measure, and on that basis, rankings of the examined countries were constructed according to their levels of human capital (latent variable *HC*) and smart growth (latent variable *SG*). The results of rankings are presented in Table 4.

Table 4. Rankings of EU countries according to levels of human capital and smart growth

Country	2010		2014	
	HC	*SG*	*HC*	*SG*
Austria	12	6	10	6
Belgium	10	10	12	11
Bulgaria	25	26	25	25
Croatia	28	20	24	23
Cyprus	13	24	13	27
Czech Republic	16	16	15	14
Denmark	1	3	1	3
Estonia	14	14	16	18
Finland	2	1	3	2
France	15	11	7	9
Germany	11	8	14	5
Greece	19	23	19	22
Hungary	26	21	27	21
Ireland	6	5	6	7
Italy	20	17	22	16
Latvia	24	27	26	26
Lithuania	18	22	18	17
Luxemburg	9	12	8	12
Malta	22	19	21	20
Netherlands	5	4	5	4
Poland	21	25	23	24
Portugal	23	13	20	13
Romania	27	28	28	28
Slovakia	17	18	17	19
Slovenia	7	9	9	8
Spain	8	15	11	15
Sweden	3	2	2	1
United Kingdom	4	7	4	10

When comparing the rankings obtained on the basis of 2010 data with those – on the basis of 2014 data, one notices relatively small changes in the ordering of the countries in terms of human capita as well as in terms of the level of smart growth. Only France moved up spectacularly in the *HC* rankings (15th in 2010, 7th in 2014). In *SG* rankings Lithuania moved up from 28th position to 24th position and Estonia recorded drops from 14th position to 18th position.

The next step consisted in dividing the countries into typological groups. The boundaries of the groups were established with the use of the arithmetical mean values and standard deviation of the synthetic variable z_i (equaling 0 and 1 for each of the latent variables, respectively). The ranges assumed the following forms:
- group I (very high level of latent variable): $z_i \geq 1$,
- group II (high level of latent variable): $0 < z_i \leq 1$,
- group III (low level of latent variable): $-1 < z_i \leq 0$,
- group IV (very low level of latent variable): $z_i \leq -1$.

In 2010, the following countries boasted very high stocks of human capital: Denmark, Finland, Sweden, United Kingdom and Netherlands. Nine countries were classified in the group with a high stock of human capital: Ireland, Slovenia, Spain, Luxemburg, Belgium, Germany, Austria, Cyprus and Estonia. The group with medium and low stocks of human capital comprised nine countries: France, Czech Republic, Slovakia, Lithuania, Greece, Italy, Poland, Malta and Portugal. Very low stocks of human capital were recorded in five countries: Latvia, Bulgaria, Hungary, Romania and Croatia. In 2014 the first and the fourth groups did not change. In the second and the third groups changes concerned France and Estonia. France moved from third to second group, while Estonia moved from second to third group.

Three countries made up the group with a very high level of smart growth in 2010: Finland, Sweden and Luxemburg. The group of countries with a high level of smart growth included: Netherlands, Ireland, Austria, United Kingdom, Germany, Slovenia, Belgium, France, Luxembourg, Portugal and Estonia. The third group of medium- and low smart growth economies was comprised of Spain, Czech Republic, Italy, Slovakia, Malta, Croatia, Hungary, Lithuania and Greece. Very low levels of smart growth were recorded in: Cyprus, Poland, Bulgaria, Latvia, and Romania. In 2014, there were changes in each group. The first group consisted of: Denmark, Sweden, Finland, Netherlands, while the second one of: Ireland, France, Luxemburg, Slovenia, Austria, Belgium, Germany, Portugal. The third group included the following countries: Spain, Czech Republic, Estonia, Slovakia, Lithuania, Greece, Malta, Italy, Hungary. Five countries: Cyprus, Poland, Croatia, Bulgaria, Latvia, Romania made up the fourth group.

5 Conclusions

The studies presented in the paper concerned the analysis of the role of human capital in the processes of smart growth in EU countries in 2010-2014.The soft modelling method used in the research enabled:

- the investigation into the relationships between observed variables and the HC latent variable,
- the investigation into the relationships between observed variables and the SG latent variable,
- the investigation into the influence of human capital on smart growth,
- the estimation of the values of HC synthetic measure as well as SG synthetic measure,

- the arrangement of countries according to the levels of human capital and smart growth as well as the division of countries into typological groups

In both estimated models indicators had a different strength of impact on the latent variables (from very strong correlation to lack of correlation). Moreover, both estimated models indicated positive influence of human capital on the level of smart growth in the studied group of countries. The highest stock of human capital both in 2010 and in 2014 was characteristic for Denmark, Finland, Sweden, United Kingdom and Netherlands, whereas the lowest one for Latvia, Bulgaria, Hungary, Romania and Croatia. Only two countries Finland, Sweden were classified in the group with very high level of smart growth both in 2010 and in 2014. The lowest level of smart growth were recorded in Cyprus, Poland, Bulgaria, Latvia, Romania.

Human capital is a significant factor of economic growth and smart growth. Therefore, determination of the stock and prospects of human capital development is an important issue today, both in economic theory and business practice. Human capital should be considered as a complex, multifaceted category with various intangible dimensions that are not directly observable and that cannot be measured with precision by a single attribute. The research on human capital and smart growth presented in this paper should be treated as a starting point for further work.

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The Czech Agrarian Foreign Trade Comparative Advantages

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Abstract. The character of Czech agrarian trade activities was changed in the 21st century. The Czech agrarian trade became even more focused on developed and especially European union countries agri-food markets. The aim of this paper is to identify the main changes affecting territorial and commodity structure within the period 2001 and 2015. Paper is focused especially on Czech agri-food trade volume, value, unit price and competitiveness analyses. Individual analyses are specified in relation to EU28, non-EU countries, World and OECD vs. Developing countries. - In relation to all analyzed group of countries, the Czech value of Czech agrarian exports and imports recorded the significant growth. The positive figure of Czech agri-food trade activities is much faster inter-annual growth rate of exports in relation to the value of imports. Czech agri-food trade balance is stabilized and import/export covering ration is recorded the positive changes. The weakness of Czech agri-food trade activities is low unit price of Czech exports in comparison to imports unit prices. Competitiveness of Czech agri-food trade is especially pushed through the growth of exported volumes. The added value in Czech agri-food trade value growth is very limited. The number of Czech agri-food trade competitive items is increasing (but they have very limited added value).

Keywords: Territorial and Commodity Structure, Agri-Food Trade, Comparative Advantage.

1 Introduction

This article analyses the basic transformation trends related to Czech agrarian foreign trade territorial and commodity structure in the period of 2001 to 2015.

Commodity structure in particular recorded significant changes during the analysed period (2001 – 2015). Finalized and especially semi-finalized food products increased their share both in export and also import activities [13]. The mentioned trend is related to two factors: the growth of economic power and also the restructuralization of the Czech foodstuff market [2]. Territorial structure has become more specifically concentrated on EU countries [1]. The importance of so called non-European and especially the "third" countries is diminishing [3]. The last really significant non-EU partner Russian federation is constantly reducing its share in Czech agrarian trade.

The importance of Russia is reduced because of political consequences [15] and because of Russian market specifics [9, 10].

Czech agrarian trade represents an extremely specific part of Czech economy performance [1]. The character of agrarian trade was affected by the transformation process from command/central planned economy to market economy. It was also affected by the reduction of agricultural production performance and the government effort to encourage cooperation especially in relation to other European countries [16].

Very important event for the Czech agrarian market was the EU accession. Even before that event, the Czech Republic was preparing itself for membership and the necessity to eliminate almost all barriers protecting Czech agrarian market both in relation to "old" EU and "new" EU members [4]. The transformation process especially in the period before Czech accession was not really a positive one [14]. The Czech Republic, as with other Central European countries, reduced the importance of non-EU territories and began focusing its trade activities specifically on European partners [7, 8, 12].

The period immediately after the accession significantly encouraged not only the export, but also import performance [17]. During the first years of Czech EU membership the import value was growing even faster in comparison to export value development. The result was a constantly growing negative trade balance performance until 2011 (the record negative trade balance was reached at about 36 billion CZK).

The current Czech agrarian trade is standing at very important crossroad. In relation to future possible liberalization processes (e.g. TTIP, CETA, Doha Development Agenda etc.) can be expected more significant changes affecting the future agrarian value, volume and structure.

2 Data and methods

This paper aims to identify changes which have occurred during the analysed time period from 2001 to 2015. This paper is focused specifically on the period of Czech EU membership. Territorial structure is analysed both in relation to the EU countries and also in relation to the "third countries" (e.g. OECD, World without the EU, Developing countries). The Commodity structure is analysed especially in relation to added value development and distribution. We applied HS system: HS01 Live animals, HS02 Meat and edible meat offal, HS03 Fish and crustaceans, molluscs and other aquatic invertebrates, HS04 Dairy produce birds' eggs natural honey edible products of animal origin, not elsewhere specified or included, HS05 Products of animal origin, not elsewhere specified or included, HS06 Live trees and other plants bulbs, roots and the like cut flowers and ornamental foliage, HS07 Edible vegetables and certain roots and tubers, HS08 Edible fruit and nuts peel of citrus fruit or melons, HS09 Coffee, tea, mate and spices, HS10 Cereals, HS11 Products of the milling industry malt starches inulin wheat gluten, HS12 Oil seeds and oleaginous fruits miscellaneous grains, seeds and fruit industrial or medicinal plants and fodder, HS13

Lac gums, resins and other vegetable saps and extracts, HS14 Vegetable plaiting materials vegetable products not elsewhere specified or included, HS15 Animal or vegetable fats and oils and their cleavage products prepared edible fats animal or vegetable waxes, HS16 Preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates, HS17 Sugars and sugar confectionery, HS18 Cocoa and cocoa preparations, HS19 Preparations of cereals, flour, starch or milk pastrycooks' products, HS20 Preparations of vegetables, fruit, nuts or other parts of plants, HS21 Miscellaneous edible preparations, HS22 Beverages, spirits and vinegar, HS23 Residues and waste from the food industries prepared animal fodder, HS24 Tobacco and manufactured tobacco substitutes.

The paper also specifies the distribution of comparative advantages both in relation to EU single market and also in relation to the rest of the world. To reach the above, mentioned objectives, the paper applies the basic and competitiveness analyses (Lafay index and trade balance index). The results coming from individual analyses are highlighted through the modified "Product mapping method", identifying the process of Czech agrarian foreign trade commodity structure profiling. Data sources are following: UN COMTRADE, Czech statistical office.

$$LFI_j^i = 100\left(\frac{x_j^i - m_j^i}{x_j^i + m_j^i} - \frac{\sum_{j=1}^{N}(x_j^i - m_j^i)}{\sum_{j=1}^{N} x_j^i + m_j^i}\right)\frac{x_j^i + m_j^i}{\sum_{l=1}^{N} x_j^i + m_j^i} \quad (1)$$

For a given country *i,* and for any given product *j*, the Lafay index [11] is defined by the formula (1) above, where x^i_j and m^i_j are exports and imports of product *j* of country *i*, towards and from the particular region or the rest of the world, respectively, and *N* is the number of items.

Positive values of the Lafay index indicate the existence of comparative advantages in a given item; the larger the value the higher the degree of specialization [19].

Trade Balance Index is simply formulated as follows:

$$TBI_j^i = \frac{x_j^i - m_j^i}{x_j^i + m_j^i} \quad (2)$$

where TBI^i_j denotes trade balance index of country *i* for product *j*; x^i_j and m^i_j represent exports and imports of group of products *j* by country *i*, respectively [11].

A country is referred to as a "net-importer" in a specific group of products if the value of TBI is negative, and as a "net-exporter" if the value of TBI is positive [18].

The next part of the analysis presented in this paper was conducted using the "products mapping", which enables the user to assess leading exported products from two different points of view, i.e. domestic trade-balance and international competitiveness. [18] The figure 1 represents a matrix for the distribution of the entire set of exported products into 4 groups according to the two selected indicators:

RSCA>0	**Group B:** Comparative Advantage Net-importer (RSCA>0 and TBI<0)	**Group A:** Comparative Advantage Net-exporter (RSCA>0 and TBI>0)
RSCA<0	**Group D:** Comparative disadvantage Net-importer (RSCA<0 and TBI<0)	**Group C:** Comparative disadvantage Net-exporter (RSCA<0 and TBI>0)
	TBI<0	TBI>0
Trade Balance Index (TBI)		

Fig. 1. Product mapping scheme. [18]

The Revealed Symmetric Comparative Advantage (RSCA) is the indicator of comparative advantage (The values of $RSCA^i_j$ index can vary from minus one to one. $RSCA^i_j$ greater than zero implies that country *i* has comparative advantage in a group of products *j*.) [6] and TBI is the indicator of export-import activities [11]. RSCA index is formulated as follows:

$$RSCA = \frac{RCA_j^i - 1}{RCA_j^i + 1} \tag{3}$$

Because the original approach does not take into consideration the real intensity/influence of imports, we decided to modify the original "product mapping approach".

Lafay index	LFI>0	**Group B:** Comparative Advantage Net-importer (LFI>0 and TBI<0)	**Group A:** Comparative Advantage Net-exporter (LFI>0 and TBI>0)
	LFI<0	**Group D:** Comparative disadvantage Net-importer (LFI<0 and TBI<0)	**Group C:** Comparative disadvantage Net-exporter (LFI<0 and TBI>0)
Czech Agrarian Foreign Trade Commodity Structure		TBI<0	TBI>0
		Trade Balance Index	

Fig. 2. Modified product mapping scheme.

Figure 2 represents the modified matrix for the distribution of the entire set of exported products into 4 groups according to the two selected indicators.

3 Results and discussion

The Czech agrarian sector still does not finish the process of its restructuring and its commodity structure profile is constantly changing. The EU share in the Czech agricultural trade reaches about 90% in the long-term. The Czech agricultural exports and also imports are based on a relatively small number of commodity aggregations. Czech exports are able to compensate for even the growth of imports – especially through its increasing added value. The key aspect of the Czech agrarian trade is its competitiveness.

Czech agrarian trade is heavily focused on European territory. There is the significant growth of export and import value performance in relation to all main territories representing the main Czech agrarian trade partners, if we compare the period between 2001 and 2015. For details see table 1:

Table 1. Czech agrarian foreign trade value development in 2001 and 2015 in ths. CZK. [5]

2001	EU28	OECD	World without EU28	Developing economies	World total
Export	41 116 307	39 951 650	8 295 196	9 459 853	49 411 503
Import	51 181 539	55 267 004	18 043 402	13 957 937	69 224 941
2015	EU28	OECD	World without EU28	Developing economics	World total
Export	185 235 908	181 291 061	16 831 159	20 776 006	202 067 067
Import	188 674 925	195 918 421	32 536 791	25 293 295	221 211 716

The Czech agrarian export growth rate exceeded the import growth rate especially in relation to the EU28, OECD members and non-European countries. The only regions increasing their imports to the Czech Republic faster than the Czech Republic exported to them are European countries without the EU and CIS members.

The Czech Republic reduced its negative trade balance share both in relation to total agrarian trade turnover and export value. The situation improved especially in relation to the EU28, other European countries and OECD members. Czech agrarian trade became extremely concentrated during the last 15 years. All indices proved the existence of Czech agrarian trade comparative disadvantages both in relation to the EU28 and also in relation to the third countries. Czech agrarian trade is probably able to be competitive, especially because of its constantly improving trade performance. The existence of comparative advantages is proved through the application of LFI and RSCA indices taking into consideration only agricultural trade performance. The below mentioned figure 3, provides an overview related to individual Czech agrarian trade items competitiveness: The first two graphs (1 and 2) provide an overview utilizing a classical product mapping approach and the other graphs (3 and 4) provide a different overview through the modified product mapping approach.

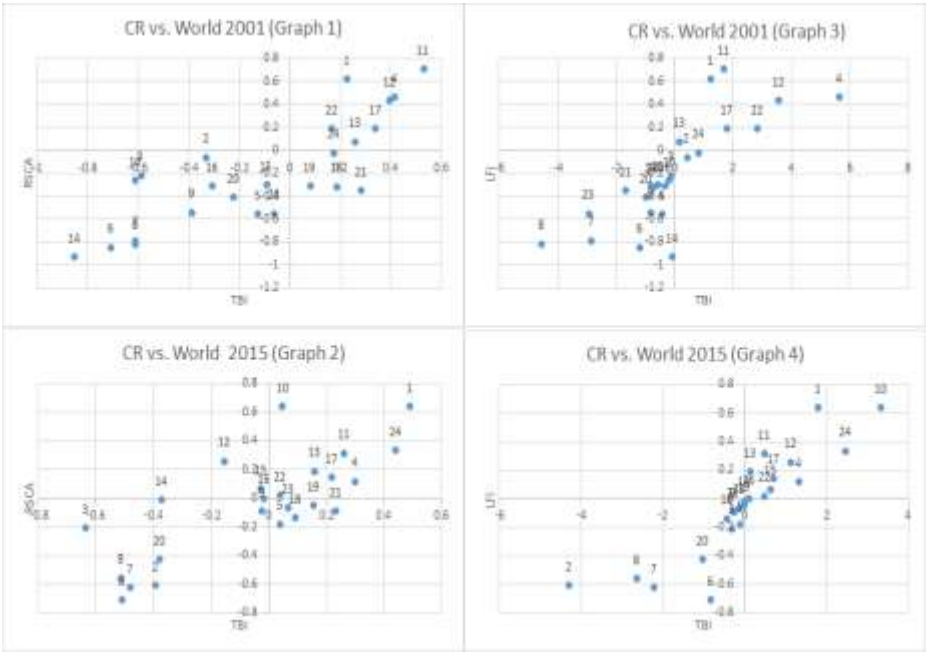

Fig. 3. Czech agrarian exports' comparative advantages distribution – traditional and modified "Product mapping approach".

The number of items located in groups B and C are significantly reduced. The whole commodity structure is divided into two groups A (having comparative advantages) and D (without comparative advantages). The modified approach is able to specify in more detail, the current level of Czech agrarian trade competitiveness and competitiveness development.

It is evident that the Czech agrarian trade commodity structure has been significantly changing its character. The commodity structure is still looking for its optimal state. Comparative advantages are especially influenced by bilateral relations. The Czech Republic is not competitive at a general level, but it is able to get comparative advantages at least at the bilateral level especially because of its EU membership and also because of the existence of special agreements between the EU and selected partners. Czech territorial structure is becoming more and more concentrated – even the share of developing countries in our trade performance is consistently decreasing because of re-exports from other European countries and our export profile is becoming more and more concentrated. The specialization process is negatively affecting some traditional production sectors (e.g. pork meat, fruit, etc.) and it is also reducing Czech food self-sufficiency.

The above mentioned calculations do not take in consideration the significant differences existing among individual regions or groups of countries in relation to their agrarian trade activities. Some countries have been applying very strict trade policy and some countries are very liberal. The Czech Republic as an EU member can operate within the EU market without any restriction. In relation to some territories as

e.g. CIS, Czech agrarian trade is influenced by multilateral agreements signed under the WTO and also signed at the bilateral level between individual CIS members and the EU. If we want to understand the real comparative advantages distribution, it is necessary to analyse them in relation to several groups of countries (EU28, European countries without the EU and CIS members, CIS members, OECD members, world without the EU28, CIS and OECD countries).

The significant dynamics of commodity structure development can be seen both in relation to the LFI and the TBI index. The significant changes in Czech agrarian trade competitiveness between 2001 and 2015 can be seen especially in relation to EU28 and other European countries. The share of A group products in total agrarian exports significantly increased between the years 2001 and 2015. The share of items located in group D has significantly reduced. Developing countries did not change their role in Czech agrarian export and import activities according to TBI and LFI values distribution.

The majority of Czech agrarian trade value is realized on the base of a proved comparative advantage in relation to individual groups of partners (almost 58% of total exports). The significant part of exports is realized under the group D. Those exports do not have comparative advantages (cc 40% of total agrarian exports). This trend can be explained through a deeper territorial structure analyses and also through traded products added value and unit prices. Deeper territorial structure analyses realized country by country is able to specifically identify the Czech agrarian trade competitiveness in relation to individual trade partners. The analysis based on the whole set of countries is only able to identify the prevalence of trends, but it does not provide an exact overview for every single partner. The other reason of our competitiveness is a much lower unit price (2015) of Czech exports (average value of export unit price reached 10.3 CZK/kg) in comparison to imports (average value of import unit price reached 28.5 CZK/kg). In 2001 the average export respectively import unit price reached 16 CZK/kg respectively 22 CZK/kg. The competitiveness of Czech exports is based on constantly decreasing unit price value and export price/import price unit ratio. Another important stimuli supporting Czech agrarian trade, especially during the last couple of years, is the significant effort of the Czech central bank to keep the exchange rate at a low level (cc 27 CZK/EUR).

The majority of Czech agrarian trade activities is realized in relation to Developed countries. The specific role within that group of countries is kept by EU28 members. Czech agrarian exports and imports increased during the analysed time by 353% respectively 254%. Commodity structure of Czech agrarian trade recorded significant changes during the analysed time period. Group A increased from cc 40% to cc 48%, Group B and C experienced only a fractional change (from 6.6% to 5.6%) and the share of group D in total agrarian trade performance was reduced from cc 54% to 47%.

EU28 are the main trade partners of the Czech Republic (their share in total Czech agrarian trade within the analysed time period was cc 78% respectively 88%) . The value of exports and imports increased by cc 350% respectively cc 268%. The share of Group A transactions in total agrarian trade increased from 38.55% to 55.21%. The share of Groups B and C was reduced from cc 4.74% to 0%. And the share of Group

D was reduced from 56.7% to 44.8%. The Czech exports to the EU28 became, during the analysed period, more focused on competitive items.

Developing countries represent only a minor share of Czech agrarian trade – cc 11%. The share of those countries was significantly reduced (in 2001 it was cc 20%). Czech agrarian exports and imports realized in relation to developing countries, significant growth by cc 120% respectively cc 80%. The growth rate was significantly lower in comparison to OECD respectively EU28 members. The share of Group A increased from 36% to 49%, the share of Groups B and C is extremely low at only cc 2.2% and the share of Group D recorded a significant reduction from 64% to 49%.

4 Conclusion

Development has affected the level of Czech agrarian trade concentration during the last fifteen years. The commodity structure has become more diversified, while the territorial structure has become even more concentrated. While in 2001 the share of TOP5 and TOP10 commodity items in total agrarian exports reached 52% respectively 76%, in 2015 it was 41% respectively 70%. The Czech trade is quite competitive, especially in relation to the European countries (EU28, CIS and the rest of Europe). The competitiveness in relation to other territories (especially developing countries and not European OECD members) is limited.

The modified product mapping approach proved that the process of Czech agrarian trade restructuralization in relation to traditional partners (especially the Europeans) is still running and it is close to its final state. The trade profile is still developing in relation to other partners and we are very far from the final state of commodity structure. There are still too many items exported under group D. The significant weakness of the Czech agrarian trade is its ability to generate added value. While the value of Czech agrarian exports and imports increased 4.1 times respectively 3.2 times, the volume of Czech agrarian trade especially exports increased more than 6.35 times. The export volume is growing much faster in comparison to import volume (2.5 times). During the monitored time period (2001 – 2015), the volume of Czech exports increased by 16.5 million tonnes, while the import volume increased by 4.6 million tonnes. The result was the significant disproportion between the Czech agrarian trade export and import unit price. While in 2001 the export and import unit prices reached 16.01 CZK/kg respectively 22.25 CZK/kg, in 2015 it was about 10.31 CZK/kg respectively 28.55 CZK/kg. The negative results are influenced by the high portion of unprocessed water and wheat in Czech agrarian export. The Czech agrarian exports realized under the group A are suffering because of constantly increasing imports. While the share in 2001 under the group A realised only 17% of total imports in 2015, it was already cc 33%. The share of export values realized under the group A within the same period increased only from cc 52.5% to 57.5%.

The TBI and LFI analyses combination proved the existence of comparative advantages in relation to the following set of aggregations: Cereals, Live animals, Oil seeds, Tobacco products, Dairy products, Sugar, Vegetable oils, saps and plaiting materials, Milling products, Beverages and alcohol. In relation to the rest of the

World (without EU28 internal trade) Czech agrarian trade is competitive in relation to these commodity groups: Live animals, Dairy products, Sugar, Beverages and alcohol, Oil seeds, Preparation of cereals, Milling products, Cocoa preparations, Vegetable saps and Tobacco products.

The profile of Czech agrarian trade is still not fixed. We can expect significant changes in commodity structure profile and also in its volume and value performance.

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Development of Satisfaction with Employee Benefits – A Case Study on the Czech Republic

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Abstract. Unemployment in the Czech Republic is at its lowest since 1997. The current situation brings more problems to companies. For them the labour market represents a significant barrier to their further growth, because finding a qualified employee is becoming a bigger problem. The demand for the workforce is enjoyed by employees whose wages grow faster thanks to that. What is the situation like regarding employee benefits? The aim of this paper is to analyse the development of the costs of social benefits. The presented study also presents the level of satisfaction with the offer of employee benefits in the Czech Republic. In order to determine the level of job satisfaction, the survey (2013, 2015 and 2017) has been carried out repeatedly - the Czech version of the "Employment Satisfaction Questionnaire". The results confirm the fact that overall job satisfaction in the Czech Republic has been at a very low level for a long time. On average the employee benefits determinant has a small increase in satisfaction, although the cost of spending on them is decreasing slightly. In this area, we can see a place for businesses to fight for a skilled workforce.

Keywords: Employee Benefits, Satisfaction, Labour Cost, Czech Republic.

1 Introduction

Data from the labour market repeatedly shows that the unemployment rate in the Czech economy is the lowest across Europe. Unemployment in the Czech Republic is the lowest since 1997 - 2.6% in October 2017 [2]. The number of people without work at the 20-year minimum and the applicants has no problem finding a job. There are plenty of opportunities and the demand that companies place on the labour force leads to faster wage growth, which is a positive factor for employees.

The current situation brings further problems to employers. In addition to the above-mentioned wage pressure, which companies are still be able to absorb due to rising orders, another problem is labour shortages. It's lacking in both quantity as well as appropriate qualifications. This lack of staff is mentioned by the companies as the main barrier to their further growth. Therefore, employers must look for ways to gain enough qualified employees to allow for possible further growth. Employee benefits can be one such method of gaining a competitive advantage in the fight for skilled workforce. The aim of the paper:

- is to analyse the development of cost for social benefits, i.e. employee benefits, in the context of the total labour costs development in the Czech Republic;
- to present the level of satisfaction with the offer of employee benefits in the Czech Republic.

2 Analysis of Labour Cost and Employee Benefit Cost Development

Table 1 shows the average labour costs from 2012-2016, including the amount of their components [2].

The average labour cost per employee represents the employer's cost per employee. They are the sum of direct costs (wages including reimbursements), social benefits, social costs/expenses, personnel costs/expenses and taxes. The subsidies received from the Labour Offices for public works or socially meaningful jobs are deducted. This is a value for an average of 1 employee over a certain period (a month/year). Sub-items are defined below:

- ***Average gross wage per employee***

Average gross wage represents the proportion of wages without other personnel costs per employee.

- ***Average personnel costs/expenses per employee***

Personnel costs include: costs/expenses for staff recruitment (excluding staff wages), costs/expenses for education and apprenticeships, costs/expenses for employees training for the occupation, costs/expenses for working clothes, uniforms and other costs/expenses on staff security (fare, rehabilitation care, etc.).

- ***Average taxes and subsidies related to the employment of people per employee***

Taxes and subsidies are the difference between taxes (sanctions) related to the employment of people (excluding insurance and wage tax) and subsidies related to the employment of people.

- ***Average social costs/expenses per employee***

Employer's social costs/expenses are statutory insurance payments (social, health and accident), costs/expenses to cover premium social programmes, supplementary pension schemes, wage compensation for the duration of temporary incapacity for work paid by the employer, other (contracted) paid by the employer, severance payments and other social benefits paid by the employer, contributions in the form of corporate savings or sale of shares, social security expenditure for social purposes, benefits for catering and refreshments, housing allowances, the difference between production costs and sales of own products to employees and service cars provided for private purposes.

- ***Social Benefits - Employee Benefits***

Social benefits include, for example, contributions in the form of corporate savings or sale of shares, social security expenditure for social purposes, benefits for catering and refreshments, housing allowances, the difference between production costs and sales of own products to employees.

Table 1. Labour costs in 2012 - 2016. [2]

Year	Labour costs, total	incl.:							
		Direct costs			Social benefits	Social costs and expenditures		Personnel expenditures	Taxes and subsidies
		wages	*payments for days not worked*	*total (col. 2+3)*		*social security contributions statutory*	*other*		
2012	34 774	22 528	2 561	25 089	424	8 538	465	317	-59
2013	34 825	22 417	2 638	25 054	428	8 606	483	312	-59
2014	35 715	23 030	2 673	25 702	404	8 946	406	340	-83
2015	36 952	23 824	2 782	26 606	412	9 203	409	421	-100
2016	38 257	24 677	2 889	27 566	406	9 506	446	422	-89

The table shows that year-on-year labour costs rise, the total increase between 2012 and 2016 was 3,483 CZK. However, the cost of social benefits/employee benefits do not follow this trend. On the contrary, there was a fall in 2014 from 428 CZK to 404 CZK.
Figure 1 shows a longer-term trend - since 1994.

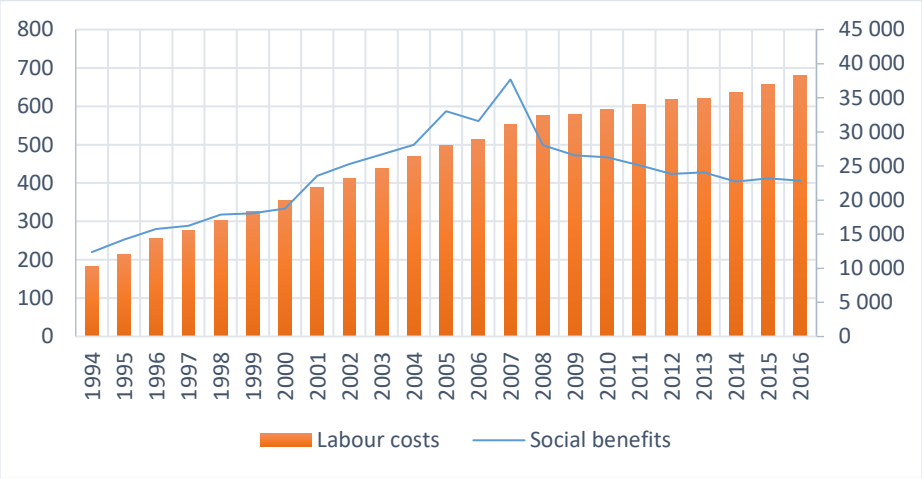

Fig. 1. Development of labour cost and social benefits in 1994 – 2016. [2]

Here, we can see that the cost of employee benefits copied labour cost growth up to 2007, in some years, the percentage increase in annual costs was even higher. In 2008, as a result of the economic crisis, there was a significant reduction in the cost of employee benefits - from 670 CZK to 499 CZK. In the following years, despite the subsequent rise in labour costs, the slightly decreasing trend persists.

3 Methodology and Data

In order to determine the level of job satisfaction, the data from the repeated surveys carried out in 2013, 2015 and in January and February 2017 were used. These surveys were carried out in the form of a questionnaire survey - the Czech version of the "Job Satisfaction Questionnaire" [6]. For the purposes of this paper, only results that measure the overall job satisfaction levels and employee benefits satisfaction levels are used.

The obtained data was collected through collaboration with university students in part-time study at the Faculty of Informatics and Management at the University of Hradec Králové.

Statistical analyses were performed using the Statistica 8 software.

Research has several limitations, but given that the Czech Republic currently has a relatively homogeneous socio-economic composition, we are convinced that our data provide results that broaden our knowledge of job satisfaction.

4 Satisfaction with Employee Benefits: Discussion and Results

In total, the studies in 2013, 2015 and 2017 were attended by 1,950, or 1,547 and 1,574 respondents, 174, 77 and 98 questionnaires were excluded from the sample due to various errors and missing values.

Respondents were aged 17-74 years or 16 - 77 years in the same period in 2015 and 2017 and their average age was 36.3 years (SD = 10.80), i.e. 36.19 years (SD = 10.70) and 36.36 years (SD = 11.45). Other selected characteristics of the respondents are given in Table 2.

The interviewees lived mostly in the north-eastern regions of the Czech Republic - the Hradec Králové and Pardubice regions and also some from Vysočina (the Czech Republic consists of 14 regions).

From the above characteristics, it's clear that the surveyed samples of respondents in all surveys are comparable.

Table 2. Selected characteristics of the surveyed sample.

Item	**2013**		**2015**		**2017**	
	Percentage	***Frequency***	***Percentage***	***Frequency***	***Percentage***	***Frequency***
Gender						
Males	42.9	762	42.1	619	45.7	675
Females	57.1	1014	57.9	851	54.3	801
Age						
Less than 30	32.4	576	32.4	476	35.6	525
30-40	35.2	625	34.7	510	29.2	431
41 and above	32.4	575	32.9	484	35.2	520
Years of experience (tenure)						
Less than 5 years	44.0	781	42.2	621	48.8	721
5-10 years	29.5	524	29.9	440	27.5	401
11-15 years	11.9	211	12.9	190	10.8	160
More than 15 years	14.6	260	14.9	219	13.1	194

The results of the studies show that the total level of job satisfaction was the same in the first two surveys, i.e. 3.73, in 2017 it increased slightly to 3.76. The influence of individual determinants on total satisfaction has changed. Besides promotion, pay and

operating conditions, other determinants that reduce overall job satisfaction levels include fringe benefits as the average level of these determinants is lower than average overall job satisfaction. On the contrary, the respondents are most satisfied with supervision, co-workers, the nature of the work and communication, whereby the average satisfaction is higher than 4.00.

For fringe benefit determinants, there was a slight increase in satisfaction among the surveyed years from 3.42 to 3.48, or to 3.52 in 2017.

Table 3. The average job satisfaction scores and satisfaction with employee benefits using the respondents selected characteristics.

Item	2013		2015		2017	
	Fringe Benefits	Overall satisfaction	Fringe Benefits	Overall satisfaction	Fringe Benefits	Overall satisfaction
Gender						
Males	3.50	3.79	3.54	3.78	3.60	3.82
Females	3.35	3.69	3.44	3.70	3.46	3.71
Age						
Less than 30	3.43	3.77	3.53	3.77	3.54	3.79
30-40	3.46	3.74	3.48	3.71	3.64	3.86
41 +	3.35	3.68	3.45	3.71	3.41	3.65
Years of experience (tenure)						
Less than 5 years	3.47	3.79	3.54	3.80	3.60	3.82
5-10 years	3.44	3.71	3.43	3.68	3.49	3.77
11-15 years	3.25	3.61	3.44	3.64	3.44	3.62
More than 15 years	3.33	3.70	3.47	3.73	3.35	3.65

Table 3 shows the average rate of total job satisfaction and employee benefit determinants for all three surveys based on the respondent's selected characteristics. Men, aged 30 to 40 as well as overall, that have been employed in the organisation for less than 5 years are more satisfied with employee benefits.

The results of 2017 again confirm the fact that overall job satisfaction in the Czech Republic has been at a very low level for a long time, as shown by previously published studies [3; 4; 5; 7].

5 Conclusion and Recommendations

Provision of employee benefits is dealt by a personnel policy that is an effective tool for personnel management that helps attract and retain high-quality employees to increase their loyalty to the employer, motivation and productivity, turnover reduction and the associated costs [1].

It's no longer true that employees are only motivated by wages. Business benefits can be a tool for recruiting new employees, companies can also make extensive use of their loyalty and motivation for their existing employees. On the other hand, future staff may be an important factor in deciding between several job offers.

In fact even in this difficult situation in the labour market, results show that companies don't use this option, since the cost of employee benefits decline slightly.

Companies must realise that currently they can't manage without a thoughtful motivation system for their own employees. Offered employee benefits help increase loyalty and employee satisfaction, or attract new employees.

Benefits are sometimes referred to as part of total remuneration. Creating and enhancing motivation is a long-term issue requiring a systematic approach with a good knowledge especially of psychology and sociology of work. By providing benefits, the employer can vary from competitor to gain a competitive advantage and strengthen the corporate culture - protecting and building up good reputation and enhancing the value of brand. Providing benefits also means increasing the image and attractiveness of the employer.

The reason why companies should use benefits for rewarding their employees (in addition to complying with the requirements of the law) is that employee benefits can:

- improve the company's reputation and competitiveness in the labour market and therefore facilitating the recruitment and stabilisation of employees;
- reduce employee dissatisfaction and fluctuation;
- promote the relaxation, development and social background of employees and therefore also their performance indirectly;
- improve employee relations, promote loyalty and identity with organisation or pride on employers.

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Influence of Climate Changes and Low-Cost Garlic from China for Traditional Producers in the Czech Republic

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Abstract. The aim of this article is to analyze the position of the Czech garlic in the domestic market to justify the reasons for the initial sharp decline in demand around the year 2000, to determine the reasons for the return of interest for this product and to evaluate offers flexibility Czech manufacturers. Because of the outlined development it was found that the initially sharp decline in demand for Czech garlic declined his offer to almost a complete stop Czech production of this crop. This situation lasted until around 2008 when it began to slow due to certain awakening consumers about the unique qualities domestic product, demand for Czech garlic grow again. However, the offer did not respond adequately to this situation. In the meantime, interest in Czech garlic has risen several times and the offer is stagnating to date. The price of Czech garlic, which has been increasing in recent years due to a large overhang of demand over the supply. For the sake of interest, the situation on the domestic market is confronted with production in the European Union, in China, which is the world's garb of great powers with worldwide production.

Keywords: Czech garlic, Consumption, Demand, Production, Price.

1 Introduction

The fruit and vegetable trade are very volatile and depends on a number of different, often very badly influenced factors. Significant changes in demand, supply, general perception of the commodity by consumers and its position on the domestic market, which occurred in the case of Czech garlic, in addition for a very short period, however, do not even exist in this changing business environment.

Garlic originated from Central Asia about 3000 years and later spread to the Mediterranean regions [8]. Growing demand for vegetables is considered to have a favourable economic effect on smallholders. [2] Onion and garlic are two important vegetables in the world, which are processed in various forms such as powder, puree, and minced paste [9]. Garlic growing has always been a great tradition in the Czech Republic. This product, thanks to its high quality, maintained its permanent position on the domestic market, it was all available and considered to be a completely natural crop of domestic agriculture. The typical growing area was Uherskohradišťsko, to this day are mainly known villages like Bánov, Dolní Němčí and Suchá Loz. An insignificant amount of garlic also flowed from the production of Czech gardeners

and thanks to which the Czech Republic was completely self-sufficient in the production of garlic. So, there was little need to import garlic from abroad, and that is why this crop did not really threaten foreign competition. This fact ensured the Czech garlic the exclusive position on the domestic market. The total annual production of Czech garlic until 2000 was approximately 7000 tons, the roughly equivalent to annual domestic consumption. The retail price for consumers ranged between CZK 50, - to 70, - per kilogram. For comparison, today, only 1769 tons of these crops are grown in the Czech Republic and its selling price is up to CZK 200, - per kilogram. Agriculture experts agree that no other commodity in the fruit and vegetable sales has gone through so much economic change as Czech garlic in recent years. [1-4], [7]

2 Methodology and objectives

The article is based on primary and secondary sources. Secondary sources comprise information about production of garlic in the Czech Republic and abroad, professional literature, information from professional press, conferences papers to this topics and discussions or previous participations in professional workshops. Primary sources are based on the information gained from The Food and Agriculture Organization (FAO), the World Health Organization (WHO) and Ministry of Agriculture of the Czech Republic. Then it was necessary to select, classify and update accessible relevant information from the numerous published materials that would provide the basic knowledge of the selected topic.

The aim of the article is to analyze the production of garlic in the Czech Republic and in the world and in EU. Subsequently, the average consumer prices of garlic will be examined in the Czech Republic.

3 Development of demand for Czech garlic in the Czech Republic

Approximately since 1999, China's garlic has gradually become increasingly popular on our Czech market, which has become very favorite by many vendors and consumers. It had a very low selling price, which did not exceed CZK 40,- per kilogram and a really nice look (large, bright white heads of garlic). China is the largest producer of garlic in the world. Its production is estimated at 16 million to 17 million tons of garlic grown per year, with most of them being exported to countries around the world. The price of the Chinese product can be so low, especially due to cheap labor there and the use of inadmissible, but available chemicals and fertilizers. The most expensive item is the cost of exporting. The cost of shipping used by China is, however, also relatively low. For this reason, the demand for Czech garlic is declining.

In the following years, Czech farmers planted a smaller amount of garlic seedlings, which meant that the total annual of production began to drop quite a bit. Only 2239 tons of Czech garlic was harvested in 2002, even a mere 953 tons a year later.

However, it should be noted that the season 2002/2003 was extremely unsuccessful and due to bad weather, the overall return was barely half that of the usual average. In the upcoming season, the area planted of garlic still declined, with a total of 1927 ton in 2004, a year later 1712 tons and its sales price, of course, increased. Poor, cheap garlic from China has further strengthened its newly acquired position on the Czech market. In 2006 the Spanish garlic began to import to the Czech Republic. The price was around CZK 50, - per kilogram. Its quality is higher than of Chinese, but it does not reach Czech garlic. [1-4], [7]

In 2008, the situation with garlic on the Czech market began to change slowly. From an economic point of view, between 2001 and 2008 there was a significant increase in prices for both Czech and imported garlic. This was due to different factors. The price of domestic garlic grew mainly due to a sharp drop in production and a drop in domestic demand. Chinese or Spanish garlic, after virtually destroying domestic competition and reaching its stable position on the Czech market, needed to be finally a profitable product. Logically, therefore, his price began to rise. Consumers could buy a kilogram of imported garlic from 80 to 100 CZK; the domestic garlic price was up to 300 CZK per kilogram. However, the offer was minimal.

Although in spring 2009 demand for Czech garlic grew again and more and more consumers preferred domestic garlic before import, domestic production did not increase. Among the main reasons for the stagnation of the Czech garlic offer on the domestic market were mainly:

- the reluctance of Czech farmers to return to a very demanding and uncertain business
- lack of quality garlic seedlings
- still many consumers favoring cheaper imported garlic rather than more expensive domestic garlic
- an exclusive position of Chinese garlic on the Czech market

Due to bad weather during the whole growing season, however, there was a further decline in annual production, which reached only 1590 tons in 2009, and on the other hand, the demand for Czech garlic increased. Some growers therefore began to perceive this situation as an opportunity. On the other hand, the number of consumers who would be willing to pay for high-quality domestic garlic still did not yet reach the number that would compensate farmers to produce garlic. There is also a lack of the rate of propagation and the expression of garlic.

However, in summer 2010 Czech farmers harvested only 1457 tons of garlic, which unfortunately meant another year-on-year decline in production. The reasons were mainly low quality of garlic seedlings from abroad and significant weather fluctuations.

For the season 2010/2011, many growers retained their own controlled crop from the previous year, which they used as seedlings. This garlic, grown on the territory of the Czech Republic, was much better and more resistant to weather fluctuations. In the relatively mild winter of 2010/2011 with an average amount of snowfall, the temperature was above average. The combination of quality seedlings and ideal

weather for garlic cultivation was the ultimate cause of better harvest. Total annual production was 1530 tons, which represented at least a slight year-on-year increase. Farmers say 2011 was the first season after a long time when they did not make a less of garlic growing. A large part of the appropriate production was again used as seed for the following season, with surplus demand for home garlic consumers rapidly and easily sold. [1-4], [7]

As a result of the successful harvest from the summer 2011, the autumn of this year is called like the "garlic mania season". The cultivation of this crop began to be published in media as a very profitable business, which naturally attracted many people.

Due of weather conditions, winter 2011/2012 was not favorable for growing garlic. Autumn and early winter was above average; so many farmers were waiting for better situation. A large amount of planted garlic has therefore faded. It is understandable, therefore, that the harvest in the summer 2012 was not successful due to the reasons described above. Annual production fell to 1272 tons of garlic grown over the previous year, although larger quantities of planting were planted in autumn. Many experienced farmers still appreciate this season, as many inexperienced growers with unscheduled planting have gone to ignorance of the problems and risks associated with growing garlic, and have left this uncertain business. The garlic was only grown for those who planted good and proven seedlings. The situation in 2013 was completely different. The total yield of garlic reached 1792 tons in the Czech Republic, thus the annual production significantly increased compared to the previous season and offered to the Czech market exceptionally high-quality goods. The reasons why there has finally been more success are several:

- farmers with experiences, who did not grow garlic for the first time, again started to grow garlic
- these farmers used in most cases high-quality Czech seed from their production, which they planted larger areas
- discovering new, much more gentle means of garlic pickling
- relatively favorable weather at the beginning of the agricultural year 2012/2013

The following season 2013/2014 was relatively favorable for domestic garlic growers. The total annual production slightly increased on the resulting 1856 tons of grown garlic, which can be considered a success due to the persistent problem with acute shortage of quality domestic seedlings. A year later, the harvest was negatively affected by lower spring temperatures and numerous rainfalls. Because of windy weather and strong storms, many plants have been damaged in some areas of the Czech Republic and a yearly decline in total garlic production to 1629 tons. The last observed season 2015/2016 is one of the above-average temperature extremes. Later varieties, due to the above-average precipitation at the beginning of summer, were better, but generally they did not grow into large dimensions. Overall, 1769 tons of domestic garlic was harvested (see Fig. 1 and Fig. 2). [1-4], [7]

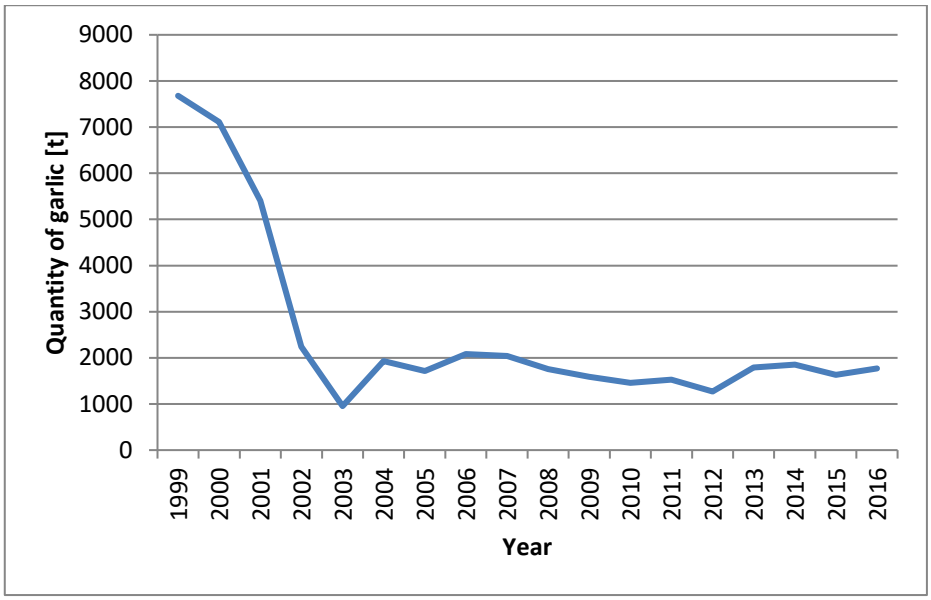

Fig. 1. Market production of garlic in the Czech Republic, [5] own processing

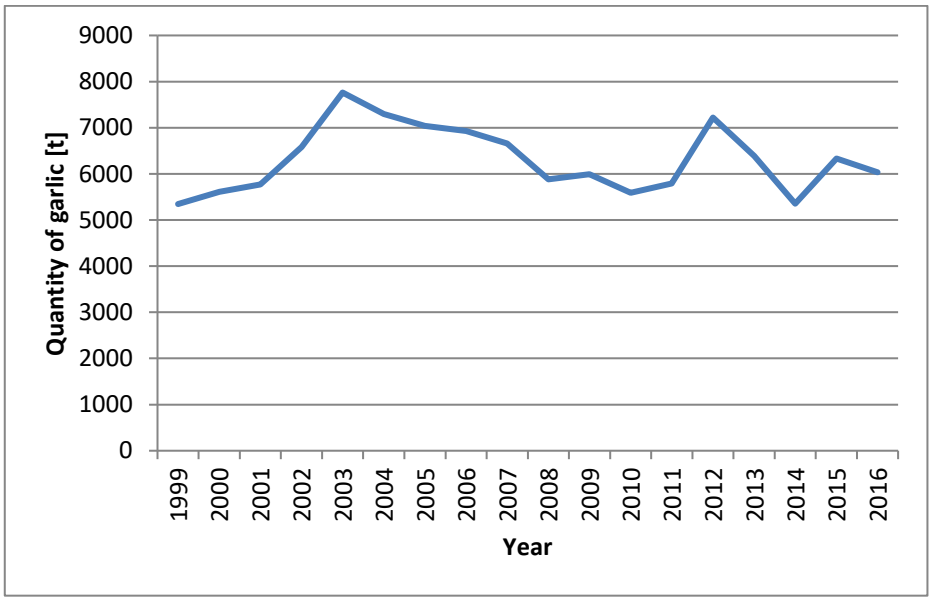

Fig. 2. Total amount of garlic imported into the Czech Republic, [5] own processing

Domestic farmers have managed at least to stabilize the production of Czech garlic in recent years, thus preventing its complete extinction. However, efforts to increase the total amount of crops grown in this crop are still unsuccessful. The main cause is the lack of high-quality seedlings on the domestic market, which makes it impossible for most farmers to grow garlic at the required size. Since 2007, consumer interest has grown more strongly, but this does not ensure a future for the domestic product. Many people are always only orientated by price and quality while shopping, and quality is often neglected. It is therefore very important that Czech farmers continue to grow garlic, multiply the necessary seedlings, promote their promotion and thus help to gain its original dominant position on the domestic market.

4 Comparing with world production

Total garlic production in the European Union declined in the years 2000 and 2005, since then, it has been relatively constant and has even slightly increased in 2013. A year later, however, there was a more marked decline again. Its biggest producer is Spain, especially the Andalusian region, where garlic production increased by 15% in 2013 and the Castilla - La Mancha region, which increased the area by 6%. However, the production of garlic from France or Poland is also significant (see Fig. 3).

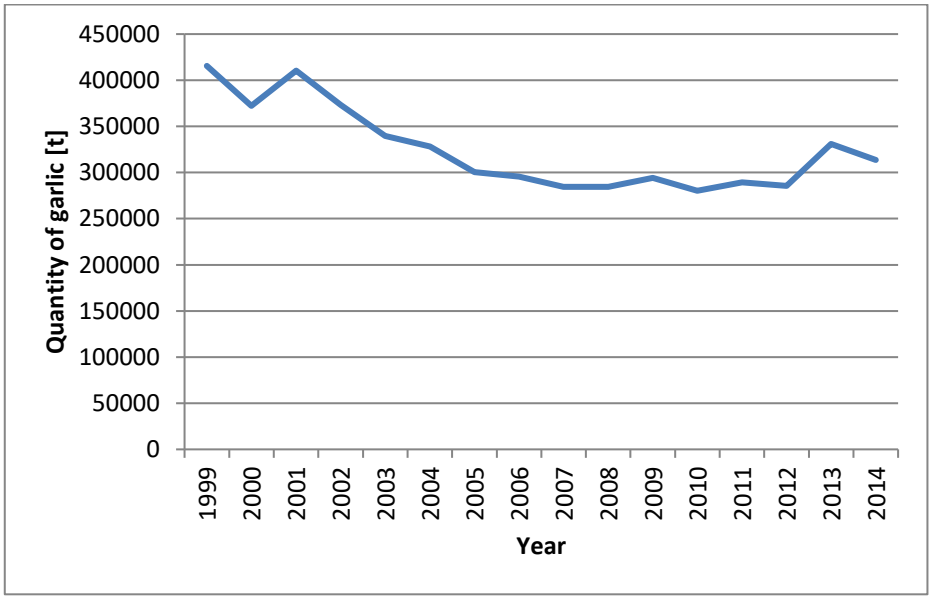

Fig. 3. Market production of garlic in the European Union, [5] own processing

China, India, South Korea, Egypt and Russia are among the world's largest garlic growers. The whole world is undoubtedly dependent on Chinese garlic production, which is enormous and is still growing. The biggest increase was recorded in 2007

and 2008, followed by constant seasons and a further significant increase in 2013 and 2014 (see Fig. 4).

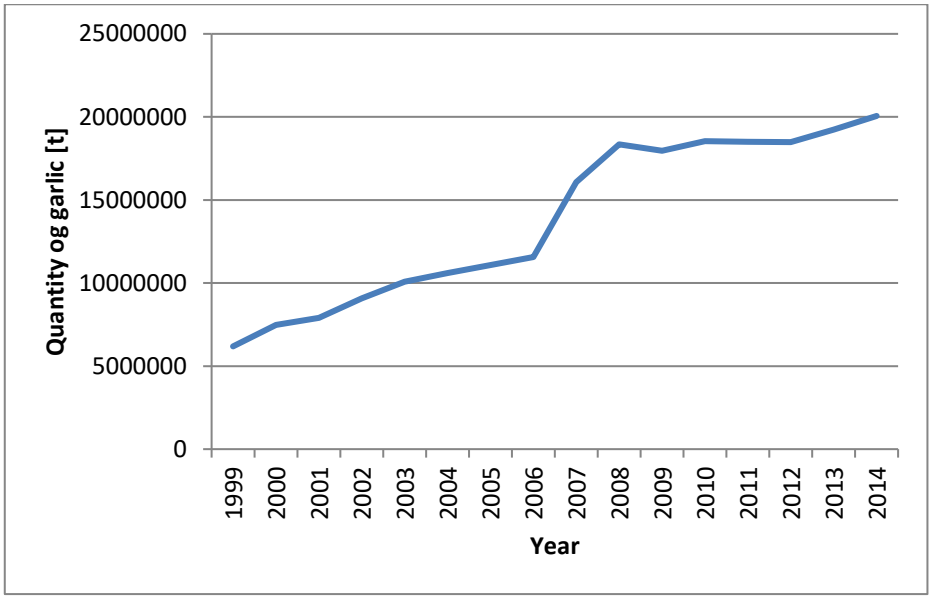

Fig. 4. Market production of garlic in China, [5] own processing

Other important world producers of garlic are the USA, whose 90% garlic is grown in California and Argentina, of which Mandoza region is surveyed with 70% garlic in Brazil and 15% in the EU and in recent years is China's major competitor. Garlic is also traditionally grown in Chile or Mexico. The total market productions of garlic in the world see in Fig. 5.

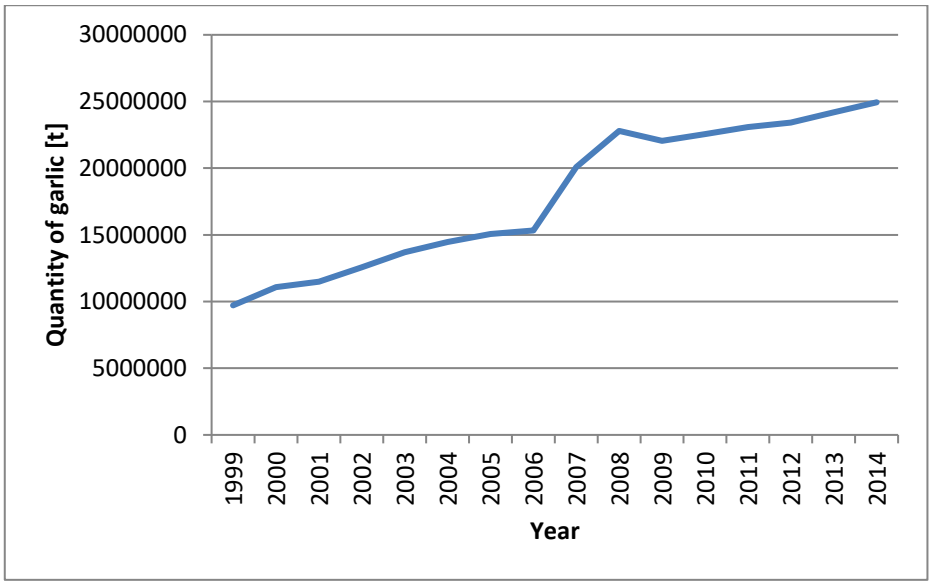

Fig. 5. Market production of garlic in the world, [5] own processing

Consumption of vegetables, expressed in the value of fresh vegetables, including vegetable products, declined again in year-on-year terms by 1.8% year-on-year, increasing consumption of salad cucumbers, peppers and lettuce. On the other hand, consumption of tomatoes, cabbage, onions, carrots, cucumber and garlic. The relatively constant consumption of garlic in the Czech Republic has been decreasing in recent years, which is probably due to the lack of a good domestic product on the market and the unwillingness of consumers to replace it with an imported substitute (see Fig. 6).

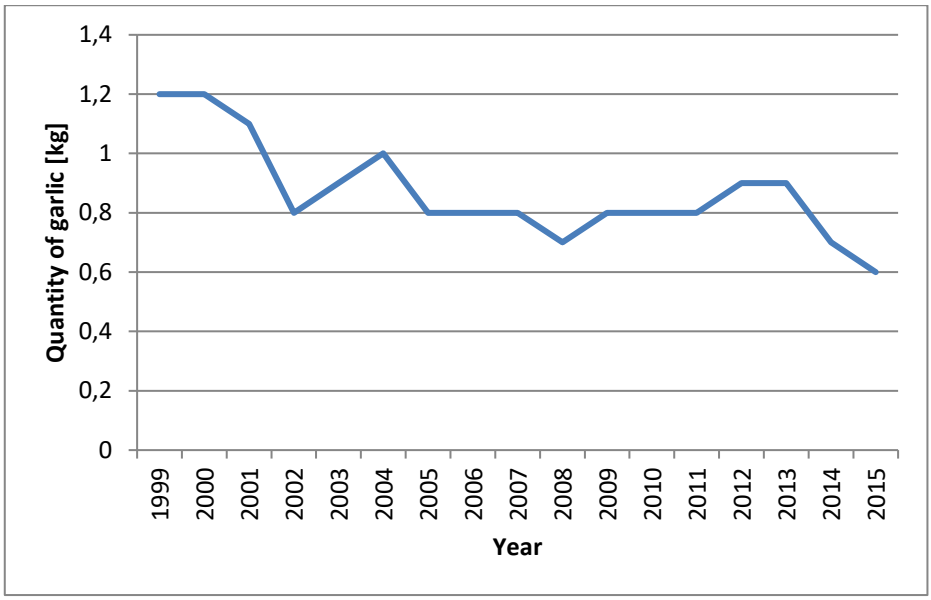

Fig. 6. Average annual consumption of garlic in the Czech Republic, [5] own processing

Currently, the United Nations Food and Agriculture Organization (FAO) and the World Health Organization (WHO) are leading a campaign to help ensure greater supply, availability and increased consumption of vegetables and fruits worldwide. Vegetables, like fruits, are an important source of a range of substances essential to healthy human nutrition. However, their consumption does not reach sufficient levels. At a global average, significantly fewer fruits and vegetables are consumed than the minimum recommended amount set by the World Health Organization; it is 400 grams per person per day. It is assumed that most people only receive about 20% to 50% of the recommended amount per day. Even if the last ones fifty years have changed the eating habits of people - at the expense of cereals and legumes, the proportion of vegetable oils, sugar and meat has grown - the proportion of fruit and vegetables has increased only slightly, and this trend continues. The World Health Organization places low consumption of fruit and vegetables on the sixth place among the twenty most risky factors causing premature deaths. Consumption of this food group ensures the supply of important substances to the body such as vitamins A, B, C and E, fiber and other antioxidant substances.

5 Development of average prices of Czech garlic

The average price of garlic causes a great variety of different factors, just like with other types of vegetables. In the Czech Republic, the price of garlic of foreign competition was the most affected, which first caused a significant drop in demand for this product to almost complete cessation of its production. After a certain period

during which consumers realized the exceptional quality of Czech garlic, there was a gradual increase in demand, but also a drop-in supply and a significant increase in the prices of this article. Czech garlic has reached the highest prices in recent years (see Fig. 7). The price of garlic is, of course, also significantly influenced by the success of the harvest in the given season and by the quality of the product (class of quality and size). It also depends very much on the demand in the given year and on the garlic variety, which are several in the Czech Republic. Some varieties are more valuable, others are less valuable.

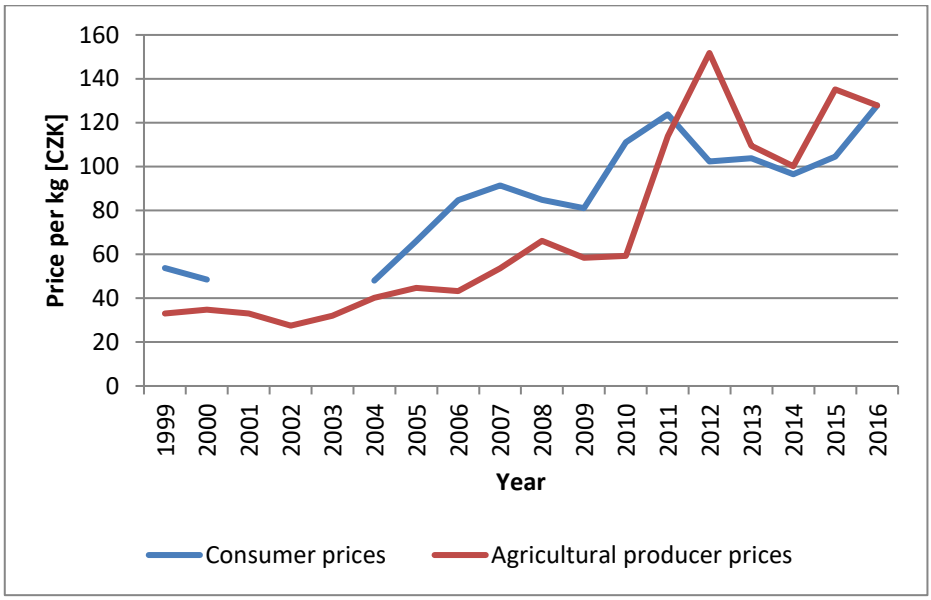

Fig. 7. Average consumer prices of garlic in the Czech Republic, [5], own processing

Conclusion

The purpose of this article was to point to a very rapid and fundamental change in the position of Czech garlic on the domestic market caused by a competitive substitute from imports, which had a negative effect on the traditional cultivation of this crop in the Czech Republic. Because of the great decline in demand for Czech garlic around 2000, there was a significant decline in the supply of this product until the production was nearly halted. When the interest in Czech garlic started in 2009 for its high quality and perfect properties again, there was a big problem with the lack of seedlings and growers willing to return to the uncertain and very expensive business. In recent years, demand for Czech garlic has exceeded its offer several times, but production is still stagnating. The price of garlic naturally responds to the demand for the product and its limited supply and is generally growing. However, the weather in the season and the associated success of the overall production, quality, variety and

size of the grown garlic are also influenced by its current level. Can Czech garlic regain its dominant position on the domestic market? How long can it take?

The overall development of vegetable production in the Czech Republic recorded a decrease between 1999 and 2016 in the same reporting period, but not at such a large scale as for garlic. While domestic vegetable production is mainly replaced by imports from the European Union, garlic is usually replaced by products from China, Spain or Argentina. On the contrary, Chinese garlic production has been on the rise for a long time and has a significant impact on the world's production of this crop. China is a world superpower in garlic growing and exports its product to most countries around the world. That Chinese garlic is a strong player on the market can be clearly seen on a real story of Czech production of this crop. Should we, as consumers, think more about the consequences of our not only buying behavior? Should we be the greater patriots of our country and its production?

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Comparative Advantages of Czech AFT in Relation to Value and Volume of Realized Trade

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Abstract. The goal of this article is to identify the most significant changes, which occurred in selected territories within the Czech agrarian foreign trade (AFT). The analysis also includes an element related to the development and situation of unit prices and the physical volume of AFT as well. The differences which exist in relation to long-term trade partners of the Czech AFT, are observed. From individual analyses, it's then possible to work on certain assumptions, necessary for the analysis of competitiveness, and more precisely the comparative advantages on the part of Czech AFT. These comparative advantages are primarily based on the ability of the Czech Republic to compete within the sector of product exporting with a lower rate of production, where the export strategies rely mainly on high volumes of exported mass and low export prices. This fact is then confirmed by analyses made possible through the LFI, RCA and TBI indices. The most noteworthy partners of the Czech AFT are the developed countries, particularly the member countries of the OECD and more significantly the EU28. It's possible to detect the deterioration of the coverage of unit prices of imports by the unit prices of exports. Due to the high growth dynamics of the export volume, it's possible to observe a noticeable and long lasting improvement, when it comes to the coverage of the value of imports by values of exports. In addition, this is visible in the relationship to the coverage of import volumes by export volumes.

Keywords: Agrarian Foreign Trade (AFT), Comparative Advantage, Volume, Value, Price, Coverage of Imports by Exports, Czech Republic, OECD, EU28, world, CIS.

1 Introduction

In the last two decades, The Czech agrarian trade has undergone a very substantial transformation [3]. This transformation was significantly influenced by several dynamically developing factors, which originate not only in the area of economics, but also in the political and social spheres [4]. This pattern was primarily influenced by a large number of factors connected with the admission of the Czech Republic to the EU, and also by the direction of the Common Agricultural and Common Trade policies of the EU countries [9]. The agrarian trade was influenced by, not only the reforms conducted on the EU level, but also by reforms realized on the level of the

national economy and national policies [13]. Last but not least, the agrarian trade was also influenced by the market situation of third countries. Another important element affecting the Czech agrarian trade is the globalization of the world economy, especially the agrarian and food markets [12]. In this regard, it is necessary to emphasize the influence of multinational capital and foreign investments on the shaping of the current state of the Czech agrarian sector, in particular the food industry. It is the large multinational companies, who to a great extent determine the level of Czech agrarian and food trade, and by their actions also influence the direction of the trends that the Czech agrarian market follows [8]. An example of such company is Phillip Morris, the parent company of Tabák Kutná Hora a.s.. In the past few years the Czech Agrarian trade has undergone a very significant transformation process, which has been influenced not only its territorial boundaries, but also the commodity structure and in large part is also reflected in the structure of the Czech agrarian trade in the terms of degree of processing of the traded products. It is mainly the structure of the trade, which in the case of the Czech Republic, is of an extreme characteristic and does not correspond with the standards, which are common to developed countries [11]. When it comes to the development in terms of volume and value of the Czech agro trade, it is the Czech Republic that shows distinctive particularities compared to a number of other countries, especially in the EU environment. This fact must then logically be projected into the area of the competitiveness of the Czech agrarian and food trade, which primarily slips its way into the international market through relatively low kilogram prices. With this in mind, it is important to mention the specific characteristics of the distribution of the comparative advantages of the Czech agro trade. The Czech Republic generally has no obvious comparative advantage, however on the level of selected commodity aggregates, these comparative advantages exist, especially in regards to relationship with member countries of the EU. It is a paradox, that when it comes to the European market, which is very lucrative, the Czech Republic makes its way through only to a limited extent by the export of products with higher values added. In addition, it dominates through the unprocessed and semi-finished goods. On the other hand, in relation to third countries, particularly countries outside Europe, the commodity structure is mainly focused towards exporting products with higher degree of processing and higher unit prices. In this regard, it is necessary to mention the Czech agrarian trade is to a great extent disadvantaged in comparison to a number of its competitors [11]. This is because of the fact that the Czech Republic is a “landlocked country”, without sea access, which in a very significant way limits the export potential of the Czech agrarian and food products in relation to non EU regions. The importance of third countries is constantly decreasing. The last really significant non-EU partner Russian federation is constantly reducing its share in Czech agrarian trade. The importance of Russia is reduced because of political consequences [10] and because of Russian market specifics [5,6]. A specific paradox of the Czech agrarian trade is its growth through trend, which is primarily built, not on the growth of export of products with a higher degree of processing and higher unit prices, but rather on the continuous growth of the volume of the exported mass. This creates a contradictory situation in the area of the balance of final trade, because if we approach

the assessment of the balance of trade in terms of development of the value, then the value is permanently and significantly negative. On the other hand, if we were to assess the balance of trade in terms of volume of traded mass, then the Czech agrarian trade has a long term surplus. The problem of the Czech agrarian trade then becomes the extreme differences concerning the per kilogram prices of realized exports and imports. However, there are significant differences in relation to individual groups of countries, which represent the trading partners of the Czech agro trade.

2 Data and methods

This article is focused on the issues of the transformation of the commodity structure of the Czech agrarian trade from 2001 until 2016. The structure of the article is divided into four parts. Firstly, the analysis of the restructualization of the commodity structure of the Czech agrarian trade is conducted and compared to all trade partners. Secondly, the commodity structure is separately analyzed and compared to the EU countries vs. third countries (all non-member countries of EU28). In the third portion, the article provides a comparison of changes in the area of the commodity structure compared to developed countries (OECD) vs. developing countries (non-member countries of OECD). Last but not least, the analysis is conducted with the emphasis on Europe. An analysis, in addition to the restructualization of the commodity structure in relation to EU countries, the restructuralization in relation to the CIS countries (countries of Common Independent States) and also in relation to the other European countries is conducted. Our analysis is accomplished through the application of the 'product mapping' approach. The analysis in this regard is achieved through the calculation of RCA, LFI and TBI indices. Its application then makes it possible to divide the commodity structure into four segments, according to their comparative advantages and value of balance.

The aim of the article is to identify the most significant changes, which occurred in relation to the selected territories. The changes are interpreted not only in the traditional values concept, but in addition the analysis also includes an element related to the development and states of unit prices and physical volume of agrarian trade. Incidentally, the differences among individual groups of countries, which represent the long-term trade partners of the Czech agrarian trade, are observed.

We applied the HS system: HS01 Live animals, HS02 Meat and edible meat offal, HS03 fish and crustaceans, mollusks and other aquatic invertebrates, HS04 Dairy produce birds' eggs natural honey edible products of animal origin, not elsewhere specified or included, HS05 Products of animal origin, not elsewhere specified or included, HS06 Live trees and other plants bulbs, roots and the like cut flowers and ornamental foliage, HS07 Edible vegetables and certain roots and tubers, HS08 Edible fruit and nuts peel of citrus fruit or melons, HS09 Coffee, tea, mate and spices, HS10 Cereals, HS11 Products of the milling industry malt starches inulin wheat gluten, HS12 Oil seeds and oleaginous fruits miscellaneous grains, seeds and fruit industrial or medicinal plants and fodder, HS13 Lac gums, resins and other vegetable saps and extracts, HS14 Vegetable plaiting materials vegetable products not elsewhere specified or included, HS15 Animal or vegetable fats and oils and their cleavage

products prepared edible fats animal or vegetable waxes, HS16 Preparations of meat, of fish or of crustaceans, mollusks or other aquatic invertebrates, HS17 Sugars and sugar confectionery, HS18 Cocoa and cocoa preparations, HS19 Preparations of cereals, flour, starch or milk pastry cooks' products, HS20 Preparations of vegetables, fruit, nuts or other parts of plants, HS21 Miscellaneous edible preparations, HS22 Beverages, spirits and vinegar, HS23 Residues and waste from the food industries prepared animal fodder, HS24 Tobacco and manufactured tobacco substitutes. Data sources for individual analyses: UN COMTRADE, Czech statistical office. Collected data cover the following categories: export and import value and volume, unit value of realized exports and imports.

This paper evaluates through, the use of basic statistical indicators, the general development trends of export and import value and volume. The other analysed categories are export/import coverage ratio, export and import unit value development. An important part of the analysis is related to the problem of comparative advantages distribution. The goal of this paper is to specify the main driving force of Czech agrarian trade value development. In this case, the paper specifies whether that main driving force of Czech agrarian trade value is unit value of traded products or volume performance. The analyses is performed in relation to above specified groups of countries representing the trade partners of the Czech Republic. The basic indicator applied to discover the actual state of Czech agrarian trade comparative advantages distribution is the standard RCA index (proposed by [2] and later modified by [1]):

$$RCA_j^i = \frac{x_j^i - m_j^i}{\sum_{l=1}^{N} x_j^i + m_j^i} \Bigg/ \frac{\sum_{j=1}^{N} x_j^i - \sum_{j=1}^{N} m_j^i}{\sum_{l=1}^{N} x_j^i + \sum_{j=1}^{N} m_j^i} \qquad (1)$$

where x^i_j and m^i_j represent country *i*'s export and import of product *j*. $RCA^i_j>1$ indicates country *i* has a comparative advantage in production of *j*; the greater the index, the stronger the advantage. $RCA^i_j<1$ indicates that country *i* has a comparative disadvantage in production of *j*; the smaller the index, the greater the disadvantage. The advantage of RCA index is its ability to identify comparative advantages/disadvatages existing at general level, but *i* is not able to identify the partinal comparative advantages existing only at the bilateral level.

The next index used in the paper is Lafay index [7]. Using this index we consider the difference between each item's normalized trade balance and the overall normalized trade balance. Unlike the above indexes, Lafay index does not take into account world variables. Using LFI index we can focus on the bilateral trade relations between the countries and the regions. Moreover, this index is more reliable on the over-time comparison of sectors within a country. The Lafay index helps us to understand how the comparative advantages over time and to compare strength of comparative advantage of individual products and product groups, for individual regions and countries.

For a given country, *i,* and for any given product *j*, the Lafay index is defined as:

$$LFI_j^i = 100\left(\frac{x_j^i - m_j^i}{x_j^i + m_j^i} - \frac{\sum_{j=1}^{N}(x_j^i - m_j^i)}{\sum_{j=1}^{N} x_j^i + m_j^i}\right)\frac{x_j^i + m_j^i}{\sum_{l=1}^{N} x_j^i + m_j^i} \quad (2)$$

where x^i_j and m^i_j are exports and imports of product *j* of country *i*, towards and from the particular region or the rest of the world, respectively, and *N* is the number of items. Positive values of the Lafay index indicate the existence of comparative advantages in a given item; the larger the value the higher the degree of specialization [15].

The next part of the analysis presented in this paper was conducted using the analytical tool, named "products mapping". This tool enables to assess leading exported products from two different points of view, i.e. domestic trade-balance and international competitiveness [14]. Product mapping approach is based on application of two different indices: LFI index and TBI index.

Trade Balance Index (TBI) is employed to analyze whether a country has specialization in export (as net-exporter) or in import (as net-importer) for a specific group of products. TBI is simply formulated as follows:

$$TBI_j^i = \frac{x_j^i - m_j^i}{x_j^i + m_j^i} \quad (3)$$

where TBI^i_j denotes trade balance index of country *i* for product *j*; x^i_j and m^i_j represent exports and imports of group of products *j* by country *i*, respectively [7]. A country is referred to as "net-importer" in a specific group of product if the value of TBI is negative, and as "net-exporter" if the value of TBI is positive [14].

Lafay index		Trade Balance Index: TBI<0	Trade Balance Index: TBI>0
Czech Agrarian Foreign Trade Commodity Structure	LFI>0	Group B: Comparative Advantage Net-importer (LFI>0 and TBI<0)	Group A: Comparative Advantage Net-exporter (LFI>0 and TBI>0)
	LFI<0	Group D: Comparative disadvantage Net-importer (LFI<0 and TBI<0)	Group C: Comparative disadvantage Net-exporter (LFI<0 and TBI>0)

Fig. 1. Modified product mapping scheme

The figure 1 represents a matrix for the distribution of the entire set of exported products into 4 groups according to the two selected indicators (LFI and TBI). LFI index is chosen for "product mapping" approach because of its ability to take in

consideration only those transactions which are really related to individual countries' trade performance (in this case the Czech Republic's trade performance). The TBI index is applied for its ability to divide the products according to their real trade performance into above specified four quadrants. The chosen approach provides a possibility to specify the comparative advantages on the base of real bilateral trade performance (in relation to selected group of partners).

3 Results and discussion

Between 2001 and 2016, the value of the turnover of conducted transactions increased from about CZK 118 billion to about CZK 426 billion. During the monitored period, the balance was about CZK 20 billion. The negative balance of turnover decreased from about 17% to about 5%. The volume of agricultural exports increased from about 3.1 million tonnes to more than 16.1 million tonnes, while the value increased from CZK 49 billion to CZK 201.6 billion. Significantly higher dynamics were shown in import value growth, from CZK 69 billion to CZK 224 billion, while the volume of realized imports increased from only 3.1 million tons to 7.54 million tons. In the years 2001-2016, the Czech Republic exported approximately 191 million tons of agrarian and food products, while importing only 86 million tons. The Czech export price dropped by about 25% per kilogram, while the import price increased by about 30%. In the selected period, the negative growth rate of unit prices was recorded primarily for the following commodity aggregates: live animals, meat and edible offal, milk, dairy products and eggs, animal products, cereals, vegetable knitting materials and non-alcoholic beverages. Czech agrarian trade is characterized not only by its own commodity structure, but also by the territorial structure which is oriented towards specific groups of countries against which, the Czech agrarian trade as a whole, is uncompetitive. Nevertheless, the Czech Republic is able to derive comparative advantages at the bilateral level and at the level of specific commodity mix.

The value of the Czech agrarian export, or rather import in relation to EU28 countries increased from CZK 41 billion to CZK 186 billion, or rather from CZK 51 billion to CZK 189 billion between 2001 and 2015. The negative balance of mutual agro-trade was significantly closer to a "balanced" trade, with a negative trade balance falling from around 11% to 0.9% over those years. In contrast, in relation to third countries, the value of agrarian exports and imports between the referenced years increased from CZK 8.3 billion to CZK 16.9 billion, and from CZK 18 billion to CZK 32.6 billion. In the case of the EU-28 countries, as export partners of the Czech Republic, most of the values of exports is based on transactions with comparative advantages. Within the segment of aggregations that show the positive value of the LFI and the TBI index, it can be observed that the value of exports and imports grew from CZK 23 billion to CZK 124 billion and from CZK 12.6 billion to CZK 82 billion. The weakness of the Czech trade within this segment of goods is its export structure that is built on high volume items with low added value. The values, which are characterized by trade with third countries, are significantly lower and different in comparison with the EU28 countries.

In the case of developed countries, the comparative advantage is based on the different position of these items in the overall turnover compared to developing countries. Also, in relation to developing countries, in the last few years the Czech Republic had experienced significant changes in the area of value development and structure of the agrarian trade. This compared to developed countries, where trade is more oriented towards the Czech Republic. It is contradictory, that in relation to developing countries, the Czech Republic reached significantly better price ratios of export/import, than in the case of developed countries. Significant differences also exist in comparison of per kilogram prices of export and import between developed countries and developing countries with focus on a group of aggregates with the framework of segment A and segment D. In relation to the developed countries, the Czech Republic recorded an increase in exports of CZK 23 billion to CZK 109 billion, and an increase in imports from approximately CZK 14.7 billion to approximately CZK 70 billion. In the case of developing countries, the growth of export and import values was much less significant between the observed years from around CZK 7.3 billion to CZK 15.6 billion, respectively CZK 1.1 billion to CZK 7 billion.

In the case of agrarian trade, the share of European countries grew from 83% to 93% during the selected period. The share of CIS countries and other European countries were not negligible either. In relation to the CIS countries, export prices between the selected years increased from CZK 18 / kg to CZK 37 / kg and, for other European countries, from CZK 25.2 / kg to CZK 44 / kg. Import prices have shifted from CZK 18.6 / kg to CZK 30.2 / kg for CIS countries and from CZK 34.24 / kg to CZK 41.4 / kg for other European countries. The average per kilogram price of exports and imports within the category with comparative advantages increased from approx. CZK 21.8 to about 40 CZK and CZK 17 to CZK 30 respectively. This suggests that, the dynamics of export price growth differed from the average, and that the growth in export value was largely driven by unit price growth rather than by growth in the volume of traded goods in relation to the EU28 countries. Kilogram prices of exports and imports have undergone substantial shifts. The reduction is mainly due to the sanctions imposed by the Russian Federation on the European Union, or more precisely Czech exports to Russia.

The analyses shows a long-term deterioration of the coverage of the unit price of imports in the case of EU28 and OECD countries, but also in relation to developing countries. On the other hand, due to high dynamics of growth in export volume, it is possible to notice permanent improvement in case of coverage of volume of imports by volume of exports. A significant increase in the coverage of value of import by value of exports was recorded in the case of EU28 countries, OECD countries and developing countries. The same situation was also recorded in the case of coverage of volume of imports by volume of exports.

4 Conclusion

The Czech agrarian trade has experienced significant changes in the past years. However, the process of transformation of its territorial and commodity structure has not ended as of yet. The weakness of the Czech agrarian trade is its primary focus on only specific trade partners. This is caused by a number of the following. The Czech Republic is a member of the EU and it agrarian trade is therefore realized under the conditions of the Common trade policy of EU countries in addition to being under the condition of the Single market. Furthermore, the Czech Republic is a typical 'landlocked country' without the access to any large harbors or ports. And yet another reason is that the Czech agrarian trade suffers from its focus on the export of a relatively limited amount of high-volume items, which can be very difficult to export abroad due to its lower per unit price, limited values added and high transaction costs connected with long distances. In the monitored period, Czech agrarian exporting recorded a significant increase in its value and volume in both export and import, where the dynamics of growth in value and volume of exports exceeded the dynamics in growth of imports. Nonetheless, the Czech agrarian trade still suffers from a long term deficit when it comes to the realized value. This, however, does not apply in the case of export and import comparison, when the Czech agrarian trade is in a long-term surplus. The weakness, but at the same token, a comparative advantage of the Czech agrarian export, is its significantly low per kilogram prices, which allows the Czech republic to get through with its exports on many and especially then European countries markets. This situation, although positive on one hand, cannot be perceived as satisfactory due to the inability of the Czech Republic to focus on the exporting of products with a higher degree of processing and therefore a higher value added. This could be considered as a very serious problem, if we take into account, that a developed industrial country usually focuses mainly on export of least process or unprocessed products, which make up the backbone of its exports. If we wanted to understand the characteristics of the Czech agrarian trade and its comparative advantages in more detail, it is necessary to analyze it separately in relation to several different groups of countries. Firstly, it is necessary to analyze the Czech agrarian trade in relation to the EU28 vs. 'third countries'. Secondly, it is necessary to understand the relationship between 'developed countries' vs. 'developing countries'. In addition, it is necessary to focus our attention on trade within Europe and the relationship with former Soviet countries. In this regard, it is necessary to analyze the trade in relation to CIS countries, as well as other European countries not belonging to any association. In this regard, it is then possible to state that the commodity structure of the Czech agrarian trade is significantly different in relation to each group of countries individually. Furthermore, it is necessary to state that even comparative advantages are distributed differently among each of the analyzed segments. Last but not least, it is also necessary to state, that in relation to each individual groups of countries, the source of the comparative advantage is also different. In relation to primarily developed countries, particularly countries of the EU28, the comparative advantages mainly come from low price exports and a high volume of realized trade. In the case of developing countries and countries of CIS, the comparative advantages

come from products with higher values added and therefore with higher per kilogram prices. In general, it is possible to affirm that from the viewpoint of price levels and the degree of processing of exported agrarian and food production, the Czech Republic achieves better results in relation to countries outside the EU28, whereas in relation to EU countries, the Czech agrarian trade can still be marked as untapped. From the viewpoint of coverage of the value of imports by value of exports, the Czech agrarian trade is constantly improving and reaching for a state of balance. This state is being ensured mainly by the export of items with a lower degree of processing (HS01, HS02, HS04, HS05, HS10 a HS22), in which the Czech Republic reaches trade surplus, in the case of other aggregates (mainly including products with higher degree of processing), the Czech Republic has a long-term trade deficit. This situation points out the necessity for further a transformation of the Czech agrarian trade, so it could be brought closer to the standards typical for developed European countries.

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Digitalization of Society and e-Government

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Abstract. Governments are increasingly utilizing digital technologies to deliver advanced electronic and mobile services aimed at bringing benefits to all people. All sectors have seen an increase in the provision of such services, albeit to varying degrees. A major trend is the increase in mobile technologies and applications. It entails new development opportunities for the poorest and the most vulnerable, and it is driving initiatives to promote sustainable development and new ways of providing services. As is the case for other aspects of e-government, the major challenge for the future will be to bridge the digital divides between countries and people. This requires policies in the social and economic areas, mobilizing technologies and providing services to the poorest and most vulnerable; while ensuring adequate attention to environmental aspects. The right mix of technological features and the settings marketing strategy makes possible for government to have a strong place on the market. The management orientation to the IT segment will show meaningful further orientation, which would be included on site for ideal effectiveness for all users.

Keywords: Digital, e-Government, Informatization.

1 e-Government

Bureaucracy and the complicated way of communication of entrepreneurs with public authorities represent a major problem of business development in Slovakia. “In order to remove this obstacle, in 2013 became part of the law system of the Slovak Republic Act No. 305/2013 Coll. on the electronic form of exercising the powers of the public authorities and on the amendment and supplementation of some laws (the e-Government Act). [10]” The main objective of the legislator was to create a legal environment for the execution of power of public authorities by electronic means, thereby simplifying, speeding up, streamlining and unifying individual communication processes while removing the excessive fragmentation of the legislation in the whole range of existing legislation in the area of electronic public services towards entrepreneurs and public authorities towards each other. “This law codifies electronic communication as a major form of communication between business entities and public authorities, as well as communication within the public

authorities together with the historically basic but still decisive and inevitable classical paper form. The e-Government Act establishes the power of public authorities to exercise the power of a public authority and to communicate with entrepreneurs electronically. [2]"

eGovernment The concept of computerization (electronisation) of the company is closely related to the informatization of public administration, nowadays often referred to as eGovernment. 13 eGov.sk defines eGovernment as "an electronic form of public administration through information and communication technologies. eGovernment is the use of IT tools and tools (in particular the Internet) to improve public services for citizens, entrepreneurs and the whole society. [1]"

1.1 Methodology

The studied issue is insufficiently scientifically processed due to its specificity and uniqueness. "Despite the general absence of this issue, it is possible to mention a number of specialists who deal with this issue, including D. Gregušová, B. Susko and M. Chlipala. [17]" Several scientific articles have been used to process this article, for example electronic filing and delivery, electronic depreciation and output of information systems of public administration as part of informatization in conditions of the Slovak Republic, Electronic form of execution of powers of public authorities or some (selected) legal aspects of electronic signature in the Slovak Republic. "In addition, the authors were based on professional literary literature, especially in the field of economics and law, as it is a multidisciplinary issue. From the point of view of the applied scientific methods of exploration representing highly qualified human activity aimed at obtaining scientific knowledge, the method of analysis, abstraction, comparison and descriptions was applied mainly to the penetration from the phenomenon. [15]"

1.2 Forms of eGovernment

"The issue of eGovernment applies to all levels of government – from local to international. According to the communicating parties, we distinguish the following forms eGovernment:

- G2C (Government to Citizens) - Online communication between the public administration and citizens,
- G2B (Government to Businesses) - Public Administration Online Communication with the business sector,
- G2E (Government to Employees) - Online communication between the public administration and staff of institutions under public administration,
- G2G (Government to Governments) - Mutual on-line communication between institutions of public administration,
- G2A (Government to Administration) - Electronic Communication between public administration and administration,

– C2G (Citizens to Governments) - Online citizens' communication towards public authorities. [6]”

Throughout the process of restructuring the public administration, the right use of information technology to overcome barriers to access to citizens and help create new services more targeted and flexible manner than it is now. Information technology can assist in the implementation of the demands of citizens have unlimited and uninterrupted access to information and government services, which is a precondition for ensuring inclusive information society for all. “From this perspective have a crucial role in the effective provision of public services and also to improve cooperation between public administrations in different countries of the European Union to take the appropriate authorities. [3]”

1.3 Global trends

The online services component of the E-Government Development Index (EGDI) is a composite indicator measuring the use of ICT by governments to deliver public services at national level. It is based on a comprehensive survey of the online presence of all 193 United Nations Member States. The Survey assesses the technical features of national websites as well as e-government policies and strategies applied in general and by specific sectors for delivery of services. “The results are tabulated and presented as a set of standardized index values on a scale from zero to one, one corresponding to the highest rated online services and zero to the lowest. As with the EGDI itself, the index values are not intended as absolute measurements. [8]” Rather, they capture the online performance of countries relative to one another at a particular point in time. Because the index is a comparative tool, a high score is an indication of best current practice rather than perfection. Similarly a very low score, or a score that has not changed since the last edition in 2012, does not mean there has been no progress in e-government development. The distance between scores conveys the gap in online service delivery (2014 UN E-Government Survey).

Too many peoples own cell phones. And especial smart phones, and that’s the reason why should firms invest every year more money to increasing chance to accost a potential buyers. “Advertisement must be personalized with software applications and other IT possibilities. [14]“

1.4 Digital society

Share web pages are displayed on mobile devices is increasing, also increasing the number of users who are searching for products or services via their smartphones or tablets. This is evidenced by available statistics - one in six YouTube video is played in Slovakia for mobile and one in four search term in Slovakia is mobile. Website optimization for mobile devices are no longer an option but a necessity. “Companies that realize this will have an undoubted advantage in the future. It most likely be that firms which can do over the phone to optimize the purchasing process will lead to a much greater extent. [4]”

Some companies are more likely ignored video advertising into thinking that purchasing power population is less computer-savvy. That was indeed true until recently. However, overall informatics knowledge of the population has changed dramatically even with the advent of smartphones and tablets, which are equipped with Internet wireless and therefore more accessible to a wide range of the population. Marketers know the potential of Youtube ads for some time. Great price, huge hit key target groups, precise targeting and perfect measurability - all paying for video advertising on Youtube for example. In the US, increased ad spending in video advertising, according to data published emarketer.com year on year by 38.9%, digital video ad spending was in 2015 at $ 5.75 billion. While the United States should growth slow in recent years, in our period the increase is yet to come. “Although the video Slovak companies access with no unnecessary respect and use it especially strong brandy, really it is seen a gradual move towards their implementation. Being successful is liable to be largely anyone who can produce video content. [18]”

Marketing information system is an information system to support the marketing activities of the organization. Based on generally applicable definition, marketing information system "consists of people, equipment and procedures for the collection, classification, analysis and distribution of the required timely and accurate information to marketing decision. [5]”

2 Solutions for public administration

The expected increase in the availability and affordability of mobile devices, especially the ones with email capabilities, will drastically change the landscape of government services and related use of email and RSS. This change will be beneficial, especially in developing countries where the growth of these services in the social sector is expected to drastically accelerate as the affordability and availability of mobile devices increases. This not only will serve to bridge digital divide amongst regions as pertaining to the online services in social sectors, but will also contribute to sustainable development

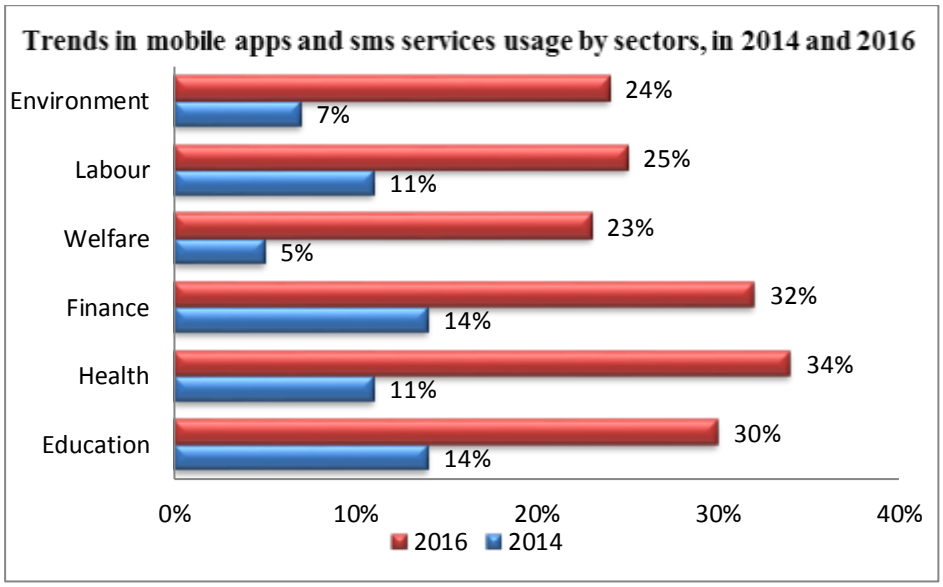

Fig.1. Mobile apps and SMS services between years 2014 and 2016 [12]

Mobile apps and SMS services show tremendous increases in almost all sectors. The highest growth in the mobile apps and SMS services was in the health sector, with an increase from 11 to 34% from 2014 to 2016, followed by the finance sector with an increase from 14 to 32%. Other sectors also experienced high levels of increase, respectively 7 to 24% for the environment, 14 to 30% for education, 8 to 23% for welfare, and 11 to 25% for labour. Figure 4.10 provides an overall picture of mobile services by sector for 2016. Updates via email or RSS experienced the highest number across the sectors as compared to mobile apps or SMS services. Mobile apps and SMS services have both been increasing in the last two years (Figure 1 and Figure 2), and the gap between the two online services is narrowing. However, the difference is still high in education (30 countries), finance (23 countries), welfare (22 countries), environment (22 countries), and labour (13 countries) [11].

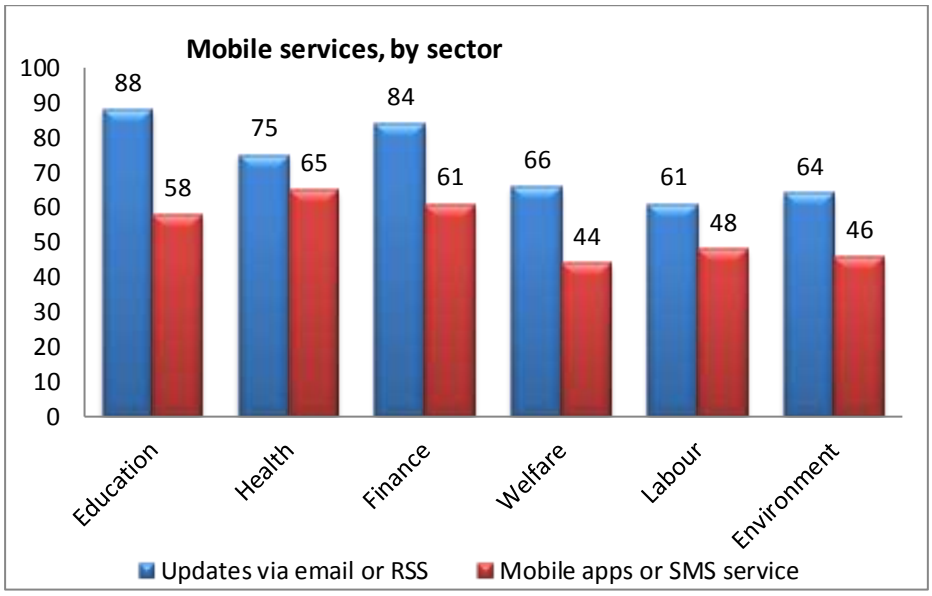

Fig.1. Mobile apps and SMS services between years 2014 and 2016 [12]

The 2016 Survey highlights two important phenomena. First, the social sectors such as health and education experienced an increase, which represents a strong commitment from governments around the world to utilize technology for the benefits of all and in support of sustainable development. "Second, given the trends highlighted by the 2014 and 2016 Surveys, it is expected that increases will occur in both services – updates via both email/RSS and mobile apps/SMS services – across sectors. Such increases will be determined by the availability and affordability of mobile devices. [7]"

2.1 Software solutions

Linux is highly flexible software solution due to its flexibility as well as stability and security. It is significant that became the foundation of the IT infrastructure of many commercial companies and institutions. In recent times various events show that Linux and open source technologies also have their place in government and even in many developed countries. Security of information systems and their level is extremely important indicator and is given directly to the man who created it, use and take care of it. This level is influenced by many factors such as: the overall quality of the information system, errors made in the development of the system and can create conditions for the emergence of other errors, inappropriate and insufficient care information system, sloppiness, irresponsible attitude and superficiality in the system operation, considerable influence external but also the internal temperature, unauthorized use of the system can attack the system, malicious data flows in the system, accepting data from illegitimate sources, preventive conservation, control,

and implementation of corrective measures to raise security levels. System security, however, degrades in proportion to the use of the system. “The main idea of Linux is that it is a software solution that is completely free, as is its development is an open source system. Cost savings on such a large environment like the government is a remarkable value that could involve substantial way to relieve the state budget. [12]”

3 Public administration research

The unequal management structures significantly exhaust the funds for the salaries of public servants, thus affecting the frequency and conditions of ordinary employees. They are not capable of being effective. Moreover, as the funds absorb some unnecessary features of their executives. “Addressing the problem of communication and a more effective early warning system would reduce the level of government. Due to the restructuring process, it would be very challenging, but in the short term it would lead to an improvement in public administration. [13]”

Digitization would be an important element in this respect as it simplifies the work of the employees and, at the same time, the development of the state administration should be offset by the tendency of reducing the administrative burden. This would lead to a reduction in the number of employees, but human capital could be relocated to sectors with a lack of manpower. Expenditure on the state would represent expenditure on staff re-qualification in this respect.

3.1 Basis of public administration management solutions

In addition to the development of infrastructure and Internet access, the improvement of basic services targeted at vulnerable groups have led to more inclusive public services at national level and contributed to the effort to overcome the digital divide. The digital gap generally persists between nations and regions and between men and women, younger and older generations, educated and less educated people and people of different population groups.

Also in developing countries, the need for understanding as important factors enables the sustainable development and prosperity of society even in less developed regions. “Connectivity and infrastructure development provide broad public access to state incentives for a broad mass of the population through mobile devices. [9]”

4 Conclusion

Bridging the digital divide between countries and people is a key objective of the international community. It requires international cooperation and support. It also requires mobilizing the public and private sectors and societies at large to develop the kind of devices, applications, technologies, and safeguards that can enable and mobilize ICT for addressing poverty, illiteracy, and disease. Progress has to be

accompanied by policies to equip people to use online and mobile services, and develop the necessary enabling environment and safeguards.

Several types of online transaction services have increased. Transaction services related to funds, personal accounts and public service payments a linear process, re-affirming the commitment of countries to increase public engagement online services, as well as improving the transparency of public finances. Improvement the business environment remained a priority for the 2014-2016 period with 37 countries introduction of online registration. However, the number request registration and licenses remain at a low level, while privacy and security concerns have blocked the efforts of countries to accept online requests in full.

"Accessibility of information has increased in the areas of education, health, finance, welfare, labor and the environment. Information about the environment and mobile apps and SMS services recorded the highest increase. [16]"

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Analysis of the Value Creation Model in Selected Sectors

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Abstract. The subject of the article is the analysis of the value creation model (hereinafter referred to as the VCM) in selected sectors of the Czech economy, namely in engineering, transport and the food industry. The aim of the article is to determine the stability of the value creation model in selected sectors over time, i.e. whether the model shows the same explanatory power in different years as in the year in which it was created. The research is based on models the authors created for each sector in 2015 and identifies the explanatory power of these models from 2012 to 2014 based on samples of the respective companies. Thanks to the VCM model being developed and tested along with the EVA indicator, the results of the model from other years under review are equally compared with the EVA results. It turns out that the model is stable in the food industry, i.e. it achieves comparable results in the years 2012 - 2014 as in 2015, while in the engineering sector it was necessary to modify the model significantly (similarly in transport). It turns out that it is appropriate to specialize complex indices capable of evaluating the performance of companies not only by industry, i.e. the indices are not universal but also in time, that the indices need not be stable (static), but may need to be dynamized.

Keywords: Value Creation Model, EVA Ratio, Performance, Food Industry, Transport Industry, Engineering.

1 Introduction

The subject of the article is the analysis of the value creation model in selected sectors of the Czech economy, namely in engineering, transport and the food industry. The aim of the article is to determine the stability of the value creation model in selected sectors over time, i.e. whether the model shows the same explanatory power in different years as in the year in which it was created. Aggregate business evaluation models are mostly universal—they are intended for cross-sectoral use, and static—as they are used unchanged over the years and are modified from time to time at best. Our research has shown that it is appropriate to modify (adapt) our VCM model based on industry. The question arises whether this model needs to be modified also in different years. The question is answered in this article.

There are a number of concepts and definitions of value [0], depending on the point of view of value, including the place, time and purpose of its definition [0]. In

our research we focus on value from the point of view of a company, or the financial value of a company as defined by Möller and Törrönen [0], as in monetary units perceived value for a set of economic, technical and other benefits received by the customer in exchange for the price paid for the product offered [0]. In the research, we are interested in the value a company has created in terms of customer payment for the product. This makes it possible to use the financial (accounting) concept, which identifies value as the value of a company's wealth (assets) [0]. There payments are relic of past events, so our concept of value is based on the transaction approach typical of the accounting concept of the value [0]. The accounting concept of value depends on the historical prices recorded through payments / transactions, and these are best traceable in the financial statements that we have chosen to base on. On the other hand, the market value, which includes non-accounting factors such as intellectual capital, is based on the capital market [0], which is not very developed in the Czech Republic.

The accounting concept of value can also be linked to the shareholder value through accounting or measurement based on accounting data [0]. With this in mind, value creation can be focused on the shareholder value and, when assessing it, financial indicators including an EVA indicator based on accounting data can be used. Thus, the EVA indicator is constructed in our research from the ROE indicator (EVA equity) [0].

This synthetic EVA indicator is largely based directly on the evaluation of the ratios. Because the research is based on accounting data of Czech companies and therefore we use Czech accounting standards, there were took over the widely used method of the Ministry of Industry aand Trade to calculate the EVA indicator. It allows calculation without further adjustments of financial statemenst [80]. We have put another synthetic indicator against this indicator composed directly of ratios, also based on accounting data, which would then allow us to directly identify the financial value-drivers in the accounting records of the respective businesses. This approach was chosen, for example, by the Neumaiers [0] who, unlike us, designed one universal indicator for all sectors with irregular modifications every few years.

2 Methodology

First, the EVA indicator was constructed on the basis of accounting data from the publicly available financial statements of the companies surveyed, followed by the VCM model. Based on the EVA ratios, companies were divided (within the industry) into value-generating and value-destroying businesses and subsequently their agreement with the VCM model was identified. All of this was conducted in the examined years 2012 – 2014. In the event of the disagreement of the division by the EVA and the VCM, the VCM model was subsequently modified to increase its explanatory power, i.e. to approximate the division of businesses according to the EVA indicator.

VCM models were developed using the LOGIT logistic regression method. Normality is a prerequisite for logistic regression modeling. In our models this

prerequisite is fulfilled by taking data from a base set, not from a data selection [0]. Hendl [5] furthermore adds that it is also essential that both possibilities were adequately represented in the data.

First, the EVA indicator [0] separated (eliminated) companies with an unclear economy, i.e. those where ROE was positive and EVA negative, and subsequently companies were divided into value-generating (EVA>0) and value-destroying (EVA<0). Next, a profile analysis was carried out for all companies and financial indicators with the respective weights being obtained by subsequent financial regression, forming a model within the respective sector in 2015. The results obtained were statistically significant at the level of significance p <0.05, the value of the chi-quadrate was verified and the possible colinearity of the variables in the model was excluded. For each of the three sectors, a separate model was designed.

$$VCM\ (Transportation) = \frac{1}{1+e^{-(0.865+1.551*F_1+2.012*F_2+0.0002*F_3+0.0002*F_4)}} \qquad (1)$$

Where: F_1 is interest coverage,
F_2 is total indebtedness,
F_3 is net working capital,
F_4 is EBIT.

$$VCM\ (Food\ Industry) = \frac{1}{1+e^{-(2.951+0.233*F_1-5.981*F_2-1.247*F_3-0.031*F_4+23.19*F_5+0.14*F_6)}} \qquad (2)$$

Where:
F_1 is normal liquidity,
F_2 is the share of own funds,
F_3 is ROS,
F_4 is the turnover of assets,
F_5 is ROA,
F_6 is net profit margin.

$$VCM\ (Engeneering) = \frac{1}{1+e^{-(3.599-3.75*F_1+4.059*F_2+48.632*F_3+0.127*F_4)}} \qquad (3)$$

Where:
F_1 is the cost,
F_2 is interest coverage,
F_3 is ROS,
F_4 is the turnover of equity.

In order to verify the applicability of the above models in the years 2012 – 2014, calculations of individual models were made using the financial data of the companies surveyed from the respective years. The first step was to obtain the relevant data via the Magnusweb database. This data was further processed and the value of the necessary indicators for the construction of VCM models and the value of the EVA indicator were calculated. Subsequently, the companies were again divided into

value-generating and value-destroying according to the EVA indicator and the agreement with the division of companies according to the VCM model in individual years and sectors surveyed was compared.

In case of the low explanatory power of a VCM model, a new model has been designed to increase the accuracy of its explanatory power based on the procedure outlined in the first part of this chapter. Thus, the financial indicators were re-evaluated, the new VCM model was designed and its (higher) explanatory power was verified by comparing it with the results achieved according to the EVA indicator.

2.1 Characteristics of Research Samples

Company data from the engineering, transport and food industries for 2012, 2013 and 2014 was obtained via the Magnusweb software. Due to the fact that the research builds on our previous research on value creation modeling (VCM model construction for 2015), we searched for data in the same industries that were used in the previous research; thanks to this, we have a predominant proportion of companies in the sample identical to those used in the previous research, and due to the same focus (the same companies in the same industry), the results are also comparable over time.

Table 1. Number of companies per sector in the years under review.

	2012	2013	2014	Total
Transport	811	850	807	2468
Engineering	926	942	957	2825
Food	839	861	884	2584
Total	2576	2653	2648	

3 Results

This section provides the results of the VCM evaluation for each industry and each year. Due to the lack of the high explanatory power of the model for the engineering sector in the years 2012 – 2014, a new model with a higher level of explanatory power was developed according to the methodology described in the previous chapter.

3.1 Transport Industry (CZ NACE H 49)

According to the above methodology, we calculated the value of the indicator and the EVA for each company and divided the companies into groups according to whether the EVA ratio is positive or negative; see Table 2. It is clear from the results that the breakdown of companies is fairly even and comparable in the individual years examined.

Second, the value of the VCM model was calculated. Table 3 summarizes the results of our calculations. There are always three categories of businesses in the first column. The first line shows companies that create value through their activity. The second line shows companies where it cannot be determined precisely whether the value is created or destroyed, and the conclusion could be misleading; therefore, they are referred to as gray zone businesses. The third group is then formed by businesses that destroy value.

Table 2. EVA ratio in the years under review

EVA value	absolute	relative
Year 2012		
Positive	446	54.9%
Negative	365	45.1%
Year 2013		
Positive	465	54.7%
Negative	385	45.3%
Year 2014		
Positive	441	54.6%
Negative	366	45.6%

Because it is a linear regression model, the values are calculated using the VCM model in the range from zero to one. The specific limits of each group of businesses in the second column of Table 3 are based on value creation. The third column of the table shows the frequency of businesses in all three groups. The fourth column of the table shows the percentage of the representation of businesses in the whole sample in the year and sector. The last column of the table shows the percentage of agreement between our model and the EVA indicator. In this case, according to our model, 674 companies are marked as value-generating and the EVA model identifies 52.57% out of these 674 businesses (354 businesses) as value-generating.

Table 3.1 The results of the model in the years 2012 and 2013

TRANSPORT 2012	VCM values	Number of businesses	% sample	Agreement
area of value-creating businesses	> 0.789	674	84.25 %	52.57 %
area of gray-zone businesses	Between	59	7.38 %	Not detected
area of value-destroying businesses	< 0.167	64	8.38 %	58.21 %
TRANSPORT 2013				
area of value- creating businesses	> 0.789	771	85.57 %	57.10 %
area of gray-zone businesses	Between	70	7.77%	Not detected
area of value-destroying businesses	< 0.167	60	6.66%	56.79 %

Table 3.2 The results of the model in the year 2014

TRANSPORT 2014				
area of value-creating businesses	> 0.789	673	84.65 %	57.40 %
area of gray-zone businesses	Between	61	7.67 %	Not detected
area of value-destroying businesses	< 0.167	61	7.67 %	60.19 %

Even though there is a strong agreement between the VCM and the EVA at first glance, the explanatory power of this model was weak in all three years. According to the results, it can be deduced that it was mainly due to the setting of its limits. These were too soft for assessment (few companies were evaluated negatively by the model compared to the EVA indicator), thus causing a disproportionate increase in the number of businesses identified by the model as value-generating. This can be explained by the fact that in 2015, based on whose data the model was created, the value-generating businesses were worse, therefore the limits were set higher than appropriate for previous years. This can be documented by the EVA average values of this industry, which declined year-on-year from CZK 3,013,685 in 2012 to CZK -14,021,767 in 2015.

Therefore, how to set limits for each year needs to be considered. An ideal, but intricately feasible way is to create an algorithm for automatic limit adjustment based on the years and average industry performance, i.e. the dynamization of this static model. Then, it would be necessary to find the factors that changed over the years, by

how much they have changed and how (how much) they affected the financial indicators contained by the VCM model.

3.2 Engineering, the Original Model (CZ NACE C 27, C 28)

In engineering, EVA indicators were first calculated as well. There is a clear trend showing that a higher percentage of businesses generate value, and thus that the state of engineering is improving. This is, however, somewhat in contrast with the average value of the EVA indicator in the industry, which continuously declined year-on-year from CZK 4,102,168 in 2012 to CZK 2,488,235.5 in 2015.

Table 4. EVA ratio in the years under review

EVA value	absolute	relative
Year 2012		
Positive	512	55.3%
Negative	414	44.7%
Year 2013		
Positive	560	59.5%
Negative	382	40.5%
Year 2014		
Positive	601	62.8%
Negative	356	37.2%

As the following table shows, the 2015 engineering model turned out poorly (in terms of its low explanatory power) in 2012 – 2014 and, therefore, we decided to create a new model that should have a better ability to discriminate between businesses over the period under review.

Table 5. The results of the model in the years under review

Engineering 2012	VCM values	Number of businesses	% sample	Agreement
area of value-generating businesses	<0.248	93	10.04 %	55.91%
area of gray-zone businesses	Between	0	0.00%	Not detected
area of value-destroying businesses	> 0.502	833	89.96 %	54.52 %
Engineering 2013				
area of value-generating	<0.248	82	8.70%	74.83%

businesses				
area of gray-zone businesses	Between	0	0.00%	Not detected
area of value-destroying businesses	> 0.502	860	91.30 %	62.67 %
Engineering 2014				
area of value-generating businesses	<0.248	59	6.17%	67.71%
area of gray-zone businesses	Between	0	0.00%	Not detected
area of value-destroying businesses	> 0.502	897	93.83 %	64.54 %

3.3 Engineering, the New Model (CZ NACE C 27, C 28)

The financial data for 2015 and 2014 were used to create the model, and we proceeded in the same way (profile analysis, logistic regression, testing) when designing it as in the previous research (when constructing the original VCM models).

$$VCM = \frac{1}{1+e^{-(-167{,}59+10*F1+0{,}4163*F2+110{,}044*F3+79{,}217*F4+59{,}032*f5-9{,}127*f6-59{,}005*F7}}$$

(4)

F1 is Share of own resources
F2 is NWC/Debt sources
F3 is Total indebtedness
F4 is ROS
F5 is Index FL
F6 is ROA
F7 is Debt ratio

As the formula shows, the new model has been enlarged by three financial indicators, which should ensure improved accuracy over a longer period. At the same time, the structure of the financial indicators of the model changed completely (only the ROS indicator remained).

Table 6. The results of the model in the years under review

Engineering 2012	VCM values	Number of businesses	% sample	Agreement
area of value- creating businesses	>0.985	421	45.47 %	77.19%
area of gray-zone	Between	229	29.81	Not detected

businesses			%	
area of value-destroying businesses	> 0.816	276	24.73 %	73.92%
Engineering 2013				
area of value- creating businesses	>0.985	435	46.18 %	80.01%
area of gray-zone businesses	Between	213	22.46 %	Not detected
area of value-destroying businesses	> 0.816	294	31.12 %	74.83%
Engineering 2014				
area of value- creating businesses	>0.985	510	55.07 %	78.43%
area of gray-zone businesses	Between	241	24.92 %	Not detected
area of value-destroying businesses	> 0.816	206	20.01 %	74.61%

The new model is much more suited for the years examined and achieves an accuracy close to 80%. Moreover, it is able to achieve this value throughout the period. However, it is clear that the gray zone is extensive in this model. The question becomes why the gray zone is not similarly large in other models as well. This is probably due to large differences between engineering companies, which is caused by the inclusion of two groups of companies (the manufacturing of electrical equipment – C27 and the manufacturing of machinery and equipment – C28) with significant differences in the average value of the EVA indicator (e.g. in 2015, the value of the indicator for C27 is CZK 5,484,624 and for C28 CZK -508,153). The model is then not able to classify businesses exactly into categories. Further, we can see the higher rigidity of the VCM model compared to the EVA indicator. However, this may not be bad because a large part of businesses determined by EVA as value-generating fall in the case of the VCM model into the gray zone.

3.4 Food Industry (CZ NACE C 10, C 11)

There is a trend regarding the improvement of the surveyed businesses also in the food sector, where 48% of EVA positive businesses observed in 2012 increased to 57% in 2014. In this case, the average value of the indicator only declined from 2012 (from CZK 3,258,000.5) to 2014 (to CZK -2,089,074.5), with an increase to CZK -1,190,751.5 in 2015. In this respect, the food industry is somewhat apart from the other two sectors.

Table 7. EVA ratio in the years under review

EVA value	absolute	relative
Year 2012		
Positive	402	47.92%
Negative	437	52.08
Year 2013		
Positive	453	52.01%
Negative	418	47.99%
Year 2014		
Positive	500	56.56%
Negative	384	43.44%

Also, the food industry model identified a positive trend in the surveyed companies, with the share of generating businesses growing and destroying businesses declining. The gray zone share stagnated.

Table 8. The results of the model in the years under review

Food industry 2012	VCM values	Number of businesses	% sample	Agreement
area of value- creating businesses	> 0.912	257	31.23 %	82.88%
area of gray-zone businesses	Between	141	17.13 %	Not detected
area of value-destroying businesses	< 0.818	425	51.64 %	76.23 %
Food industry 2013				
area of value- creating businesses	> 0.912	311	36.12 %	83.92%
area of gray-zone businesses	Between	138	16.03 %	Not detected
area of value-destroying businesses	< 0.818	412	47.85 %	74.17 %
Food industry 2014				
area of value- creating businesses	> 0.912	356	40.59 %	85.112%
area of gray-zone businesses	Between	163	18.59 %	Not detected
area of value-destroying businesses	< 0.818	358	40.82 %	74.52 %

The food industry model seems to be the most valuable model. It is based on data from 2015, but maintains a high accuracy of up to 85% over the period under review. This model leads us to consider whether the aspect of changes in the sector or the susceptibility of the sector to cyclicality is important for modeling. This reflection should be developed through further research, especially in the context of the different sectoral development indicated by the renewed increase in the average value of the EVA indicator.

4 Discussion

The results confirm the need to construct different synthetic models for different industries. Although the variants of the VCM model are similar, they are not the same and do not work with the same indicators. It can be deduced that the more diverse the industries are, the more suitable it is to construct separate synthetic indicators, or variants.

It also appears that in some cases (food, and to some extent the transport industry) it is possible to use the same model in different years without losing its explanatory power. In contrast, in some industries (here, engineering) it is appropriate and necessary to construct a separate variant of the model in order to maintain the high explanatory power of the model.

The cause of these results could be the dynamics of changes taking place in the sector, or the environment in which the business operates and their direction and impact on the internal functioning of these businesses, which are subsequently reflected in financial indicators and in the ability to generate value. In this respect, there seems to have been radical changes in engineering during the period under review, which were fully demonstrated in the industry and businesses in 2015. The years 2012 – 2014 could be identified as relatively quiet in this sector at first glance as the new VCM constructed from the values of 2014 and 2015 achieved a very good level of explanatory power.

Nevertheless, 2012 – 2014 were not stable in terms of the evolution of the EVA indicator. This is evident in the development of the EVA indicator, whose average value in engineering in 2012 – 2015 continued to decline (the relative drop of the indicator was almost by 40%). However, the value of the EVA indicator declined steadily and the dynamics of the change tended to decline. It can be deduced from this that the level of change is important for the explanatory power of the VCM model, while a relatively high degree of change that causes the decline in the explanatory power of the VCM model needs to be reflected in its construction. It is insignificant whether the change has taken place quickly or gradually; the essential aspect is that it has gone beyond the limit after which the VCM model needs to be modified.

But the question becomes how to determine this limit? It is obvious that changes must be reflected in altering the financial indicators used in the VCM model. But once more, the question arises as to how to identify which factors and the extent of their effect on the financial indicators (parameters).

The problem of the trend can be illustrated by the food industry, which declined significantly between 2012 and 2014 according to the EVA average values, but increased again in 2015. This was probably the cause (including the stability of the financial value-generating indicators – see below) of the solid explanatory power of the VCM model in years under review other than 2015.

Another problem is that the original and the new VCM model for engineering differs significantly both in terms of the number of financial indicators (originally 4 indicators, newly 7 indicators) and the structure (in both models there is only one common ROS indicator). In this case, the modification of the model is not only about modifying the parameters, but basically constructing a new VCM model. Again, however, the question arises as to how to determine that it is time to change the model, i.e. how to detect that some of the current financial indicators in the VCM model wrongly reflect value creation, or that the focus of the value creation has transferred elsewhere?

Unlike in the engineering sector, there was a much more radical decrease in the average value of EVA in the transport sector. Still, the model designed for 2015 was also usable (albeit in a limited way) for the other years surveyed. It seems that in this case, the financial indicators identifying value creation remained the same (as in the food industry) and only the change of the limits or parameters of the VCM model can be considered.

5 Conclusion

The results clearly show that if it proved effective to construct different VCM models within each sector, there is no such agreement in the case of a time-on-time change. Research shows that there are sectors for which it is not necessary to recalculate the results in the short term (annually), or to always construct new VCM models (the food industry). Similarly, there are sectors for which it is necessary (engineering). Finally, there are also sectors for which it is not necessary;, however, the explanatory power of the model is so low that it would be advisable to at least consider it.

The problem seems to consist of the stability of the sector's environment in relation to the financial indicators that enter into the VCM in each sector. It is possible to hypothesize that the higher stability of the environment, i.e. the fewer factors affect the relevant financial indicators of the VCM model, the more stable the model is over time and does not need to be changed or modified.

From this point of view, engineering seems to be a more dynamic sector than transport, whereas the latter seems more dynamic than the food industry. Interestingly, the results of the VCM model (calculated from data for 2015) for engineering show that the performance of businesses in 2012-2014 was higher than in 2015 (the same can be said about the transport industry).

In further research, it would be appropriate to consider which factors affect the financial indicators of the models and how and how much they affect the financial indicators of the VCM models. The related question is how the weights of the individual parameters (financial indicators) – value holders can be made dynamic.

There is a possibility to examine the industry as a whole and the average values of the financial indicators, or to examine the values of the entire economy, led by factors such as GDP, inflation and others, and to estimate their impact on the financial indicators used in the model. Last but not least, it will be necessary to examine whether there are universal indicators indicating value creation, whether these indicators change, how they change and why.

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Verification of Strategic Management Process Model in SME into Practice

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Abstract. Implementing the principles of strategic management into business processes improve decision-making, reduce cost, increase productivity and overall performance of business. Nevertheless, this area is in practice deeply underestimated, especially in small and medium-sized entrepreneurship, in which strategic management is often confused with operational and tactical management. The main goal of paper is to verify the validity of strategic management process model in small and medium-sized entrepreneurship into practice. The model derives from previous research activities that identify strengths and weaknesses in strategic management process of SMEs and optimizes the whole process. The model is simulated on the example of selected SME based on restrictive criteria. The main research methods used in this paper are case study, personal interviewing, financial analyzing, modelling and simulating. The simulation of proposed model into practice verified its validity into practice and showed that its implementing into business could optimize and improve the whole processes and explored the area in small and medium-sized entrepreneurship.

Keywords: Strategic Management, Simulation, Modelling, Case Atudy, Small and Medium-sized Entrepreneurship.

1 Introduction

Implementing the principles of strategic management is considered to be a decisive factor in long-term business success. It helps to long-term strategic development, improve overall effectiveness, productivity, cost efficiency, and other related to them. Despite of the importance of strategic management for strategic business development, this area is in practice is deeply underestimated and is often confused with operational and tactical management, especially in the area of small and medium-sized entrepreneurship. These findings may cause an impossibility to be in long-term developed. Srpová, Řehoř et al. [10] also highlight that in small-sized enterprises, operational management usually prevails over the strategic one, while oral communication prevails over the written one. Work is distributed among staff somewhat spontaneously; any decision is normally based on the current mood of the entrepreneur or manager. North and Varvakis [8] stated the manifold effect of low productivity among SMEs that makes it impossible for them to expand. Low

productivity does not only lead to loss of the home market due to foreign competitiveness but also reduces the possibilities of integration in international value chains. The resulting fragility of SMEs reduces their innovation capabilities and options for upgrading production, which again results in low productivity. According to Durgulu et al. [4], SMEs are increasingly compelled to develop strategies to increase their effectiveness and sustainability, in order to gain financial and performance goals. According to Šebestová and Nováková [9], we can distinguish companies (including both SMEs and big firms) in terms of business strategy development into three categories: *(1) Companies that have a well-planned and detailed written primary strategic document (business plan); (2) Companies that have a strategic document drawn up in some written but concise form, with insufficient details in all important chapters; (3) Companies that have no written strategic document; it is never clear if the strategy is kept in the mind of top management, some parts are the subject of company culture or do not exist at all.* According to research [6], the majority of examined Czech small and medium-sized enterprises (60%) had a formulated strategy. Otherwise, the research of author [13] focused on importance of strategy and strategic management for SME found out only 47 % of SMEs formulated any strategy of which only 27.5% formulated the strategy in written form. Based on identified strengths and weaknesses of SMEs in process of strategic management, the process model of strategic management in SME optimizing the whole process has been proposed. The main purpose of this paper is to verify a validation of this proposed process model in practice by simulating on an example of selected enterprise fulfilling set criteria.

2 Theoretical Framework

According to Zich [16], strategic continuity of level of goals has several important aspects. First and foremost, goals must be clearly stated to be achieved. Defining goals must be based on the overall imagination of the development of company. It could be generally considered that there is a link to the vision and mission, which would, however, in most cases mean the owner's point of view. The requirement for development should also take into account the element of the time frame. Although it is already contained in each essence of management, in the context of the strategy, it nonetheless requires special attention. This stems from the fact that the goals, which will be the main elements of the strategy, should cover all key activities and all levels of the company.

Strategy in SME is defined as a set of [2]: planned activities being carried out to achieve stated objectives, resources and capabilities being deployed to action strategic decisions, market being entered, explored and learned from, competitor being engaged and benchmarked, environments providing signals filtered through personal and entrepreneurial networks. Critical factors in SME strategies in the form of a model are the following [11]: *Entrepreneurial management behaviour – opportunity identification, resource leveraging, networking, effectual decision-making, creativity and innovation; Knowledge/technical skills – product/service knowledge,*

market/industry understanding, IP knowledge; Personal attributes – innovative, determined, external focus, team leader; Strategic management competencies – marketing, finance, human relations; Critical internal factors – motivations; Critical external factors – market sector, barriers to entry, adjustments.

Strategic management can be defined as an art and science formulating, implementing and evaluating cross-functional decisions that enable an organization to achieve its objectives. It has been discussed that the dominant paradigm in strategic management is a model characterized by two functions: strategy formulation and implementation [7, 1]. Strategic management consists of research, review, assessment and selection efforts required for planning strategies; putting into action any kind of precautions within the organization in order for these strategies to be implemented and all activities related with controlling the works performed [5]. There are many benefits in adapting strategic management in SME [3, 1]: it helps strategists to understand the current situation of the enterprise and have a clear sense of vision and mission; it enables managers to assess the strengths and weaknesses and focus on what is strategically important; it helps to establish proper goals and prepare the means to achieve them; it allows an enterprise to be more proactive than reactive and to be ready to face any controlled and uncontrolled issues and situations. Some SMEs still avoid using strategic management. The reasons are the following [3, 1]: *lack of knowledge of strategic management techniques, lack of time and/or inability to plan; SME managers may be unaware of the importance of strategic management for their business; the lack of information and knowledge about strategic planning and its advantages will lead to an inability to establish a strategic management system within their enterprises; lack of attention paid to financial indicators such as cash flow; lack of necessary managerial skills; excessive involvement in daily and routine operations; anxiety about the uncertain future; low number of employees or poor management information system, i.e. ineffective data recording systems.*

3 Materials and Methods

The purpose of this paper is to verify the proposed process model of strategic management in small and medium-sized entrepreneurship into practice with a help pf model simulation on the example of selected enterprise. This model derives from the previous research activities exploring the quality and importance of strategic management for strategic development among selected research sample of SMEs [12, 14]. This research also identified the determinants of strategic development [12]. These determinants are distinguished into three main categories: **general aspects of strategic managemen**t (mission and vision, situational analysis, corporate strategy formulation, strategy implementation, strategy control), **internal factors of strategic development** (corporate culture, quality of management, marketing strategy and management, financial strategy and management, human resources strategy and management, production strategy and production policy, competitive advantage, flexibility, innovation ability, financial condition) and **external factors of strategic development** (orientation in industry, ability to work with legislation, negotiation

with customers, negotiation with suppliers, struggle with competition). Focusing on these determinants could support more effective application of strategic management in SME and further strategic development of SME. Based on determinants for strategic development in SME, the process model of strategic development in SME has been proposed and after that verified and simulated in practice [12, 14].

The main aim of this process model of strategic management in SME is to identify the strengths and weaknesses identified in strategic management process in small and medium-sized entrepreneurship that optimizes the whole process and support strategic and competitive position of SME on the market. The main research methods are the analysis of internal documents, the method of personal interviewing, case study and modelling and simulating. The case study points out the main strengths and weaknesses of the enterprises in strategic management and other aspects of strategic development. Based on the findings of case study, the determinants of optimal strategic development have been demonstrated in practice. Simultaneously, the main benefits and shortcomings in process of strategic management have been identified The main purpose of this simulated model is to prevent from the most common shortcomings in strategic development and provide a recipe and recommendations for the long-term business success for the selected company and other SMEs.

Simulation of this model is realized in the form of case study, for which the selected enterprise fulfilling the following criteria has been analysed: **enterprises belonging to SMEs** (i.e. enterprises with 1 to 249 employees), **scope of business**: according to CZ-NACE Section F (Building industry), **headquarters:** in the Czech Republic in South Moravian Region, **legal form of enterprise**: joint-stock company. This enterprise is indicated as enterprise A under the promise of its anonymity. The criteria for the selection of this enterprise are the same as in the previous research [13].

4 Results and Discussion

This chapter is divided into two main parts – description of process model in SME as a result of previous research activities [12, 14] and the further simulation of this model on the selected agricultural company. This model verifies its practical application and functionality and highlights the main benefits and shortcomings in the process of creating and implementing the strategy of selected enterprises. The process strategy model simulation compares theoretical knowledge about processing of strategy and strategic management in SME, theoretical identification of determinants of strategic development in SME and practical usage and its functionality in business practice (mainly using the experience and opinions of owner-managers of SME).

4.1 Proposal of Process Model of Strategic Management in SME

The previous research activities helped to propose process model of strategic development in SME respecting identified determinants for strategic development

[12]. This model (see figure 1) is consequently specialized and adopted to the results of research realized among representative research sample of SME [15].

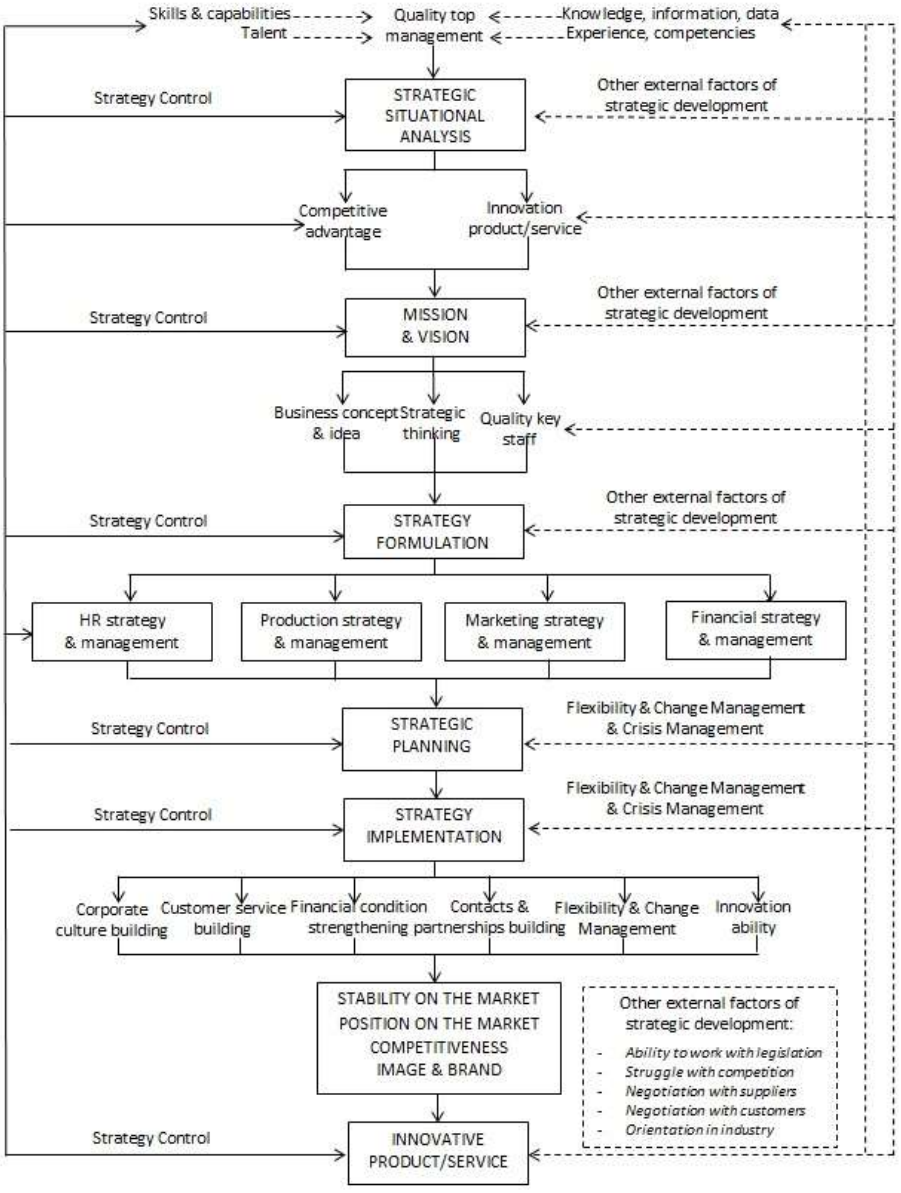

Fig. 1. Process Model of Strategic Management in SME [15].

This model identifies problematic areas (weaknesses) and highlights strong areas (strengths) to prevent from threats and to use future opportunities for other strategic

development. The main shortcomings of SMEs in strategic management process are based on the matter of fact only minority of them formulated any corporate strategy and functional strategies are underestimated and determinants and key elements of strategic development are not considered as equally important. Situational analysis is not considered as important including defining mission and vision, strategy control is underestimated as well. Flexibility, change management and crisis management practically do not exist in strategic management process among selected SMEs. External factors of strategic development are not taken account for other strategic decision-makings, especially orientation in industry and negotiation with customers. We can conclude in practice SMEs do not use comprehensive insight on implementing principles of strategic management and practically no strategic approach to the strategic management process is implemented. The findings might be a reason for impossibility of strategic development in SME. On the other hand, the SMEs are aware of importance of strategy formulation and implementation together with strategic thinking and strategic planning. The other determinants, such as quality of management, corporate culture, financial condition, competitive advantage and innovation ability, are considered as very important for other strategic development. Despite of this fact, SMEs do not know how to optimize the whole process of strategic management for other strategic development. The possible solution could be a proposed process model of strategic management in SME that is described as following. The main path respects the basic steps of strategic management, i.e. strategic situational analysis, strategy formulation, strategic planning and implementing and strategy control. This main path is in figure 1 framed (the main line of the whole process). The prerequisite of the whole process is quality skills, knowledge and experience of top management enabling to precise this process. The process then continues with situational analysis exploring internal and external factors influencing the enterprise. It is then important to define competitive advantage and unique innovation product/service that is considered as the important determinant for strategic development in SME. Based on results of situational analysis, the mission and vision is formulated as a prerequisite of main basic business concept and idea, strategic thinking and finding and keeping key staff. After that, the main corporate strategy is formulated, from which functional strategies are with the same priority identified, i.e. HR strategy, marketing strategy, financial strategy, production strategy with further proposal of their effective management. The process is then followed by proper strategic planning and plan. Corporate and functional strategies are then implemented with respecting and implementing corporate culture building, customer service building, caring of financial condition, searching strategic contacts and partnerships including respecting main principle of change and crisis management, i.e. to be as flexible as possible. When the previous steps of that process is respected, there is a high probability of reaching main business goals, i.e. required position and stability on the market, competitiveness, image building and brand building that support further strategic development. These goals lead to other innovation of core unique product/service strengthening the other competitive position on the market. The whole process is followed by strategic controlling and involving positive and negative aspects of other external factors of strategic development (orientation in

industry, negotiation with customers, negotiation with suppliers, ability to work with legislation, struggle with competition). This model respects the previous one (figure 1) implementing main path and principles of strategic management process. The main benefits of this model are based on optimizing the whole strategic management process involving all main key elements and determinants for strategic development, highlighting main strengths and eliminating main weaknesses realized in practice by SME. The other benefit of this model is not only based on optimizing the whole process but also based on supporting the long-term strategic development in SME. [15]

4.2 Simulation of Process Model of Strategic Management in SME into Practice

The following chapter deals the simulation of process model of strategic management in SME into practice in the form of case study of the selected building enterprise, marked as enterprise A under the promise of its anonymity. The main reason for selected this enterprise is its willingness to be in detail participated in this project, its previous cooperation of research [13] and possibility on the other cooperation (especially by implementing the proposed model into its business processes). The case study derives from the information of financial statements, annual reports, web sites and personal interviewing with owner-managers of the enterprise A. The enterprise A was established in 1997 such as building joint stock company with basic capital 10 million CZK employing approximately on average 15 employees. It is presented as “a professional and experienced construction enterprise that is engaged in the construction of new apartments and family houses; its services related to the construction and sale of real estates focused on the attractive locations of the Brno region”. The subject of the enterprise's activities is the construction of buildings, including their alterations and removals. The aim of all projects is to combine the purpose of the layout solution with an attractive modern design and a high standard of design. As one of the few enterprises on the market, enterprise A offers a purchase of cooperative flats. Part of the enterprise's services consists of legal services to clients or advice on the use of mortgage loans. With quality and modern concepts, enterprise A can satisfy even the most demanding customer. During the construction, it also offers a solution of client changes in the equipment of the apartment according to the customer's requirements.

The main purpose of this case study is to evaluate a quality of implementing the strategic management principles into business processes. First of all, the author forced to find out if the enterprise A implements all of the identified determinants of strategic development in SME and basic pillars of strategic management (analyzing, planning, implementing, controlling). Based on the personal interviewing with owner-managers it could be stated no comprehensive strategic management principles are in enterprises A implemented. Therefore the process model of strategic management in SME could not be directly implemented into processes of enterprise A. Firstly, the following information describes the current situation in enterprises A. Afterwards, the main strengths and weaknesses of enterprise A have been identified. Finally, the

missing used determinants of strategic development SME have been complemented and used for process model in enterprise A proposal (see Figure 2).

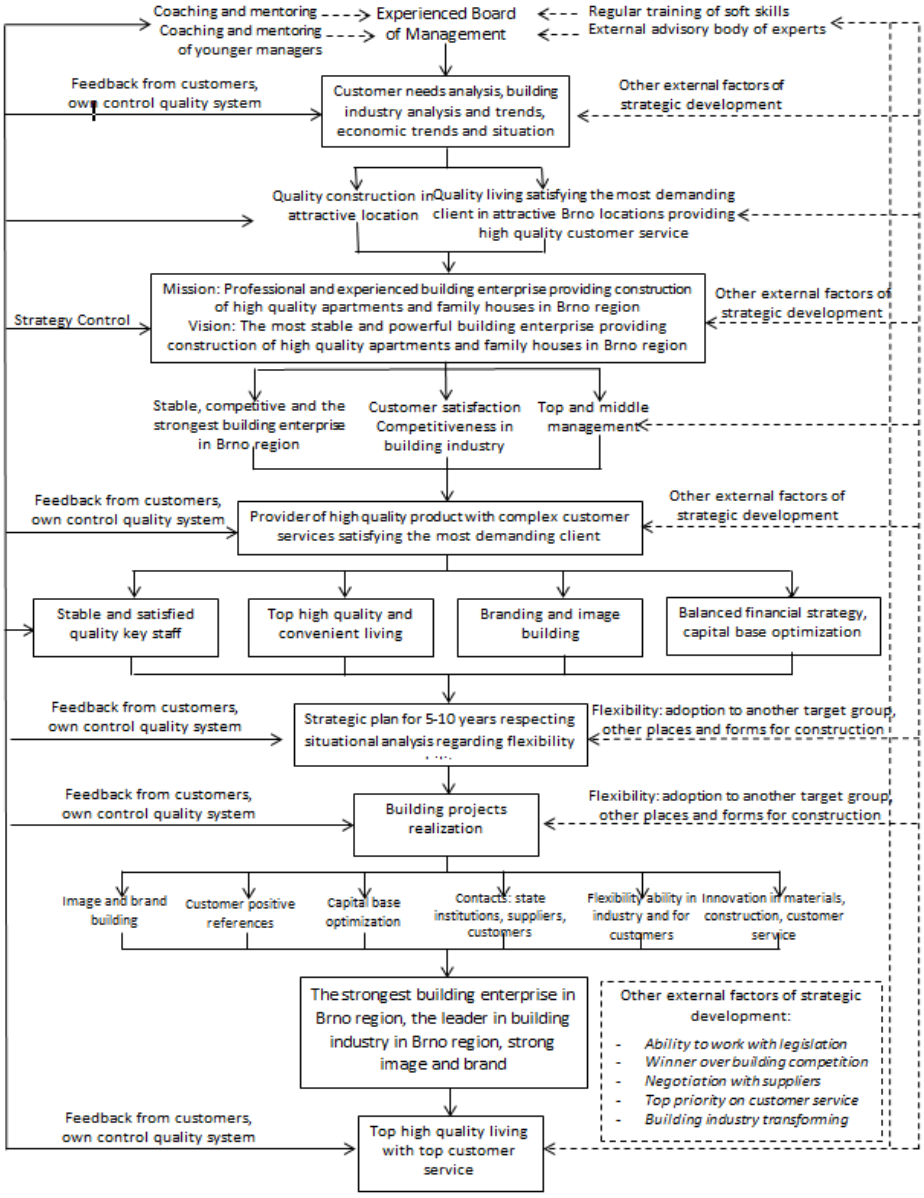

Fig. 2. Process Model of Strategic Management in enterprise A.

This proposed model is served at the series of recommendations for optimizing the whole process of strategic management and implementing its principles in enterprise

A and at the same time eliminating the main weaknesses that threaten the stability of whole enterprise and the possibility to be developed. This model was subsequently discussed with board of management that decided to implement it into next annual strategic plans.

The process model from Figure 2 describes main determinants of strategic development implemented into current business processes in enterprise A. Simultaneously, this model proposes these determinants that have not been identified and used here yet, i.e. instruments for improving managerial skills, identification of innovative product, proposal of mission and vision, defining the business concept and idea, strategic thinking and key staff, identification of functional strategies, form of strategic control and change management, and long-term goals in the form of outputs of the model. Based on personal interviewing with owner-managers, top management uses some of these principles, indeed mainly based on their experience and intuition. Top management consists of three members of board management that has been managing the enterprise A since its establishment. Their form of managing the enterprise A is based mainly on intuition and 20 years of experience from the field of building and construction. No previous management experience has been implemented here. The process model recommends to follow modern trends in management with regular trainings of soft managerial skills (they have never done so yet), hiring the external advisory body experts (from the area customer relationship management, personnel management, marketing management, strategy building and implementing). Based on internal analysis, these areas of enterprise A are considered to be the most critical or insufficient. It is also recommended to use regular coaching and mentoring in managerial skills by selected experts that could disclose possible problematic areas in management and help with strengthening the position of enterprise A. After that, it is recommended to start training younger managers such as successors (in the form of coaching and mentoring current top management) from middle management that could undertake the whole top management of enterprise A in the future. Owner-managers are aware of this situation, but they have not started implementing any action. These recommendations require long-term financial and non-financial investment into enterprise A that change the current strategic approach, nevertheless it could enable to develop the enterprise A and to strengthen its current strategic position.

The process model continues with external situational analysis that enterprise A regularly evaluates, especially trends and legislative changes in building industry, economic analysis of the market including regular internal financial analysis is deeply underestimated, therefore it is recommended to imply these analyses into everyday practices realized by internal or external staff. Customer needs analysis is also recommended to be provided for instance in the form of survey of customer satisfaction and needs that is also underestimated. The situational analysis is then used for competitive advantage (based on quality construction and attractive location of construction) and innovative product (based on quality living satisfying the most demanding client in attractive Brno locations providing high quality customer service) identification. When exploring the own opinion of owner-managers on competitive advantage and innovative product, they were hardly thinking of its clear identification

and especially there is no written document that identifies key components of tis entrepreneurship. These determinants are consequently used for mission and vision definition (their specifications are given in figure 2). Even in this area, enterprise A does not identify them. Mission and vision is then transformed into business concept and idea, identified as stable, competitive and the strongest building enterprise in Brno region, strategic thinking based on customer satisfaction and the strongest competitiveness in building industry and key staff that should be consisted of top management and competencies of middle management (nowadays it is missing here).

The other procedural step of this model is based on corporate strategy definition. Owner-managers declared enterprise A identifies strategy based on quality and orientation on customer. Its clear definition is, however, missing in any written form. The model recommends the following strategy formulation: Provider of high quality product with complex customer services satisfying the most demanding client. It was also detected the no functional strategies are in enterprise A identified and even any extra responsible person or middle-manager is responsible for each identified area. The model attempts to eliminate these shortcomings. Firstly, HR strategy should be based on care of stable and satisfied quality key staff, i.e. to implemented benefit and motivational system attracting the most quailed staff from the field. Production strategy is based on providing top high quality and convenient living that closely relates to overall strategic approach of enterprise A. The marketing area of enterprise A is deeply underestimated and is considered as the same priority as other areas. Therefore, marketing strategy should be oriented on branding and image building in building industry. For implementing this strategy it is needed to hire external or even internal marketing managers that could strongly help the overall strategic management process. This area requires again more significant financial and nonfinancial investments that could be quickly returned back in case of its effective implementation and long-term priority care. The last financial strategy is based on balanced financial approach based on improving liquidity and profitability level and also based on capital base optimization. The last five years were connected with financial losses or low profit and financing mainly by short-term liabilities. Now financial manager is working for enterprise A. It is therefore recommended to hire responsible person for deep financial analysis and audit to optimize these processes.

Based on corporate and functional strategies identification, the strategic plan for next 5-10 years should be set up and further realized in the form of projects with prior orientation on investment strategic approach to strengthen the strategic position with corporate culture based on image and brand building, together with more efficient case for customers and building their loyalty, financial and capital base optimization and implementing principles of change management and to be flexible and to be prepared to adapt to customers and building industry and to build innovation ability in materials, customer service and construction. During the whole process the feedback and control processes are realized with concision of external factors of strategic development mentioned in figure 2. The out of the whole process is fulfilling the main business goals such as the strategic positon, image and branding, firstly in Brno region then in other territories in case of long-term financial success. Even though, all business goals are reached, the enterprise A is forced to think over permanent

innovation of product and customer services provided. This process highlights the strengths and eliminates the weaknesses in strategic management process of enterprise A. This model enables to strengthen the strategic position and optimizes the whole observes process; thereby it was verified into practice.

5 Conclusion

The main purpose of this paper was to verify and simulate the theoretically proposed strategy process model of strategic management in SME into the practice in form of case study (on an example of selected enterprise A from building industry). Based on the internal analysis and personal interviews with owner-managers of selected enterprise A, it could be stated the forming this model could be applied in practice and this model could be used in other strategic decision-makings. Owner-managers agree with the forming of this model and its practical usage. The main benefits of this model are based on highlighting the most important determinants for strategic development in SME, giving the consequences in strategic management process and reciprocal incidences. At the same time, the model could identify the shortcomings in implementing the strategic management that could threaten strategic plans and reaching main strategic goals of the enterprise. Based on the simulation of strategic process model for the enterprise A, the main benefits and shortcomings in the process of strategic management have been identified and subsequently the recommendations for elimination of identified shortcomings have been proposed. These recommendations have been discussed with owner-managers. They decided to deal them with all members of board of management. This model could be served as an inspiration for optimizing the process in business development from theoretical and practical point of view. The results of the case study cannot be generalized for the whole research sample; nevertheless, it could be served as a basis for other research activities in this field. The research has been provided a detailed internal analysis and information about selected SME that could compare its strategic processes with the current theoretical findings in this field.

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Do Producers of Accounting Software Use Social Media?

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Abstract. The goal of the article is to present seven most often used accounting software and their producers in the connection with use of social networks by producers of accounting software in the Czech Republic. At the beginning there is shortly described the theoretical background. Classification of social networks, web 2.0 and accounting software are solved. The main part of the article is focused on the accounting software and analysis of social networks that are used by producers of accounting software. In the article is also analyzed whether producers use links from their web pages on the selected social networks. The topic is not often solved and is up-to-date. Primary and also secondary sources are used in the article. It was founded that most often used social network by producers of accounting software are Facebook, YouTube and Twitter. The links from web pages are often used also in the connection with Google+.

Keywords: Accounting Software, Communication, Information, Social Network, Use.

1 Introduction

Social networks are widely used not only in the personal life, but also in the commercial sphere. They have a lot of effects on the society. Increased online communication and fastened communication are some of them. The question may be whether the companies that produce accounting software in the Czech Republic use selected social networks for communication with their customers, potential customers, students and next audience. Selection of new accounting software was presented in the previous research done by Svobodová, Černá [22]. One of the key elements in the selection may be communication with producer of the accounting software via various channels. Author would like to focus on communication and marketing of selected companies by modern channels. The organization of the paper is follows. Firstly theoretical background is described. The main part of the article is focused on the evaluation of use of social networks by producers of accounting systems. The paper contributes to the exploration of utilization of Web 2.0 phenomenon and social networks by companies and individuals in the field of accounting software.

2 Literature review

2.1 Web 2.0

Web 2.0 concept was defined by Tim O'Reilly in 2004 as a designation of the new generation of the Web. Reily´s definition of Web 2.0 is as follows: "Web 2.0 is the business revolution in the computer industry, which is caused by deflection in the understanding of the Web as a platform. Key among those rules is this: build applications that will be better and better due to the network effect with an increasing number of people." [18]

2.2 Social networks

A sociologist J. A. Barnes (1954) is considered to be the author of the definition of the social network. The term social network is associated with the Internet and directly with the social networks on the Internet. But this is not the only connection there is a need to deal with the concept of social network from the sociological point of view, therefore, the social network can be described as a "map of the area near and distant surroundings where relationships of involved people are defined." [5]

Social network on the Internet is considered to be a group of people who communicate and share documents and information on users. The Social Network concept is described and defined by Boyd and Ellison: Social networking is defined as a web service that allows individuals to create a public or semi-public profile within the bounded system, create a group of users with whom they share a connection, and browse the list of own connections and that created by other users of the system [6]. The most often used social networks Facebook, Instagram and Twitter were presented in previous article of Černá, Svobodová [9] or YouTube in Svobodová [23].

Over the last few years, online social networks such as Facebook and Twitter have experienced exponential growth in both profile registrations and social interactions. These networks allow people to share different information ranging from news, photos, videos, feelings, personal information or research activities. [2]

Social networks have global popularity. One of the most common online activities in the EU-28 in 2015 was participation in social networking. Half (50 %) of individuals aged 16 to 74 used the internet for social networking, for example using sites such as Facebook or Twitter in the EU. According to Eurostat [13] 45% of individuals use social networks in the Czech Republic.

2.3 Social media

Social media are applications which become social networks via users´ use.

Social media are a form of electronic communication (social networking and microblogging networks), through which users create online communities to share information, ideas, personal messages and other content (videos). [20] Social media can be divided on the basis of their focus, and also according to marketing tactics. Social media according to the marketing tactics is considered to be more transparent than on

their focus. Also surveys on utilization of social media are more frequently conducted on the basis of marketing media division:

- Social networks (Facebook, MySpace, LinkedIn).
- Blogs, video blogs, microblogs (Twitter).
- Discussion forums, Q & A portals (Yahoo Answers).
- Wikis (Wikipedia, Google Knol).
- Bookmarking systems (Digg, Delicious, Jagg).
- Shared multimedia (YouTube, Flickr).
- Virtual worlds (Second Life, The Sims). [16]

How Brand Actions and User Actions Influence Brand Value by use of social networks is solved in [8] and performance measurement system to quantify the contribution of social media is presented in [3]. Du and Jiang [11] find that firm use of social media is associated with firm performance, measured by stock price and return on assets. When testing the individual association of the various platforms and firm performance, the authors find that only Facebook and Twitter has a statistically significant relationship. They observe that half of the firms use one or both of these platforms.

2.4 Accounting software

The term refers to software accounting software that handles accounting and financial processes. The offer of accounting software focuses on the specific size of the company. According to company size amount of income, the number of transactions processed and the number of employees differs. [10]

3 Methodology and goal

The article was prepared on the basis of print and electronic resources. Specialized articles that deal with issue of financial accounting or social media can be found. By contrast, printed literature on accounting (economic) software doesn´t nearly occurs on the Czech market. Available books on accounting are primarily concerned with the processing and are intended for teaching or as a handbook for accountants. Specialized materials in the field of information technology are in particular focused on the area of enterprise information technologies and their application. Publications on ERP systems are available in this field and in most cases they contain accounting (economic) software, but they do not aim deeper on it. In contrast to the situation on the Czech market there are a lot of foreign sources abroad.

In case that we link those two areas together (accounting software and their producers and social networks) there are not a lot of articles focused on this issue. The existing literature focused separately on the accounting software and Facebook or social media or social network in the connection of promotion of the brand or product, communication with customers or training etc. There were not founded relevant articles in databases Web of Knowledge or Scopus focused on the interconnected topic.

This topic is still in its infancy. The intention of the article is to stimulate a conversation and proposes ways in which to frame early and future research.

The main part of the article is based on the available resources of the most often used accounting software and their producers in the Czech Republic. Selected accounting software will be applicable for SME. The selection was done due the highest proportion on the market. In the next step was done analysis whether the producers of accounting software use selected social networks or not and whether are web pages of the producers connected with their social networks.

The goal of the article is to present the most often used accounting software, their producers in the connection with use of social networks by producers of accounting software and links with producer´s web pages in the Czech Republic.

4 Results

The first part contains the results of selection from accounting software products and their producers. Data were taken over from the SystemOnLine website [24] which deals with statistical data about accounting, economic and ERP systems and with their use, information about functions, prices etc. Into consideration will be taken accounting software for basic SME in the Czech Republic. The second part contains information about social network Facebook, YouTube, Twitter, Instagram and their use by accounting software producers. Next topic is focused on the interconnection of social networks with web pages of companies. Topics of producers of accounting software and communication via social networks were connected because companies are searching how to save money in all areas of doing business, earn more money, have a larger share on the market and other goals. Social media are very often perceived as the possibility how to save money in the communication with customers and how to engage attention. Contrary people like to use social networks that are nowadays modern, popular and often used not only by one generation.

4.1 Accounting software and producers

On the basis of gained results from the investigation a selection of the below discussed results have been made utilizing SystemOnLine website. Individual companies regularly update detailed information about accounting software products, including the number of installations, number of hot-line workers, number of consultants of the product, functions of the product, price, etc. In the filter it was firstly entered - ´find a product that has more than 10,000 installations`. The following products were displayed: Ekonom, Pohoda, Money S3 and "Účto" (Accounting). Due the larger sample of the companies was the selection repeated with the smaller number of installations that were reduced on 5,000 installations. Into research will be added Abra Gen, Helios Orange and Stereo Ježek Software. In the next search specific data of all other products were found. Table 1 shows all the above mentioned accounting software and ERP systems. Pohoda and Money are the most widely used box systems in the Czech Republic. Pohoda is with more than 200,000 licenses and Money S3 with 60,000

licenses. Important are also information about workers on hot-line. Some data were not by the companies filled in. From accessible sources it is possible to mention, that the biggest number of workers on hot-line is in company Asseco Solutions. It can be connected also with their other products that they offer to bigger companies. Asseco has also the biggest number of the consultants. Účto Tichý and Stereo Ježek Software are cooperating companies. Účto Tichý has software for individuals that lead single-entry bookkeeping and Ježek Software for corporate bodies that lead double-entry bookkeeping.

Table 1. Accounting software, more than 5,000 installations [24, own elaboration]

Name of product	Name of producer	Number of installations	Size of the biggest installation	Workers on hot-line	Number of consultants of the product
Pohoda	Stormware	200 000 +	60	76	100
Money S3	Cígler Software	60 000	50	65	120
Ekonom	Elisoft	30 000	15	8	15
Účto Tichý	Tichý & spol.	24 200		4	A few tens
Abra Gen	Abra Software	9 400		20	64
Helios Orange	Asseco Solutions	6 088	250	101	203
Stereo Ježek Software	Ježek Software	5 000		8	44

4.2 Accounting software, web pages and social networks

In the next part of the research there were analysed social networks Facebook, Twitter, Instagram, YouTube and others in the connection with producers of accounting software in the Czech Republic. It was searched whether or not have the producers of accounting software account on the widely used social network Facebook or on others. Accounts of the individual brands were searched on the all mentioned social networks.
Results are presented in table 2.

Table 2. Accounting software and social networks [14, 15, 25, 27 own elaboration]

	Facebook	YouTube	Twitter	Instagram
Pohoda	X	X	X	-
Money S3	X	X	-	-
Ekonom	X	X	-	-
Účto Tichý	X	X	-	-
Abra Gen	X	X	X	-
Helios Orange	X	X	X	-
Stereo Ježek Software	X	X	X	-

The table above presented use of the selected social networks by producers of the accounting software. It was founded that all producers use social networks Facebook and YouTube for communication with audience. Twitter use only three from seven investigated companies. It was Abra Software, Asseco Solutions and Ježek Software. Producers do not use Instagram for communication with audience.

Table 3 presents interconnection between web pages and direct links on social networks where their accounts were founded.

Table 3. Direct links between companies social networks and www [4, 7, 12, 14, 15, 17, 21, 25, 26, 27 own elaboration]

	www + Facebook	www + Twitter	www + Instagram	www + YouTube	www + Google+
Pohoda	X	X	-	-	X
Money S3	X	-	-	-	X
Ekonom	X	-	-	-	-
Účto Tichý	-	-	-	-	-
Abra Gen	X	X	-	X	X
Helios Orange	X	X	-	X	-
Stereo Ježek Software	X	X	-	-	X

It was founded that all companies instead Účto Tichý have direct links of their Facebook profile. All users that use Twitter have also interconnection between webpages and social network. Companies do not use Instagram. Also on their web pages were not founded links. Even though all companies use YouTube, the direct link from the first page uses only two companies Abra Software and Asseco Solutions. On the webpages were also founded next links on others social networks. Four companies use Google+ and have direct link.

Other social networks are also used. Money S3 has the link on their Skype. Cígler Software, Abra Software and Asseco Solutions also uses LinkedIn and have direct link on their webpages. Asseco Solutions use also blog.

5 Conclusion and discussion

Virtual space has been giving our real world new dimension. Creativity, originality and innovations are valued characteristics. Social networks fit knowledge management as they open the door to new ways of communication, enable development, editing, sharing and storing materials on the virtual platform. Social networks are nowadays one of the most popular and most often used channels to inform and communicate not only in the private sphere but also in the corporate settings.

The goal of the article was to present the most often used accounting software, their producers in the connection with use of social networks by producers of accounting software and links with producer´s web pages in the Czech Republic.

It has been founded that all producers use Facebook and YouTube. Only four from analyzed companies use Twitter and no one is using Instagram. As far as the connec-

tivity of web pages and social networking sites was concerned that there are missing some links on the web pages. Účto Tichý is missing link of Facebook. On YouTube are missing links by Stormware and Stereo Ježek SW. Google+ and interconnection with www pages use four companies.

In future there is potential for an interesting area of exploration. It can be investigated the number of posts, topics of posts, focusing, like, tracking, tweets, mobile apps, their use, training and posts on YouTube, benefits for producers, benefits for users of software and other areas related to informing existing users as well as new users for the software can be found in more depth.

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Outlays on Fixed Assets for Environmental Protection in Dolnośląskie Voivodeship - Selected Problems

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Abstract. This article presents the value of fixed investment, which should serve the development of environmental protection in the Dolnośląskie Voivodeship in the years 2011-2015. Particular attention was paid in this study on the analysis of the structure of distribution expenses by directions of investing. This article also focuses attention on the sources of financing investments of environmental protection. This paper presents the positive changes that have occurred in the technical infrastructure related to environmental protection in the Dolnośląskie Voivodeship in the years 2011-2015.

Keywords: Outlays on Fixed Assets, Environmental Protection, Dolnośląskie Voivodeship.

1 Introduction

Natural habitats are all ecological (abiotic and biotic) factors that are directly related to the life and development of the organism of the species or its population. Industrialization and urbanization of the areas in question cause deformation of the original natural environment. There appears an anthropogenic environment, whose creator, with the participation of nature, is a man.

Environmental protection processes have developed particularly intensively in the second half of the twentieth century. While initially their main goal was to create conditions for maintaining high ecosystem use, it is now essential to preserve biodiversity on the planet as a prerequisite for the continued existence and development of humanity and to protect against radical changes in the climate [1, 3, 5].

Outlays on fixed assets used for environmental protection form part of the investment outlays (financial or tangible), the remaining part of which constitutes expenditures on the so-called first investment equipment and other costs related to the realization of investments which do not increase the value of fixed assets). These include expenditures on: acquisition of land (including perpetual usufruct of land), buildings, premises and civil and water engineering facilities (including, for example, construction and assembly works, design and cost estimate documentation) means of

transport, tools, instruments, movables and equipment, and other fixed assets designed to achieve environmental effects [6].

The concept of fixed assets is to be understood as both new and existing goods, purchased, manufactured on their own and purchased through a financial lease with a useful life of more than one year, as well as any additions, changes, improvements and renewals that prolong their useful life or increase their productivity. fixed assets [6].

Expenditures on fixed assets that serve the protection of the environment in specific regions, regions or the whole of the country include expenditures for the following groups of undertakings: waste water management and protection, air and climate protection, waste management, biodiversity and landscape protection, noise reduction and vibration, other funding directions [1, 4, 6].

The aim of the study is to analyze the structure of expenditures on fixed assets for environmental protection in Dolnośląskie , due to the directions of investment and sources of financing and the presentation of selected material effects in the examined area. The time horizon of the study was years 2011-2015.

2 Methods and sources of data

The study was based on the analysis of data using universal statistics. For the preparation of the article, selected items from the literature of the subject, specialized studies and data of universal statistics, which are included in the yearbooks Environmental protection.

3 Structure of expenditure on fixed assets for environmental protection

Dolnośląskie Voivodship adopted for analysis is industrial-agricultural. They decide:

- historical conditions (development, especially since the nineteenth century, of the Sudeten Industrial District based on diverse and abundant mineral resources, mainly hard coal and rock raw materials and a large-scale industrial center in Wrocław, and then in Legnica and other former German cities in Lower Silesia);
- processes of intensive industrialization and urbanization of parts of the Lower Silesian Voivodeship in the seventies of the twentieth century (commencement of the processing of copper ores on the basis of newly discovered, very rich deposits of these ores, further development of the Wałbrzych Coal Basin, development of the Wroclaw Industrial District, creation and development of the Turoszów Industrial District, lignite resources and the launch of the Turoszów power plant);
- Poland's accession to the European Union (new industrial investments, service trade and housing development related to foreign capital inflows and the strengthening of domestic capital).

As emphasized by B. Poskrobko and T. Poskrobko, the management of the natural environment is the subject of management as well as entities affected by management tools (individuals, groups and communities, business entities and various organizational units) [5].

Share of expenditures on environmental protection, in total expenditure on fixed assets serving both water management and environmental protection in the Dolnośląskie voivodeship was - during the period considered (in the years 2011-2015) - average 63.7% (compared with 36.3% share of fixed assets for water management). A significantly greater share of the analyzed environmental outlays, compared to the corresponding share of expenditure on water management, was due to the established priorities for environmental protection (European Union), in line with the adopted socioeconomic needs (national, regional and local) and financial investor.

In the analyzed period (in the years 2011-2015), fixed capital expenditures, which should serve to improve the situation in the protection of the environment in the Dolnośląskie Voivodeship showed some variations: fall-height (Figure 1). This should in particular be linked to the depletion of resources available to the end of some EU programs (a decrease in expenditure in the years 2011-2013) and a new support period (growth in the years 2014-2015). The observed increase in the analyzed expenditures was due both to the existing needs in terms of improvement of the environmental situation as well as to the financial capacity of the investors. Supporting the construction, extension or modernization of the technical infrastructure serving the protection of the environment, especially the improvement of the sanitary condition of rural areas in Poland, was adopted - after the accession of Poland to the European Union - as one of the priorities of sustainable development [8].

The increase in expenditures on fixed assets, which should be used to protect the environment in the Dolnośląskie Voivodeship (in comparison with year 2011), was accompanied by an increase in per capita expenditure. This ratio increased to PLN 403 in the year 2015 (by half compared to the year 2011). It also increased on average in Poland, to 394 PLN per capita in 2015 (respectively by a quarter, less dynamically than in the analyzed voivodeship (see Fig. 1).

In the analysed period (in the years 2011-2015) the total number of inhabitants of the Lower Silesian Voivodeship decreased by 12 370 people. The phenomenon was affected by the decrease in the number of inhabitants of cities (by 25 705 people), as the number of inhabitants of the village increased by 13 335 people.

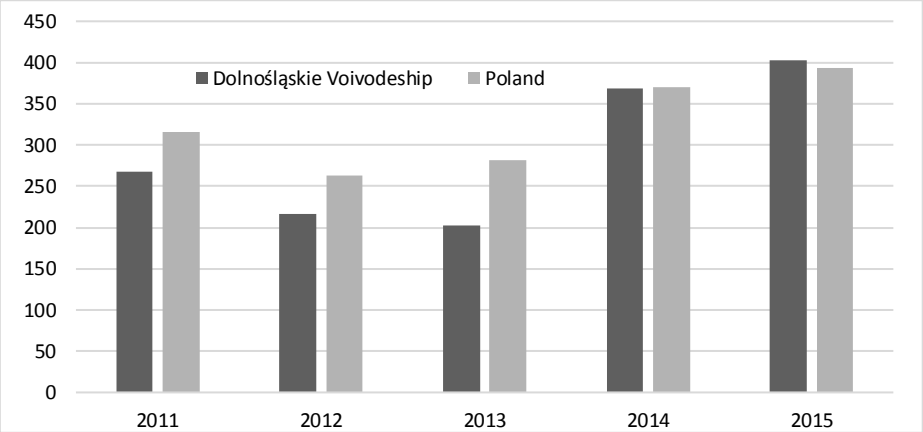

Fig. 1. Outlays on fixed assets for environmental protection in the voivodeship and on average in Poland in the years 2011-2015 (PLN per capita) [5].

In general expenditure on fixed assets should serve the protection of the environment in the province. The investments in sewage management and water protection (54%) were the highest average yearly shares (years 2011-2015). In the first three cases, there were also investments in: air and climate protection (32.5%) and waste management, but with a significantly lower share (7.5%). The remaining sites were ranked according to the decreasing share: the remaining investment directions included 4.5% of total expenditure, noise and vibration reduction (1.2%) and biodiversity protection (0.3%) (see Fig. 2).

The identified structure of the expenditures analysed is closely related to the existing needs of improving the quality of life of the inhabitants of these areas and adopted by Poland after the accession to the European Union, the objectives of regional development [8].

By giving a detailed analysis of the structure of expenditures for fixed assets for environmental protection in the Dolnośląskie Voivodeship, in the years 2011-2015, some changes may be observed according to the directions of investment. While in the years 2011-2013 most of the total of the expenditure under consideration was allocated to sewage management and water protection, the latter is allocated to air and climate protection in the later period (in the years 2014-2015).

Atmospheric air is one of the most important protected components of the natural environment, as emphasized in the literature of the subject. Due to international agreements, the protection of atmospheric air also includes the ozone layer and the climate [2].

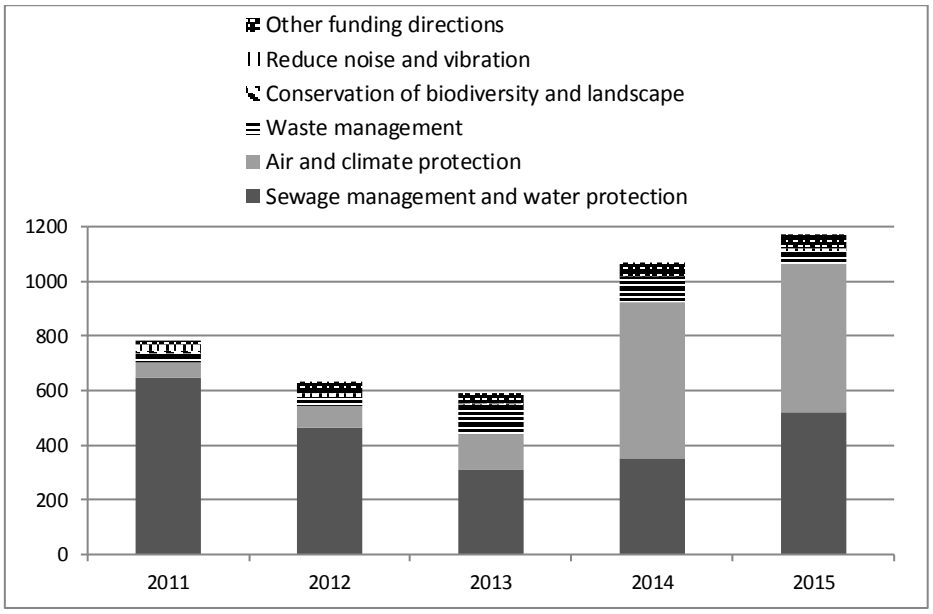

Fig. 2. Outlays on fixed assets for the protection of the environment in the Province Dolnośląskie in the years 2011-2015 according to major directions of investment (mln PLN, current prices) [6].

Financing of fixed assets for environmental protection may come from the own resources of investors, from budgets: central, county, commune, from foreign sources, from ecological funds and from other sources. Most of these types of investments are funded financially from mixed sources.

The largest average annual share in expenditures for fixed assets is for environmental protection in the voivodeship. According to the sources of financing, in the audited period (years 2011-2015), they had own funds (56.1% - from the own funds of the enterprises and from the own funds of the communes). In the second place, but with a significantly smaller share, the funds from the ecological funds (17.6%) and the third ones (15.9%) came from abroad. The following places were ranked according to the decreasing share: domestic loans (8.2%), other funds (0.9%), central budget funds (0.6%), municipal budget funds (0.3%) , funds from the budget of the voivodeship and from the country budget (0.2% each) (see Fig. 3).

By providing a detailed analysis of the structure of outlays for the construction, extension or modernization of the collective water and sewerage network, it is noted that the majority of these expenditures were allocated to municipalities. They also increased their share of EU structural funds. In the case of the development of collective sewer, the share of expenditures from other sources (eg by the Agricultural Property Agency, District Water Supply and Sewerage Enterprise, EcoFund, Regional Water Management Board) increased. The construction, expansion or modernization of collective sewage treatment plants was the most supported by the expenditures

from the environmental protection and water management funds, then from the European Union structural funds and allocated by the local governments [6].

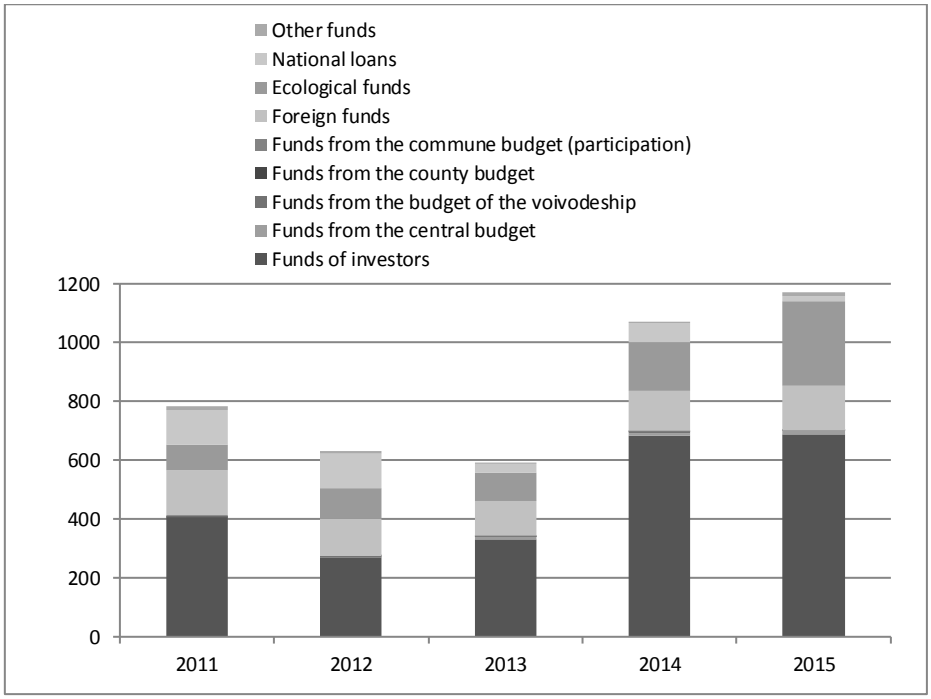

Fig. 3. Outlays on fixed assets for the protection of the environment in the Dolnośląskie voivodship in the years 2011-2015 according to sources of financing (mln PLN, current prices) [6].

As emphasized in the literature of the subject, ecological funds in Poland (the National Fund for Environmental Protection and Water Management, provincial, district and municipal funds, the Agricultural Land Protection Fund, the Forest Fund) are a specific source of funding for conservation initiatives and water management.

They are involved in acquiring and redistributing financial resources for the implementation of priority environmental projects. Funds for environmental protection projects include the Cohesion Fund and the Structural Funds (European Regional Development Fund, European Social Fund, European Agricultural Guidance and Guarantee Fund). Financial resources from the Operational Program Infrastructure and Environment, the European Regional Development Fund, the Norwegian Financial Mechanism and the European Economic Area Financial Mechanism, and the Financial Instrument LIFE+ [5].

4 Examples of tangible effects of investment in environmental protection

As a result of the increase in expenditure on fixed assets used to protect the environment in Dolnośląskie Voivodeship in the years 2011-2015 certain tangible effects were obtained (Fig. 4-7).

Additional sections of the sewerage network (and water supply) were added to use, which contributed to the maintenance of the length of these networks on the trend path. In the year 2015 the length of the sewerage network was in the voivodeship 10914.9 km (increase by 1/4 compared to 2011), water supply was longer (by law 4800 km). In this drawing (see Fig. 3) the predicted trend lines are also shown (predicted linear trend line of length of the water supply network (T-1) and predicted linear trend line of length of sewerage network (T-2) (see Fig. 4).

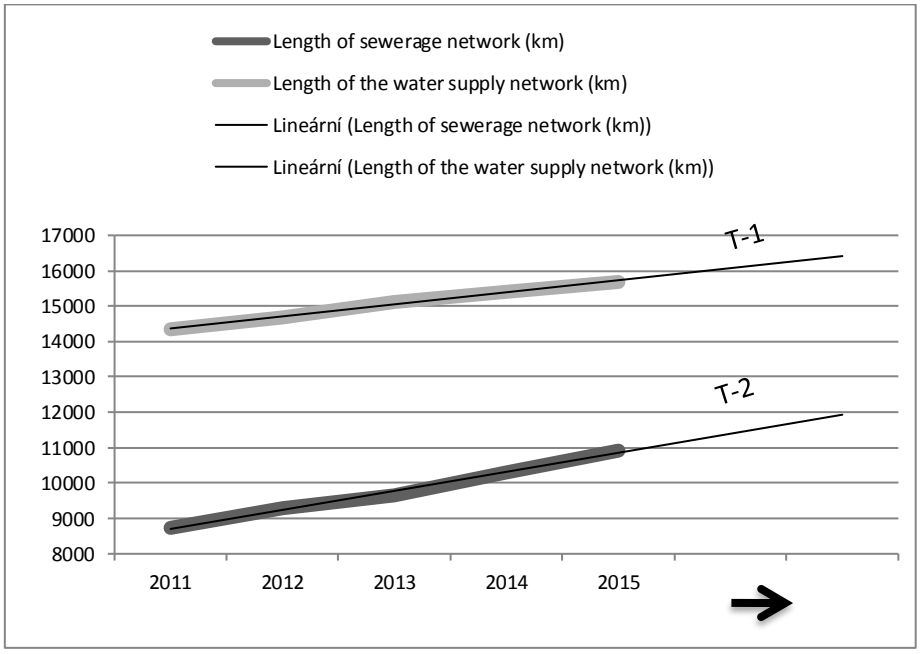

Fig. 4. Length of the water and sewage network in the Dolnośląskie voivodeship in years 2011-2015 and forecasted linear trend lines (km) [7].

The number of sewage connections leading to residential buildings has increased, to 221660 total connections in the Dolnośląskie voivodeship in year 2015 (an increase of 22% compared to year 2011). In the rural areas of Dolnośląskie voivodeship their growth has been more dynamic (38% growth, up to 86795 in year 2015). The number of connections to the water supply system was still higher than the number of sewage connections, both in the Dolnośląskie voivodeship (343513 connections to the water supply system against 221660 connections to the sewerage network in year 2015) and

in the rural areas of Dolnośląskie voivodeship (188861 connections to the water supply system against 86795 connections to the sewerage network). However, relations have been improved: the number of sewage connections leading to residential buildings to the number of analogue water connections. While in year 2011 the total number of water supply connections in the Dolnośląskie voivodeship was

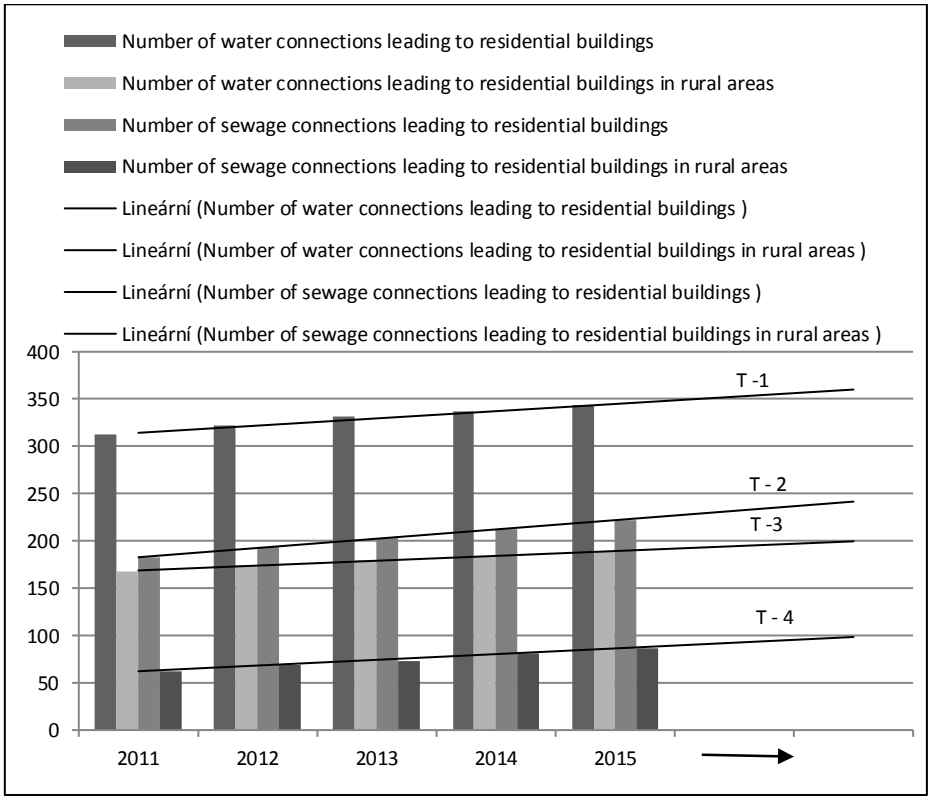

Fig. 5. Water and sewage connections leading to residential buildings in Dolnośląskie Voivodeship and in rural areas of Dolnośląskie Voivodeship in the years 2011-2015 and forecasted linear trend lines (number of connections in thousand.) [7].

lower in the rural areas of Dolnośląskie voivodeship (1 to 2.7), in year 2015 this relation was already more favorable, both in the Dolnośląskie voivodeship (1 to 1.5) as well as in the rural areas of Dolnośląskie voivodeship (1 to 2.2) (see Fig. 5). In this drawing the predicted trend lines are also shown (predicted linear trend line of number of water connections leading to residential buildings (T-1), predicted linear trend line of number of sewage connections leading to residential buildings (T-2), predicted linear trend line of number of water connections leading to residential buildings in the rural areas of Dolnośląskie Voivodeship (T-3) and predicted linear

trend line of number of sewage connections leading to residential buildings in the rural areas of Dolnośląskie Voivodeship (T-4)) (see Fig. 5).

According to data analysis, in year 2015, compared to year 2011, the population in the Dolnośląskie Voivodeship decreased, which drained the sewage system with a sewage network (a decrease of just over 10%, to 1812.8 thousand persons). In the same period, the number of such persons increased in the rural areas of Dolnośląskie Voivodeship (almost by half, to 386.7 thousand persons). In earlier sections of this study, the number of inhabitants of the Dolnośląskie voivodeship was decreasing in the years 2011-2015 (by 12370 people), which was influenced by the decrease in the number of inhabitants of the Dolnośląskie Voivodeship towns. The reported phenomenon of the decrease in the overall population of the analyzed voivodeship did not, however, affect the indicators informing about the number of population using the water supply network. In the years 2011-2015, the total number of population

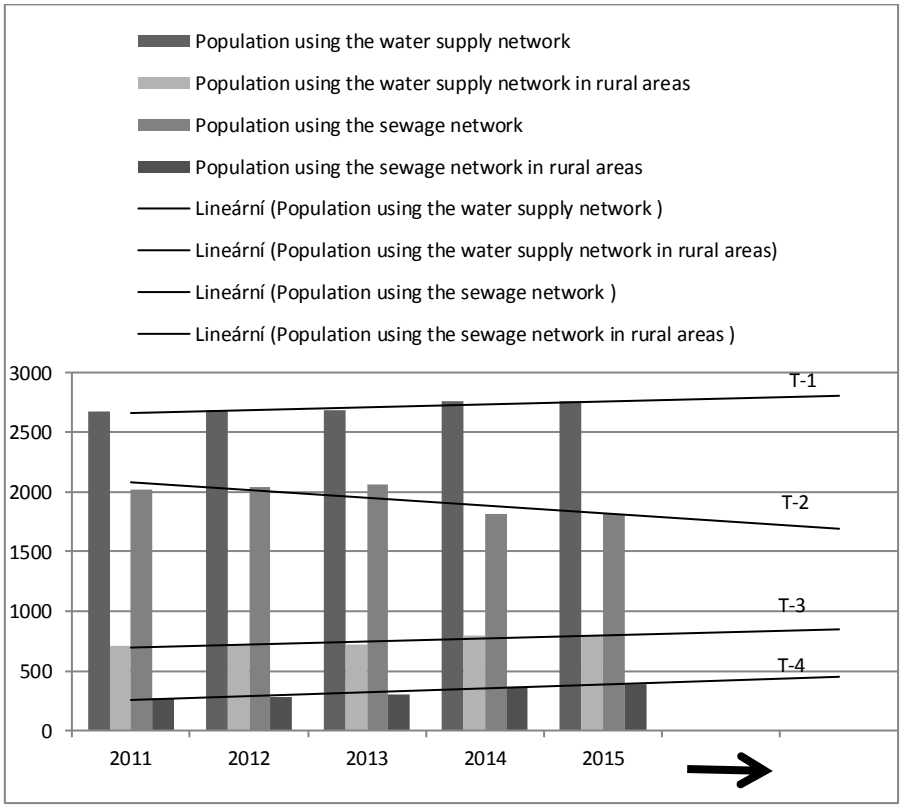

Fig. 6. Population using the water and sewage network in the Dolnośląskie Voivodeship and in rural areas of Dolnośląskie Voivodeship in the years 2011-2015 and forecasted linear trend lines (in thousand) [7].

using the water supply system in the Dolnośląskie Voivodeship increased (by 3%, to 2754.9 thousand persons) as well as the number of inhabitants living in rural areas

of the Dolnośląskie Voivodeship (increase by almost 13%, to 794. 9 thousand people). In this drawing the predicted trend lines are also shown (predicted linear trend line of population using the water supply network in Dolnośląskie Voivodeship (T-1), predicted linear trend line of population using the sewage network in Dolnośląskie Voivodeship (T-2); predicted linear trend line of population using the water supply network in rural areas of Dolnośląskie Voivodeship (T-3) and predicted linear trend line of population using the sewage network in rural areas of Dolnośląskie Voivodeship (T-4)) (see Fig. 6).

The change was accompanied by an increase in the population of the Dolnośląskie Voivodeship, which uses wastewater treatment plants, to 2315.2 thousand people in year 2015 (an increase of just over 3% compared to year 2011) (see Fig. 7). In this drawing the predicted trend lines are also shown (predicted linear trend line of population using the water supply network (T-1), predicted linear trend line of population using the sewage network (T-2) and predicted linear trend line of population using wastewater treatment plants (T-3) (see Fig. 7).

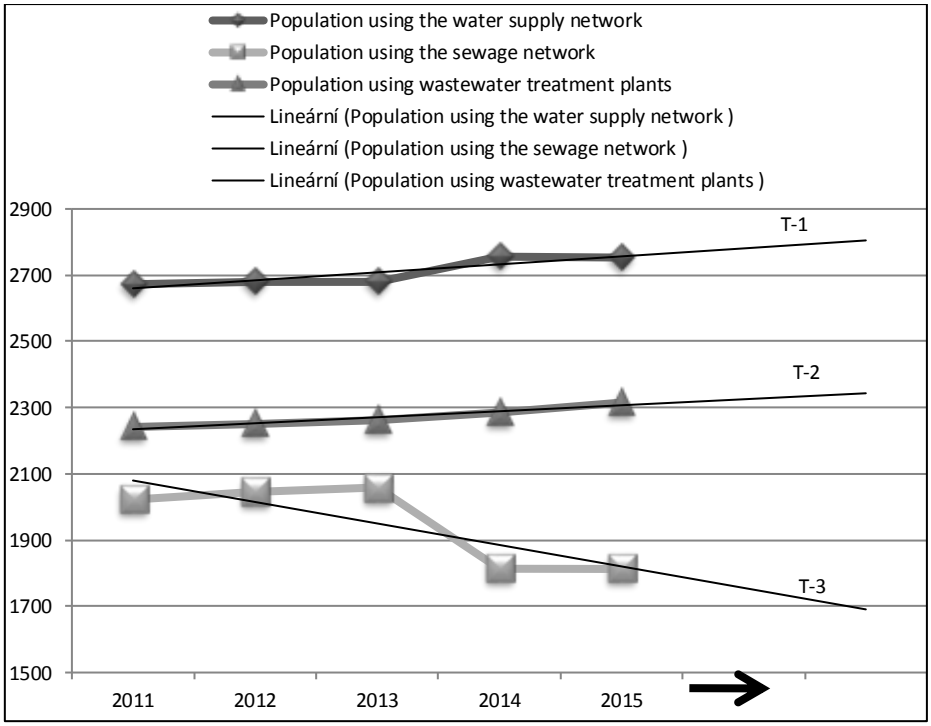

Fig. 7. Population using water supply, sewerage and sewage treatment plants in the Dolnośląskie Voivodeship in 2011-2015 and forecasted linear trend lines (in thousand) [7].

Sewage management was significantly weaker than the water management in the Dolnośląskie Voivodeship. Nevertheless, there are clear regional differences. The

smallest (and degraded) are the communes of the southern part of this voivodeship, especially mountain communities. The average degree of sewerage (and drainage) of towns in Dolnośląskie Voivodeship is relatively high [8].

5 Conclusion

In the analysed period (2011-2015), in the Dolnośląskie Voivodeship, expenditure on fixed assets for environmental protection remained on the upward trend track. This should be assessed as a very beneficial phenomenon, due to the still unsatisfactory socio-economic and ecological needs for equipping this region with adequate technical infrastructure.

The main directions of financial support in the examined area were the sewage management and the protection of waters. These directions was under-invested in the earlier period, especially in the rural areas of Dolnośląskie Voivodeship. In many regions of the voivodeship these systems were dominated by water supply systems without sewage systems. In addition, sewerage networks were often deprived of sewage treatment plants. After Poland's accession to the European Union, it was necessary to solve these problems (the existing Water Framework Directive), following the earlier harmonization of certain legal acts. The saturation of areas in water and sewage infrastructure and the treatment of wastewater has a significant impact on improving the quality of life of their inhabitants and increasingly determines the investment attractiveness of the regions concerned. At the same time it promotes the protection and improvement of the environment, health, preservation of cultural identity and development of territorial cohesion.

The increase in outlays on water and sewage management in the Dolnośląskie Voivodeship in the analysed period has been positively correlated with the increase in the length of the water and sewerage networks, the increase in the number of water and sewage connections leading to residential buildings and the increase in the number of people using the water supply and sewage treatment plants.

In the case of the indicator informing about the population of this voivodeship using the sewerage network, a downward trend has emerged. An in-depth analysis revealed the outlook for the downward trend forecast only for the urban areas of Dolnośląskie Voivodeship. On the other hand, in the rural areas of the voivodeship, the number of people using the sewerage network increased and it is expected that it will continue to grow (forecast upward trend). This phenomenon is linked to the observed increase in population in rural areas of the Dolnośląskie Voivodeship, at the decrease of the population in the urban areas of the voivodeship.

Air and climate protection has become increasingly important in the financing structure. This is correlated with accepted European priorities, especially for Central and Eastern Europe. A growing problem is the emission of gases and particulates from coal-fired households and the emission of gases and dusts caused by the intensive development of motor vehicles (low emissions).

In industrialized and urbanized areas, the Dolnośląskie Voivodeship is also experiencing a high level of traffic noise. Efforts are aimed at its reduction. It were

reflected in expenditures on fixed assets for environmental protection in the analyzed voivodeship.

Expenditures for environmental protection in the Dolnośląskie Voivodeship in the analyzed period came from diversified domestic and foreign sources. Investments of own investors (mainly municipalities), large ecological funds and funds from abroad were the leading factor in the development of the water and sewage network.

Further improvements in fixed assets for environmental protection in the Dolnośląskie Voivodeship are to be implemented in the framework of the Infrastructure and Environment Operational Program 2014-2020, the European Regional Development Fund, the Norwegian Financial Mechanism and the European Economic Area Financial Mechanism and the LIFE + Financial Instrument.

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Development of Milk Prices in the Czech Republic

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Abstract. The sector of milk production underwent through the crisis. Knowing the future price can help the management of the farm to minimize the risks related to the decision-making in production. Hence, the aim of the paper is to find optimal model for modelling of monthly prices of milk from 01/1998 to 06/2016 and predict them for 07/2016–06/2017.
First, the development of milk producers' prices is modelled by Autoregressive Integrated Moving Averages models. Consequently, the relations with monthly prices of maize (02/2006–06/2016) were examined using Vector Autoregressive (VAR) model. ARIMA model suggests prices of milk in the interval from 5.97 CZK/l to 7.06 CZK/l that is more realistic prediction than in case of VAR model that predicts lower prices (5.86–6.38 CZK/l). There might be missing some important variables in VAR model of prices of milk that can improve the prediction capability. Therefore, the challenge for future research is to improve the models further using regression analysis with relevant determinants.

Keywords: Milk Price, ARIMA Model, Vector Autoregressive Model

1 Introduction

The sector of milk production underwent a crisis recently. The price has always been volatile, but "Extreme price spike and volatility in agricultural commodity prices creates negative effects on macroeconomic instability, posing a threat to food security in many countries," [4]. Like in other sectors, the price is determined based on the agreement between the seller and the buyer. However, as Jaile-Benitez, Ferrer-Comalat and Linares-Mustarós [5] noted, "this agreement rarely remains stable because it is often reached after unwanted pressures, creating situations of dissatisfaction that involve one of the two parties". The market situation is unfavourable for the farmers as they are not unified and their bargaining power is lower than the power of dairy companies. The reasons for asymmetric price transmission in the agro-food chain was examined for example by Bakucs, Falkowski and Fertö [3] using meta-analysis of existing studies.

In the US, there might be a problem with speculative bubbles at stock markets. Adämmer and Bohl [1] found that they were present in wheat prices in years 2003–2013, but for prices of corn and soybeans the results were inconclusive.

Besides, the competition with other producers on the market is an important reason for prices fluctuations. Especially after the entrance to the EU, impacts of the single market on the Czech milk sector were significant as about one third of Czech milk production is being exported. Cancelling the import tariffs lead to increased competition on the market. The producer's prices were low and the costs of production high [11]. The important changes since the entrance to the EU happened also in the size of the farms – especially those aimed at pig production. The number of farms has reduced, but their size has increased. This enabled them to adjust their production and achieve the returns to scale. [7].

Modelling and prediction of prices and finding the relations between the developments of various prices had been a subject of examination by many authors. Rumánková [8] used Box-Jenkins Autoregressive Integrated Moving Averages (ARIMA) modelling method to project the prices of selected agricultural commodities. She found that mostly the time series are integrated by the order of 1. Saengwong et al. [9] also found that the prices of broilers, cattle, duck and hogs are stationary when their first differences were taken into account. Šimpach [10] modelled honey prices.

Regarding the prediction capability of the various models, Tenege and Kuchler (1994) compared and evaluate two variations of the present-value model (PV1 and PV2), an ARIMA, a vector autoregression (VAR), and an error-correcting model (ECM) based on root mean-squared error (forecast accuracy) and Henriksson-Merton test (ability to predict turning points).

In the article, in order to examine the current development and to project the future development of the milk price in the Czech Republic our paper uses both, univariate and multivariate approaches to the time series analysis. Particularly, it scrutinises and forecasts individual time series by Box-Jenkinson methodology (ARIMA models), and examines the type of the relations among multiple time series using VAR model. Both models are also used for predictions.

2 Methodology

There are basically two groups of methods used for the time series analysis. In the study, we employ both, the univariate and multivariate. First, the Box-Jenkins Autoregressive Integrated Moving Average (ARIMA) analysis is applied on time series of individual series of price of milk. Second, the influence of the prices of the feed maize on the commodity prices (short-term relationship) was examined using Vector Autoregressive (VAR) model. Both models are diagnostically tested. At the beginning, the time series are examined by Augmented Dickey-Fuller (ADF) test whether they are stationary or non-stationary, because VAR model can be used only if they are integrated of the same order. We applied ADF test without constant and trend.

$$\Delta Y_t = \beta\, Y_{t-1} + \sum_{i=1}^{m} \alpha_i Y_{t-i} + \varepsilon_t \qquad (1)$$

where ΔY_t is the first difference of the examined variable, t is time, m is the maximum length of the lagged dependent variable, α, β are parameters, and ε_t is a pure white noise error term.

Diagnostic of the type of ARIMA model is done by Autocorrelation function (ACF) and Partial Autocorrelation function (PACF) that are plotted to determine the order p of Autoregressive (AR) process and order q of Moving Average (MA) process. Sample ACF is calculated from time series Y_t.

$$ACF(k) = \frac{\sum_{t=k+1}^{n}(Y_t - \overline{Y})(Y_{t-k} - \overline{Y})}{\sum_{t=1}^{n}(Y_t - \overline{Y})^2} \tag{2}$$

ACF and PACF can be expressed graphically in correlograms. PACF consider the fact that correlation between two random variables is often caused by the fact that those two variables are correlated with the third variable and is adjusted from the influence of other quantities. PACF is defined for k >2 as

$$\begin{aligned} PACF(1) &= cor(Y_{t+1}, Y_t) \\ PACF(k) &= cor(Y_{t+k} - P_{t,k}(Y_{t+k}), Y_t - P_{t,k}(Y_t)) \end{aligned} \tag{3}$$

where $P_{t,k}(Y)$ denotes the projection of Y onto space spanned by Y_{t+1}, ..., Y_{t+k-1}.

Consequently, the appropriate type of the model is identified. There are compared the results of Autoregressive (AR) model, Moving Average (MA) model, Autoregressive Integrated Moving Average (ARIMA) model in terms of statistically significant parameters and their ability to explain the correlation structure of the process that generated the time series. Then the ARIMA(p, d, q) model can be written in the form

$$Y_t = \beta + \sum_{i=1}^{p}\alpha_i Y_{t-i} + \sum_{j=1}^{q}\delta_j \varepsilon_{t-j} \tag{4}$$

After finding the appropriate model, the presence of autocorrelation is checked using Breusch-Godfrey serial autocorrelation LM test. Null hypothesis states that there is no serial autocorrelation. If the calculated value of the test exceeds the tabled test criterion from Fisher and χ^2 distribution the null hypothesis is rejected and there is autocorrelation. Durbin-Watson test also enables to decide whether there is autocorrelation. However, it has some drawbacks (e.g. it has "grey" zones where it is not possible to evaluate the test). Its value should be between lower and upper level of the critical values of Durbin-Watson distribution. Values around 2 indicate that there is no autocorrelation.

Heteroscedastity is tested by Autoregressive Conditional Heteroscedasticity (ARCH) test. Null hypothesis is again that there is no heteroscedasticity present (i.e. that the variance of the residues is constant and finite). The test is also using Fisher and χ^2 critical values and rejects the null hypothesis if the calculated value of the test exceeds the table values.

Normality is tested by Jarque-Bera test with null hypothesis that the residues are normally distributed. Calculated value of the test is compared to critical value of

Jarque-Bera distribution. If the value exceeds the table one, null hypothesis is rejected. All tests are done at 0.05% level of significance.

Consequently, the fitted models are used to predict the future producers' prices of milk in future 12-month period. Also 95% confidence intervals are elaborated.

Second, the possible correlation between the time series of milk and feed maize is examined. It is supposed that variables have similar trend. They also have to be integrated of the same order. Therefore, they are tested by ADF test (after and before seasonal adjustment). Consequently, the time series are tested for spurious regression by Granger test. General VAR(p) model can be written in the form

$$\mathbf{Y}_t = \boldsymbol{\beta} + \sum_{i=1}^{m} \boldsymbol{\Phi}_i \mathbf{Y}_{t-i} + \boldsymbol{\varepsilon}_t \qquad (5)$$

where $\boldsymbol{\beta}$ is l x 1 dimensional vector of constants, $\boldsymbol{\Phi}_i$, i = 1, 2, …, m are l x l dimensional non-random matrices of AR parameters and $\boldsymbol{\varepsilon}_t$ is l-dimensional process of white noise. In our case, price of milk is modelled by VAR with two time series (in natural logarithms).

$$\ln Y_{1,t} = c_1 + \ln Y_{1,t-1} + \ln Y_{1,t-2} + \ln Y_{1,t-3} + \ln Y_{2,t-1} + \ln Y_{2,t-2} + \ln Y_{2,t-3} + \varepsilon_{1,t}$$
$$\ln Y_{2,t} = c_2 + \ln Y_{1,t-1} + \ln Y_{1,t-2} + \ln Y_{1,t-3} + \ln Y_{2,t-1} + \ln Y_{2,t-2} + \ln Y_{2,t-3} + \varepsilon_{2,t} \qquad (6)$$

Then the model was econometrically verified. Autocorrelation was tested by residual serial correlation LM tests and heteroscedasticity by VAR residual heteroskedasticity tests. Using Jarque-Bera test it was examined whether the distribution of residuals is normal. The projections with 95% confidence intervals are done for 12-month period.

3 Data

Data were taken from Agris [2]. Originally, the frequency of milk price was weekly, but was transformed on monthly data by calculating the monthly average as the prices of feed were available on the monthly bases. Observed period is from 01/1998 to the latest available data for all commodities – 06/2016. There were 222 observations. Average annual prices are given in Table 1. Calculations are done in EViews 8.

Table 1. Average annual producers' prices of milk, and fodder maize. Source: own elaboration.

Year	**1998**	**1999**	**2000**	**2001**	**2002**
Milk [CZK/l]	7.88	7.2	7.45	7.73	8.09
Year	**2003**	**2004**	**2005**	**2006**	**2007**
Milk [CZK/l]	7.8	7.94	8.25	7.86	8.22
Fodder maize [CZK/t]				2921.09*	4182.92
Year	**2008**	**2009**	**2010**	**2011**	**2012**
Milk [CZK/l]	8.76	6.2	7.39	8.28	7.79
Fodder maize [CZK/t]	4634.17	2800.00	3282.25	4797.64	4640.54

Year	2013	2014	2015	2016**
Milk [CZK/l]	8.4	9.51	7.86	6.93
Fodder maize [CZK/t]	4975.33	4252.67	3781	4085.57

4 Results

First, the development of the time series was scrutinized. Second, the development was modelled individually by Box-Jenkinson methodology (by ARIMA model). Finally, a VAR model was constructed and utilized for price predictions.

The time series was plotted to get the basic idea about the character of the development of prices (see Fig. 1). The highest increase in milk price was in 01/2008 (10.10 CZK/l). It was increasing since 11/2007, but after reaching the maximum at the beginning of the next year, it decreased again below 9 CZK/l in 06/2018. The reason for increase was the lack of milk on the EU market. However, the lack was replaced by the surplus later and the prices decreased again. "Clear explanation, why there is suddenly a lot of milk while there was lack of it last year, does not exists. The only sure thing is that the production of important exporters such as Australia or New Zealand has started again and it began to remain more milk in Europe. [6] Nevertheless, the year with highest average price of milk was 2014, when the monthly prices were moving over 9 CZK/l. On the other hand, minimal prices were noted in 2009 (6.20 on average) when they decreased even on 5.92 CZK/l in 08 and 09/2009. In over 50% of cases, the prices were higher than 7.88 CZK/l, 25% months were the prices lower than 7.50 CZK/l and higher than 8.21 CZK/l.

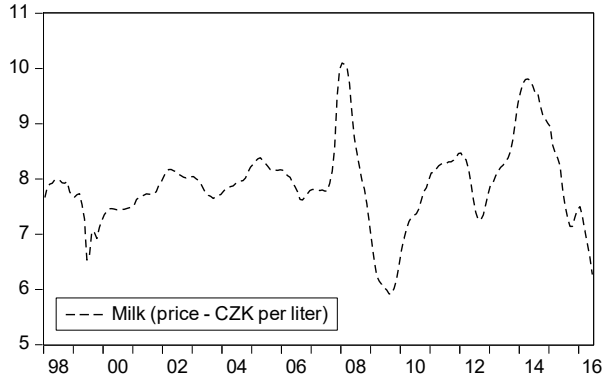

Fig. 1. Development of prices of milk (01/1998-06/2016). Source: own elaboration.

The price of milk was modelled individually by Box-Jenkins methodology and was further used for prediction. The results of the model together with verification tests are displayed in Table 2. Fisher seasonality test (F-test) revealed that time series is seasonal, but seasonal parameter (SAR or SMA) is not statistically significant. Therefore, it is not modelled. After testing, it was found that the most suitable model for price of milk was ARIMA(2,0,1)c. It means that the time series was stationary at

the 5% significance level (the degree of integration is 0) and that the prices depends on the price one and two months ago (AR process is of degree 2) and that the MA model is of 1st order.

There was added a dummy variable IMP that takes value of 1 in May 1999 and zero in other case in order to capture the shock in the time series. Otherwise the residues would be autocorrelated. Constant 7.78 equals almost to mean dependent variable (7.90). Durbin-Watson test suggests that there is not autocorrelation (its value is almost equal to 2). Breusch-Godfrey test confirms that there is no autocorrelation at 5% level of significance (the probability of Fisher and χ^2 is higher than 0.05). The distribution of residues is not normal, finite and constant as the time series is long (18 years) and variable. Due to the presence of heteroscedasticity, we used Heteroscedasticity and Autocorrelation Corrected (HAC) errors. These standard errors take into account the heteroscedasticity and results are not biased (undervalued).

Table 2. Price of milk: ARIMA(2,0,1)c model, impulse = 1 (05/1999). Source: own elaboration.

Variable	**Coeff. (Std. error) Prob.**	**Model diagnostic**	
β	7.7834 (0.2539) ***	R^2	0.9842
IMP	0.2652 (0.0421) ***	Adjusted R^2	0.9840
AR(1)	1.6147 (0.1195) ***	F-statistic	3357.5600
AR(2)	-0.6508 (0.1152) ***	Prob. (F-statistic)	0.0000
MA(1)	0.3883 (0.1232) ***	Durbin-Watson statistic	2.0217
Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	2.1725		
Prob. $F^{[2,215]}$	0.1164		
Obs* R^2	4.3980		
Prob. $\chi^{2\,[2]}$	0.1109		

Note: *** marks statistical significance at $\alpha = 0.01$

Fig. 2 presents the development of real prices of milk (drawn with dotted line) and prices fitted by the model (displayed with dashed line). The residues (difference between real and fitted values) are displayed by solid line.

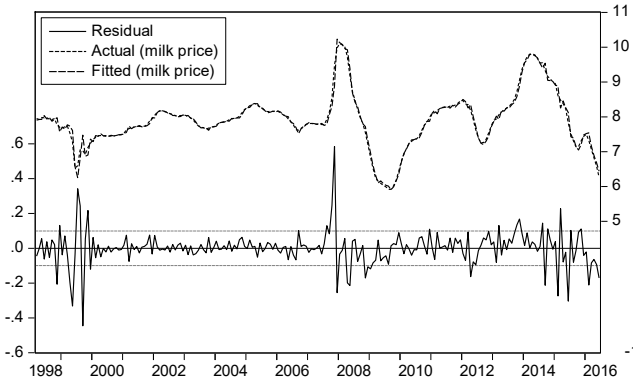

Fig. 2. Development of milk prices with residuals (01/1998-06/2016). Source: own elaboration.

Estimated model was used for predictions and construction of 95% confidence intervals. The results are displayed at Fig. 3. Despite that the prices of milk were decreasing at the end of the observed period (since 01/2016), the model suggests that there will be an increase again. At the beginning, the price shall be the lowest (5.97 CZK/l in 08/2017 and 5.98 CZK/l in 09/2017) and then increase up to 7.06 CZK/l in 06/2017.

Lower bound of 95% confidence interval predict further decrease of the price, down to 4.99 CZK/l in 12/2016, but then also the price shall be higher (5.27 CZK/l in 06/2017). Upper bound suggests that the price might increase up to 8.85 CZK/l in 06/2017.

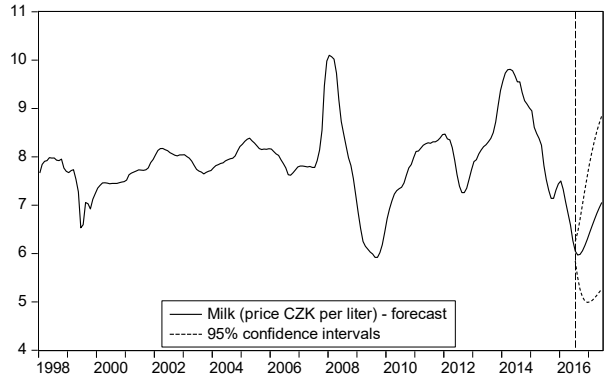

Fig. 3. Predictions of producers' prices of milk based on ARIMA model. Source: own elaboration.

VAR models examine the short-time relationship between the development of producers' prices of milk and possible determinants. In order to make possible the construction of the VAR models, the time series has to be integrated of the same order. While individual time series of the price of milk is modelled as non-seasonal, it enters the VAR model as seasonally adjusted. Also price of maize is seasonal and is

seasonally adjusted. Milk price and fodder maize were tested by ADF test without constant and trend. It was found out that they are non-stationary and integrated of the order 1 (stationary after first differences). Granger spurious regression test revealed that the relation is regression (it is not spurious, hence, it is possible to further model the time series in VAR). It was found that fodder maize Granger cause price of milk. On the other hand, the null hypothesis that price of milk does not Granger cause the price of fodder maize was not rejected. Therefore, the relation and causality between the prices is according to the expectations. Then the time series are used in two-equation model and short-term relation is searched.

Results of the VAR model are presented in Table 3. Time series was included in logarithms (in order to improve the diagnostic tests). According to information criteria and FPE (Final Prediction Error) it is optimal to choose VAR model of second order. However, the diagnostics tests of this type of model were not optimal.

Therefore, we elaborated VAR model with three lags of milk and fodder maize (VAR model of the third order). Milk is statistically significantly dependent on itself in the first and second lag. It is also influenced by the prices of fodder maize one and two months ago. There were six unit impulses (dummy variable taking the value of 1 in case of the impulse, 0 otherwise) in periods 11/2007, 08, 10, 12/2012, and 10, 11/2015 to capture the shocks in the price development and to improve the econometric characteristics of the model. Price of the fodder maize is not dependent at the price of the milk. It depends only on its value one month ago and dummy variable IMP. While in the case of price of milk the development is statistically significantly explained by the constant at 0.1 level of significance, in the case of price of fodder it is already at 0.01 level of significance. VAR Residual serial correlation LM tests show that there is no serial correlation of the residues. Similarly, there was no heteroscedasticity present. However, due to the fact that time series is long, the distribution of the residues is not normal. This does not affect the mean prediction, but can have consequence in the prediction of confidence intervals (they can be biased).

Table 3. Estimates of VAR model of price of milk and fodder maize. Source: own elaboration.

	Price of milk (log)	**Price of maize (log)**
Variable	**Coeff. (Std. error) Prob.**	**Coeff. (Std. error) Prob.**
β	0.0548 (0.0359) *	1.0132 (0.2689) ***
Price of milk (log) (-1)	1.7710 (0.0917)***	0.5672 (0.6864)
Price of milk (log) (-2)	-0.7130 (0.1727)***	-0.1479 (1.2919)
Price of milk (log) (-3)	-0.0786 (0.0897)	-0.3196 (0.6713)
Price of maize (log) (-1)	0.0293 (0.0118) ***	0.8327 (0.0882) ***
Price of maize (log) (-2)	-0.0337 (0.0156) **	0.0529 (0.1167)
Price of maize (log) (-3)	0.0026 (0.0119)	-0.0333 (0.0891)
IMP (dummy)	0.0147 (0.0045) ***	0.1608 (0.0339) ***
Model diagnostic		
R^2	0.9936	0.8940
Adjusted R^2	0.9932	0.8875

F-statistic	2538.521	137.3163
Akaike info criterion	-6.2419	-2.2168
Schwarz criterion	-6.0580	-2.0329

Note: *** marks significance at α = 0.01, ** at α = 0.05, * at α = 0.1

VAR model enables to predict both prices – of fodder maize and milk. The development of the original data with joined projection can be found in Figure 4. Price of milk will further decrease on 5.85 CZK/l in 11/2016 when it will be the lowest. Than it will increase again and in 04/2017 and 07/2016 will be the same (6.13 CZK/l 6.14 CZK/l, respectively). In 06/2017 it shall achieve 6.38 CZK/l that is higher than it was in 06/2016. Upper bound of the confidence interval follows the increase of the price of milk, but without mild decrease as in the mean prediction. The price shall continue to increase since 07, 08/2016 when it is 6.27 CZK/l up to 8 CZK/l at the end of the projection horizon 06/2017. Lower bound suggests steep decrease down to unreal value of 4.74 CZK/l (05/2017).

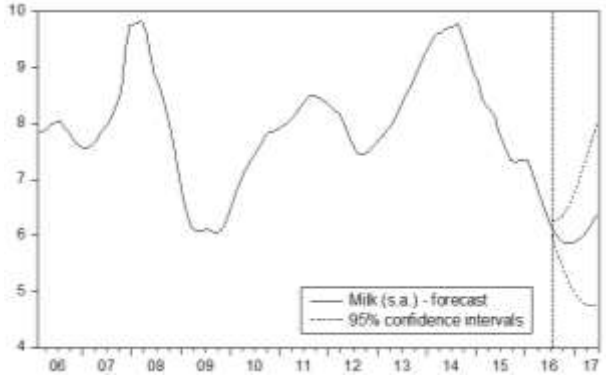

Fig. 4. Predictions of producers' prices of milk based on VAR model. Source: own elaboration.

Comparison of univariate and multivariate approaches can be seen from the Fig. 5. ARIMA and VAR models give almost similar results of the future development of prices of milk – i.e. the price will be lower at first (5.97 CZK/l in 08/2016 in the case of ARIMA and 5.85 CZK/l in 11/2016 in the case of VAR) and then it will increase up to 7.06 CZK/l, 6.38 CZK/l, resp., in 06/2017.

According to ARIMA, lower bound of 95% confidence interval predicts decrease of the price (down to 4.99 CZK/l in 12/2016) followed by increase up to 5.27 CZK/l in 06/2017. VAR's lower bound suggests only decrease of the price that should be as low as 4.76 CZK/l. This price is too low and in the context of current development of the price of milk is not real. In other words, regarding the pessimistic variant of price of milk development, ARIMA model gives better results, but also not realistic as the minimal price for the whole period was only 5.92 CZK/l. Upper bound of ARIMA model says that price might increase up to 8.85 CZK/l in 06/2017. VAR model also project constant increase of price, but only up to 8.00 CZK/l. This development is realistic, as during the examined period, the price of milk increased up to 10.10 CZK/l.

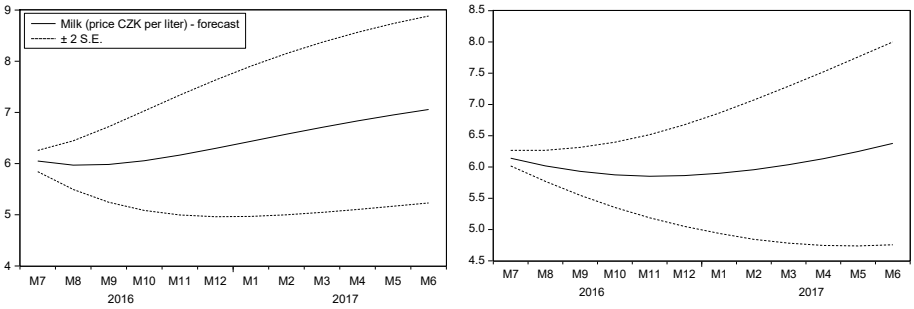

Fig. 5. Predicted prices of milk by Box-Jenkins methodology (left) and VAR model (right). Source: own elaboration.

Lower bound of ARIMA prediction of price of milk was much lower than VAR until the end of 2016. Then the VAR model predicts unrealistic low values. While in the case of prices of the milk, the difference between lower and upper bound starts at 0.41 CZK/l and finishes at 4.58 CZK/l – that is 2.44 CZK/l on average, in case of VAR it is only 1.77 CZK/l average difference between the highest and lowest price.

5 Conclusion

Analysis of the characteristics of agricultural product price volatility and trend forecasting are necessary to formulate and implement business strategies of agricultural holdings and for policy-making. In 2016, the sector of milk production underwent through the crisis. Therefore, the aim of the paper was to find the optimal model for modelling and predictions of monthly price of milk. It was modelled by Autoregressive Integrated Moving Averages (ARIMA) models (time series from 01/1998 to 06/2016) and by Vector Autoregressive (VAR) model in relation with price of maize (data from 02/2006 to 06/2016). Predictions are done for 12 months (until 06/2017).

VAR model predicts lower prices of milk in the pessimistic variant than could be in reality. Mean development and prices in upper bound of confidence interval are also lower, but feasible. The price of milk shall increase 7.06 CZK/l (ARIMA), 6.38 CZK/l (VAR) at the end of predicted period, but will experience the decrease under 6.00 CZK/l at the end of 2016. There might be missing some important variables in VAR model of prices of milk that can improve its prediction capability. Therefore, the challenge for future research is to find other time series that can be included in the VAR model of price of milk.

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Using Digital Media in Marketing when Presenting the Czech Republic's National Parks

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Abstract. This paper analyses the area of modern, dynamically developing marketing tools in the field of tourism, using the example of national parks in terms of visitors' activity. Websites and social networks are currently an integral part of promoting process of each organisation. These include new tools, widely used by the majority of tourists – visitors. Their motivation is planning a future visit or they just watch the current events in a given location. Digital media represents a very pleasant, ubiquitous and accessible way for all interested parties. The aim of the paper is to evaluate the utilisation and the quality of provided information and also the way of Internet communication between the national parks in the Czech Republic. A quantitative method was chosen for the analysis as it's the most suitable method for the evaluating user activity. As an example study, the websites of all four Czech Republic national parks were chosen and their use of selected social networks. The paper describes the individual aspects of website structure and the potential of use is assessed.

Keywords: Websites Analysis, National Parks, Czech Republic

1 Introduction

Tourism is defined by the United Nations as the activity of people travelling to and also staying in places outside their usual environment for less than a year, in order to spend their free time, business and other non-business activities for which they are rewarded from the visited site [9].

Tourism is one of the largest and most dynamic economic sectors. It's an important and significant part of the external economy in many developed and developing countries throughout the world [10]. The high rate of tourism development affects different economic segments. In this sense, tourism is mainly understood to be a separate area of the national economy. Tourism as such, significantly affects other development areas, the most important of these undoubtedly include GDP creation, balance of payments contribution, state budget revenues, as well as having a significant effect on regional budget revenues and beneficially affecting the investment activity of other entities [8].

Tourism is inherently linked to marketing and marketing tools to obtain support for the given tourist sites.

According to Kotler [4], marketing mix is "a set of tactical marketing tools that a company uses to adjust the supply for target markets." A marketing mix includes everything a company can do to influence demand for its product." The concept of a marketing mix was dealt with by e.g. [2, 3]. Bachmann [1] states that: "Marketing has many forms and areas of use today. It has traditionally been associated with the business sector, its expansion into the non-profit sector in the 1960s and 1970s. In the 1990s, the Internet phenomenon began to develop. Society is changing and the Internet is becoming a common way of life. Marketing naturally follows this fact and comes into its online form."

This paper analyses the segments supporting tourism development, specifically in the context of today's society well-established websites and selected social networks using the example of Czech national parks. Specific structures and related orientation for visitors [5-7], up-to-dateness, visual structure and other aspects will be compared. Given that all Czech national parks are situated on the national borders, so there are neighbours over the border to the adjacent national park - the so-called Transboundary Parks. The aspect of digital media inter-connection will also be assessed.

The issue of assessing the significance of social networks for the impact of tourist activity in the region and the related determination of the tourist potential in the area has always been a difficult task to research. The study of this paradigm began towards the end of the 20th century with the massive onset of information technologies and their approximation, adaptation to complete establishment in all society social groups. The aim of this paper is to analyse a certain part of the marketing, i.e. the current Internet tools - specifically the websites and selected social networks belonging to the Czech national parks as one part of the marketing mix for addressing and informing visitors.

2 Methods

This work uses the method of quantitative comparison of individual Czech national parks websites - regarding structure, quality, information and other characteristics.
According to Disman, [3], quantitative methods are best suited to investigating simple and measurable traits or combinations thereof. The analysis of all four Czech national park websites, visual representations, up-to-dateness, language versions, types of posts, tourism promotion and creating a separate application are compared, as well as using the following selected social networks such as Instagram, Facebook (number of friends, number of followers, response rate and rating) and twitter (tweets, following, followers and connecting to this network).

3 Results

3.1 Comparison of the use of websites and social networking

With the advent of new marketing tools, all institutions, irrespective of whether they're private or public, including the Czech national parks, started to create their first websites that have been improved and edited for their users over the years. As part of this paper, a comparison of individual Czech National Park websites as of 28.10.2017 has been carried out - see Table 1 below.
From the analysis carried out, in terms of structure, visual style, search intensity, language versions and other aspects of Czech national parks individual websites, the following applies:

Šumava National Park has a visually appealing website that are organised logically for the visitor and well-sorted individual icons and other related components, however, the information contained on this website is extensive. In case of a quick search in hectic times, it's necessary to use the search engine on this website. However currently, the available information suggests generalisation, clarification and updating existing websites.

In terms of clarity and visual aspect, the best website is the Krkonoše National Park, which appeals to be modern, clear and in very interactive manner, in the sense of up-to-date and includes the possibility of response. A very interesting attraction for users is the absolutely identical website structure for two neighbouring border national parks and the website visitor chooses right from the start whether they would like to see the Polish Karkonoszki park narodowy or the Krkonoše (Ore Mountains) National Park. Both parks have the same logo - the only difference being, that the inscription that is part of the logo is always in the national language. Other up-to-date news featured in this park is the built-in National Park application for Smartphones, which demonstrates its connection and approach to potential visitors through a new marketing tool, namely social networks. A huge welcoming moment for Facebook social network visitors or users is the fact that the response is within 24 hours on this type of media, such a rapid response from all four national parks isn't recorded for any others.

The České Švýcarsko (Czech Switzerland) National Park, with its neighbouring German partner, the Sächsische Schweiz National Park, has a similar graphic design for the website, which is very pleasant for visitors of this border region. Websites have a well-designed structure for good visitor orientation in the virtual world. From the viewpoint of tourist information, individual tourist destinations or attractions, the National Park website contains the absolute minimum, especially because regional tourist destination management is in operation in this region, i.e. the local benefit company of Czech Switzerland, o.p.s. It manages all tourist information and offers for visitors and the National Park is one of the stakeholders. Therefore, all tourist destinations are promoted on the company's website. Destination management has also created its own application for this national park's visitors.

The Podyjí National Park's website is visually stark compared to the sites mentioned above and it's less attractive in regard to visual comparison. However, this

park's website is clear and simple to navigate and it also provides a quick search on the information you need.(Table 1)

Table 1 Comparison of National Park's website

	Šumava National Park	Krkonoše National Park	Bohemian Switzerland National Park	Podyjí National Park
Websites	yes	yes	yes	yes
Clarity	medium	yes	medium	yes
Scope of information	huge - complicated for orientation	medium	big - complicated for orientation	medium
Connected with the transboundary national park	no	yes	no	no
English translation	yes	yes	yes	yes
Other language translations	German	Polish	German	German
Typs of articles	current, interesting, adequate and up-to-date, attractive for visitors	current, interesting, adequate and up-to-date, attractive for visitors	current, interesting, adequate and up-to-date, attractive for visitors	current, interesting, adequate and up-to-date, attractive for visitors
Currents	yes	yes	yes	yes
PR of tourism attractions	yes	yes	no - job of est. Public Service Company	yes
Visual shape	visually impressive, above all the headings, many subfolders and recommendable via search for findings and quick response	clear, easy for orientation and serching, good designation and naming	more difficult for searching - less components and many subfolders, recommendable via search	clear, easy for orientation, visually less impressive a. attractive
Own App	no	yes (it is their own product)	yes (product of the Public Service Co.)	no
Facebook	yes	yes	yes	yes
Number of friends (28.10.2017)	23 936	18 084	9 489	2 790
Number of viewers	23 445	17 796	9 426	2 769

(28.10.2017)				
Quick reply	neutral	yes - at latest in one day	neutral	neutral
Evaluation (28.10.2017)	4,8 (47 reviews)	4,2 (68 reviews)	4,9 (227 reviews)	4,7 (188 reviews)
Currents	yes	yes	yes	yes
Instagram	yes	yes	yes	yes
Twitter	yes	yes	yes	yes
tweets (28.10.2017)	192	1 528	968	279
viewing (28.10.2017)	0	279	27	283
viewers (28.10.2017)	193	794	406	193
joined in	August 2009	June 2015	October 2010	December 2011

If Facebook social network is compared, especially from the viewpoint of the possible quantified number of friends and the number of followers, it can be stated that it corresponds to the individual sizes of the national parks. So the most extensive Šumava National Park has the largest number of friends and followers, followed by the Krkonoše National Park. The smallest number belongs to Podyjí, the Czech Republic's smallest national park. At the same time, it has to be mentioned that the response to the reactions, i.e. the actual response to individual stimuli, is the absolute best with the Krkonoše National Park, which responds within 24 hours. Such service isn't offered by any other national park

In terms of Facebook evaluation, all national parks are comparable, the lowest imaginary position surprisingly belongs to the Krkonoše National Park, which is surprising with regard to structure and constant updating. Instagram and Twitter are both used by all Czech national parks. However, links to these particular social networks aren't listed on their homepage. Only the Podyjí National Park has a link for the Twitter application on its website.

From the point of view of the comparison of Twitter's social network, it's the most successful in the number of tweets and watching the Krkonoše National Park, even though it was the last to join the network. It's followed by the České Švýcarsko National Park. The worst statistic in terms of tweets and following is surprisingly reported by the Šumava National Park, even though it was first to join the network in August 2009.

4 Conclusion

The Internet and other social networks are the more current marketing tools used to support tourism and as well as for current awareness of events or news. The Czech national parks approach this new media individually. The significance of these media

outlets is to share different insights, news or warnings and to share your own opinions. For individual administrations of these public institutions, this is an interesting feedback in relation to the further direction and possible development of the given areas.

According to our opinion, the pages on the Krkonoše National Park websites are among the most pleasant and most user-friendly. Importantly, the fact that they unite with their cross-border neighbour, the Polish National Park and are therefore very user-friendly for quick orientation. The remaining national parks have the same geographic location and so they're destined for a similar possibility for this kind of social media, which would certainly be welcomed by the users. Language versions are unified regarding English. The other language version is based on the reality with which state and therefore language they adjoin across the state border, which is logical and natural.

The most significant difference in the České Švýcarsko National Park Administration's website is the absence of a description for tourist attractions that the company o.p.s. presents as a regional manager who supports this activity. Facebook, Instagram as well as Twitter are used by all Czech national parks in basic form.

It's also clear that the Internet and social networks have become an obligatory part of the national parks marketing tools, which is firmly established in today's information technology society. Nowadays, they're considered to be an indispensable part of promotion even in the case of large-scale protected territories dominated by national parks. Their development and future adjustments are entirely natural, according to the further development of these media and public pressure to make the pages clear and accurate.

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Human Resources Management - the Example of Wilderness Guides

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Abstract. The aim of the paper is to introduce the possibilities of managing the development of new tourism activities associated with visits to national parks. Sustainable activities, especially in large-scale protected areas, which include national parks, are developing training examples for local residents and the provision of guide services themselves. Case studies present the unique wilderness guides project in the Šumava National Park. Emphasis is placed on the co-operation of public institution with local residents, which is one of the basic forms of participatory management of the territory. First, it's focused on the theoretical, general issues in terms of national parks, knowledge management and human resources management - especially in respect to current trends in employee savings in individual institutions. From the theoretical paradigms, Cohen's guide roles were analysed. The Šumava National Park was chosen as the case study, which is unique in terms of developing the concept of local guides training. This paper describes the development of this activity and the development of a two-stage division of the guides. Finally, the results are summarised with the emphasis placed on the indispensable role of each national park as a publicly established institution that is also economically among the major players in each region.

Keywords: Guides, National Park, Human Resources.

1 Introduction

Worldwide, concepts and new activities are being proposed and developed to attract more tourists and visitors within the sustainable areas of tourism and activities linked to them both in national parks as well as other protected or wildlife areas. Preserved nature becomes a major attraction. Some people want to experience nature on their own, others understand natural laws better, find inspiration or just relax during their spare time from pre-urbanised cities and ubiquitous networked technological inter-connections.

Local actors are motivated by the trend to develop new, interesting and lucrative offers that can attract visitors in the form of services and follow-up activities. "Return to nature" has become an increasingly important trend in recent years and every region that has sufficient natural assumptions tries to exploit the economic potential.

These such regions, not only regions in the Czech Republic, undoubtedly include national parks with preserved natural heritage and other protected areas with their natural jewels.
This paper analyses the services development by local guides as a specifically evolving offer in the Šumava National Park. The main attraction of this complementary service in the region isn't just the possibility to enjoy a guided tour in places where access is forbidden due to nature protection, but the programme itself prepared by the guides is the main attraction. More and more visitors prefer the ability of drawing information on the place itself from a trained professional's mouth, preferably directly from a local person.

Finally, the research states the given individual recommendations for destination management and management of national parks for further development of the area of tourists' interest, which has been developing dynamically, or to suggest possibilities for its further development in the future**.**

National parks, just like other protected areas are a matter of interest for visitors who are seeking engagement in recreation with the use of nature, i.e. tourism that's connected with nature. There are a number of conceptual models that present changes on the visitors' side in terms of quantity and "quality" of their activities, i.e. type activities, spatial and time models [3,11]. In addition, in parks and protected areas, which include many protected sites, the management's priority is very often aimed at preventing disturbances that might arise from excessive or careless use, i.e. making accessible to the public.

Through their work some authors [11, 8, 12] deal with perspectives to minimise possible ecological changes, which is very important in terms of the monitoring factors that affect the intensity of the visitors' stays in given locations, as well as types of leisure time use, length of stay and conditions of individual services. It's the managers of individual national parks that often have the greatest influence on some of these factors and above all, thanks to their understanding of the protected areas which they manage, they can balance the interrelated relationship between nature and humans. Therefore, they can create long-term sustainable environmental management. [8] Authors dealing with these issues in the long term [1, 11] agree on several basic principles:

- Recreation, which is carried out in harmonisation with nature or more nature-oriented recreation has an impact on soil, vegetation, animals, water, air and other ecosystem components.
- A given space for the relationship between ecological change and use, can be described in individual steps or in linear functions.
- Visitors' behaviour in nature, their choice of leisure time use and their movement in the space including the length of their stay in it, is one of the first determinants of ecological disturbances.

On one hand, personnel policy and management policy are related to the issues of nature conservation and visitor policy and on the other hand, they are balanced with the correct nature conservation policy.

Human resources and human resources management, sometimes also referred to as human capital [1] management or HR, is a process area within an organisation that deals with the management and development of human resources. It includes comprehensive personnel work, i.e. a variety of procedures and different management methods for managing human resources - for working with people in an organisation. From recruitment, is entering into employment, personal development up to payroll. In practice, various terms are used, such as personnel administration, personnel management, human resources management or human capital management. There is no major difference between them from a practical point of view, but they are theoretical concepts of personnel work and its place within the organisation - from simple staff management to active work with human capital.

Human resources management isn't limited to the HR manager and other personnel department staff, it also concerns practically every manager in the organisation. Human resources management is often applied in the past to the management of national parks. [7, 10] Addressing specific aspects is the subject of even later research, often with the focus and specifics of a given country.[9,14,16]

2 Methods

The main method for specifying Human Resources Management in national parks is the case study. The study analyzes the contribution of the wilderness guides in the Šumava National Park.

The trainings of local guides started in 2006. The participants have provided their services since 2008 with the coordinating role of the Šumava National Park Administration. The database of the trained local guides, who are active, is accessible on the websites of the trainers (www.npsumava.cz). The guiding services are also promoted in a leaflet for public, which is handed out on many places in and outside the national park region, above all in information and visitor centres.

All the data for this case study were collected from the local guides themselves using the contacts on the website. There were also made some face-to-face interviews with ten most experienced guides as well as with their coordinator, who is responsible for the public use of the Šumava National Park.

3 Šumava National Park - case study

3.1 Local guides

Public institutions, which also include national park administrations, are under constant pressure from the point of view of staff savings and not increasing their numbers [4]. The lack of adequate personnel and managerial resources to provide well-designed, sufficient promotional services [2] is also closely linked to this fact, although these services are very important locally, nationally and globally. Dearden & Rollins [6] reports that they have come to a critical position in Canada. As a result,

they state it was necessary to change access to these, from the public side, demanded activities and change the management of this segment. Their example has been used to support tour operators and guides who have an important and influential role in providing information, interpreting and guiding individual groups to nature. It also states that, despite reasonably widespread support, relatively little attention is paid to the guide's role [13, 15, 17].

Studies that recognised and investigated the guide's role, included the Cohen model [5] as the basis for exploring the guide's role. Cohen [5] first conceptualized the guide's role in four different sub-roles of leadership.

The orientation of the "externally managed" guide's role is focused on organisation and management (supporting roles) and facilitating meetings with host groups (interaction roles). In these roles, the tour guide must meet both the individual and the group needs of the party, through resources outside of the group tour.

The "tourist guide" role "internally" focused, includes leadership in the form of social interaction (social roles) and dissemination of information (communicative roles) and these needs are summarised as follows within the Cohen's four-role tourism guide:

- instrumental roles: focus on direction, navigation, access to territory and security,
- inter-rational roles: focus on representing the area in a non-threatening manner and organisation,
- social roles: focus on tension management, social integration, as well as cohesion and the use of humour and entertainment for maintaining and building group morale,
- communication roles: focus on selecting the groups' points of interest, disseminating correct information and translating an unknown person (modified by Cohen 1985).

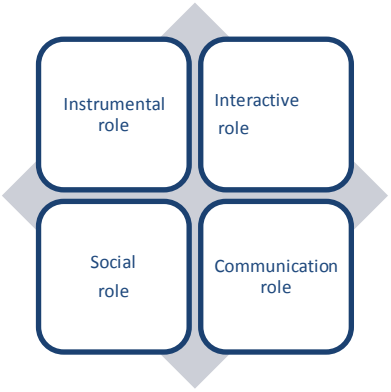

Fig. 1. The guide's roles

3.2 Guides in Šumava National Park

The Šumava National Park is the largest national park in the Czech Republic with a total area of 690 km^2. It was established in 1991 by Government Regulation No. 163/1991. The Šumava National Park Administration is a resort organisation for the Czech Republic Ministry of the Environment, which has a total staff of 265 (2016) and a total state budget contribution amounting to 274,370.27 CZK (2016), which is steadily decreasing at the expense of the contribution to the activity.

The Šumava National Park Administration has been developing local guides training since 2006. From the Czech point of view, it's a rare and in a way unique activity, which not every national park develops within its services portfolio. Within the Czech Republic, the Šumava National Park has so far been unique in regard to this activity. This activity started on the basis of numerous debates on the existence and benefits of the Šumava National Park. The debate went across both the political and the broad social spectrum. The questions mainly concerned the extent of nature protection, the accessibility of the strict protected zone that is inaccessible to ordinary public, the development of services in the area of tourism for visitors to the National Park, etc. In 2006, one of the demands for the National Park's top management was to create a guided tour of the Šumava Mountains and then start implementing it.

Based on this concept, a two-stage programme was developed to create a network of guides. The first stage consisted of the trained Šumava Guides and the second stage Wilderness Guides, recruited from the local Šumava guides, see Fig. 2.

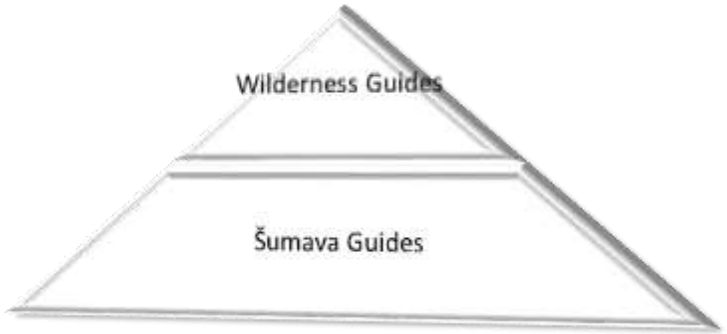

Fig. 2. Hierarchy of Guides in the Šumava National Park

A call for candidates and volunteers to participate in this new project was launched within this programme. The main organiser was the Šumava National Park Administration in co-operation with experts from a number of institutions (Czech Republic Academy of Sciences, Museum of Bohemian Forest, University of South Bohemia in České Budějovice, Šumava Regional Development Agency, etc.) and together with other practical guides. The whole project co-ordinates the so-called co-

ordinator for the Šumava National Park Administration, who synchronises the necessary activities.

The prerequisite was that the candidates for guide course come from the National Park's region. The compulsory 8-day training consisted of both the theoretical lectures on the Šumava topic and practical examples of the guide's work. Signed participants were trained in two stages, theoretically as well as practically. The programme was fully completed by experts from the Šumava National Park Administration, as well as external experts from various fields and also from relevant institutions. The final part of the training was the preparation and execution of a model walk to nature. The individual has selected the site independently for the entire group, of course again under the supervision of experts from the Šumava National Park Administration.

Training local guides took place in three cycles in 2006, 2008 and 2009. A total of 71 participants were trained mainly by locals with a deep interest in the Šumava region and with good prerequisites for guide activities. The most beneficial part of this training was the evaluation of both the trainers and the participants themselves, the practical demonstration of a model guide for the entire "learner" group. Upon successfully completing this training, each participant received a certificate for the training completion and a badge with a guide's licence from the hands of the National Park Administration's Director.

The average cost of training each individual, including lecture fees, study materials, as well as boarding and accommodation during the courses, amounted to 7,500 CZK. Subsidies from UNEP GEF funds covered approximately 60% of the cost. The participants themselves paid a fee of 1,500 CZK and any other costs were paid by the course organisers. The Šumava landscape and nature guide helps all visitors to discover Šumava from a different point of view, from the point of view of local people with knowledge of nature, animals, plants, as well as local history and culture. The task of each local guide is to introduce the visitor to their native region, to which they have a personal positive relationship that seeks to transfer positive perceptions to the participant of each particular guide.

The Wilderness Guides are recruited from the trained Šumava Guides, there are currently around 30 of them. The difference between the first and second level guides is that the Wilderness Guides undertake further follow-up training annually and besides that, they must be physically competent due to the difficult terrain excursions and an active interest in contemporary events in the region is a matter of course, as they present it and must also be able to respond to questions about current media and public media issues.

Excursions to the wilderness are offered as one-day and to a lesser extent, two-day tours. (The two-day tours were first introduced in 2009 and then regularly since 2016). The fee for the guide ranges from 190 CZK to 450 CZK, derived from the length, difficulty and accessibility of the route. The price for a two-day tour to the wilderness is set at 900 CZK. Each participant, of course, pays all the costs associated with staying in Šumava, in addition to the guide fee, which bring other direct economic gains for the Šumava National Park region, which included a total of 269,702 CZK in 2016.

Given the fact that the National Park and the Protected Landscape Area of Šumava is located on the border between Austria and Germany, it's an enormous positive if the guide speaks German or English, especially for incoming media representatives or tour operators from abroad. As far as language for wilderness guides is concerned, German language is the strongest(14) followed by English(10). Russian or French language are also represented, but to a very minor extent, as is evident from Fig. 3.

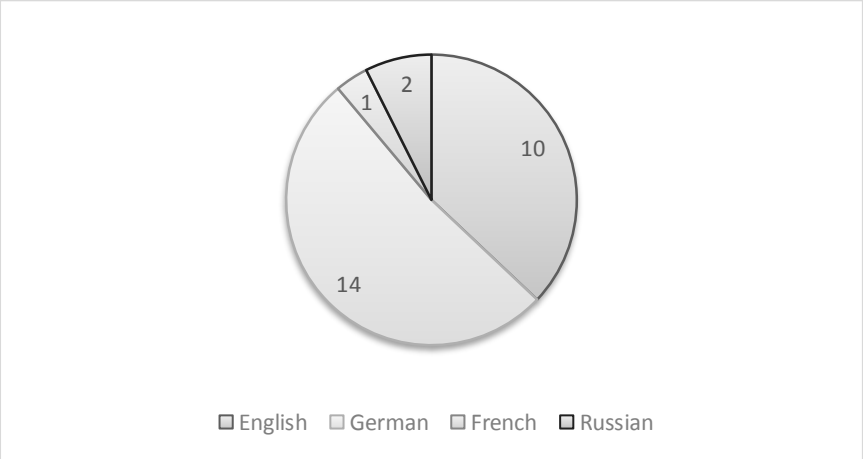

Fig. 3. Wilderness Guides' Language Skills

The gender ratio for wilderness guides is slightly to the benefit of women. In total: 16 women and 14 men. In conclusion, regarding Wilderness Guides' we must state that they're mostly self-employed people, who to a certain extent, can participate at any time during the week regardless whether it's a working day or a weekend.

4 Conclusion

An example study in the Šumava National Park shows that the programme of creation or extension of the current offer through Šumava guides or wilderness guides has a strong reputation on the visitors' side. The provided co-ordinator has to work continuously on the development of this activity. Updating the offer and new programmes, especially in the form of new routes and maintains and increases the attractiveness for existing and new entrants. The extension of this uniquely environmentally friendly and economically beneficial and socially appropriate activity makes it a model example of sustainable activity in the National Park Region, i.e. in a particularly preserved natural environment with the most strict nature protection form in the Czech Republic, regarding legislation.

All financial income generated directly by the provision of guide services flows into the pockets of local residents, who are therefore highly motivated for the best possible performance. The Šumava National Park Administration indirectly benefits from their activities, which, through the trained guides, transfers their own information, as well as views and philosophy to the region's visitors. The main benefit is the increased acceptance of the territory's status, which is the national park and which can be seen in many respects as a negative fact for the region's economic development. Nature conservation plays a role here as a key factor for the sustainability and development of the region's economy. The entire National Park region benefits from the expansion of the tourist offer, which includes tourism to the ever stronger pillars of the region's economic development.

The main recommendations follow up:

- Education of people helps to understand the goals of the nature protection.
- Training of local inhabitants increases their acceptance of the national park.
- From financial income by locals from the availability of the national park profits even the nature protection, incl. the nature protection body.
- Development of the tourism sustainable activities supports the sustainable development of the national park region.

The Šumava National Park is therefore a significant player in the region not only on the basis of a well-known public institution, a significant employer, an important development partner and a tourist investor but also an exemplary partner for inspiration and the development of other types and activities in the field of tourism in its friendly form.

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Leader's Information Processing Preferences and Leadership Effectiveness: The Moderating Effect of Environmental Uncertainty

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Abstract. Drawing on trait activation theory, the present study empirically examines the moderating role of environmental uncertainty plays in linking leader's information processing preferences (thinking-feeling, TF) with different aspects of leadership effectiveness (task performance and contextual performance). Using a sample of 236 leaders in China, we found that (1) leader's information processing preferences (TF) was positively related to both leader's task performance and contextual performance, that is, F leaders have higher task performance as well as contextual performance than T leaders; (2) environmental uncertainty moderated the relation between TF preference and task performance, that is, above relation was positive and stronger when environmental uncertainty was low rather than high; (3) environmental uncertainty moderated the relation between TF preference and contextual performance, that is, above relation was positive and stronger when environmental uncertainty was high rather than low. Theoretical contributions, practical implications and future directions were discussed.

Keywords: Leader, Information Processing Preferences, Leadership Effectiveness, Environmental Uncertainty, Moderation.

1 Introduction

In the present study, we extend the trait activation mechanism of leader's information processing preferences (thinking-feeling, TF) on leadership effectiveness with the proposition that environmental uncertainty moderates the relationship between leader's information processing preferences and leadership effectiveness. Information processing preferences are very important to leader's making decision and then to leadership effectiveness [1]. Previous research had identified leader's information processing preferences- Thinking (T) preferring to make decisions base on objective logic and Feeling (F) preferring to make decisions base on others' or group values - as an important factor underlying leadership behaviour [17], team performance [20], consciousness development [37], self–other agreement of leadership effectiveness [3, 31].

Despite these findings, our knowledge of how leader's information processing preferences relates to leadership effectiveness, especially under uncertain environmental conditions, is still limited. Today's organizations are facing dramatically increasing environmental uncertainty. Whether leader could improve effectiveness under uncertain environmental conditions has become a prominent factor that helps organizations attain their competitive advantages [39]. Built on trait activation theory which asserts certain situations are trait-relevant and can increase the likelihood a trait is manifested in behaviour [32, 33], we empirically examine the moderating effect of environmental uncertainty on the relationship between leader's information processing preferences and leadership effectiveness, to address above gap.

2 Literature Overview and Hypotheses

2.1 Leader's TF Preference and Leadership Effectiveness

Although scholars vary in their definition of leadership effectiveness, leadership effectiveness has always been characterized as how well leader capacities and how well leaders function [8, 27]. We view leadership effectiveness as leader performance, conceivably through the component of individual work performance. A wealth of evidence exists to support the multidimensional nature of individual work performance [7, 6]. Scholars differentiate work performance into task performance and contextual performance on the basis of job roles [4, 3]. Further, the research extended to the study of management positions and divided the manager's performance into two parts: task performance and contextual performance [19]. Although there is a significant distinction between leaders and managers [22, 40], we still assumed that participants occupied formal management positions are leaders as management and leadership roles overlap [19]. Thus the current study seeks to operationalize leadership effectiveness in terms of both task performance and contextual performance.

According to the study [24], task performance of the leader means that the leader's behaviour is guided by completing the work, effectively selecting and using the resources, and maintaining orderly and credible management. Contextual performance refers to the leader's behaviour to establish relationships, help others, enhance cooperation and teamwork, as well as increase employee satisfaction and job-oriented.

TF, which pertains to information processing preferences. Leaders with a preference for thinking (T leaders) prefer to make decisions by objective logic; whereas leaders with a preference for feeling (F leaders) prefer make decisions on the basis of others' or group values [25]. F leaders are more subjective than T leaders because they are based on personal or community values [26]. According to information processing perspective, by obeying the objective truth and the principle of fairness, T leaders maybe make more rational decision, and achieve higher task performance than the more subjective, F leaders who rely on individual and group values. The study found that preference for thinking positively correlated to

"experienced" and "reliable" indicators in leadership performance, while preference for feeling are negatively related [10]. They explained that T leaders pay more attention to 'right' than 'liking'. And the authors studied the relationship between TF dimensions and leadership performance, and found that as much as 79% of high-performance leaders are T leaders [11]. Accordingly, we propose that T leaders have higher task performance than F leaders from the functionalist perspective. As a high TF score indicates a preference for feeling whereas a low score indicates a preference for thinking when processing information. TF Preference was negatively related to task performance as following hypothesis.

Hypothesis1. TF preference is negatively related to leader's task performance. That is, T leaders have higher task performance than F leaders.

Contextual performance can be defined as behaviours that influence social, organizational and motivational climate in which the work is performed [4, 5]. Contextual performance is extra-role performance which can be distinguished from task performance. Contextual performance related activities include cooperating, helping peer and facilitating team performance which are the voluntary and loyal behaviors [16]. Leaders are expected to perform above contextual behaviours that may not only be directly related to leadership functions but also are more crucial for team and organization performance. F leaders always make decisions subjectively based on values and feeling processes [3], who would be have high social sensitivity and other-orientation [36, 21]. Some studies have found that the T leaders often have more arbitrary and less cooperative behaviours in their relationship with subordinates [26]. Accordingly, we propose that F leaders would have more helping and cooperating behaviours which facilitating contextual performance than F leaders from the social constructivist perspective. We put forth the following hypothesis:

Hypothesis2. TF preference is positively related to leader's contextual performance. That is, F leaders have higher contextual performance than T leaders.

2.2 The Moderating Effect of Environmental Uncertainty

Previous research and review suggest that leader's individual differences relate to leadership effectiveness [23]. However, the correlation is often small [2]. The identification of moderators could increase the relation of individual differences–leadership effectiveness relation [29]. We extend previous studies by examining environmental uncertainty moderates the relation between leader's information processing preferences (TF) and leadership effectiveness.

Environmental uncertainty refers to the degree to which an absence of patterns, unpredictability, and unexpected change characterize a firm’s context [12]. According to trait activation theory, individual traits are viewed as latent potential residing in a person that can be triggered into actions by trait-specific situational cues or "weak" situation [32]. Uncertain environment is a "weak" situation because it couldn't provide

clear cues about desired behaviour [2]. It provides a “weak” situation that would be favourable for TF Preference to be expressed into the corresponding behaviours.

T leaders prefer to make decisions based on rational thought; whereas F leaders prefer to make decisions based on personal or group values [25, 3]. On the one hand, uncertain environment requires leaders have a higher ability to precisely and reasonably judge information and analyze information so as to improve task performance [1]. Environmental uncertainty provides situational cues for T leaders' trait-relevant expression. Accordingly, we propose that as environmental uncertainty increases, T leaders would have higher task performance. On the other hand, according to uncertainty–identity theory [18], F leaders would reduce members' self-uncertainty by providing members a sense of identification and belonging because they pay attention to personal or group values and feelings, which would be helpful to improve contextual performance. We propose that as environmental uncertainty increases, F leaders would have higher contextual performance. Overall, Environmental uncertainty will moderate the relationship between TF and task performance/contextual performance. We put forth the following hypothesis:

H3: Environmental uncertainty will moderate the relationship between TF preference and leader’s task performance, such that the relationship will be stronger under low environmental uncertainty than under high environmental uncertainty.

H4: Environmental uncertainty will moderate the relationship between TF preference and leader’s contextual performance, such that the relationship will be stronger under high environmental uncertainty than under low environmental uncertainty.

3 Methods

3.1 Sample and Data Collection

We collected data from different sources (i.e., focal manager, and superiors) at different time points from 58 Chinese companies. Leader’s information processing preferences (TF) and environmental uncertainty was self-rated by 290 focal leaders. Leadership effectiveness was assessed by 58 supervisors. Participants were assured their survey results would stay confidential and anonymous and be used for the purpose of scientific research only. The number of valid responses we received from leaders and supervisors were 236 and 45 respectively, yielding a response rate of 81.38% and 77.59% respectively. The average age of the participants was 38, and average tenure in the company was 9.5 years. 57.63% of the participants were male, and 80% had a college or higher degree. Age, education level and tenure were normally distributed.

3.2 Measures and Analysis

We used existing scales to measure all variables. Leader’s information processing preferences (TF) was measured with 23 items from MBTI-F version. We adopted a

continuous scoring method as recommended by recent studies [14, 15]. A low TF score indicates the leader prefers to rely on objective logic (T) when processing information, whereas a high TF score indicates the leader tends to processing information based on values or feelings (F). The Cronbach α of TF scale was .72 and the split-half reliability was .74, both exceeding .70. Task performance (TP) was measured with 7 items from existing scale [1]. The Cronbach α for this scale was .946. Contextual performance (CP) was measured with the 7-item scale [38]. The Cronbach α for this scale was .946. Environmental uncertainty (EU) was measured with the 7-item scale [13]. The Cronbach α for this scale was .949. We controlled other three dimensions of MBTI, Extravert–Introvert (EI), Sensing–Intuition (SN) and Judging–Perceiving (JP). We employed path analysis and structural equation modelling (SEM) to analyze the proposed model using SPSS13.0 and LISREL8.80.

4 Results

4.1 Descriptive Statistics Results

We firstly conducted descriptive statistics and correlation analysis. The results were summarized in Table 1. Regarding correlations, the results showed that Leader's information processing preference (TF) was positively correlated with contextual performance (.169, $p < .01$), but not with task performance (.058, $p > .05$).

Table 1. Descriptive Statistics and Correlations among variables

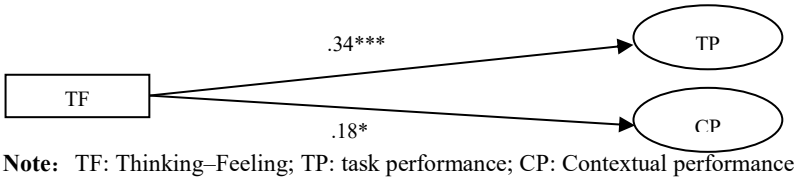
	Mean	s.d.	EI	SN	TF	JP	EU	TP	CP
EI	92.82	22.92	1.000	-.244(**)	-.295(**)	-.090	.182(**)	.063	.015
SN	87.92	20.87		1.000	.414(**)	.557(**)	.332(**)	-.071	.171(**)
TF	89.14	22.64			1.000	.513(**)	.149(*)	.058	.169(**)
JP	83.75	23.14				1.000	.390(**)	-.247(**)	.046
EU	3.21	.62					1.000	-.050	-.092
TP	3.72	.77						1.000	.129(*)
CP	3.65	.72							1.000

Note: Two-tailed test; EI: Extraversion–Introversion; SN: Sensing-Intuition; TF: Thinking–Feeling; JP: Judging–Perceiving; EU: Environmental uncertainty; TP: task performance; CP: Contextual performance $^{***}p < .001$, $^{**}p < .01$, $^{*}p < .05$; n = 236

4.2 Hypotheses Testing Results

To test direct effects of TF on task performance and contextual performance for H1 and H2, we then conducted a mixed-model path analysis. The model fit indices indicated a good fit ($\chi 2/df = 1.55$, below 2.00; RMSEA = .049, below .08; GFI = .92, AGFI = .90, both above the acceptable level of .90; NFI, NNFI, IFI and CFI, all above .95). The results were shown in Figure 1. The result confirmed the

hypothesized relationship between TF preference and contextual performance (β = .18, p < .05) after controlling for EI (β = .03, p > .05), SN (β = .13, p < .05), JP (β = -.10, p > .05), supporting H2. However, although the result found that TF preference was positively correlated with task performance (β = .34, p < .001), but not supporting H1 because we supposed that TF preference is negatively related to leader's task performance. That is, both the task performance and contextual performance of F leaders was higher than T leaders.



Note：TF: Thinking–Feeling; TP: task performance; CP: Contextual performance
$^{***}p < .001$，$^{**}p < .01$，$^{*}p < .05$; n = 236

Fig. 1. Direct effect of TF on task performance and contextual performance

We finally test moderated hypothesis for H3 and H4, using a mixed-model path analysis. The results were shown in Figure 2. For H3 (Figure 2, left), the model fit indices indicated a good fit of the proposed model (χ2/df = 1.89, below 2.00; RMSEA = .062, below .08; GFI = .92; AGFI = .88; NFI, NNFI, IFI and CFI all above .95). Our results showed that the interaction term between TF preference and environmental uncertainty was negatively but significantly related to task performance (β = -.18, p < .01), supporting H3. For H4, the results were shown in Figure 3. For H4 (Figure 2, right), the model fit indices indicated a good fit of the proposed model (χ2/df = 1.98, below 2.00; RMSEA = .065, below .08; GFI = .93; AGFI = .88; NFI, NNFI, IFI and CFI all above .95). Our results showed that the interaction term between TF preference and environmental uncertainty was positively but significantly related to contextual performance (β =.14, p < .05), supporting H4.

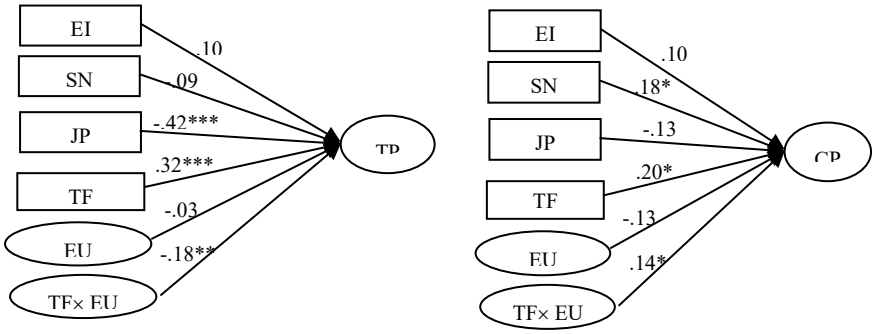
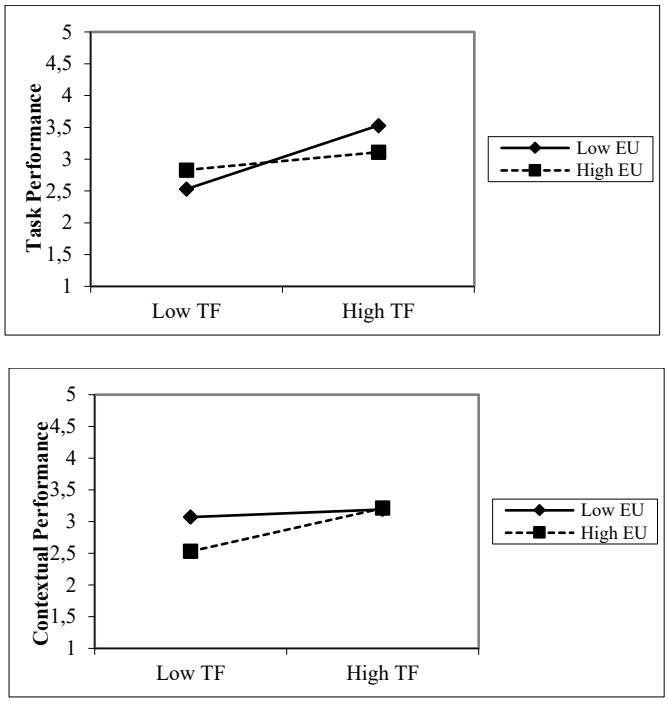


Fig. 2. Moderated effects of environmental uncertainty

Note： EI: Extraversion–Introversion; SN: Sensing-Intuition; TF: Thinking–Feeling; JP: Judging–Perceiving; EU: Environmental uncertainty; TP: task performance; CP: Contextual performance $^{***}p < .001$，$^{**}p < .01$，$^{*}p < .05$; n = 236

Figure 3 further graphically illustrate above interaction effects. Figure 3 shows that the relation between TF preference and task performance was positive and stronger when environmental uncertainty was low rather than high. However, the relation between TF preference and contextual performance was positive and stronger when environmental uncertainty was high rather than low.



Note：TF: Thinking–Feeling; EU: Environmental uncertainty

Fig. 3. Moderated effects of environmental uncertainty

5 Discussion and Conclusion

5.1 Discussion

This paper set out to examine the moderating effect of environmental uncertainty on the relationship between leader's information processing preferences (TF) and leadership effectiveness. Drawing on trait activation theory, the present study empirically examined and revealed three interesting findings: (1) TF preference was positively related to both leader's task performance and contextual performance, that is, F leaders have higher task performance as well as contextual performance than T

leaders; (2) environmental uncertainty moderated the relation between TF preference and task performance, that is, above relation was positive and stronger when environmental uncertainty was low rather than high; (3) environmental uncertainty moderated the relation between TF preference and contextual performance, that is, above relation was positive and stronger when environmental uncertainty was high rather than low.

The present study provides three distinct contributions to the extant literature. Firstly, our results are most favorable towards the importance of leader's information processing preferences, one of individual differences, in improving leadership effectiveness under uncertainty. Our results suggested high environmental uncertainty weakened the relationship between TF preference and task performance whereas strengthened the relationship between TF preference and contextual performance. Under high uncertainty, F leaders showed more high contextual performance. Subordinates need more guidance under high environmental uncertainty, F leaders would give them more confidence and help them to improve performance [30] (Shamir & Howell, 1999). Secondly, our results also contributed to trait activation theory by demonstrating the activating role of a contextual factor-- environmental uncertainty-- on TF preference. Thirdly, our contribution relates to the MBTI literature and, more specifically, to extension of Jung's psychological type theory in Chinese leadership domain. Our results highlighted the association between leader's TF Preference and leadership effectiveness and demonstrated that F leaders had higher task and contextual performance than T leaders. However, H1 was not supported by the results. We supposed that TF preference is negatively related to leader's task performance. That is, T leaders have higher task performance than F leaders. Conversely, F leaders have higher task performance than T leaders. We try to explain from context perspective. Maybe there are conditions under which T leaders are more likely to have higher task performance (e.g. task characteristics). Future studies should consider the other context factors even examine more complex mechanisms by multiple moderating effects, moderated mediation or mediated moderation.

These findings also had important practical implications. Managers often use the MBTI instrument to assist coaching, team building, and management development, decision making and managerial effectiveness [3]. The current findings are useful for HR managers and business leaders. The most important practical contribution of this study is that our results provided guidance for organizational personnel selection and training in an uncertain environment. In uncertain environments, using feeling preference would be helpful to cope with uncertainty by providing members a sense of identification and belonging. As such, it is better to select F leaders or provide related training to improve leadership effectiveness. This idea is consistent with the emotional intelligence literature [34] (van der Linden, Pekaar, Bakker, et al., 2017).

5.2 Limitations and Future Research

Several limitations of the present study provide possible opportunities for further research. First and foremost, the current research, like all cross-sectional studies, does

not allow for conclusions about causality. Future research may want to use longitudinal data or experimental design to examine the causal relationships. Secondly, it incorporates Chinese-specific sample. Future research may examine the relationships using samples from other parts of the world and further do some comparing. Thirdly, our study did not examine the question of how leader's TF preference affects outcomes. Future research may examine more complex mechanisms by multiple moderating effects, moderated mediation or mediated moderation.

5.3 Conclusion

In sum, the present study extends the trait activation mechanism of leader's information processing preferences (TF) on leadership effectiveness by examining the moderated effect of environmental uncertainty on above relationship. Future research need to further explore how leader's information processing preferences (TF) affect leadership effectiveness under contextual variables by examining moderated mediation or mediated moderation effect.

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Regionalization of Production and Foreign Trade of Vegetables in the European Union

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Abstract. Vegetables are a very important and valuable ingredient in a healthy and varied diet. According to FAO/WHO experts recommendation a day should be consumed about 400 grams of vegetables and fruits. Current production in the world as well as in the EU is insufficient to cover the recommended intake. Vegetable production in the EU since 1962 was subject to regulations aimed at protecting the home market as well as selected producers. Since 2008, producers in the Community market have been subject to the same rules. This makes the EU vegetable market more competitive. However, the volume of their production varies regionally due to land resources, climate and technological advances. The largest producers of qualitative vegetables are the southern countries (Spain and Italy). Poland produces the most cabbages and carrots. Spain is Europe's largest net exporter of vegetables and this trade direction is of great economic importance for this country. The largest net importer of vegetables in the EU is Germany, which is not able to meet domestic demand.

Keywords: Vegetable Production, Internal EU Trade, External EU Trade.

1 Introduction

The term vegetable refers to the edible parts of plants. Welbaum [14] claims that vegetables are green plants or parts of plants that are eaten raw or cooked. In general, they are served as an entree or used to prepare salads and are not eaten for dessert. They require intensive care in cultivation and special care after harvest to preserve their quality.

At the FAO/WHO workshop promoting adequate consumption, the recommendations of experts on diet, nutrition and prevention of chronic diseases were reviewed. According to them, a day should be consumed about 400 grams of vegetables and fruits in five portions. However, it was found that the availability of these products increased only slightly in most countries. It is still at a level lower than the recommended intake in both developed and developing countries [8].

According to Eurostat figures, even in the European Union, 5 or more servings of vegetables and fruits a day consumed only 14.3% of its population and 34.4% did not

eat them at all. More than half of the respondents in Bulgaria and Romania did not consume any fruit and vegetables [5]. In the light of these reports and recommendations, in times of greater care for health and fitness, the production and consumption of vegetables will increase. It is a market that is still growing and will continue to grow.

It is known that the best are fresh vegetables, seasonal, coming from the nearest surroundings. Are there opportunities in Europe to produce enough vegetables to meet the demand of EU citizens? Which countries are the biggest producers and exporters? Is there regional specialization in Europe? This article is mainly to give answers to these questions.

2 Purpose, scope and methodology of research

The aim of the article was a regional analysis of the vegetable market in the European Union. It focused on the production capacities of individual states and on import and export within the EU and with third countries. Total trade value analysis was accompanied by a question relative focus of surveyed countries.

The spatial scope of study covered all 28 EU states. Due to the completeness of the data and fluctuations in the economic situation, the three-year means were calculated for period 2014-2016.

The legal conditions governing the Community vegetable market were examined. Subsequently, the area of vegetable cultivation and their total production were analyzed. Further analysis was aimed at defining the structure of vegetable production in the EU. This made it possible to select six vegetables produced in the highest quantities in their most important groups. The selected six vegetables were: tomatoes, onions, carrots, cabbage, peppers and lettuce. Then, by examining the geographical structure of the production of the above-mentioned vegetables, ten of the largest producers were identified. In this part of the study, structure indicators and descriptive methods were used. The presentation of results was enriched with tables and graphs.

The hierarchical cluster analysis was used for further analysis of the total trade value and relative focus of each country. This procedure attempts to identify relatively homogeneous groups of cases based on selected variables, using an algorithm that starts with each case in a separate cluster and combines clusters until only one is left. For method description, metrics and segmentation criterion see e.g. [9, 11, 12, 13]. We used Squared Euclidean distance which is a suitable metrics for most recommended clustering algorithms such as Ward's and Centroid based. The latter one was employed. It is based on the geometric center of each cluster which is computed first. The distance between the two clusters equals the distance between the two centroids. Clusters are merged accordingly its distance. This method was chosen prior to the Ward's one since Ward's criterion tends to create outliers more frequently that cluster based criterion [12]. With a chosen metrics let us have linkage criterion for given $X_1 \dots X_n$ vectors and pairwise dissimilarities $d_{ij} = \left\| X_i - X_{jn} \right\|_2$. Let $\overline{X_A}, \overline{X_B}$ denote group averages for A and B groups. Then dissimilarity of groups is $d(A,B) = \| \overline{X_A} - \overline{X_B} \|_2$.

To validate the clustering solution we followed expert and agglomeration schedule point of view. Agglomeration schedule provides information on the objects being combined at each stage of the clustering process. We followed the "elbow rule" [11] which generally indicate the solution regarding where an additional combination of two objects or clusters would occur at a greatly increased distance. Thus, the number of clusters prior to this merger is the most probable solution.

For the second case of relative importance a standardization by case was performed (also known as ipsative standardization) in the data preparation phase. This method is employed in order to assess the difference in the survey sample concerning the scale [15]. The surveyed sample showed significant heterogeneity that comes mostly from the market size. Since the scale and units were the same for all employed variables smaller countries would be naturally discriminated in any distance metrics. Moreover, the most recommended metric of Square Euclidian distance even increases already present distance difference among the members. Therefore, a Z-scoring [10, 12] was applied as standardization by case.

3 Legal regulations on the market of vegetables and fruits in the EU

The European Union, which wanted to protect the native market and very fragmented producers, introduced two systems regulating the turnover of vegetables and fruits. The first regulations appeared in 1962 and concerned fresh products. In 1978 there was introduced legislation on trade in the processed goods. Both market regulation systems assumed primarily of uniform quality standards, intervention mechanisms to maintain producer prices and incomes, and the application of a common customs tariff to protect the internal market from imports from third countries.

Pursuant to Council Regulation (EC) No 2200/96 of 28 October 1996 [1], the market for fresh vegetables and fruits was reformed. The aim was to link the production and trade of fresh fruits and vegetables to the environment. In addition, efforts were made to strengthen the position of producers and promote producer organizations.

Another Council Regulation (EC) No 2201/96 of 28 October 1996 [2] also introduced new rules for the organization of the common market in fruit and vegetable products. There are various forms of support. Asparagus producers were able to count on area subsidies in the 1997-1999 period. Tomato producers received subsidies if they directed their products for processing. Financial support was received by farmers through processing plants and producer groups.

Since January 1, 2008, the European Commission has introduced new regulations on the fruit and vegetable market [3]. The reform was intended to encourage manufacturers to join organizations and larger groups. This would result in the supply to the market of larger batches of raw material with a more evenly assortment. Another argument was the threat of growing competition from Asia and America. An important reason was the desire to further improve the environment. The budget for this operational program has been increased.

The payment mechanism concerned the so-called decoupling, i.e. the change of payments for production to area payments. Processing payments have been abolished, but a four-year transitional period has been maintained for tomatoes to be sent to the processing plant. However, there was introduced the principle of payment for hectares of crops, rather than 1 ton of processed products. This has led to the unification of the conditions of fruit and vegetable producers in all the countries of the Community [7].

4 Area and production volume of vegetables in the EU

Vegetable production in the world is growing. In 1980, there were produced 321 mln tonnes, in 1990 – 466 mln tonnes and in 2000 – 778 mln tonnes. The latest figures from 2014 report 1169 mln tonnes. There are also more and more people in the world, however, it is still recorded an increase in production per person. In 1980 one person in the world accounted for 7.3 kg of vegetables produced, in 1990 – 8.9 kg, in 2000 – 12.9 kg. In 2014, when the world population was 7298 mln, per capita of the world was produced 16.0 kg of vegetables [6].

According to FAOSTAT in 2014 the total volume of vegetable production in the EU amounted to 67.7 mln tonnes, representing 5.8% of world production of these crops. Their cultivation in the EU stretched on the surface of 2.3 mln ha, i.e. 3.8% of the global acreage of these crops. The share of the vegetable area in the total utilized agricultural area is relatively small. In the world in 2014 it was only 1.25%, in the EU – 1.26%.

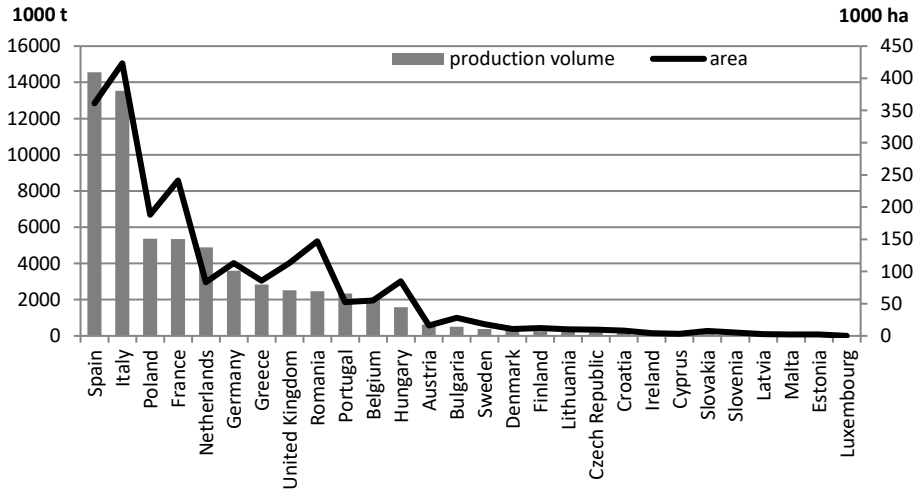

Fig. 1. Area (ha) and production volume (t) of vegetables in UE-28 average in the years 2014-2016, based on [4].

Eurostat data show that the area of cultivation has been growing since 2013. In 2014 it amounted to 2069 thous. ha. In the absence of a complete set of data from recent years, authors based on Eurostat data have estimated average annual crop area and

vegetable production in EU-28 for 2014-2016 (fig. 1). The countries were rank in descending order according to a size of vegetable production. As can be seen in the graph serialization by the surface would give a different order.

It was estimated that in Italy vegetable crops area was the largest in EU-28 (423 thous. ha, ie 20.5%). Crops in the next Spain and France together occupy 29.2% of the EU area of these crops. Poland and Romania also had significant European vegetable growing areas. They accounted for 9.1% and 7.1%, respectively. The relatively small area of these crops occurred in Germany and Great Britain, which are characterized by a large population. In each of these countries vegetable crops only accounted for 5.5% of the EU area. The total share of these crops acreage in these seven countries amounted to 76.7% of the EU.

Production of vegetables in the UE-28 in the years 2014-2016 was on average 64.3 mln tonnes a year and was conducted by about 920 thous. holdings in the area of over 2 mln ha [4]. The largest vegetable producers in the EU were Spain and Italy (fig. 1). In total they produced 43.7% of all EU vegetables. Major growers of these crops were also Poland, France and the Netherlands. The level of vegetable production in Poland and France was similar (5.3 mln tonnes). A little less were produced in the Netherlands (4.9 mln tonnes). Relatively few vegetables were produced in Germany, which has the highest population in the European Union.

5 Structure of production and the main producers of vegetables in the EU

Vegetables are generally divided into qualitative and volumetric. The Eurostat data on vegetables describes 40 species of them divided into 6 groups [5]:

- brassicas (mainly cauliflower and broccoli, Brussels sprouts and cabbages),
- leafy and stalked vegetables (mainly lettuces, leeks and spinach),
- vegetables cultivated for fruit (mainly tomatoes, peppers and melons),
- root, tuber and bulb vegetables (mainly onions and carrots),
- fresh pulses (peas and beans),
- other fresh vegetables (for example caper, okra etc.)

Half the amount of vegetables produced in the EU-28 belongs to the group vegetables cultivated for fruit including melons (fig. 2). The volume of vegetable production in this group in 2016 amounted to 32 274 thous. tonnes. Most of them are tomatoes. They represent 57.5% of vegetables in their group and 28.8% of total vegetables. An important place in this group occupies pepper, whose production in 2016 amounted to 2,519 thous. tonnes (almost 8%).

Another group of vegetables in terms of production volume are root, tuber and bulb vegetables. In 2016 there were produced 14,187 thous. tonnes, ie over 22% of total EU-28 vegetable production. Most important in this group are onions (46.5%) and carrots (39.4%).

By volume of production, the third group of vegetables grown in EU-28 is leafy and stalked vegetables (14% of all produced vegetables). In this group the most are

produced lettuces. In 2016 it was 2,283 thous. tonnes, ie 25.1% of production in this group.

The fourth relatively small group is brassicas (10% of all vegetables). In this group the most important role is played by cabbages, which was produced in the amount of 3,713 thous. tonnes, ie 60.2% of production in this group.

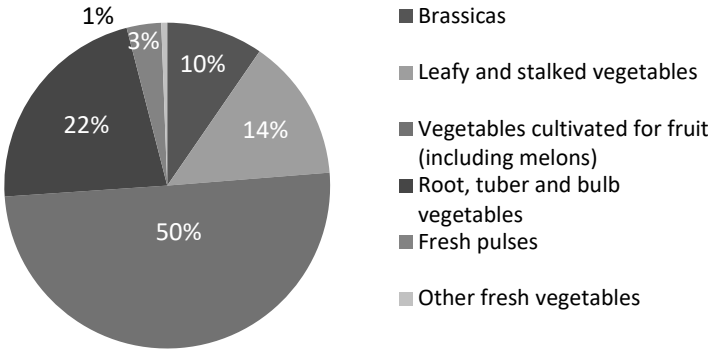

Fig. 2. Structure of production of vegetables in UE in 2016, based on [4].

The number of vegetables included in the last two groups represents about 4% of all vegetables produced in the EU-28. Further analysis is focused on the four largest groups mentioned above. There were selected in each group vegetables produced in the biggest amount and then their area structure was analysed. In tab. 1 lists 10 countries which are the largest producers of a given vegetable. Next to the symbol of the country is its production share. The selected 6 species of vegetables are in turn according to the volume of production: tomatoes, onions, carrots, cabbage, peppers and lettuce.

Tomatoes are a vegetable, which are produced in the EU-28 in the largest amount (18,545 thous. tonnes in 2016). Their most important producers are Italy and Spain, which in 2016 collected together 63.7% of total tomatoes production in the Community. In turn, the 10 states listed in the tab. 1 first column produced 97.0% of this vegetable. In the case of tomatoes it can be observed the concentration of production in southern Europe. There is a climate conducive to the cultivation of these thermophilic crops.

In terms of production volume, the second vegetable in the EU-28 is onion (6,576 thous. tonnes). Spain apart from tomatoes is also an important producer of onions. It ranks the second after the Netherlands. Both countries together provide to the market 43.4% of the total onion production in the Community. In turn, the 10 largest manufacturers are responsible for 91.1% of this production.

The third very popular vegetable in Europe is carrot, which in 2016 was produced in the amount of 5,589 thous. tonnes. Almost 15% of this production took place in Poland. Great Britain, Germany, Holland and France each deliver to the market over 10% of total European production of carrots. The top 10 carrot producers account for 88.0% of this production. Carrot production is the domain of the countries located in warm temperate climate.

Table 1. The biggest producers of selected vegetables in 2016 and their share in volume of production (%), based on [4].

Tomatoes	%	Onions	%	Carrots	%
IT	35.5	NL	22.0	PL	14.7
ES	28.2	ES	21.4	UK	12.9
PT	9.1	PL	9.9	DE	11.5
GR	5.5	DE	9.4	NL	10.7
NL	4.8	FR	7.0	FR	10.4
PL	4.7	IT	6.9	IT	9.5
FR	4.4	UK	5.9	ES	7.2
RO	2.3	GR	3.3	BE	6.9
BE	1.4	RO	2.9	DK	2.1
HU	1.1	AT	2.5	RO	2.0
Cabbages	**%**	**Peppers**	**%**	**Lettuces**	**%**
PL	27.4	ES	46.7	ES	40.7
RO	16.6	NL	14.5	IT	14.1
DE	15.8	IT	6.9	FR	10.0
UK	6.2	PL	6.3	DE	9.1
NL	4.9	GR	6.0	NL	5.2
ES	4.4	RO	4.8	UK	4.7
GR	3.0	HU	4.7	GR	2.6
PT	2.9	BG	2.9	BE	2.3
IT	2.1	FR	1.7	PT	2.3
BG	2.0	PT	1.4	AT	1.9

Cabbage also plays an important role among vegetables produced in Europe. In 2016, there were produced 3,713 thous. tonnes of this vegetable. Poland is the leader in cabbage production (27.4%). The major producers are also Romania (16.6%) and Germany (15.8%). Cabbages are considered as a volumetric vegetable and its increased production in these countries results primarily from culinary traditions.

Another popular vegetable produced in Europe is peppers. In 2016 its collection was estimated at 2,519 thous. tonnes. The largest share of peppers production has Spain (46.7%). The Netherlands ranked second (14.5%). Ten of the largest producers of peppers in Europe corresponded in total for 95.9% of its production. The statistics of small European countries, i.e. Estonia, Luxembourg, Lithuania, Latvia, Malta did not demonstrated the production of peppers at all.

The last of the discussed vegetables that are grown in EU-28 in large quantities were lettuce (2,283 thous. tonnes in 2016). The leading producer of this vegetable is Spain. Its share in the EU production of this vegetable amounts to as much as 40.7%. Another Italy and France produced together 24.1% of whole union production. The top ten producers account for a total of 92.9% of European salads.

6 International trade of vegetables inside and outside the EU

Vegetables produced in the EU-28 are predominantly consumed in the Community. The average annual export volume of vegetables from EU countries in the years 2014-2016 was 27.5 mln tonnes. Of this, 83.0% of vegetables went to the countries of the Community. On the other hand, 28.0 million tonnes were delivered to EU countries during the same period and 86.7% were from EU origin. The Community support local producers and protect their own market from vegetables originating mainly from China. Unfortunately, the EU is not self-sufficient.

In terms of value, the EU deficit in international vegetable trade was 2168 mln EUR a year in the period 2014-2016. This accounted for 9.1% of all vegetable imports to the EU. Of course, the Community countries are diverse in terms of export opportunities and import needs.

The EU vegetable market is another example of a market with concentration issues concerning the national point of view. To demonstrate this problem we performed a cluster analysis to identify countries that are the market makers i.e. important outliers by four main value variables: average internal import and export, average external import and export value over the surveyed period.

On the Fig. 3 there can be distinguished three clusters of countries as an optimal solution. The first one is the biggest one. It consists of 25 EU countries. These countries, unlike Germany, Spain and the Netherlands, showed relatively little activity in the vegetable international trade over the period 2014-2016. The average value of intra-EU imports in this group did not exceed 490 mln EUR, and exports 300 mln EUR. In this group of countries, the United Kingdom is the country that is the largest net importer. The trade balance of UK with EU partners amounted to an average of –2562 mln EUR per year in the analyzed tree year period.

A cluster of Spain and Netherlands is the last to join the rest. These two countries represent more than 55% of internal export performance and slightly over 50% in external vegetable export performance of the EU. Spain has the highest positive balance of vegetable sales in the EU market. Its value was 4603 mln EUR (Tab. 2) and the volume reached 4336 mln tonnes of vegetables delivered on average per year to other EU countries. Spain has an extensive vegetable base and an average of 38.4% of its production was exported to the markets of other European countries.

The second largest vegetable net exporter in Europe is the Netherlands. This country exports vegetables in quantities corresponding to 93.3% of its own production. In fact, a major part of it is connected with so-called “Rotterdam effect”. This is related to the re-export of goods which are being transhipped at the Europe's leading seaport and register there, but are not destined for the Dutch market. Nevertheless, the balance of trade in vegetables is positive in the Netherlands and in the years 2014-2016 reached 3508 mln EUR.

The Germany was the last but one to be merged. It is due to an exceptionally high level of intra EU import which is 26% of total internal import. Germany is the largest net importer of vegetable in EU (Tab. 2). This is mainly due to the consumption needs of the vast population of this country.

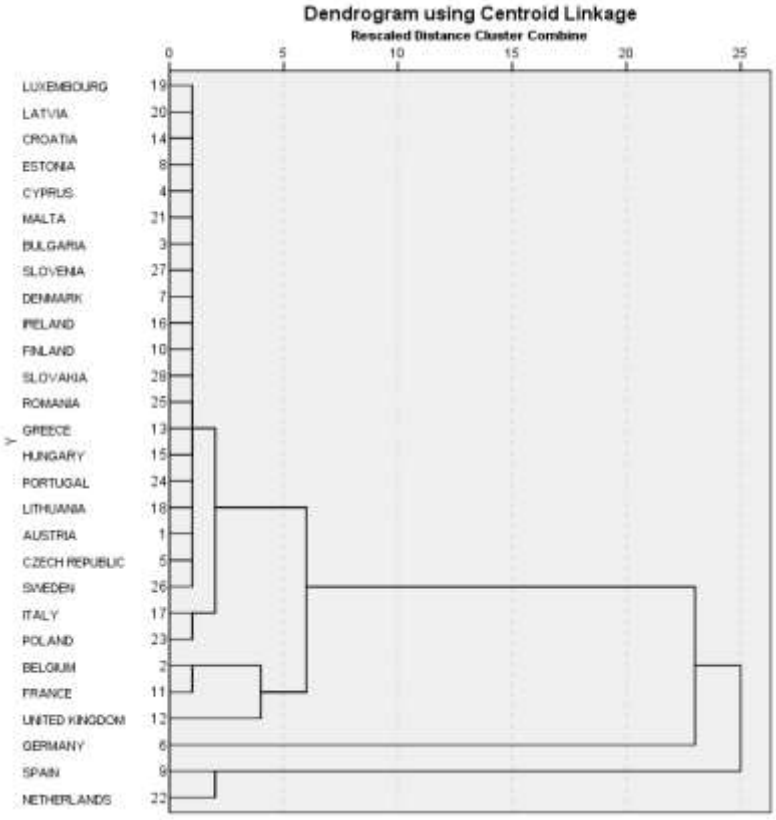

Fig. 3. Outliers identification based on average international trade values during 2014-2016, calculation based on [4].

Table 2. Result of the most important EU countries (outliers) in international trade in mln EUR, calculation based on [4].

Country	EU import	EU export	nonEU import	nonEU export
Germany	5105.7	877.5	379.1	120.2
Spain	557.2	5 159.7	487.7	366.5
Netherlands	1651.8	5 160.1	561.1	1 118.6

To answer the question of the relative importance of internal and external international trade for each country a market size bias was treated by ipsative standardization. The agglomerative schedule suggested that the most suitable number of clusters is six clusters. However, as the dendrogram (Fig. 4) shows, see below, the optimal number of clusters is five.

After the centroid examination we found significant and explainable similarities of the second and the fourth cluster. Therefore, in Tab. 3 presents the division of EU states into

5 groups. The results of relative importance bring more detailed insight on countries' position in the vegetable international trade, see tab. 3.

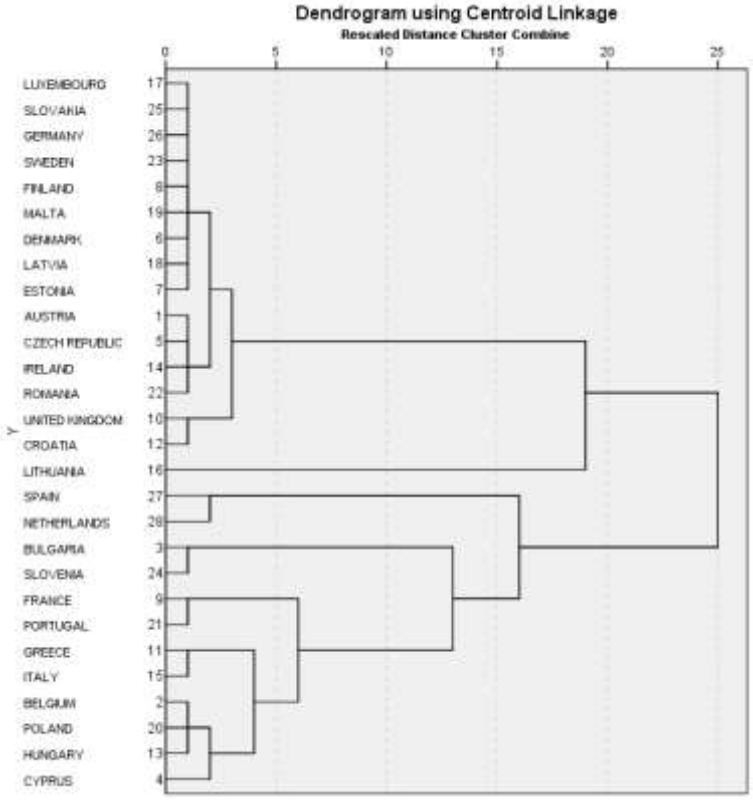

Fig. 4. Classification of countries by relative importance of intra-EU and extra-EU trade, calculation based on [4].

Table 3. Z-scores for classification of relative importance of international trade for UE countries, calculation based on [4].

Cluster no	Country symbol	EU import	EU export	nonEU import	nonEU export
1	LU, SL, DE SE, FI, MT, DK, LV, EE, AT, CZ, IE, RO, GB, HR	1,69	-0,34	-0,61	-0,74
2	GR, IT, BE, PL, HU, CY, FR, PT	0,92	0,98	-0,78	-1,12
3	BG, SI	0,91	0,53	0,24	-1,68
4	FR, PT	1,24	-0,65	-1,26	0,67
5	ES, NL	-0,40	1,71	-0,72	-0,59

Based on clusters assessment concerning relative importance of international trade each country of EU can be classified to one of following group – counties in which:

1. intra-EU import importance is very high – not self-sufficient countries with high intra-EU deficit,
2. intra-EU import and intra-EU export importance is high – not self-sufficient countries in commodity structure only which are relying on intra-EU trade, value is mostly balanced,
3. intra-EU import importance is very high and only average concerning intra-EU export – not self-sufficient countries in commodity structure only which are relying on both intra and extra-EU import,
4. Very high importance has intra-EU import and above high average importance has extra-EU export – not self-sufficient countries relying on intra-EU import but partially balancing their net position by extra-EU trade,
5. Intra-EU export is very high important – surplus net position country.

Conclusion

Vegetables are becoming increasingly important part of the daily diet of Europeans. Growing demand for vegetables and growing their production. Vegetable farming occupies a relatively small area of agricultural land in the EU. For a few years there has been a slight increase in the area of vegetable cultivation. The current EU legislation favors enlarging production and linking producers in the group. The cultivation of vegetables has been covered by the instruments of the common agricultural policy, which is supposed to contribute to the development of production. Most of the vegetables produced in the EU is consumed in its territory. Unfortunately, the Community is not self-sufficient.

EU vegetable production is diversified and concentrated regionally. In southern countries, i.e. Spain and Italy, nearly 44% of EU production is concentrated. In Spain, productivity is higher than in Italy. Spain is also the largest net exporter of vegetables on the EU territory. It supplies 27.6% of all EU vegetable exports to the EU. Spain is an unrivaled vegetable producer and exporter in the EU. It possesses huge resources of land, has a very favorable climate and ever increasing production capacity. It has the highest share in the EU in the production of peppers (46.7%) and lettuce (40.7). It ranks second in terms of tomato production (28.2%) and onion (21.4%).

From the new Member States, Poland is an important vegetable producer in the EU. It has a large production area and specializes mainly in the production of cabbage and carrots belonging to the volumetric vegetables. However, Poland does not play a big role in the international trade of vegetables. An important position as a European manufacturer of vegetables occupies the Netherlands. The vegetable production in this country is very efficient and modern. It is the EU's leading producer of onions.

Cluster analysis shown that the vegetable market is another proof of half-way closed economic center. EU economic center is relying heavily on internal market making it far less opened compared to e.g. center in the Asia or the North America.

There is one large group of mostly smaller countries that are not self-sufficient concerning vegetable production but they are saturated from internal EU sources and therefore they manifest high EU internal trade deficit. The second group contains regions that are balanced regarding the EU internal trade. Only France and Portugal show high importance of the external EU export regarding their trade structure. High activity of the Netherlands in the international exchange of vegetables is caused by so-called Rotterdam effect and also Spain is very strong surplus region in the EU.

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Public Investment and EU Funds in a Small Open Economy Integrated in the Euro Area

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Abstract. Small open economies within the European Union can be extensively influenced by the utilization of the structural and investment EU funds. Even more so if they are eligible to draw from the Cohesion Fund targeted at the less developed EU countries. In many of these countries, we observe an EU-funds cycle that causes spikes in total investment as the programming period draws near to its end, and a decline after the new programming period begins. As the share of EU-funded public investment and the public investment financed from domestic sources varies highly over time, we decided to explore the differences in the transmission of these two types of public investment shocks into the real economy. We use a version of the EAGLE model calibrated for the Slovak economy integrated in the euro area and extended with EU funds mechanisms. We find that if the part of the total investment that is funded from domestic sources comes from an increase in taxes, the EU-funded investment delivers larger improvement in real GDP. The difference is especially striking for investment funded by an increase of social security contributions paid by firms. Debt-financed public investment delivers virtually the same results irrespective of whether it is co-financed from EU funds or not.

Keywords: DSGE Model, EU Funds, Public Investment, Taxes.

1 Introduction

The European Structural and Investment Funds (ESIF) provide fiscal transfers from the richer EU Member States to the countries and regions that are lagging behind in terms of per capita GDP. According to [7] the net position of Slovakia over period 2007-2015 was 1.8 % of GDP. Funds for regional and cohesion policy allocated for period 2014-2020 amount to €351.8 bn, € 15.3 bn of which are allocated for the Slovak Republic. This represents an average of 2.830 euro per person from the EU budget over the period 2014-2020. National contribution is supposed to be 4.7 billion. So far only 5.3% of the total amount was spent [5].

Small open economies within the European Union can be extensively influenced by the utilization of the EU funds. Even more so if they are eligible to draw from the Cohesion Fund targeted at the less developed EU countries. In many of these countries, we observe an EU-funds cycle that causes spikes in total investment as the programming period draws to its end, and a decline after the new programming period

begins. As the share of EU-funded public investment and the public investment financed from domestic sources varies highly over time, we decided to explore the differences in the transmission of these two types of public investment shocks into the real economy. The aim of this paper is to evaluate the potential impact of Structural and Cohesion Fund programmes for the small open economy that is part of the euro area and which is a net recipient of the funds.

For simulation of scenarios related to cohesion policy there have been at least two models used in the literature – HERMIN [1] and QUEST.

In order to fulfill our goal, a micro-founded dynamic general equilibrium model is used. We use the multi-country model of the euro area - EAGLE], its fiscal extension that incorporates productive government spending and investment, and furthermore, we introduce another extension that allows us to explore the effects of changes in the drawing of the EU funds.

The rest of the paper is organized as follows: Section 2 describes the main features of the EAGLE model and its extensions; Section 3 summarizes the calibration of the model; Section 4 contains the main contribution of this paper – the impulse response analysis; and the final section concludes.

2 The model

2.1 The EAGLE and its extension

In this section the brief overview of the EAGLE model is presented. For more details, see the original paper Calibration of this benchmark version for Slovakia was created and used for policy simulations in [9].

The model is structured into four symmetric regions of the world economy. Three regions form a monetary union with common monetary policy and fixed exchange rate. There are two types of households – Ricardians (I-type) and non-Ricardians (J-type), which differ in having (I) or not having (J) an access to the financial markets. Households supply differentiated labor services to intermediate firms, acting as wage setters, which gives us an opportunity to introduce nominal rigidities in the labor market. Wage rigidities are modelled using the Calvo [2] framework.

Intermediate good firms operate in monopolistically competitive markets and use a Cobb-Douglas production function to produce tradeable and non-tradable goods. Non-tradable products can be consumed only domestically while tradable products can be also exported. Prices of the differentiated tradeable and non-tradeable goods varieties are set again according to the Calvo-type mechanism with indexation.

Final goods sector contains perfectly competitive firms who aggregate different domestic non-tradable, tradable and imported goods into the final product. Final production is divided in following sectors – consumption, investment and export.

Monetary authority follows a Taylor rule in setting interest rates according to the deviations of inflation and output growth from their target levels. In the monetary union, the response of monetary policy is due to deviations from policy targets of the union as a whole, rather than in individual member countries.

Fiscal authority collects tax revenues, both proportional and lump-sum, earns seigniorage on money holdings and issues bonds to finance its debt. In the original framework, these funds are used to purchase domestic non-tradable goods and to makes transfers to households. Work by further extends the model in a way that government spending can contain an imported component as is usually seen in small open economies (SOEs) simply because many of the goods purchased by the government are not produced domestically. Further, they introduce complementarity between public and private consumption in line with [4] and [8], and also a productive government investment that can increase the productivity of private capital. Public capital appears as an additional production factor in the Cobb-Douglas production function of intermediate good producing firms.

2.2 Modelling of public investment and EU funds

In order to simulate shocks in public investment funded either wholly from domestic sources or with co-financing from EU funds, we introduce another extension of the model inspired by the expenditure side of the budget constraint of the government we added the part of EU funds that is sent as a payment to the European union, $\mathrm{EU}_{\mathrm{t}}^{\mathrm{OUT}}$, and on the revenue side, we added a variable EU_t^{IN} that tells us the amount of money that comes to the country from the EU. Payment sent to the EU is proportional to the size of the economy, which leads to the same amount paid in per capita terms across the EU:

$$EU_t^{OUT} = \frac{s^{CO_1} EU_t^{IN,CO_1} + s^{CO_2} EU_t^{IN,CO_2} + s^{CO_3} EU_t^{IN,CO_3}}{s^{CO_1} + s^{CO_2} + s^{CO_3}}, \quad (1)$$

where s^{CO_1} is weight of a country in the union.

We define the total government investment in the following manner:

$$G_{I,t} = \frac{EU_t^{IN}}{P_{G_I,t}} + G_{I_C,t} + G_{I_A,t} \, . \quad (2)$$

where $G_{I_C,t}$ is the part of government investment that is generated by the incoming EU funds due to compulsory co-financing by the home country:

$$G_{I_C,t} = \chi^{EU} \frac{EU_t^{IN}}{P_{G_I,t}} \quad (3)$$

where χ^{EU} is the co-financing parameter. The last remaining part of the total public investment is the autonomous government investment $\mathrm{G}_{\mathrm{I_A,t}}$ that is decided and paid from domestic sources independently from the EU funds mechanisms.

Both, the government investment and the drawing of EU funds, are driven by exogenous processes in their respective shares over nominal GDP:

$$AGIY_t = \frac{G_{I_A,t}}{P_{Y,t} Y_t}, \quad (4)$$

and

$$EUY_t = \frac{EU_t^{IN}}{P_{Y,t}Y_t}. \quad (5)$$

Autonomous government investment shock then develops according to:

$$AGIY_t = (1 - \varrho^{G_{I_A}})\overline{AGIY} + \varrho^{G_{I_A}} AGIY_{t-1} + \varepsilon_t^{G_{I_A}}, \quad (6)$$

and the EU funds shock is defined as:

$$EUY_t = (1 - \varrho^{EU})\overline{EUY} + \varrho^{EU} EUY_{t-1} + \varepsilon_t^{EU}. \quad (7)$$

3 Calibration

Taking the calibration of the model for the Slovak economy used by [9] as a starting point, we made some necessary updates and adjustments, especially in the fiscal sector. Namely, we set the import shares for the public consumption and investment goods as can be seen in Table 1. We also increased the calibration of nominal rigidities in the domestic tradable and non-tradable sectors, which can be seen in Table 2. Setting of the technology and preference parameters concerning the public consumption and investment goods is presented in Table 3. Extension of the model with EU funds mechanisms lead to a calibration of the χ^{EU} co-financing parameter to a value of 0.25, which results in a ratio of EU funds and domestic funds in EU-funded public investment projects of 4:1. Persistence and volatility parameters of newly defined shocks were calibrated to 0.9 and 0.01 respectively. Tables with the model calibration are included in the Appendix and contain a comparison to the original calibration of [6] and used for Slovenia and Ireland.

4 Impulse Response Analysis

In this section, results of the model simulations are shown. First, we treat the autonomous government investment shock and EU funds shock separately and compare the different ways of financing the domestic part of the expense. First possibility is the debt-financing by bond issuance without debt repayment on the simulation horizon. Another possibility is to raise taxes. We chose three alternatives – lump-sum tax, VAT tax and an increase in social security contributions (SSC) paid by firms. Taxes are then set in such a way that leads to a stable public debt-to-GDP ratio. Next, we compare the effects of autonomous public investment shock and EU funds shock to each other.

4.1 Autonomous government investment shock

Effects of the autonomous public investment increase of 1 percent of ex-ante GDP are depicted in Fig. 2 in the Appendix. First consequence of the shock is roughly 25-percent increase of public investment and an increase of imports across all types of financing.

On impact, output and hours worked increase because the economy has to produce more intermediate goods to supply the domestically produced part of the public investment.

Private consumption declines across the three types of financing that use the tax increases and rises in the case of financing the government investment through public debt increase without the obligation of immediate repayment. Therefore, the agents in the economy do not have to increase savings and postpone the consumption.

One of the key roles of productive public capital is that the rise of government investment reduces the marginal costs in the medium run and improves the competitiveness of the domestic economy. This leads after the initial demand driven increase of domestic inflation to its reduction and to depreciation of the real effective exchange rate, which stimulates production in the domestic tradable sector and draws in private investment. Alternative types of financing differ only in timing. The main dissimilarity is in financing through social security contributions paid by firms. Since the raise of the SSC paid by firms increases the marginal costs of firms more and for longer period of time, the positive effects do not appear sooner than almost after 5 years after the initial shock. The higher marginal costs translate directly into higher domestic inflation.

The magnitude of the impact on imports relies on the import content of the government investment goods. If it is high, increase of imports leads to a deterioration of the trade balance, but after government capital accumulation takes effect, exports increase too and the trade balance becomes positive.

These results are in line with the intuition that government expenditure aimed at the improvement of infrastructure can reduce private sector's costs and have positive impact on the economy.

Fig. 2 contains also the tax rates setting needed for immediate repayment of the public debt. VAT tax and SSC are expressed as deviation from steady state in percentage points. It means for example that VAT tax has to increase from 20 percent as it is now in Slovakia to roughly 21.75 percentage points to pay for the amount of government investment.

In our exercise, the most beneficial scenario seems to be the one where government investments are debt-financed while the worst results are obtained by increasing the SSC paid by firms.

4.2 EU funds shock

As the previous EU funds programming period of 2007-2014 was prolonged by 1 year in order to allow for completion delayed projects, larger than expected amount of allocated funds was drawn by the very end of 2015, which brought about positive surprises in investment. Since then, we observe the opposite development as the new projects eligible for co-financing from EU funds are finalized and approved only slowly and there is a negative surprise in investment every forecasting round.

The EU funds shock leads to the same (1 percent share of nominal GDP) increase in the total public investment as the autonomous public investment shock. The important difference is that under our calibration 80 % of the whole volume is financed via the

EU funds and only 20 % is co-financed from the domestic sources. The domestic co-financing is again paid-off by the same four types of debt or tax financing. The results are depicted in Fig. 3 in the Appendix.

The transmission channels are the same as in the previous scenario, but significant differences appear in the magnitudes of reactions in individual variables.

First interesting result is that the public debt in debt-financed scenario decreases slightly during the first year. The reason behind this is that this variable is defined as public debt to GDP ratio and GDP increase on impact is higher than the increase of domestic public debt, which is used only for the co-financing of the whole project. Imports increase once again according to the import content of government investment and according to the import content in other sectors of domestic economy. Hours worked increase as the firms hire more labor to be able to supply the domestically produced part of the investment. Marginal costs rise on impact, but decline in the medium run. The same holds for CPI inflation, which influences the competitiveness of the economy and draws in the private investment and bolsters exports in medium run. Taxes are set in order to balance the public debt in the three tax scenarios, so they decrease initially because the public debt would decline on impact. As public debt rises in medium run, tax hikes are needed.

Comparison of the alternative ways of domestic co-funding of the EU funds projects shows that the debt-financing is the best option from the point of view of GDP while the increase of SSC paid by firms would be the least preferred alternative.

4.3 Comparison: Government investment shock vs. EU funds shock

We now turn to the comparison of the autonomous government investment shock and the EU funds shock from the point of view of real GDP under the different scenarios of funding the domestic part of the investment. The results are presented in Fig. 1.

Debt-financing. We work with a model of the monetary union that assumes the existence of common European bond guaranteed by all the member states. Therefore it is irrelevant which country issues the new debt through Eurobonds – be it the home country in case of autonomous government investment shock or the rest of the EU in case of EU funds. In both cases, the newly issued Eurobonds are bought by agents from across the EU on the common bond market. Therefore, there is little difference between the two shocks under this type of financing.

Lump-sum tax. The main difference between the two shocks in terms of GDP is the larger initial increase in case of EU funds shock. This is given by the fact that the shock is not accompanied by such a large tax hike as in the case of public investment funded wholly from domestic sources. Higher aggregate demand in the case of EU funds shock leads to higher consumption, hours worked and consequently also marginal costs of firms and higher inflation. Because of that, the real effective exchange rate appreciates and domestic exporters become increasingly less competitive. As a result, the deviation of the GDP after the EU funds shock approaches the autonomous government investment alternative in the medium run.

VAT tax. The main differences in the transmission of the two public investment shocks are the same as in the case of Lump-sum tax. However, the distortionary effects of the VAT tax on the decision making of households cause smaller GDP increase after the autonomous public investment shock and larger gap between the two shocks overall.

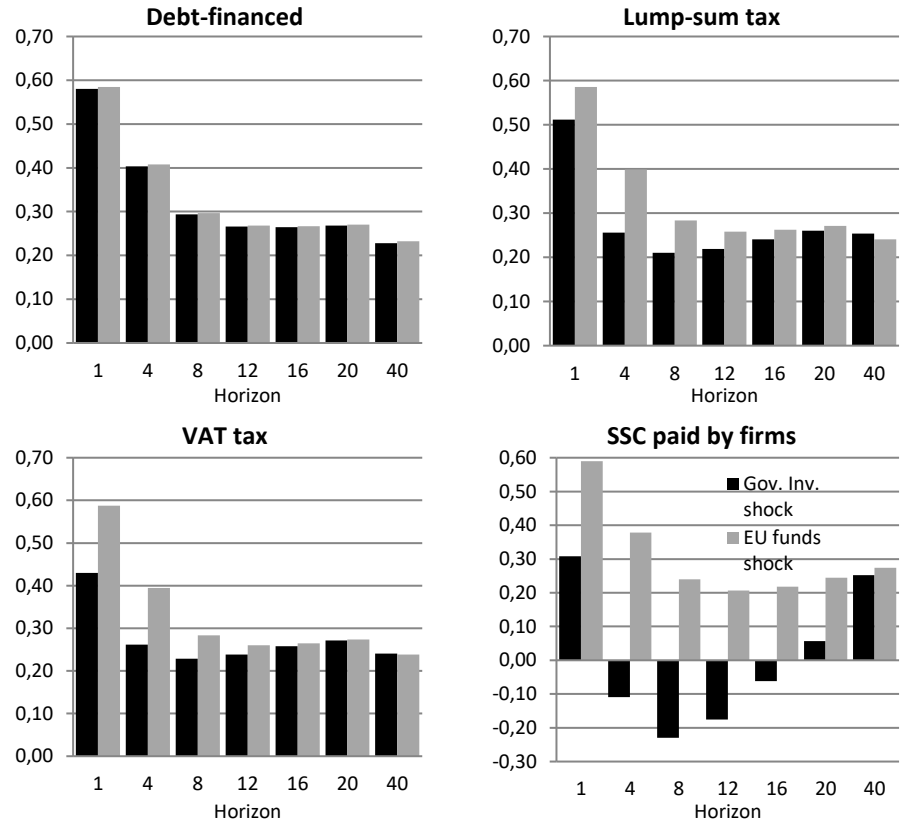

Fig. 1. Response of GDP by shock and type of financing (in % of steady state).

SSC paid by firms. The transmission mechanism is now different. In this scenario the higher rise in SSC paid by firms leads to higher marginal costs for the firms when public investment is financed wholly from domestic sources. This translates directly into higher domestic inflation and lower consumption. Higher inflation also implies higher appreciation of the real exchange rate, which depresses the private investment and exports for almost 4 years after the initial shock. The EU funds shock generates substantial positive effects in the GDP over the whole simulation horizon. Should the investment be funded by SSC paid by firms, the EU funds are thus much better choice for government investment.

Conclusion

Using EAGLE – a multi-country DSGE model with monetary union setup and extended fiscal sector – we have analyzed and compared the transmission of autonomous government investment shock and EU funds shock into the home economy. We have arrived at several interesting findings relevant for a small euro area economy, such as the Slovak Republic. Due to the assumption of common EU wide bonds market, the debt-financed public investment would have the same impact on the home economy irrelevant of the co-financing from the EU funds. On the other hand, the way of financing the domestic part of the whole public investment project, can have important macroeconomic consequences. Since, the tax hikes needed for domestic (co-)financing of the public investment depress the domestic aggregate demand, the impacts of EU-funded investment on GDP are generally stronger. Unlike the lump-sum tax and VAT tax hikes, the increase of social security paid by firms is inflationary in itself, which translates not only into loss of aggregate demand but also immediate loss of competitiveness in the international trade, making this way of financing the least desirable from the point of view of GDP.

Disclaimer. The views expressed in this paper are those of the authors and do not necessarily reflect the official views of the National Bank of Slovakia.

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Appendix

Table 1. Steady-state national accounts and trade matrix (as % of nominal GDP).

	SK	IE	SI
Great ratios			
Private consumption	0.561	0.5791	0.5692
Private investment	0.225	0.176	0.1506
Target public debt (% of GDP)	0.6000	0.6000	0.6000
Trade linkages			
Imports	0.9349	0.6300	0.6981
Consumption goods	0.2060	0.1498	0.2203
From REA	0.0446	0.0543	0.1758
From DE/US	0.0251	0.0737	0.0436
From RW	0.1364	0.0218	0.0009
Investment goods	0.1142	0.0972	0.1297
From REA	0.0288	0.0343	0.1011
From DE/US	0.0333	0.0465	0.0252
From RW	0.0520	0.0164	0.0034
Imports for export goods	0.5526	0.3530	0.3181
From REA	0.1907	0.1130	0.2340
From DE/US	0.0401	0.1532	0.0693
From RW	0.3218	0.0868	0.0148
Government expenditure			
Public consumption	0.1900	0.1290	0.2080
Imports	0.0456	0.0200	0.0200
Public investment	0.0350	0.0400	0.0400
Imports	0.0165	0.0100	0.0100
Country size			
Size (as % of world GDP)	0.0110	0.0300	0.0200

Table 2. Calibration - Real and Nominal Rigidities.

	SK	IE	SI	REA	DE	RW
Real rigidities						
Investment adjustment (Γ_I)	3	6	3	6	4	4
Import adjustment (cons., Γ_{IM^C})	1	5	1	5	5	5
Import adjustment (inv., Γ_{IM^I})	1.5	2	1.5	2	2	2
Quasi-share of govt cons. (ν_{CCES})	0.25	0.25	0.25	0.25	0.20	0.20
Complementarity of gov. and priv. cons. (μ_{CCES})	0.15	0.20	0.20	0.29	0.33	0.33

Nominal rigidities						
Wage stickiness $(\xi_{I,}\, \xi_J)$	0.75	0.80	0.81	0.78	0.78	0.78
Wage indexation $(\chi_{I,}\, \chi_J)$	0.75	0.75	0.75	0.75	0.75	0.75
Price stickiness (domestic, ξ_N)	0.92	0.75	0.75	0.79	0.79	0.79
Price indexation (domestic, χ_N)	0.70	0.50	0.50	0.70	0.70	0.70
Price stickiness (imported, ξ_X)	0.75	0.75	0.75	0.75	0.75	0.75
Price indexation (imported, χ_X)	0.70	0.50	0.50	0.70	0.70	0.70
Price stickiness (services, ξ_H)	0.92	0.75	0.93	0.79	0.79	0.79
Price indexation (services, χ_H)	0.70	0.50	0.50	0.70	0.70	0.70

Table 3. Calibration - Households and Firms.

	SK	**IE**	**SI**
Households			
Subjective discount factor (β)	$1.03^{1/4}$	$1.03^{1/4}$	$1.03^{1/4}$
Depreciation rate (private capital, δ)	0.025	0.025	0.025
Depreciation rate (public capital, δ_G)	0.025	0.025	0.025
Int. elasticity of substitution (σ^{-1})	1	1	1
Share of J-type households (ω)	0.5	0.25	0.25
Habit formation (κ)	0.7	0.6	0.6
Frisch elasticity of labour (inverse, ζ)	2	2	2
Intermediate goods firms			
Tradable - bias toward capital (α_T)	0.35	0.35	0.42
Nontradable - bias toward capital (α_N)	0.35	0.3	0.3
Final consumption goods			
Subst. btw. domestic and imported (μ_{TC})	2.5	2.5	2.5
Subst. Imported (μ_{MC})	2.5	2.5	2.5
Bias toward domestic tradables (ν_{TC})	0.0692	0.3872	0.3601
Subst. btw. tradable and nontradable (μ_C)	0.5	0.5	0.5
Bias toward tradable (ν_C)	0.45	0.475	0.7
Final investment goods			
Subst. btw. domestic and imported (μ_{TI})	2.5	1.5	1.5
Subst. Imported (μ_{MI})	2.5	2.5	2.5
Bias toward domestic tradables (ν_{TI})	0.1735	0.2336	0.0024
Subst. btw. tradable and nontradable (μ_I)	0.5	0.5	0.5
Bias toward tradable (ν_I)	0.75	0.75	0.89
Final government consumption goods			
Subst. btw. domestic and imported (μ_{TCG})	2.5	2.5	2.5
Subst. Imported (μ_{MCG})	2.5	2.5	2.5
Bias toward domestic tradables (ν_{TCG})	0.5168	0.2084	0.5247
Subst. btw. tradable and nontradable (μ_{CG})	0.5	0.5	0.5
Bias toward tradable (ν_{CG})	0.8	0.8	0.8
Final government investment goods			
Subst. btw. domestic and imported (μ_{TIG})	2.5	2.5	2.5
Subst. Imported (μ_{MIG})	2.5	2.5	2.5
Bias toward domestic tradables (ν_{TIG})	0.3696	0.4252	0.3787
Subst. btw. tradable and nontradable (μ_{IG})	0.5	0.5	0.5

Bias toward tradable (ν_{IG})	0.6	0.6	0.6
Final export goods			
Subst. btw. domestic and imported (μ_X)	1.5	1.5	1.5
Subst. Imported (μ_{MX})	2.5	2.5	2.5
Bias toward domestic tradables (ν_X)	0.2212	-	-

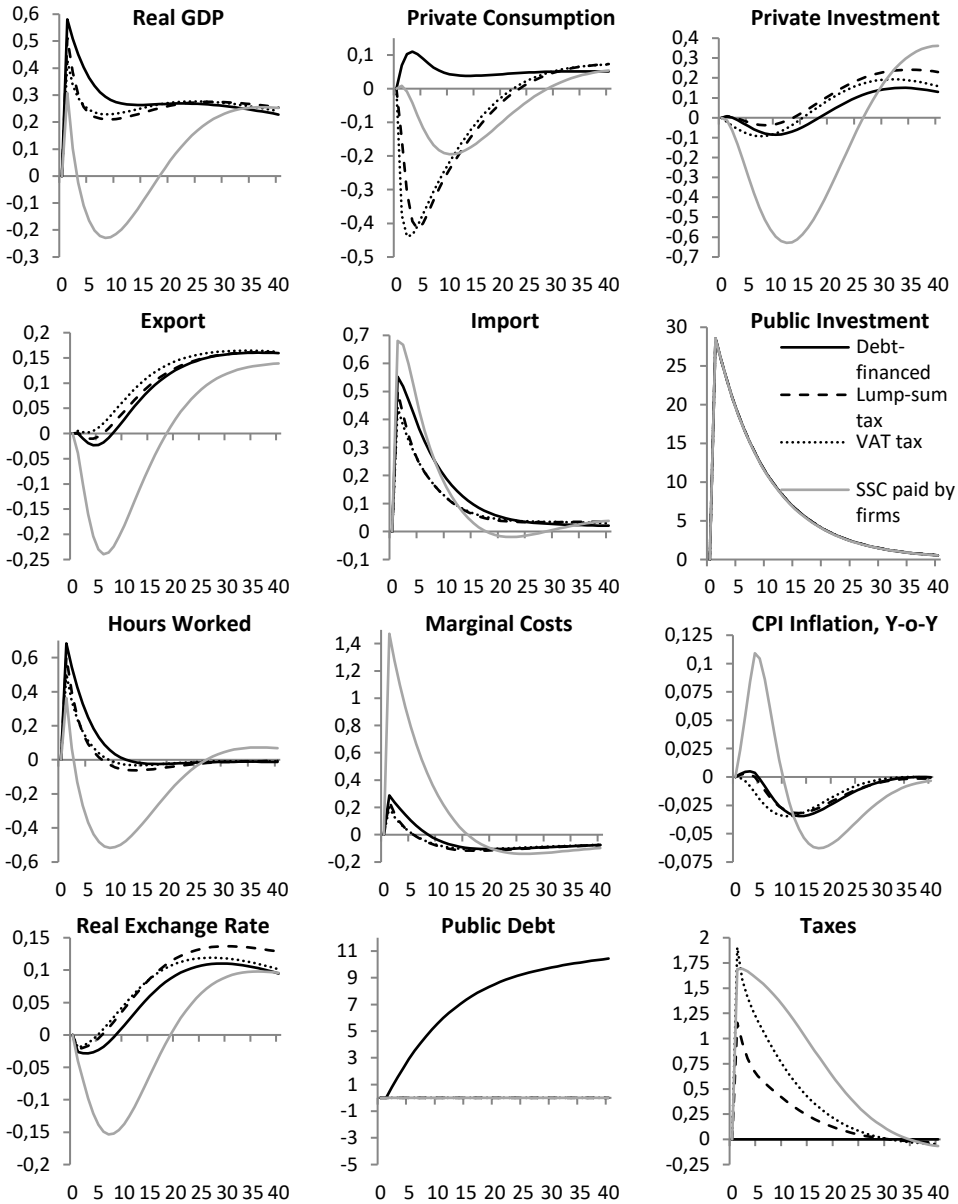

Fig. 2. Government investment shock - comparison of different types of financing (deviations from steady state in %).

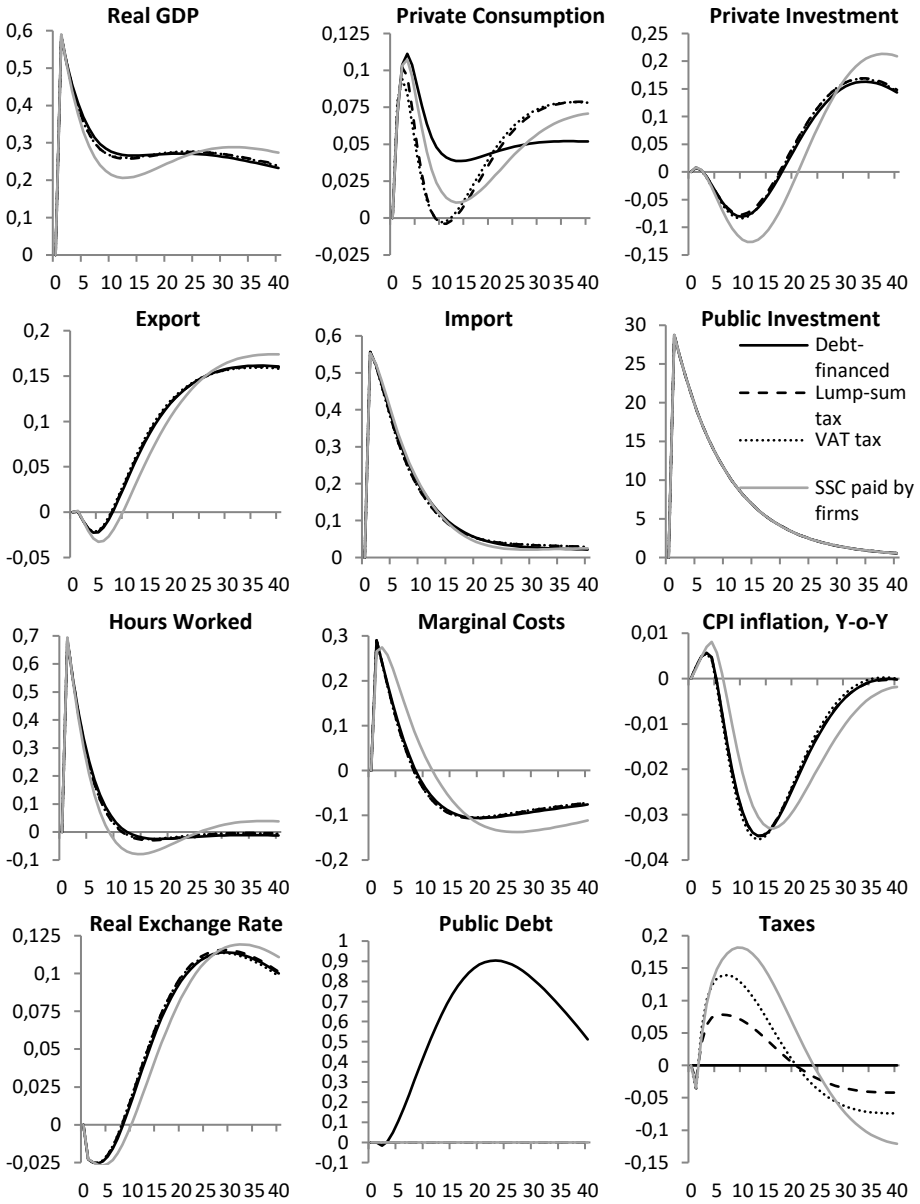

Fig. 3. EU funds shock - comparison of different types of financing (deviations from steady state in %).

Dependency of Accounting Data Quality on Selected Financial Indicators

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Abstract. The basic element for assessing the quality of accounting data is the level perceived by the users of accounting information; that is, to what extent the information approaches its requirements. High-quality accounting data reduces the risk for prospective investors, supports management and decision-making, and at the same time increases the ability of businesses to raise finance at a reasonable price. The aim of this paper, based on a survey determining the quality of accounting data, is to set the quality of the reported accounting data in the individual regions of the Czech Republic and at the same time determining whether this quality of accounting data develops depending, for example, on the total revenues of the company, expenses, cash flow and profit. Those financial indicators provide data on the performance, cash flows, and this information is used to evaluate the company's performance, to make high quality management decisions and the future plans.

Keywords: Quality of Accounting Data, Regions of the Czech Republic, EBIT, Cash Flow.

1 Introduction

The aim of financial accounting is to use relevant information regarding the property, sources of finance, costs, revenues and profit or loss based on the principle of true and fair view of accounting [2]. This basic role is subordinate to structure of assets and liabilities in the balance sheet - in terms of their long-term and short-term, in terms of liquidity, leverage, etc., as well as content costs, revenues and profit concept in the profit and loss account.

The quality of accounting information also depends on the quality of the management and presentation of the accounting data, but also on the quality of the financial statements and their compliance with reality and the applicable laws. Some companies require only a mechanical application of the accounting rules, while others rely on the decision of the company managers and accountants. Error rate and creative accounting are generally viewed as negative phenomena, i.e. accountants have to admit that they error, which could be understood as poorly executed work or even fraud where creative accounting is concerned [13].

Some authors [5, 11] and others say that one of the greatest influences in achieving above-average quality is the involvement of top management, which plays an

important role in this field. And [6] says that for the successful implementation of quality is necessary support for motivation, teamwork and the use of quality management tools and techniques. The aim of accounting information is to provide information necessary for the management and prepare reports based on which they decide [1]. If the quality is set in accordance with the comprehensive determination of quality, the enterprise will be able to succeed in today's society [9]. The benefit of the quality of information, offered through financial reports, is proven in the conditions in which the users use the information in order to understand the economic reality of the enterprise, and in order to make decisions. Thus the accounting information benefit has to be defined only through its quality [4, 14].

Other authors [12] have the opinion that if the quality control is carried out effectively the company can have considerable results especially from the financial point of view. Enterprises that have successfully established management systems achieve higher performance and better financial results. A number of prosperous businesses can see that a good quality information system and, above all, a sophisticated system of managerial accounting contribute to their successful management. These businesses know that they will only be able to compete in a competitive environment if they are able to effectively manage their costs and revenues, cash flow, profits, accounting and other financial value information needed for quality and efficient management. In many companies we can see that for their successful management highly contributes quality information system. The companies use the quality of accounting data throughout its life cycle [10]. From the perspective of the user requirements, the quality is defined as suitability to use in the economic calculations [8]. It is generally known that the quality of accounting information in the companies is usually not in very good condition and at the same time there is a reduction in the ability of managers.

2 Methodology

This article aims at assessing the quality of the reported accounting data according to predefined criteria in the individual regions of the Czech Republic and at the same time determining whether this quality of accounting data develops depending, for example, on the total revenues of the company, expense, cash flow and profit.

The method used for evaluation of quality of accounting data is DQAD (determination of quality of accounting data). This method is composed based to the criteria which have the biggest impact to the quality of accounting data and to the management as well [15]. Those criteria were divided into three groups – first group is Errors and fraud, second group is Accounting Methodology and third group is Influence to information system in a company.

The first group is composed of four criteria:

- accounting fraud by management, unethical behavior,
- accounting fraud by employees, unethical behavior,
- creative accounting and
- accounting errors arising out ignorance, human accounts error.

The second group is composed of five criteria:

- methods of depreciation,
- methods of valuation,
- methods of accounting organization, processing,
- internal directive and
- internal control.

The third group is composed of three criteria:

- lack of information, poor internal communication,
- legislation - too wide or narrow, confusion, frequent changes and
- requirements for managers to information system.

Based on these criteria was, by the using the methods AHP (Analytic Hierarchy Process) and Multiple Linear Regression, composed this model to determining quality of accounting [15]:

$$DQAD = 1{,}746+1{,}326 * x1+0{,}002 * x2-0{,}236 * x3-0{,}378 * x4+0{,}075 * x5 \quad (1)$$

where:

x1 is the value of the indicator (Adjusting Entries + Reserves) / Total Asset,
x2 is the value of the indicator Cash Flow / EBIT,
x3 is the value of the indicator Revenue / Total Asset,
x4 is the value of the indicator Cash Flow / Liability,
x5 is the value of the indicator Interest / Cash Flow.

The higher the value of accounting data quality is the worst quality of accounting data in the company is. It is on base that the criteria have negative position in the company. The range for accounting data quality was compiled:

To 0,8	very good quality,
From 0,81 to 1,6	good quality,
From 1,61 to 2,4	average quality,
From 2,41 to 3,2	bad quality,
Up to 3,21	very bad quality.

Regression analysis is a set of statistical processes for estimating the relationships among variables. More specifically, regression analysis helps one understand how the typical value of the dependent variable changes when any one of the independent variables is varied.

$$y = (b_0 + b_1 x_1) \quad (2)$$

which describes a line with slope b_1 and y-intercept b_0 [7].
The zero hypothesis H0 was set that both groups are equal over against HA, where the two samples are different.

3 Results

The model DQAD (determination of quality of accounting data) was applied for 23 587 companies. There were companies from all regions of the Czech Republic, with number of employees from 10. Data are obtained from the Albertina Gold Edition database for the period 2015.

Firstly, the quality of accounting data in the companies were detected in each region of the Czech Republic. The quality of accounting data you can see in the picture 1 and in the table 1.

Fig. 1. Quality of accounting data in the regions of the Czech Republic.

It is seen that the best quality of accounting data is in Prague, then in Plzeň Region and in South-Moravia Region. On the other side, the worst quality of accounting data is in Hradec Králové Region, in Vysočina Region and in South Bohemia Region. The numbers of analyzed companies are in the next table.

Table 1. Quality of accounting data in the regions of the Czech Republic.

Region	Number of companies	Quality average
Prague	5741	1,1257
Plzeň Region	1148	1,1252
South-Moravia Region	2963	1,1288
Liberec Region	760	1,1313

Moravia-Silesia Region	2041	1,1334
Zlín Region	1335	1,1394
Ústi Region	1232	1,1416
Central Bohemia Region	2017	1,1447
Pardubice Region	1082	1,1518
Hradec Kralové Region	1248	1,1533
Vysočina Region	1039	1,1547
South Bohemia Region	1241	1,1551
Olomouc Region	1251	1,1674
Karlovy Vary Region	489	1,1790
Total	**23587**	**1,1451**

The next step was to investigate whether there is a dependency between the quality of the accounting data and selected financial indicators. These indicators included EBIT, Total Revenues, Cash Flow and Total Cost Ratio. Linear regression was used as a statistical test to determine dependence. The results of this regression are in the following table and graphs.

Table 2. Results of statistical analyses.

Variable	Distrib. frequenc. model	Sum of squares residual	DoF residual	Distrib. frequenc. residual	F	p-value
EBIT	1,84430	3811,28	23585	0,16159	11,4129	0,00073
Total Revenues	2,85868	3810,26	23585	0,16155	17,6948	0,00002
Cash Flow	0,06122	3813,06	23585	0,16167	0,37868	0,53831
Total Cost Ratio	8,31393	3804,81	23585	0,16132	51,5358	0,00000

From a statistical point of view, there was a comparison of indicators EBIT, Total Revenues and Total Cost Ratio with the quality of accounting data, when these financial indicators rejected a zero hypothesis H0 in favor of HA, where in those cases the value of the p-value is less than 0.05. Analysis between the quality of the accounting data and Cash Flow does not prove significant differences at significance level of 0.05. P-value in Cash Flow was found at 0.53831. In this case a zero hypothesis H0 was not rejected in favor of HA and we can say that there is a

dependency between the quality of the accounting data and financial indicator Cash Flow.

On the following graphs we can see the histograms of residues for the selected criteria. Analysis of the residue gives us information about the suitability of the used model. As a selected criteria were used one criterion that confirmed the zero hypothesis and one criterion that did not confirm the zero hypothesis. For illustration, the Cash Flow and Total Cost Ratio criteria were selected.

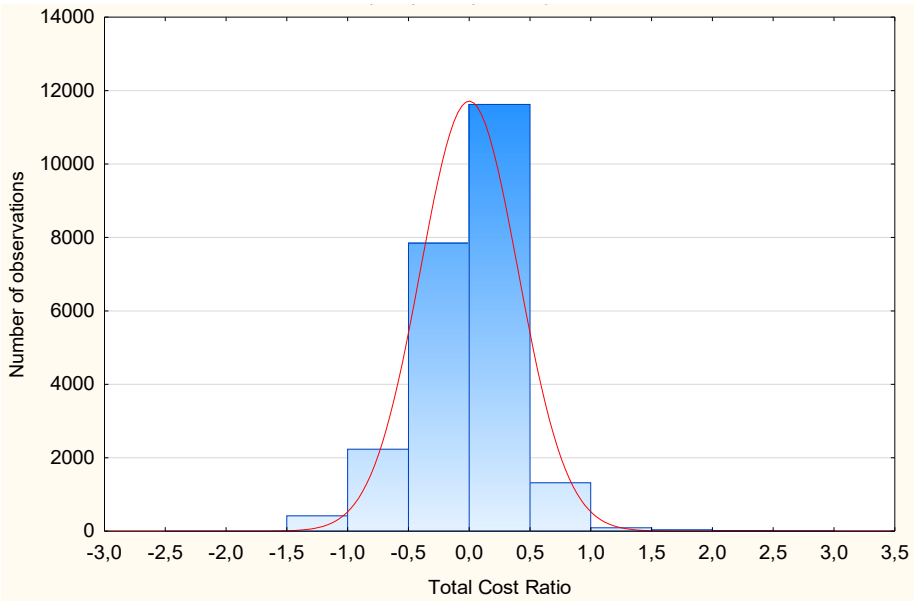

Fig. 2. A histogram of net residues – Total Cost Ratio

A histogram of residues is a graphical representation of the distribution of residues. It is an estimate of the probability distribution of a continuous variable. Both histograms of the residues are symmetric, its shape corresponds approximately to the Gaussian curve.

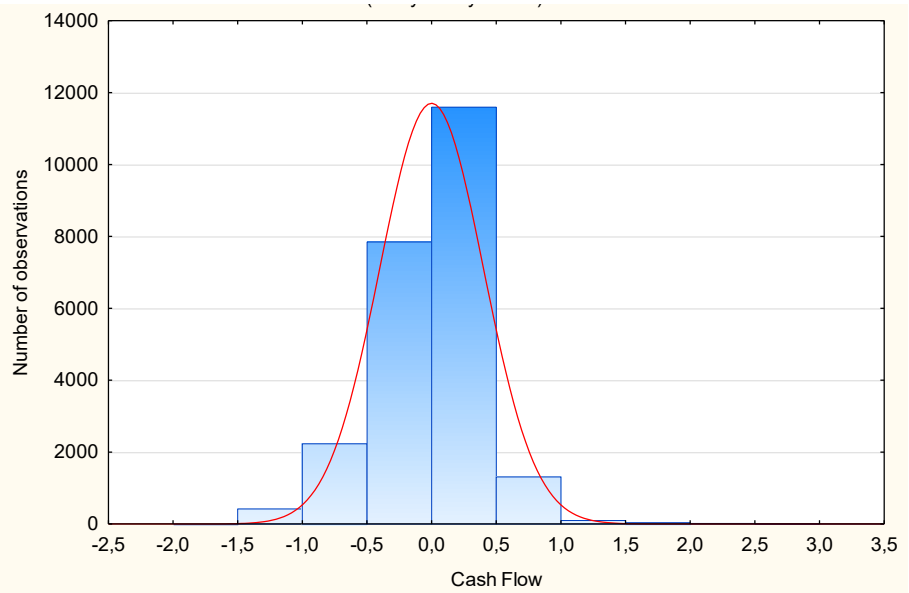

Fig. 3. A histogram of net residues – Cash Flow

Source: Own research

4 Discussion

Accounting system is designed as a process of collecting information and creating accounting reports.

Donnelly [3] argue that the more quality information the managers have the more the level of risk and uncertainty in their decisions are reduced. The output of financial accounting information is often poor because of several reasons. These are, in particular, the possibilities of influencing accounting data, even within the framework of legislative regulations.

During the analyzing the quality of accounting data in the individual regions of the Czech Republic, it was interesting to find out that the highest quality was found in Prague. Moreover, Prague is the concentration of most businesses of all cities in the Czech Republic, and there is the highest concentration of medium and large enterprises. An analysis of the quality of accounting data by company size would also be interesting. On the other hand, the worst quality of accounting data was demonstrated in the Karlovy Vary region, the Olomouc region and the South Bohemia region.

The basic objective of financial accounting is to provide relevant information regarding the property, sources of financing, costs, revenues and profit or loss based on the principle of true and fair view of accounting. This basic role is subordinate to structure of assets and liabilities in the balance sheet - in terms of their long-term and

short-term, in terms of liquidity, leverage, etc., as well as content costs, revenues and profit concept in the profit and loss account. Although the difference in the average quality of the accounting data in each region was not very large, it should be noted that the differences between the individual enterprises were. Not all businesses are thus provided true and fair view.

The results of the statistical analysis were interesting. Although the Cash Flow value is found in the used DQAD model, this indicator did not appear to be statistically significant in relation to the quality of the accounting data.

5 Conclusion

The more quality information the managers have the more the level of risk and uncertainty in their decisions are reduced. Increased emphasis on compliance with the financial discipline and internal control of accounting data can significantly contribute to improving the quality of accounting information, especially with regard to making decisions. The article is primarily concerned with analysis of the accounting data quality and selected indicators of financial analysis. In the first step the values of data quality accounting were detected and evaluated depending on the regions of the Czech Republic. The model DQAD was used for 23 587 companies and indicators of financial analysis was calculate. Analysis between the quality of the accounting data and EBIT, Total Revenues and Total Cost Ratio prove significant differences at significance level of 0.05.

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Comparison of Telework in the Czech Republic and Poland and Slovakia with Respect to the Gender

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Abstract. Home-based telework can bring new excellent quality workers to a company searching for working powers under the situation that there is an economic growth and the unemployment rate is very low. New young workers often seek for a work-life balance and the offer of a home-based telework may be a sought-after requirement from the employee's part. At the same time, it can help to reduce company costs in certain situations, such as the costs relating to the creation of a new job and overhead costs. In the context of the increasing demand for labor and the gradual growth of the interest in part-time work, the active search for this possibility of work is mainly found among families with children under 15 years of age. The accessions of small and medium sized enterprises in the EU member states such as Czech Republic, Slovakia, and Poland are not uniform, which is reflected in the frequency of the use of telework by individual employees on the one hand and the possibility of telework on the part of the employers. The aim of the paper is to compare the approaches of the chosen countries such as Slovakia, Poland, to the approach in the Czech Republic and to the average values within the EU using the EUROSTAT data 2017. The comparison is carried out according to the frequency of use (usually, sometimes and never) and according to the selected statistical methods with respect to the gender in the above-mentioned countries.

Keywords: Telework, Teleworking, Gender, Work-life Balance.

1 Introduction

In accordance with the European Trade Union Confederation, telework is defined as a form of organizing and/or performing work, using information technology, where work, which could also be performed at the employers' premises, is carried out away from those premises on a regular basis [16]. Telework as a concept was first introduced as telecommuting by Jack Nilles [18]. Telework is often defined as a way of work where information communication technology (ICT) enables employees' access to work remotely, usually from home [21, 22]. Increased flexibility supported by the development of IT technology and information society has contributed to the spread of the telework phenomenon [6].

Speaking about the gender there are two approaches regarding the telework and its influence on women: the "new opportunities for flexibility model" and the

"exploitation model" [15]. The first mentioned approach is supported by Huws [15] claiming that telework enables the better management of life and family thanks to the flexibility; by Dooley [8] arguing that the possibility of telework gives freedom to those who are limited in their work by childcare responsibilities; or by Silver [20] envisaging that the spatial closeness of work and home would break the traditional separation of household roles, which ends up in bigger participation of men in household chores. The latter mentioned model as it is expressed in the title, prompts the disadvantages of telework claimed by Haddon and Silverstone [12] saying that telework is an exploitation of women by both paid work, and the domestic burden of responsibility or by Silver [20] declaring that a home-based telework is an employment that leads to women being exploited and isolated socially, subject to demands from both family and employer, subject to control of their husbands [13, 14].

According to the approaches mentioned in the literature it is obvious that telework is not suitable for everybody and it has its pros and cons. The focus of the paper is to compare telework in the Czech Republic, Slovakia and Poland from the perspective of its frequency and gender. Before to do so, there is a brief survey of telework legal definitions in the chosen countries.

In the Czech Republic, telework is regulated in Section 317 of Act No. 262/2006 Sb., the Labor Code. It is defined as the regime of work of an employee who does not work at the employer's place of work but, under the agreed conditions and who performs a negotiated job during the working hours he/she plans. Sections regarding working hours, overtime, compensation of wages, spare time off in case of overtime and compensation of wages in case of some personal obstacles at the employee's side cannot be applied in case of telework [2, 19]. On the other hand, employers should compensate the costs paid by the distant/home employees, however this is regulated implicitly and that's why most employers do not keep the regulation and do not compensate the costs employees pay by doing their work from home. Therefore, the new proposal of the amendment of Labor Code counts with the implementation of new regulation consisting in the specification of the employers' duty to compensate the costs arisen on employee's side.

Regarding the data featuring the usage of telework of the Czech Republic and Slovakia we would presume that the legal regulation would be rather the same. Section 52 of the Labor Code [3, 4] first speaks about homework defining it as "the employment relationship of an employee who performs work for an employer at home or at another agreed place, pursuant to conditions agreed in the employment contract" or about telework defining it as "the employment relationship of an employee the teleworker as a person who performs work for an employer at home or at another agreed place, pursuant to conditions agreed in the employment contract, using information technology within the working time arranged by himself/herself." Same as in case of the Czech regulation sections regarding working hours, overtime, compensation of wages, spare time off in case of overtime and compensation of wages in case of some personal obstacles at the employee's side cannot be applied in case of telework.

To summarize it up, the legal regulation of telework in the Czech Republic and in Slovakia is the same, however, the Slovak regulation does distinguish in the regulation home work from telework and in case of telework it does emphasize the use of information technology and similarly to the Czech Republic, it emphasizes the freedom regarding the working hours at the employee's side.

In Poland the telework is defined in the Polish Labor Code. The Polish Labor Code (Kodeks Pracy) in article 675 § 1 states that "the work may be carried out regularly outside the employer's office using electronic means of communication within the meaning of the rules on electronic provision of services (telework)." § 2 of the article then states that "a teleworker is an employee who carries out work under the conditions of § 1 and delivers the employer's results of his work mainly by means of electronic means of communication." Telework is a normal employment relation that is why the legal regulation is normally applied. The characteristics of telework that distinguish this form of organization and performance from the typical form of employment are: the regularity of the work performed under the conditions of telework, the performance of work outside the employer's workplace, the use of electronic means of communication in the sense of the regulations on electronic provision of services and the transfer of the results of the work by employers mainly by electronic means of communication. Unlike the Czech and Slovak legal regulation of telework, in the Polish legal regulation more than flexible working hours the regularity of telework performance is emphasized as a defining feature of the telework.

2 Methodology

Labor market statistics, including telework analyzes, are the priority points of many European Union policies. Telework statistics can be used for a range of analyzes, both macroeconomic, if we see work as one of the factors of production, as well as for analysis of productivity, or competitiveness in the labor market. Analyzes can also be carried out from the point of view of social aspects related to diverse ways of employing workers.

The aim of the paper is to analyze the use of telework within the Czech Republic, Poland and Slovakia. The main target is the comparison of the use of telework with respect to the gender and frequency.

The data tested for further analysis were obtained using publicly available Eurostat data [9]. The comparison was based on several aspects, with the basic division being the use of telework in the individual countries of the European Union, the use of telework by gender (men, women) and the frequency of use (usually, sometimes, never). The survey was attended only by employed people aged 15-64. The comparison was made using the data from the period 2007-2016. The newer data were not available at the date of analysis.

As regards the statistical methods used, the t-test was used for the difference test. The zero hypothesis H0 was set that both groups are equal over against HA, where the two samples are different.

Test data were obtained using publicly available EUROSTAT [9] data, compared to data for the period 2007 to 2016.

In the statistical comparison of the use of telework, a t-test for a random sample from a two-dimensional layout was used for research purposes, with $n \geq 2$ [5, 10]. Here we denote $\mu = \mu_1 - \mu_2$ and introduce the difference random sample $Z_1 = X_1 - Y_1$, ..., $Z_n = X_n - Y_n$ whose sample mean and sample variance are [11, 1]:

$$M = \frac{1}{n}\sum_{i=1}^{n} . Z_i \quad (1)$$

$$S^2 = \frac{1}{n-1}\sum_{i=1}^{n}(Z_i - M)^2 \quad (2)$$

Statistically, it has always been tested at a significance level of 0.05 where zero hypothesis H_0: $\mu_1 - \mu_2 = 0$ against alternative hypothesis H_A: $\mu_1 - \mu_2 \neq 0$.

Before testing the hypotheses, the tests of both dispersions of both samples were always performed using the F-test. The calculation is based on the difference between the means of the two samples, the variability of the observed quantity and the size of the two samples. This test statistics is distributed according to Student t-distribution with $n_1 + n_2 - 2$ degrees of freedom [17]. The degrees of freedom are a t-distribution parameter. Using the Statistica software, we find the exact p-value. This probability corresponds to the probability of occurrence of such or an even more extreme value of the test criterion t assuming the validity of the zero hypothesis. If it is less than 0.05, we reject the zero hypothesis. This means that the probability that the observed differences occur only by chance is less than 5%. The classical two-sample t-test, in addition to the normal distribution of the observed variable, also assumes that variances are the same in both groups. This assumption is tested by sample estimates of the standard deviations s_1 and s_2 by the F-test [7, 23].

3 Results

The aim of the paper is to compare the use of telework by men and women in the categories of sometimes, usually and never in the Czech Republic, Poland and Slovakia.

In the first instance, the use of telework by men was tested in the chosen countries. As it is shown in Figure 1 below, the statistical difference between the Czech Republic and Poland was in all categories: sometimes (p-value 0.0000), usually (p-value 0.0001) and never (p-value 0.0000). Similarly, H_0 was rejected in the category of usually between Slovakia and the Czech Republic where the p-value is 0.0017. In all these cases the p-value is below the alpha of 0.05.

Table 1. Men comparison in Poland, Czech and Slovakia.

	Mean group 1	**Mean group 2**	**Value *t***	***p***	**Devia. Group 1**	**Devia. Group 2**	***p* Var.**
CZS vs. PolS	4.88	7.73	-7.9532	0.0000	0.5553	0.9877	0.1013
CZS vs. SlovS	4.88	4.41	1.5509	0.1383	0.5553	0.7809	0.3243
CZU vs. PolU	2.59	4.11	-4.9234	0.0001	0.3754	0.9011	0.0155
CZU vs. SlovU	2.59	3.09	-3.6838	0.0017	0.3754	0.2078	0.0929
CZN vs. PolN	92.53	88.14	6.9698	0.0000	0.8353	1.8081	0.0310
CZN vs. SlovN	92.53	92.49	0.1112	0.9126	0.8353	0.7709	0.8148

In other cases, the zero-hypothesis failed to be rejected, therefore we can claim that the use of telework in the category of sometimes in the Czech Republic and Slovakia is the same (*p*-value 0.183). For the category of never, the data are very similar between the Czech Republic and Slovakia, as is documented by the *p*-value (0.9126) and the graphical representation - the left box plot. The right box plot shows the difference between the use of TW in the Czech Republic and Poland in the category of sometimes.

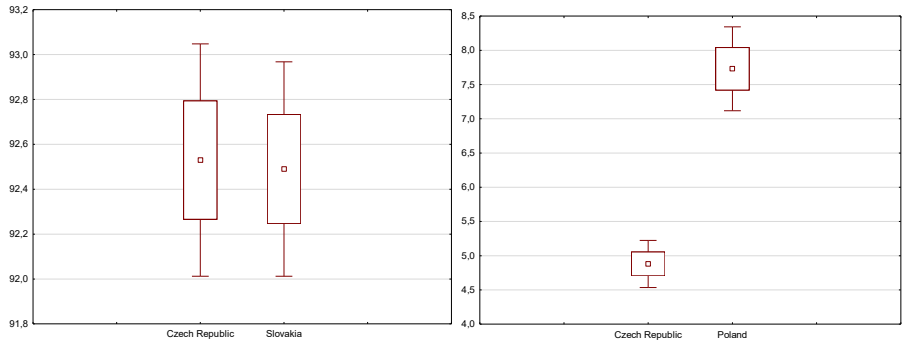

Fig. 1. Comparison of CZ and Slovakia men never using TW, Comparison of CZ and Poland men sometimes using TW.

The next comparison was related to the use of telework by women. As it is shown in Figure 2, the statistically significant differences between the Czech Republic and Poland were found in all categories, similar to those categories of the previous Figure. Comparing the Czech Republic and Slovakia, the zero hypothesis on the conformity

of both samples was refuted in the category of sometimes (p-value 0.0000) and never (p-value 0.0002) in favor of the alternative.

Table 2. Women comparison in Poland, Czech and Slovakia.

	Mean group 1	**Mean group 2**	**Value *t***	***p***	**Devia. Group 1**	**Devia. Group 2**	***p* Var.**
CZS vs. PolS	3.56	9.22	-25.312	0.0000	0.3306	0.6250	0.0715
CZS vs. SlovS	3.56	5.02	-6.2828	0.0000	0.3306	0.6562	0.0534
CZU vs. PolU	4	4.78	-3.1679	0.0053	0.4082	0.6629	0.1647
CZU vs. SlovU	4	3.99	0.0558	0.9561	0.4082	0.3928	0.9107
CZN vs. PolN	92.44	85.99	15.058	0.0000	0.6883	1.1666	0.1318
CZN vs. SlovN	92.44	91.01	4.7628	0.0005	0.6883	0.6539	0.8812

In the category of women, there was a zero hypothesis (*p*-value 0.9561). As it is shown in the left box plot both samples are very similar, and their mean values are 4, as well as maximum and minimum values. The right box plot compares the use of HW in the category of sometimes for Czech and Polish women.

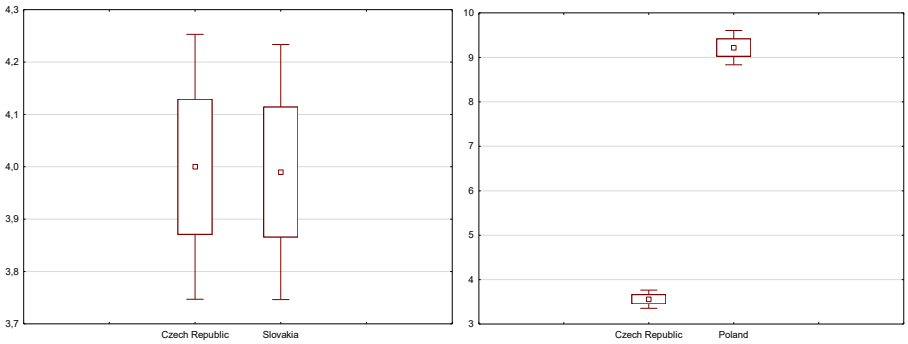

Fig. 2. Comparison of CZ and Slovakia women usually using TW, Comparison of CZ and Poland women sometimes using TW.

4 Conclusion

Telework statistics can be used for a range of analyzes It should be macroeconomic analysis, when we see telework as one of the factors of production, and it should be analysis of productivity, or competitiveness in a selected company. Analyzes of

telework can also be carried out from the point of view of social aspects related to diverse ways of employing workers.

From the statistical analysis it is obvious that the use of telework in the Czech Republic and in Slovakia is relatively comparable. Both countries do not reach its use to such an extent as the average across the European Union. It should be noted that the use of telework within the European Union is highest in the Netherlands, Sweden and Germany [9].

In case of gender analysis, there are interesting differences between the use of telework for women and men in Poland and the Czech Republic and between Poland and Slovakia.

In practice, there are two basic telework models - complete (or almost complete) which is called “usually” and partial which is called sometimes. Many businesses that tested these models have concluded that when telework is complete that is that employees have moved away from the company, employees lose contact with the other colleagues and with current events. Therefore, it is preferable to choose partial telework when employees work for two or three days at home and the remaining days are at work.

From the statistical analysis results, it is evident that in the "men" category there is a significant difference in both telework models between Poland in comparison with the Czech Republic and Slovakia. There is no obvious difference between the Czech Republic and Slovakia in the frequency "sometimes".

In the "women" category, the results were very similar to the "men" category. Significant differences were found in both models in all three countries, only in the "usual" frequency when compared to the Czech Republic and Slovakia the difference was not statistically proven.

The differences in the use of telework can be given by the legislation when the Labor Code in the Czech Republic regulates very briefly this way of employment or by more demanding communication among colleagues, stricter discipline and bigger motivation and overall workforce on the employees' side.

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Technology, Organizational Structure and Innovation – in Organizations Operating in Poland

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Abstract. The article presents the results of empirical research related to determinants of innovation. Authors concentrate on the most important determinants: organizational structure and technology. Both practitioners and theoreticians deal with the problems of managing innovation, seeking its determinants which can emerge by minimizing barriers to the creation and implementation of innovations. Organizational structures and technology are decisive factors for a company's innovation and performance. The purpose of this article is to indicate what type of technology is conducive to the development of innovation and their effective use in the development of enterprise value. Empirical research was carried out using a questionnaire on a sample of 105 organisations operating in Poland that differed in terms of size, sector and ownership model. In order to examine the relationship between the nonroutine technology variable and the subjective level of innovation, regression and variation analysis was performed. All calculations were performed using SPSS packages for Windows. The research presented in this article shows that there is a statistically significant relationship between nonroutine technology and innovation.

Keywords: Innovation, Technology, Organizational Structure, Research.

1 Introduction

There is widespread agreement among authors, researchers, consultants and thinkers in the field of management that innovation is the central capability for all organisations interested in maximizing the opportunities for success in the 21st century. However, as J. de Cagna said, while the pursuit of innovation cannot absolutely guarantee meaningful growth, it is the best strategy most enterprises have for achieving it in a way can become sustainable over time [4]. Both practitioners and theoreticians deal with the problems of managing innovation, seeking its determinants which can emerge by minimising barriers to the creation and implementation of innovations. On the other hand, innovation can be practised as well as learned. The goal of researchers is to show how to formulate and implement each determinants of innovation (i.e. organizational structure, technology) to promote the development of innovations and their effective use in the development of the long-term value of an organisation.

According to both theoreticians and practitioners who deal with innovation management, innovation is the key to the survival and development of modern organisations [6, 7, 8, 13]. At the same time, technology is also considered an important component of organisational business models by authors such as Leavitt, Krzyżanowski and McKinsey with his 7S model [14, 15, 18]. The purpose of this article is to indicate what type of technology is conducive to the development of innovation and their effective use in the development of enterprise value.

Modern organisations operate in an increasingly dynamic and complex environment. In order to be successful in such conditions, they cannot build their competitive advantage solely on individual products, technologies, or resources; instead, they need to make an effort to be more innovative than their competitors. Changes that take place in their surroundings create a constant need for innovation, which become the main determining factors for competitiveness of both individual companies and regional and national economies as a whole. Innovation is also one of the priorities of the European Union, as supporting innovation is becoming one of the basic purposes of numerous EU projects. Back in the 90's, P. F. Drucker believed that if a company was unable to innovate, it would die [7]. Therefore, a feature of an innovative entrepreneur is to seek changes, to respond to them, and to treat them as opportunities, as well as to continuously aim to create imbalance. Most often, innovation is equated with the physical characteristics of products manufactured. However, in reality, it is process and service innovation that is important for establishing a competitive position of a business. Creating an innovative product is only one of the aspects of building a competitive advantage; the rest of it involves developing an innovative process, as innovations in both of the abovementioned areas are intertwined. In some cases, product innovations require process innovations needed to bring the product to market [9], as well as organisational or even marketing changes. The level of the management's awareness of any limitations in the innovation process resulting from the company's technological processes seems to be vital for the issue at hand.

2 The concept of innovation

There are different approaches to innovation, related to different scientific disciplines in which this term originated (in organisation theory, economics, sociology, technology). Most authors emphasise the aspects of the organisation’s search for new solutions in response to changes in the environment (both changes in customer needs and changes in organisational environment elements such as technology). Innovation is commonly interpreted as the introduction of a new product and is associated with the production process, especially technology. More rarely is it related to organisational, administrative and cultural changes [12]. The differences in the definition of this concept are also determined by the understanding of innovation as a process or as a result/outcome of a process. However, most definitions emphasise innovation novelty understood objectively (the macroeconomic view: innovation is something absolutely new, pioneering work) and subjectively (the microeconomic view: it is new to the

organisation, developed and implemented regardless of whether such a solu-tion exists in other organisations). Another common element is that innovation has to lead to the success of the organisation by improving the use of resources or generat-ing socio-economic benefits, and thereby to improve the competitive position of the organisation [2, 18]. The word 'introduced' is also key here since an important as-pect is the implementation of innovation, not just theoretical assumptions or a new idea. Undoubtedly, innovative activity in organisations should also be reflected in economic profit, personal development of employees, higher job satisfaction, better communication within the organization, higher group consistency, the increase of knowledge and experience resources, the increase of production and economic indicators.

For the research, it was assumed that innovation is a change in the subjective sense (change is new only for the organisation) leading to an improved product, pro-duction process or organisation itself, which was developed to achieve economic or social benefits. Innovation is also the process, in which the final step is to implement new ideas. Thus, innovation is not only the ability of the organisation to create the idea but it should also lead to economic and/or social benefits. It must be completed by the emergence of innovations on the market. The activities related to innovation include changes in both the incremental and radical transformation of the existing solutions. However, the adoption of the subjective understanding allows achieving a high level of innovation even if the organisation implements the changes that exist in other entities, especially when they contribute to the improvement of the organisation [25].

3 Technology

Source literature defines technology as: physical objects, artefacts, including prod-ucts and tools, equipment used for their production, actions and processes constitut-ing production methods, as well as knowledge required to develop and use equipment and production methods (know-how) [10].

According to the definition proposed by [23], technology is "the entire-ty of transformation processes employed by the enterprise, combining both the basic stream of internal transformation and all purchases needed to power the process, as well as the enterprise's outflow" [23]. It should be considered that literature's sources link technology to the individual features of the organisational structure. One of the first typologies of technology was proposed by J. Woodward [10] (research indicated a correlation between the organisational structure and efficiency, when the types of technology used by the organisation are considered) as cited in [10]. The typology is presented in Fig. 1.

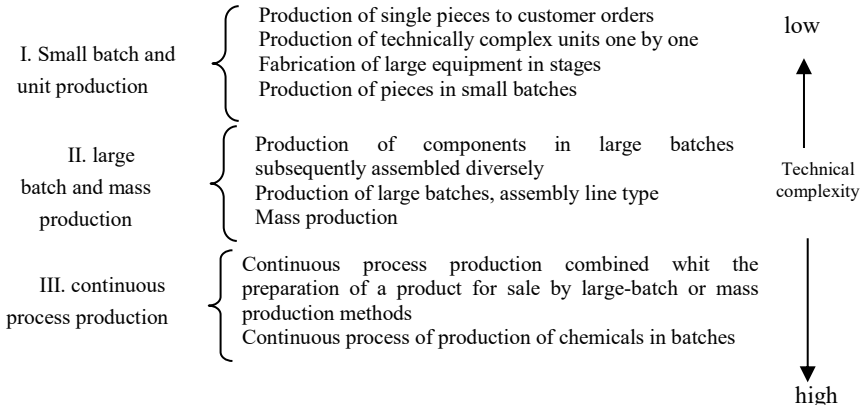

Fig. 1. J. Woodward's typology of technology, [10].

J. Woodward's idea [10] establishes three technological groups ordered according to the technical complexity parameter, i.e. the level of mechanisation of the production process:

- small batch and unit production – less control, less management levels and decentralisation, high employee competences,
- large batch and mass production – highly specialised, routine procedures, more control and centralisation, low employee competences,
- continuous process production – similarly to unit production – based on low level of control and decentralisation, at the same time there are more management levels, high employee competences [10].

Woodward claimed that in case of technologies found at the extremes of the scale, organic structures are most suitable, whereas in case of mass production, mechanistic structures are desirable. This is based on the routine of the work performed with different technologies. Extreme technologies are based on non-routine work (suitable for organic structures); work related to mass production is highly routinized (better adjusted to mechanistic structures). This correlation is shown in Fig. 2.

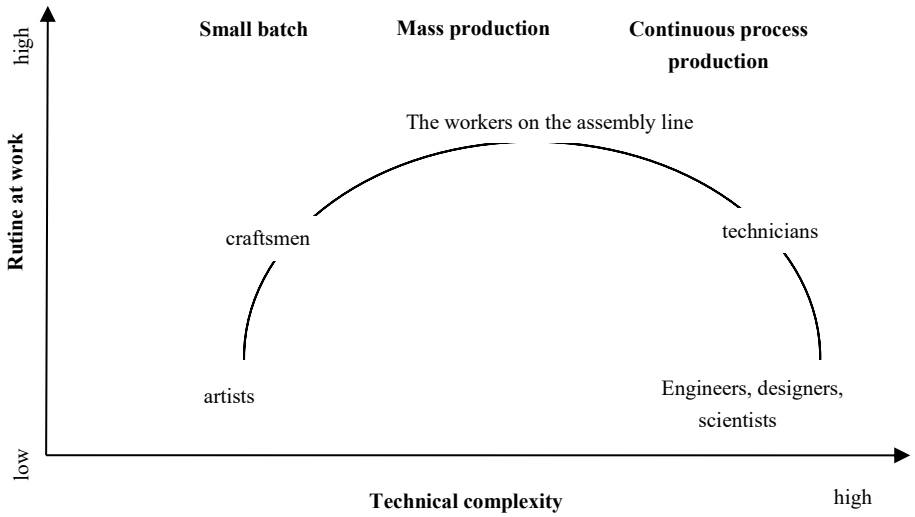

Fig. 2. The relationship between work routines and technical complexity, [10].

Ch. Perrow, cited from [10], also believes that technology is linked to the organisational structure and imposes a specific division of tasks and manner of individual's activities coordination. Technology determines the structure in two ways:

- by distinguishing between the components used – standard or nonstandard materials, frequency of unexpected occurrences, simplicity or complexity of the situation; in other words, it concerns the variability of tasks defined as a number of deviations from standard procedures encountered while using a particular technology [10],
- based on the type of efforts required while making decisions (analysability of the situation) the number of known analytical methods used to deal with deviations encountered [10], which grows with the number of available routine solutions.

Depending on how those two parameters intertwine, C. Perrow, cited from [10], proposes a specific type of organisation, using a specific type of technology (presented on fig. 3).

	Few exceptions (Formal structure)	**Massy exceptions** (Flexible structure)
Unanalysable decision (Simple to decentralize)	**Craft Technology** (specialty glass)	**Nonrutine Technology** (airplanes, rockets)
Analysable decision (Difficult to decentralize)	**Rutine Technology** (steel industry, automotive)	**Engineering Technology** (heavy machinery and equipment)

Fig. 3. Types of technology according to C. Perrow, [10, 23].

Craft technologies involve low task variability and low analysability. Intuition and experience play a particularly important role in this technology, especially when standard operating methods fail (although usually there are several known solutions which can be relied on) [10]. The structure has organic characteristics (according to H. Steinmann and G. Schreyögg, similarly to the organic structure): moderate level of formalisation and centralisation, relatively wide management range, mostly verbal and lateral communication. Qualifications and experience of staff play an important role, and control and coordination are less significant (training is more important) [22].

Routine technologies involve low task variability and high analysability. In case of deviations from standard procedures, almost always there is a method available to solve the problem [10]. The structure has mechanistic characteristics: high level of formalisation and centralisation, wide management range, vertical communication, low qualifications of the staff, close coordination and control (regulations, budget and reporting) [22].

Engineering technologies involve high variability and task analysability, with many deviations from standard practices, but the staff have known methods of solving the problem at their disposal (usually as a result of advanced or highly advanced training) [10]. The structure shows characteristics closer to mechanistic models: moderate level of formalisation and centralisation, narrow management range, written and oral communication, coordination and control through reporting and conferences, staff selection based on formal education [22].

Nonroutine technologies involve high variability and low task analysability, with many problems and a lack of known methods of solving them, which means that the staff need to search for new operating methods [10]. The structure shows organic characteristics: low level of formalisation and centralisation, narrow management range, extensive experience and high qualifications of staff, lateral communication, coordination and control through group discussions and social norms [22].

During his research on nonroutine technologies, Ch. Perrow [10] focused on technology as the determinant of uncertainty in organisations (the figure below shows the impact of the typology of technology on the level of routine). Technology influences uncertainty through the variability of quality or availability of input factors or variability of the nature of the transformation process. Increased uncertainty creates difficulties in organising the company's activity because it is not certain which actions will be necessary.

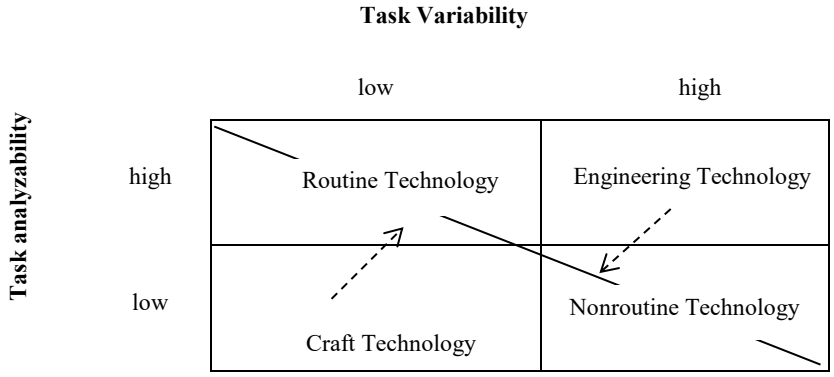

Fig. 4. Effects of two-dimensional typology of technology according to Ch. Perrow on one routine dimension, [10].

Nonroutine technologies require independent staff, professionals and knowledge workers able to use their flexibility to find solutions for constantly changing problems. Their characteristic features include the desire to gain new knowledge, high competences, take innovative approaches (the ability to see opportunities to establish new knowledge, initiating revolutionary changes, showing innovative entrepreneurship, encouraging others to think creatively and working with others in that scope), as well as seeking diversity through cooperation [22]. Morawski indicates that they are able to hold at least four organisational roles in the company, including the role of an innovator who introduces break-through changes independently or in collaboration with other creative members of staff [16]. Knowledge workers, in order to be able to propose nonstandard solutions, require a great deal of freedom in their work, independence and self-reliance. This means that they work well within flexible organisational structures that are much closer to organic solutions with a low level of formalisation and centralisation etc., which facilitates use of the employees' knowledge and aids introduction of nonstandard solutions. It seems, therefore, that the more nonroutine technology is, the more opportunities are created for developing new innovative solutions. The final hypothesis adopted is the following: H: The less routine the technology is in a given enterprise, the higher the company's innovation will be.

4 The relationship between technology and innovation

The general aim of the research was to define the determinants of the organisational innovation, with a particular emphasis on the knowledge management processes One questionnaire was sent to each surveyed organisation with the request that a person with a broad view of the whole organisation (i.e. CEO, management team, quality specialist etc.) fill it in. The questionnaire included questions to measure the level of various determinants of innovations and the level of innovation. The survey also dealt

with questions concerning certain characteristics in order to determine the structure of the surveyed organisations (size, the ownership and position of the organisation). Competent experts (scientists and senior managers) verified the accuracy of the items included in the questionnaire. The experts, independently of one another, made an individual assessment of the questionnaire. Each respondent received a questionnaire and a cover letter (which included the request for help in the research programme, the explanation of the aims and scope of the programme as well as the assurance of anonymity).

To investigate the results of the relation between innovation and technology, the key variables were defined.The **innovation** variable was measured with 4 indicators:

- the subjective indicator: level of innovation, i.e. the degree to which:
  - the organisation's innovation is higher than the innovation of its main competitor,
  - many ideas on how to improve the organisational procedures are developed at the organisation,
  - many ideas on how to improve the technological process are developed at the organisation,
  - many ideas on how to improve the services/products are developed at the organisation,
  - ideas created at the organisation are often implemented.

The items were analysed on the basis of the discrimination coefficient and Cronbach's alpha parameter. Cronbach's alpha equalled 0.861, which shows a very high internal scale and reliability of the measurement of the innovation variable.

- 3 objective indicators (assessed on a 0-1 scale):
  - having or not having formal signs of innovation (such as patent applications, granted patents, granted utility models, licences, proprietary rationalisation ideas),
  - employing or not employing R&D staff,
  - expenditure or no expenditure on R&D.

The scale measuring **nonroutine technology** initially included 4 items. The items were analysed on the basis of the discrimination coefficient and Cronbach's alpha parameter. One item was removed from the scale, as its discrimination coefficient was less than 0.2. The final scale comprised of 3 items, Cronbach's alpha equalled 0.678, which shows a high internal consistency of the scale and reliability of the measurement.

The **nonroutine technology** variable was measured with the following indicators:

- tasks carried out at the enterprise are very complex,
- tasks carried out at the enterprise are variable,
- work is mostly based on routine activities

In order to examine the relationship between variables and the subjective level of innovation, regression analysis was performed. In case of objective indicators,

variation analysis was performed to compare the average scores for the nonroutine technology independent variable in groups distinguished on the basis of, respectively: having or not having formal signs of innovation, employing or not employing R&D staff and expenditure or no expenditure on R&D. All calculations were performed using SPSS packages for Windows.

The variation analysis concerning the objective indicators and the nonroutine technology variable did not produce statistically significant results. However, it should be considered that the respondents often did not answer the questions concerning R&D employment figures, R&D finances, and formal signs of innovation. Whereas the regression analysis showed a significant correlation between the nonroutine technology variable and the innovation variable [$F(1.103) = 17.363$, $p < 0.001$]. The nonroutine technology variable explains $R^2 = 14.4\%$ of the innovation variable.

5 Technology and organizational structure – discussion

While analysing the types of organisational technology favourable to innovation, it is clear that the authors often link technology to the organisational structure, see among others the authors cited earlier in [10, 22]. It should be pointed out that research on the relationship between structure and innovation points to certain characteristics which also support nonroutine technology– giving the structures a more organic character.

The organisational structure is believed to have the following features: configuration, centralisation, specialisation, standardisation and formalisation (Fig. 5.). Configuration and centralisation determine the place of every employee in the organisation, while specialisation and the other characteristics determine the desired individual and collective activities [11, 19].

Fig. 5. Structural features according to K. Mreła, [11].

The issue of the degree of work division and specialisation is one of the basic dilemmas while building an organisational structure [2]. From the team perspective, a high level of specialisation is mostly connected to the economies of scale of the operations, as repeatability and inalterability facilitate the use of routine and specialised technology, as well as a better use of specialist qualifications of staff. On the individual level, specialisation involves gaining experience and low requirements in terms of employee qualifications. However, Bielski believes that there is also the other side to this coin. Extensive work division and high specialisation also have negative effects from the team perspective, such as obstructed flow of information between organisational units, as well as decreased work efficiency caused by dissatisfaction with work, which is a very important issue from the perspective of innovation [2]. On the individual level, the following effects have been observed: degradation of people and their qualifications in the work process (with monotony and mental exhaustion), degradation of the role of people in the organisation's operations (separation of conceptual work from executive work), difficulties in seeing the connection between tasks performed and business goals, which also affects the staff's creativity and consequently the organisation's innovation. The main feature of the organisational structure is the basic criterion of specialisation [23]. In the case of departmental specialisation, the ability to implement innovative projects grows with an increased integration of functions involved in the innovation process. At the same time, creating single-function departments may lead to autonomisation of the goals of individual organisational components [16, 20]. Meanwhile, Sikorski describes the impact of positional specialisation on innovation. This type of specialisation limits the likelihood of creating pro-innovation attitudes, which is a result of establishing specific expectations for the staff (separating conceptual work from executive work), low complexity of tasks performed, difficulties in seeing a connection between tasks

performed at individual posts and a lack of necessary information [19]. It is important to notice that also organizational configuration is an important factor that can support or discourage innovation processes in organization. Flexibility and agility are characterizing structures in innovation-oriented organizations [5]. It can be concluded that factors, which are the most important for innovation should facilitate organic-type structure in organization (more flexible and agile then mechanistic structure), which is characterized by low centralization, low formalization, low specialization, and simple hierarchy [24].

6 Summary

Modern organisations operate in an increasingly complex environment, where changes occur very dynamically. Maintaining a competitive advantage in such conditions requires more than an individual product, technology or resources – it requires an effort made to ensure that the organisation stands out from the competition thanks to its innovation. Leonard and Straus describe a simple principle of competitiveness: introduce innovations or stay behind [9]. The issue of business innovation is very important in the field of management. Both practitioners and theoreticians considered innovation as one of the factors which determine the success of an organisation. The conditions of innovation are the subject of many scientific publications. However, there is a shortage of empirical studies indicating a clear correlation between the type of technology employed and innovation. The research presented in this article shows that there is a statistically significant relationship between nonroutine technology and innovation. This means that the more variable are the team's tasks and the more varied are the solutions that are applied, the higher level of innovation of the organisation. Technology is also linked to the organizational structure. For example, the nonroutine technology used by companies influences the tasks and skills of employees, and these changes in turn exert an emphasis on modifying the organizational structure towards organic structures. An important dimension of organizational structure is the criterion of specialization. The relationship of specialization to technology, generally refers to the way of division of work. The lower the degree of specialization in the enterprise, the more likely it is to have non-routine technology. As a future studies it would seem interesting to examine the correlation between technology, organizational structure and types of innovation.

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GDP and Dynamic Intensity and Extensity Parameters – Calculation for the Czech Republic and Germany in the Period 1991 - 2017

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Abstract. The paper introduces so called dynamic intensity and extensity parameters and dynamic parameters of the share of the influence of the labor and capital development on the TIF development. The parameters analyze GDP development whether it is based on qualitative or quantitative factors and how change of labor or capital contributes to change of total input (TIF) factor. It can be used as an alternative method to growth accounting. The parameters are calculated for the Czech and German GDP development for the period 1991 – 2017. The calculation confirms similarity of the development in both countries.

Keywords: GDP Development, Dynamic Intensity Parameter. Dynamic Extensity Parameter, Czech Republic, Germany

1 Materials and methods

The purpose of the paper is to calculate values of dynamic intensive and extensive parameters and dynamic parameters of the share of the influence of the labor and capital development on the TIF development for the Czech Republic and Germany for the period 1991–2017. The article is organized as follows. This chapter describes all parameters. The second one calculates the value of parameters for the mentioned countries in the given period. The third one discusses some issues connected with parameters. Conclusion summarizes main points.

The topic how specific factors contribute to economic development (growth) belongs to the main economic issues (for details see e. g. Sandamo 2011). Principal contribution was done by Solow (1957) and others (e. g. Kendrick 1961, Denison 1962, Jorgerson and Griliches 1967) in growth accounting equation. The equation looks at the economic growth (change) as contribution of labor growth, capital growth and technological progress (total factor productivity) growth. The basic form of growth accounting equation can be written as:

$$G(Y) = G(TFP) + \alpha * G(K) + (1 - \alpha) * G(L), \quad (1)$$

where α and $(1-\alpha)$ represents the weights expressing impact of capital and labor. The equation assumes constant returns to scale. It further expects perfect competition – generally situation when factors prices coincide with social marginal product and where the revenues of owners of capital and labor equal product$MP_K . K,$ respectively$MP_L . L$. As Barro (1999) notes the growth accounting equation is useful if the determinants of factor growth rates are substantially independent from those that matter for technological change. However, the development of labor and capital is interconnected n reality. The presence of both factors is essential in the economy. Not even a vending machine can do without live labor, just as a man cannot practically do without at least minimal amenities in the economy. The changes of labor or capital usually also affect value of technological progress.

There were made a lot of attempts how to overcome the shortage of growth accounting (see e. g. Barro 1999 or la Grandville 2016 for details). One of them (Mihola 2007a, Mihola 2007b, Hájek and Mihola 2009, Cyhelský, Mihola and Wawrosz 2012, Mihola and Wawrosz 2013, 2014a, 2014b, 2015) introduces so called dynamic intensity parameter (*i*) and dynamic extensity parameter (*e*), respectively the dynamic parameter of the share of the influence of the labor development on the total input factor (*TIF*) development (*l*) and the dynamic parameter of the share of the influence of the capital development on the *TIF* development (*k*). The dynamic intensity and extensity parameters express how change of intensive factors that is represented by change of *TFP* and change of extensive factors that is represented by change of *TIF* contributes to change of GDP (*Y*). Dynamic parameters of the share of the influence of the labor or capital development on the development of *TIF* similarly express how change of labor or capital contributes to change of *TIF*.

The logic of dynamic intensity and extensity parameters comes from the basic relationship that sees output as the product of inputs and their efficiency (see e.g. Froeb and Ward, 2015, for details). GDP growth, decline or stagnation may be attributable to a change in only one of these variables, with the other variables unchanged, or both variables having an effect. In that event, the effects may also counteract each other, which may even result in a full compensation of the impact of their changes, if one variable rises and the other falls in such a way that the GDP does not change. A change in TIF is related to a change in the amounts of inputs, i.e. to a quantitative or extensive change, and a change in TFP is related to a qualitative or intensive change.

Mathematically, the parameters come from expressing GDP as the product of *TFP* and *TIF*.

$$Y = TFP \,.\, TIF \qquad (2)$$

TIF is further expressed in the form of Cobb-Douglas function:

$$TIF = K^{\alpha} . L^{(1-\alpha)} \qquad (3)$$

Both the equation (2) and equation (3) can be made dynamic:

$$I(Y) = I(TFP) \,.\, I(TIF) \qquad (4)$$

$$I(TIF) = I(K)^{\alpha} . I(L)^{(1-\alpha)}. \quad (5)$$

It is worth to mention that basic equation of growth accounting (1) can be derived from equation (4) and (5). First change of Y is expressed as:

$$I(Y) = I(TFP) \, . \, I(K)^{\alpha} . I(L)^{(1-\alpha)}. \quad (6)$$

Taking a logarithm of this, it is possible to obtain the following expression after introducing the growth rates

$$ln[G(Y) +1] = ln[G(TFP) +1] + \alpha \, . \, ln[G(K) +1] + (1 - \alpha) \, . \, ln[G(L) +1]. \quad (7)$$

For small growth rates of up to ±5%, the following equation is accurate enough for any variable A

$$ln[G(A) + 1] \approx G(A) \quad (8)$$

Using this approximate relationship, we can modify expression (12) into

$$G(Y) = G(TFP) + \alpha \, . \, G(K) + (1 - \alpha) \, . \, G(L) \quad (9)$$

It must be emphasized that the equation (9) was derived by using an approximate equation (8), and therefore it applies only approximately. Accurate results can be obtained using direct calculations, which do not rely on relationships between dynamic characteristics.

The dynamic parameters of intensity and extensity comes from relationship:

$$ln(I(Y)) = ln(I(TFP)) + ln(I(TIF)) \quad (10)$$

The impact of change of intensive factors (dynamic intensity parameter) on GDP change can be then easily expressed as:

$$i = \frac{ln\, I(TFP)}{|ln\, I(TFP)| + |ln\, I(TIF)|}, \quad (11)$$

Similarly, the impact of change of extensive factors (dynamic extensity parameter) on GDP change can be then easily expressed as:

$$e = \frac{ln\, I(TIF)}{|ln\, I(TFP)| + |ln\, I(TIF)|}. \quad (12)$$

The parameters are designed to be able to describe truthfully all possible situations. Specifically, if a change of any factor contributes to production growth, the relevant parameter should be positive (e.g. if a change of intensive factors contributes to growth, the dynamic parameter of intensity is positive), whereas if it leads to a decline in output, the parameter value is negative. If the given factor remains unchanged, the relevant parameter is equal to zero. The following applies to the sum of absolute values of relevant parameters:

$$|i| + |e| = 1. \qquad (13)$$

The detailed characteristics of individual situations with values of parameters are specified in Table 1.

Table 1. Overview of individual types of developments *I(TIF)* and *I(TFP)* and values of dynamic parameters of intensity and extensity

	Change of extensive factors (*I(TIF)*)	**Change of intensive factors (*I(TFP)*)**	**Change of output (*I(Y)*)**	**Values of intensity (*i*) and extensity (*e*)**	**Type of development**
1.	growth, (*I(TIF)* > 1)	unchanged, (*I(TFP)* = 1)	growth, (*I(Y)* > 1)	*e* = 1; *i* = 0	pure extensive growth
2.	unchanged, (*I(TIF)* = 1)	growth, (*I(TFP)* > 1)	growth, (*I(Y)* > 1)	*e* = 0; *i* = 1	pure intensive growth
3.	same growth as intensive ones, (*I(TIF)* > 1, *I(TIF)* = *I(TFP)*)	same growth as extensive ones, (*I(TFP)* > 1, *I(TFP)* = *I(TIF)*)	growth, (*I(Y)* > 1)	*e* = 0.5; *i* = 0.5	pure intensive-extensive growth
4.	faster growth than intensive ones, (*I(TIF)* > 1), *I(TIF)* > *I(TFP)*)	slower growth than extensive ones, (*I(TFP)* > 1, *I(TFP)* < *I(TIF)*)	growth, (*I(Y)* > 1)	*e* >*0*; *i* >*0;* *e* > *i*	predominantly extensive growth
5.	slower growth than intensive ones, (*I(TIF)* > 1), *I(TIF)* < *I(TFP)*)	faster growth than extensive ones, (*I(TFP)* > 1, *I(TFP)* > *I(TIF)*)	growth, (*I(Y)* > 1)	*e* > *0*; *i* > *0;i* > *e*	predominantly intensive growth
6.	is greater than inverted value of intensive ones, (*I(TIF)* > 1), *I(TIF)* >1/*I(TFP)*)	is greater than inverted value of extensive ones, (*I(TFP)* < 1, *I(TFP)* >1/*I(TIF)*)	growth, (*I(Y)* > 1)	*e* > *0*; *i* < *0;* *e* > |*i*|	extensive-intensive compensatory growth
7.	is greater than inverted value of intensive ones, (*I(TIF)* < 1), *I(TIF)* >1/*I(TFP)*)	is greater than inverted value of extensive ones, (*I(TFP)* > 1, *I(TFP)*>1/*I(TIF)*)	growth, (*I(Y)* > 1)	*e* <*0*; *i*> *0;* *i* > |*e*|	intensive-extensive compensatory growth
8.	equal to inverted value of intensive ones, (*I(TIF)* > 1), *I(TIF)* = 1/*I(TFP)*)	equal to inverted value of extensive ones, (*I(TFP)* < 1, *I(TFP)* = 1/*I(TIF)*)	no change (stagnation), (*I(Y)* = 1)	*e* = 0.5; *i* = -0.5	pure extensive-intensive compensation
9.	equal to inverted value of intensive ones, (*I(TIF)* < 1),	equal to inverted value of extensive ones, (*I(TFP)* > 1,	no change (stagnation), (*I(Y)* = 1)	*e* = -0.5; *i* = 0.5	pure intensive-extensive compensation

	I(TIF) = 1/*I(TFP)*)	*I(TFP)* = 1/*I(TIF)*)			
10.	is less than inverted value of intensive ones, (*I(TIF)* < 1), *I(TIF)* < 1/*I(TFP)*)	is less than inverted value of extensive ones, (*I(TFP)* > 1, *I(TFP)* < 1/*I(TIF)*)	decline, (*I(Y)* < 1)	*e* < *0; i* > *0;* *i* < |*e*|	intensive-extensive compensatory decline
11.	is less than inverted value of intensive ones, (*I(TIF)* > 1), *I(TIF)* < 1/*I(TFP)*)	is less than inverted value of extensive ones, (*I(TFP)* < 1, *I(TFP)* < 1/*I(TIF)*)	decline, (*I(Y)* < 1)	*e* >*0; i* < *0;* *e* < |*i*|	extensive-intensive compensatory decline
12.	faster decline than intensive ones, (*I(TIF)* < 1), *I(TIF)* <*I(TFP)*)	slower decline than extensive ones, (*I(TFP)* < 1, *I(TFP)* > *I(TIF)*)	decline, (*I(Y)* < 1)	*e* < 0; *i* < 0; |*e*| > |*i*|	predominantly extensive decline
13.	slower decline than intensive ones, (*I(TIF)*< 1), *I(TIF)* > *I(TFP)*)	faster decline than extensive ones, (*I(TFP)*< 1), *I(TFP)* < *I(TIF)*)	decline, (*I(Y)* < 1)	*e* < 0; *i* < 0; |*i*| > |*e*|	predominantly intensive decline
14.	same decline as intensive ones, (*I(TIF)* < 1), *I(TIF)*=*I(TFP)*)	same decline as extensive ones, (*I(TFP)* < 1), *I(TFP)*=*I(TIF)*)	decline, (*I(Y)* < 1)	*e* = -0.5; *i* = -0.5	pure intensive-extensive decline
15.	declining, (*I(TIF)* < 1),	unchanged, (*I(TFP)* = 1)	decline, (*I(Y)* < 1)	*e* = -1; *i* = 0	pure extensive decline
16.	unchanged, (*I(TIF)* = 1)	declining, (*I(TFP)* < 1)	decline, (*I(Y)* < 1)	*e* = 0; *i* = -1	pure intensive decline

The dynamic parameters of the share of the influence of the labor or capital development on the development of *TIF* are derived from the equation:

$$ln(I(TIF)) = ln(I(K))^{\alpha} + ln/I(L)^{(1-\alpha)}). \quad (14)$$

The dynamic parameter of the share of the influence of the development on the development of *TIF* equals:

$$k = \frac{\alpha \,.\, ln\, I(K)}{\alpha \,.\, |ln\, I(K)| + (1-\alpha) \,.\, |ln\, I(L)|}. \quad (15)$$

The dynamic parameter of the share of the influence of the labor development on the development of *TIF* equals:

$$l = \frac{(1-\alpha) \,.\, ln\, I(L)}{\alpha \,.\, |ln\, I(K)| + (1-\alpha) \,.\, |ln\, I(L)|}. \quad (16)$$

The important issue is how to set the weight α and $1-\alpha$ at the above-mentioned equations. Mihola and Wawrosz (2013, 2014a, 2014b, 2015) give α value 0.5. It can be explained by following arguments:

- There is no reason why, in the event of the complete compensation of capital growth with a decline in labor or in the case of complete compensation of labor growth with a decline in capital, the relationship between the indexes of labor and capital should be asymmetrical. If α was not equal to 0.5, it would mean that a certain change in the labour *I(L)* would always be compensated for by a smaller or always larger change in capital *I(K)*. Here it should be noted that modelling the substitution of labour with capital is almost always accompanied by some positive effect, which however captures the change in total factor productivity *TFP*, and hence is not a problem of substitution. Only if $\alpha = 0.5$ we receive in the case of complete compensation the well interpretable values $l = 50\%$ and k = -50% or $l = -50\%$ and $k = 50\%$. Table 2 shows values of k and l for pure development (when only one factor changes and the second one stagnates or when one factor completely compensates the second one).
- The construction of parameters allows to use same value of parameters both for static situation (when values K and L do not change) and dynamic situation (when K and L change). The weights 0.5 relate to hyperbolic isoquants that do not intersect horizontal and vertical axis expressing the above-mentioned fact that both labor and capital are interconnected and there is no economy using only one factor.

Table 2. The typology of *TIF* development

Type of development	***l***	***k***
purely labor growth *TIF*	100 %	0%
balanced labor-capital growth *TIF*	50 %	50 %
purely capital growth *TIF*	0%	100 %
balanced labor-capital compensation	-50%	50 %
purely labor decline	-100%	0%
purely extensive-intensive decline	-50%	-50%
purely capital decline	0%	-100%
purely intensive-extensive compensation	50 %	-50%

2 Results

The all parameters were calculated for German and Czech GDP development for the period1991-2017. The input data ((*G(Y), G(K)* and *G(L)*) was for both countries taken

or count from Statistical Annexes to the European Economy from Spring 2017, issued by the European Commission, and from the AMECO database. The data for the year 2017 are preliminary. G(Y) and G(K) is expressed in in constant prices of the year 2010. The algorithm for the calculations shown below is the same for both analyzed countries.

1. Using the three initial growth rates, we calculate the average growth rate for the entire period.
2. We calculate the growth rate of capital labour equipment G(K/L) using the equation

$$G\left(\frac{K}{L}\right) = \frac{G(K)+1}{G(L)+1} - 1. \quad (17)$$

3. We calculate the growth rate of the aggregate input factor *G(TIF)* using the equation

$$G(TIF) = \sqrt{(G(K)+1).(G(L)+1)} - 1. \quad (18)$$

4. We calculate the growth rate of aggregate productivity *G(TIF)* using the equation

$$G(TFP) = \frac{G(Y)+1}{G(TIF)+1} - 1 \quad (19)$$

5. The dynamic parameters of intensity and extensity and dynamic parameters of the share of the influence of the labor or capital development on the *TIF* development are calculated according to equations (11), (12), (15), (16).

All input data (*G(Y), G(K), G(L)*) and calculated results (*G(K/L), G(TIF), G(TFP), i, e, k, l*) are summarized in percentage form in Table 3 for Germany and in Table 4 for the Czech Republic.

Table 3. The values of dynamic intensity and extensity parameters and dynamic parameters of the share of the influence of the labor or capital development on the development of *TIF* for Germany.

year	G(Y)	G(L)	G(K)	G(K/L)	G(TIF)	G(TFP)	i	e	l	k
1991	5.1	2.8	5.3	2.4	4.0	1.0	20	80	35	65
1992	1.9	-1.3	4.1	5.5	1.4	0.5	28	72	-25	75
1993	-1	-1.3	-4.2	-2.9	-2.8	1.8	39	-61	-23	-77
1994	2.5	0	3.6	3.6	1.8	0.7	28	72	0	100
1995	1.7	0.4	0	-0.4	0.2	1.5	88	12	100	0
1996	0.8	0	-0.5	-0.5	-0.3	1.1	81	-19	0	-100
1997	1.8	-0.1	0.8	0.9	0.3	1.4	80	20	-11	89
1998	2	1.2	3.9	2.7	2.5	-0.5	-17	83	24	76
1999	2	1.6	4.6	3.0	3.1	-1.1	-26	74	26	74
2000	3	2.3	2.3	0.0	2.3	0.7	23	77	50	50

2001	1.7	-0.3	-2.5	-2.2	-1.4	3.2	69	-31	-11	89
2002	0	-0.4	-5.8	-5.4	-3.1	3.2	50	-50	-6	-94
2003	-0.7	-1.1	-1.3	-0.2	-1.2	0.5	29	-71	-46	-54
2004	1.2	0.3	0	-0.3	0.1	1.0	87	13	100	0
2005	0.7	0	0.7	0.7	0.3	0.3	50	50	0	100
2006	3.7	0.8	7.5	6.6	4.1	-0.4	-9	91	10	90
2007	3.3	1.7	4.1	2.4	2.9	0.4	12	88	30	70
2008	1.1	1.3	1.5	0.2	1.4	-0.3	-18	82	46	54
2009	-5.6	0.1	-10.1	-10.2	-5.1	-0.5	-8	-92	1	-99
2010	4.1	0.3	5.4	5.1	2.8	1.2	31	69	5	95
2011	3.7	1.4	7.2	5.7	4.3	-0.5	-11	89	17	83
2012	0.4	1.2	-0.4	-1.6	0.4	0.0	1	99	75	-25
2013	0.3	0.6	-1.3	-1.9	-0.4	0.7	65	-35	31	-69
2014	1.6	0.9	3.5	2.6	2.2	-0.6	-21	79	21	79
2015	1.7	0.8	2.2	1.4	1.5	0.2	12	88	27	73
2016	1.6	1.1	2.5	1.4	1.8	-0.2	-10	90	31	69
2017	1.6	0.8	2.7	1.9	1.7	-0.1	-8	92	23	77
1991/ 2017	1.47	0.55	1.25	0.7	0.9	0.6	38	62	31	69

Source: Statistical Annexes of European Economy, AMNECO database; own calculations.

Table 4. The values of dynamic intensity and extensity parameters and dynamic parameters of the share of the influence of the labor or capital development on the development of *TIF* for the Czech Republic

year	G(Y)	G(L)	G(K)	G(K/L)	G(TIF)	G(TFP)	i	e	l	k
1991	-11..6	-5.5	-27.3	-23.1	-17.1	6.6	26	-74	-15	-85
1992	-0.5	-2.6	16.5	19.6	6.5	-6.6	-52	48	-15	85
1993	0.1	-1.6	0.2	1.8	-0.7	0.8	53	-47	-89	11
1994	2.9	1.1	11.7	10.5	6.3	-3.2	-35	65	9	91
1995	6.2	0.7	23.3	22.4	11.4	-4.7	-31	69	3	97
1996	4.3	0.5	9.8	9.3	5.0	-0.7	-13	87	5	95
1997	-0.7	-0.7	-5.2	-4.5	-3.0	2.3	43	-57	-12	-88
1998	-0.3	-1.7	-1.1	0.6	-1.4	1.1	44	-56	-61	-39
1999	1.4	-2.2	-2.6	-0.4	-2.4	3.9	61	-39	-46	-54
2000	4.3	-0.8	8.4	9.3	3.7	0.6	14	86	-9	91
2001	3.1	-0.3	5.6	5.9	2.6	0.5	16	84	-5	95
2002	1.6	0.6	2.2	1.6	1.4	0.2	13	87	22	78
2003	3.6	-0.8	1.8	2.6	0.5	3.1	86	14	-31	69
2004	4.9	-0.2	3.9	4.1	1.8	3.0	62	38	-5	95
2005	6.4	1.9	6.4	4.4	4.1	2.2	35	65	23	77
2006	6.9	1.3	5.9	4.5	3.6	3.2	47	53	18	82
2007	5.5	2.1	13.5	11.2	7.6	-2.0	-21	79	14	86
2008	2.7	2.2	2.5	0.3	2.3	0.3	13	87	47	53
2009	-4.8	-1.8	-10.1	-8.5	-6.0	1.3	17	-83	-15	-85

2010	2.3	-1.0	1.3	2.3	0.1	2.2	94	6	-44	56
2011	2.0	-0.3	1.1	1.4	0.4	1.6	80	20	-22	78
2012	-0.9	0.4	-3.2	-3.6	-1.4	0.5	27	-73	11	-89
2013	-0.5	0.3	-2.7	-3.0	-1.2	0.7	37	-63	10	-90
2014	2	0.6	2	1.4	1.3	0.7	35	65	23	77
2015	4.2	1.2	7.3	6.0	4.2	0.0	0	100	14	86
2016	2.1	0.4	-0.5	0.9	-0.1	2.2	98	-2	44	-56
2017	2.6	0.3	3.0	2.7	1.6	0.9	37	63	9	91
1991/2017	1.77	-0.23	2.30	2.5	1.0	0.7	42	58	-9	91

Source: Statistical Annexes of European Economy, AMNECO database; own calculations

The very similar economic development in Germany and the Czech Republic (CR) is clear from Figure 1 describing GDP development in both countries at constant 2010 prices. This similarity is due to numerous interrelations between the two economies, which also has historical roots. Deviations are more essential in the 1990s, when the CR was going through economic transformations including economic crisis at the second half of the period and Germany had to solve the consequences of the reunification in 1990. The Czech Republic has higher growth rate period after the year 2000 as the consequence of its preparation on EU membership. The EU entrance was connected with capital inflow that brought to the country new modern technology. It also meant higher international involvement and cooperation, higher international division of labor and other positive factors. The result was quit high Czech growth rate and high positive yearly values of dynamic intensity parameter. Both countries were hit by the deep crisis in 2009. The recovery from the crisis after 2009 also happens similarly.

As shown in the last lines of Tables 1 and 2, the Czech Republic achieved an only slightly higher average GDP growth rate for the whole period, i.e. 1.77% compared to 1.47% for Germany. The biggest difference is in the labor factor, which in the Czech Republic is declining on average by a quarter of a percent year-on-year, while in Germany it is growing by half a percent. Intensity and extensity are also very similar, since in both cases there is predominantly extensive development, however with high intensity. The intensity in the Czech Republic is 4 percentage points higher, reaching 42%, while in Germany it is 38%. The balance up to 100% in both countries is extensive development.

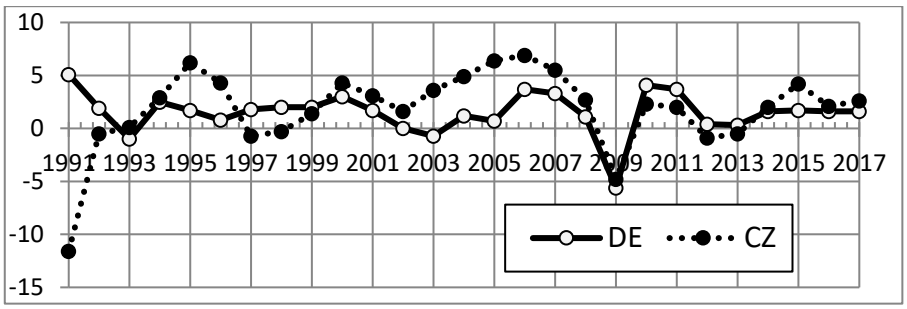

Fig. 1. GDP development for the period 1991 to 2017 for Germany (DE) and the Czech Republic (CZ)

If we concentrate on the columns *i* and *e* in the tables 3 and 4, it is possible to see the year-on-year development in intensity and extensity is similar in both countries, especially after the period of transformation in the 1990s. The processes of transformation of the Czech economy and the impacts of German unification were nevertheless different in nature. Former East Germany can rely on wealthy West Germany that can easily export to East Germany its technology, knowledge and other factors. People form East Germany could further move to west and to find here jobs that was connected with higher level of capital goods that increased their productivity. All these factors caused mainly positive values of dynamic intensity parameter (*i*). The position of Czech Republic was more difficult. Czech economic transformation meant deeper changes resulting in negative values of dynamic intensity parameter in the beginning of the transformation. Negative German values of dynamic intensity parameters in years 1998 and 1999 were mainly due to the entry of Germany into the euro area. Entry into the euro area is a process in which we can expect negative extensity.

The period 2000 – 2007 means positive values of dynamic intensity parameter for both countries in whole period (except year 2006 in the case of Germany and 2007 in the case of the Czech Republic). Germany was able to succeed in liberalization of labor market (so called The Hartz Reform, see e. g. Krebs and Scheffel 2013 for details). It also uses the fact that euro exchange rate is generally under valuated in its case what is favorable for German export. The more intensive development in the CR in the same period can be attributed to the preparation of the CR for accession to the EU and the impacts of this serious step.

The crisis in year 2009 brought negative values of both parameters in the case of the Czech Republic and negative value of German dynamic extensity parameter. The process of recovery from the crisis are connected with slightly different Czech and German values of both parameter. However, the values of parameters are affected by temporary demand shock and interpretation of their year values can be misleading (see Chapter 3 for details). When we shortly move to the to the analysis of the dynamic parameter of the share of the influence of the labor development on the development of *TIF* (*l*) and the dynamic parameter of the share of the influence of the capital development on the development of *TIF* (*k*) we find higher differences. They are caused due to different labor mobility (generally higher in Germany), higher change of capital structure that was realized in the Czech Republic and other factors.

3 Discussion

How accurate are the parameters? And do they always describe exactly what happens in reality? The values of the parameters depend, of course, on input data. Our approach uses as the input data only growth rates of labor, capital and GDP. The analysis looks at labor and capital as a homogeneous factor and it does not consider other features as education, skill, quality of capital goods and so on. However, identical value of labor or capital change can result in different GDP development. For instance, if one country experiences growth of educated labor force (e. g. people

with university education) and the second on growth of unskilled person. Although labor growth rates are equal in both countries GDP growth rates differ. Similarly, if one country is introducing modern technically progressive capital goods and the second one increases number of obsolete ones, the change of GDP will be probably different even in the case when both changes of capital are expressed by same value. It is reasonable to expect that the change containing a qualitative character will result in higher *TFP* change of and thus in higher value of dynamic intensity parameter.

If we want to distinguish quality of inputs, it is possible to add to equation other factors or to divide labor and capital to more specific forms. Equation (3) then can be for instance rewritten as

$$TIF = \sum_{i=1}^{n} K_i^{\alpha} . \sum_{j=1}^{m} L_j^{1-\alpha}, \qquad (19)$$

where *i* and j represents different forms of capital and labor. The equation (5) than can be rewritten as:

$$I(TIF) = \sum_{i=1}^{n} I(K)_i^{\alpha} . \sum_{j=1}^{m} I(L)_j^{1-\alpha}. \qquad (20)$$

Share of the influence of the specific factor (e.g. educated labor force) on TIF development can be then expressed as:

$$k_i = \frac{\alpha \,.\, ln\, I(\backslash\backslash K_i)}{\alpha \,.\, |ln\, I(\sum_{i=1}^{n} K_i)| + (1-\alpha) \,.\, |ln\, I(\sum_{j=1}^{m} L_j)|}, \qquad (21)$$

$$i_j = \frac{(1-\alpha) \,.\, ln\, I(L_j)}{\alpha \,.\, |ln\, I(\sum_{i=1}^{n} K_i)| + (1-\alpha) \,.\, |ln\, I(\sum_{j=1}^{m} L_j)|}. \qquad (22)$$

The interpretation of dynamic intensity or extensity parameters´ values can be sometimes misleading. Especially in the case of sudden demand or supply shocks. Yearly values of both parameters are usually affected by a shock. For instance, the output in the case of negative demand shock decreases, but amount of inputs usually does not decrease in the same rate. The input decline is usually lower, or inputs can even stagnate or grow especially in the beginning of the shock when their development is not affected by the shock. The dynamic parameter of intensity is negative in such case. But the country does not experience real technological regression. It is reasonable for firms not to reduce amount of inputs in same rate as output decline. If the negative shock is temporary, it makes sense to keep the inputs in the firms and to avoid costs connected with input reduction and subsequent input increase. Oppositely, when the demand shock ends, inputs and output usually grow but the inputs change is lower that the output change. The value of dynamic intensity parameter is positive, but it does not mean real technological progress. Firms only started to use more the inputs that had not been reduced during shock.

Negative supply shock due to sudden increase prices of inputs (e. g. oil) can cause misinterpretation too. The change of inputs is usually higher than change of output due to the shock. Value of inputs usually grows; value of output grows smaller, stagnates or even declines. The result is negative value of dynamic intensity parameter which, however, does not again mean technological regression. Economy is not only able to respond in short run to the shock appropriately. Generally, yearly

values of dynamic intensity and extensity parameters express what happens on the aggregate level. Their negative values can be seen as a sign of some economic problems, but the essence of the problem must be further investigated. It is not possible to conclude without other research that yearly negative values mean real technological regression or real decline of inputs. Yearly negative value of dynamic extensive parameters can be further caused by change of depreciation methodology or by the fact the new capital good cost less than the removed ones.

Extraordinary yearly positive values of both parameters must be carefully analyzed too as they often describe the situation when an economy improves from previous negative development. The positive values thus balance what happened in the past. The value of the parameters can be also misleading in the case when all values (*I(TIF), I(TFP) I(Y)*) are close to 1 – so they describe slight change. The small difference in their values in such situation can cause extraordinary value of any dynamic parameter – e.g. value of *i* is 98 % and value of *e* is 2 %. A big technological change seems to happen, but it does not. Long run values of both parameters counted e. g. for 10-years period describe technological progress or regression more preciously. Long run development is not affected by temporary shocks, it contains higher aggregate values of I*(TIF)*, *I(TFP)* and *I(Y)* and it is possible to analyze whether GDP development is really based on intensive or extensive factors

4 Conclusion

The methodology for measuring the quality of the development of the economic trajectory based on the dynamic intensity and extensity parameters and dynamic parameters of the share of the influence of the labor or capital development on the development TIF differs from existing methods using at the national economy level, primarily through growth accounting, because it is based not on additive relations between component factors, but multiplicative relations of the Cobb-Douglas production function type. The paper introduces the parameters and it provides explanation of the consequences of their choice. We further discuss the issue of capital and labor weights and explain why it is possible to set them equal 0.5.

The German and Czech example shows that the parameters give meaningful results that clearly depict the key events in the development of both countries. The values of parameters confirm similar economic development and the dependence of Czech economy on Germany. Larger differences are apparent in all the monitored characteristics in the 1990s, which were a period of fundamental transformation in the Czech Republic, while Germany was dealing with the consequences of unification. The beginning of the millennium in Germany was mainly influenced by its entry into the euro area, while the CR subsequently acceded to the EU. The pre-crisis period and the recovery from the crisis were very similar in both countries. The slightly higher intensity in the Czech Republic for whole period 1991 – 2017 comes mainly from the convergence process.

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The Internal Structure of Human Capital of China's Economic Growth

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Abstract. In the process of economic development, professional human capital plays a key role and general human capital plays a supporting role. The both of them have a different impact on economic growth. This paper divides the human capital into professional human capital and general human capital according to the difference between the proportion of educated population at different levels, through the quantile regression, and has empirically studied the relationship between human capital at different levels and economic growth on the panel data of 30 provinces (except Hong Kong, Macao, Taiwan and Tibet) in China from 1998 to 2015. The results have shown that the increase of internal structure of human capital plays a positive role in promoting economic growth, and the positive effect of internal structure of human capital on the economic growth is decreased with the increase of the quantile.

Keywords: Internal Structure of Human Capital, Professional Human Capital, General Human Capital, Economic Growth.

1 Introduction

With the coming of knowledge economy, as a competitive resource, the advantage of human capital has gradually emerged, and the brain economy has been the mainstream of the development of economy in the world. Since the 19th National Congress of the Communist Party of China (CPC), China has entered a pivotal stage with characteristics of transforming economic structure, improving economic structure and fostering new drivers of growth. Especially the increase of human capital has become an essential factor contributing to the high-quality economic development because the traditional demographic dividend of China is wearing off at present. Thus we should focus more on human capital. So human capital in China should change in which direction? How does the human capital at different levels influence chinese economic growth? The study could help us to understand the current situation of the internal structure of human capital in China and provide new thoughts for the internal structure of human capital's driving force to promote economic growth.

2 Literature Overview

Human capital has indelible influences on the long-term economic growth [2, 4, 7]. Most of the existing literature about the concept of the human capital and economic growth is studied from the following two aspects: on the one hand, some studies analyze the relation of human capital and economic growth. There are mainly three kinds of views: Firstly, from the perspective of technological progress, it is believed that human capital has indirect effect on economic growth due to the progress of the technology [16, 20]. Secondly, from the perspective of "dual effect" of human capital, it considers that human capital could influence economic growth through accumulating and learning because of the knowledge spillover [12, 18] . Thirdly, from the perspective of economic structure, with the structural characteristics of the economy, it states that human capital affects the economic growth. And human capital has an obvious influence on the economic growth only if the development of human capital should agree with its economic structure [1, 15]. On the other hand, some studies analyze the internal structure of the human capital to economic growth. It considers that the economic growth is correlated with the internal structure of human capital which reflects the difference in the quality of labor. The one used generalized least squares to analyze the relationship between the human capital and human capital structure and the regional economic growth from 1990 to 2004. The result showed that human capital structure can only promote economic growth in a few areas, and the vast regions relied on material capital to promote economic growth [9]. The one defined the difference between high-skilled workers and low-skilled workers as the human capital structure, and studied the factors of realizing the equilibrium between the two countries in the open economy. It showed that human capital structure was the factor which affected the comparative advantage between the two countries, and the human capital structure determines the channels of comparative advantage through the matching of labor skills and departments[13]. There was a study researching on the effect of educational human capital on economic growth used data from 1996 to 2010. The result showed that education human capital could obviously promote economic growth[10]. Through combing the literatures, we find that most of them focus on the mean-value regression, but pay less attention to the influence of conditional distribution on independent variables. In addition, in the existing literature, there are different views about the division of the internal structure of human capital, many scholars generally use the years of education to divide human capital [5, 6, 11]. And some scholars divide the human capital according to the difference in education earning rate [14, 17]. Some scholars use the structure of labor demand to divide the human capital structure [3, 19]. We can see that they lack considerations of differences in the quantity of human capital.

Based on that, this paper defines the professional human capital which is indicated by the percentage of population with higher education and general human capital which is indicated by the percentage of population with non-higher education, and then we select panel data from 1998 to 2015 to analyze the relationship between the internal structure of human capital and economic growth.

3 Model Specification

3.1 Construction of the Economic Model

On the basis of existing literature, there is a correlation between the internal sturcture of human capital and economic growth. And we establish the benchmark model as follows:

$$Lnpergdp_{it}=\alpha+\beta_1 s_{it}+\lambda X_{it}+\mu_i+\nu_{it} \quad (1)$$

where the subscrip i and t distiguish the area and time, per capita real GDP can be represented as $pergdp_{it,}$ which is a measure of economic growth. s_{it} represents the internal structure of human capital, which means the proportion of professional human capital and general human capital. And X_{it} is a vector of variables indicating for the impact of other factors which affect economic growth including: k_{it} represents the actual stock of physical capital, L_{it} represents the total workforce, pub_{it} represents the proportion of public service expenditure, $trad_{it}$ represents trade openness, ind_{it} represents the industrial structure, which measures the high-grade of industrial structure, mar_{it} epresents the owership structure, old_{it} represents the proportion of the elderly dependent ratio, c_{it} represents consumption rate, tfp_{it} represents rate of total factor productivity.

Then, this paper further uses the quantile regression for panel data to analyze the impact of internal structure of human capital on economic growth in different quantile, so as to comprehensively reflect the conditional distribution of the internal structure of human capital and economic growth and exclude extreme values. Thus the econometric model is specified as following:

$$Lnpergdp_{it}=\alpha+\beta_1(q)s_{it}+\lambda(q)X_{it}+\mu_i+\nu_{it} \quad (2)$$

where q distiguishes different quantiles which equal to 0.25, 0.5, 0.75, 0.95.

3.2 Data and Variables

In this paper, we use the data of sample period (1998-2015) as the empirical basis covering 30 provinces except Hong Kong, Macao, Taiwan and Tibet. Then, The explained variable is expressed by the actual per capita output (*pergdp*). The core explanatory variable refers to human capital internal structure (*s*), which is computed by the professional human capital level divided by general human capital level, where the level of professional human capital and the level of general human capital are defined as the proportion of higher education population and the proportion of non-higher education population.

In addition, the study uses all control variables including: the actual stock of physical capital (*k*) refers to calculated by using the research methods[8]; Total workforce (*L*) refers to the number of employment in all provinces; Proportion of public service expenditure (*pub*) refers to the proportion of public service expenditure to finance expenditure; Trade openness (*trad*) refers to the proportion of total value of imports and exports to GDP; Industrial structure (*ind*) refers to represented with the

proportion of tertiary industry to secondary industry; Structure of ownership (*mar*) refers to the proportion of non-state-owned assets in fixed assets investment; Proportion of the elderly dependent ratio (*old*) refers to the proportion of the old people aged 65 years and more than 65 years in the labor force; Consumption rate (*c*) refers to the proportion of consumption expenditure to total expenditure; Rate of total factor productivity (*tfp*) is calcuated by the index of Malmquist, solved with DEAP2.1, where the output indicator is represented by the per capita output, investment indicators are represented by the actual stock of physical capital and total workforce.

The study is drawn from data on China Statistical Yearbook (1998-2015), Date of Gross Domestic Product of China (1952-2004) and Statistical Yearbook for regions. some population data are obtained from China Population Yearbook (1998-2015). Besides, we give descriptive statistics on the correlated variables from 1998 to 2015 (see Table 1).

Table 1. Descriptive statistics of variables.

Variable	Province	N	Mean	St.d	Min	Max
pergdp	30	540	8133.03	8453.36	220.92	52342.03
s	30	540	0.10	0.09	0.01	0.73
k	30	540	182.36	197.99	3.67	1176.75
L	30	540	24.49	16.42	2.54	66.36
pub	30	540	11.05	3.85	3.48	30.89
trad	30	540	11.05	3.85	3.48	30.89
ind	30	540	0.96	0.44	0.50	4.04
mar	30	540	0.62	0.14	0.16	1.00
old	30	540	12.00	2.52	6.13	21.88
c	30	540	52.59	8.86	36.07	89.4
tfp	30	540	1.01	0.22	0.47	1.90

4 Empirical Results

4.1 Results of the Benchmark Model

We firstly analyze the relationship between the internal structure of human capital and economic growth with the data of 30 provinces (1998-2015) in China, using the fixed effect model, random effect model, ordinary least square (OLS) model and system generalized method of moments(GMM) model to do empirical test (see Table 2). The results of fixed effects, random effect and the ordinary least square are reported in Table 2 (columns 1-3), the result shows that the coefficient of *s* is significantly positive at the 1 level, indicating that the internal structure of human capital has a

significantly effect on the economic growth. And the results of the system GMM estimation are reported in Table 2 (column 4), it shows that the original model can be set for the system GMM estimation because it is accord with the original hypothesis of the autocorrelation test and Sargan test. And the coefficient of *s* is also positive at 1 level from the estimation result, which is consistent with the results of the above model.

In terms of control variables, the coefficients of *k*, *L*, *mar*, *trad* is significantly positive, indicating that the physical capital stock, total workforce, ownership structure and trade openness have positive effect on economic growth. The coefficient of *c* and *ind* are negative and statistically significant, and the coefficient of *tfp* is not significant. However, the coefficient of *old* is positive and significant in the fixed effects, random effect and ordinary least square model except in the system GMM model. The coefficient of *pub* is significantly negative in the fixed effects, random effect and ordinary least square model, but contrary to the system GMM model. Because the one-period lag variable of economic growth as a tool variable which improves the accuracy of model in the dynamic panel regression . It may be due to the poor willingness of the residents. So the lack of consumer demand leads to a negative effect on economic growth. And the negative relationship between the industrial structure and economic growth may be caused by the fact that the secondary industry still plays important role on the economic growth.

Table 2. Regression results of China's internal structure of human capital and economic growth.

Estima-tion	(1) Fixed effects	(2) Random effects	(3) OLS	(4) System GMM (twostep)
L.pergdp				0.968*** (0.005)
s	3.254*** (0.253)	3.267*** (0.251)	3.328*** (0.373)	0.082*** (0.013)
k	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.000*** (0.000)
L	0.025*** (0.006)	0.030*** (0.003)	0.030*** (0.002)	0.002*** (0.000)
pub	-0.011*** (0.003)	-0.012*** (0.003)	-0.014*** (0.005)	0.001*** (0.000)
ind	-0.157*** (0.062)	-0.176*** (0.059)	-0.400*** (0.065)	-0.068*** (0.005)
mar	1.734*** (0.133)	1.691*** (0.130)	0.940*** (0.207)	0.167*** (0.014)

old	0.021***	0.024***	0.051***	-0.000
	(0.007)	(0.006)	(0.008)	(0.000)
c	-0.018***	-0.018***	-0.014***	-0.001***
	(0.002)	(0.002)	(0.003)	(0.000)
tfp	0.020	0.020	0.034	-0.005
	(0.036)	(0.036)	(0.077)	(0.001)
trad	0.172***	0.180***	0.296***	0.011***
	(0.076)	(0.070)	(0.057)	(0.005)
_cons	7.268***	7.138***	7.235***	0.335***
	(0.206)	(0.186)	(0.239)	(0.039)
AR(1)				-0.283
				（0.777）
AR(2)				-0.187
				（0.852）
sargan				28.704
				（0.926）
N	510	510	510	480
R^2	0.912	0.912	0.866	
Haus-man	5.3 (0.87)			
Wald		4993.13		3.89e+06
F	488.97		323.58	

Notes: Data is calculated by Stata15.0.

***, **, * significant respectively at 1 percent, 5 percent, 10 percent level.

4.2 Results of the Extended Model

Considering that the quantile regression is the method of weighted average of the absolute value of residual, which has less effect on the extreme value. Furthermore, compared to mean reversion, it can more clearly observe the effect of the internal structure of human capital on economic growth. This paper further uses the panel quantile regression to estimate the impact of the internal structure of human capital on economic growth by using panel data from 1998 to 2015 in China, and verifies whether internal structure of human capital has different impact on economic growth in different quantile. We analyze the relationship between the internal structure of human capital and economic growth in provinces by selecting representative quantiles which are 0.25, 0.5, 0.75 and 0.9. The quantile regression results are shown in Table 3.

Table 3. Quantile regression results of China's internal structure of human capital and economic growth.

Explanatory variables	(1) QR_25	(2) QR_50	(3) QR_75	(4) QR_90
s	3.585*** (0.678)	2.615*** (0.557)	2.475*** (0.659)	1.096 (0.686)
k	0.001*** (0.000)	0.002*** (0.000)	0.002*** (0.000)	0.003*** (0.000)
L	0.029*** (0.003)	0.023*** (0.002)	0.017*** (0.002)	0.012*** (0.002)
pub	-0.010 (0.017)	-0.003 (0.008)	-0.008 (0.006)	-0.009* (0.005)
trad	0.228** (0.109)	0.317*** (0.079)	0.366*** (0.042)	0.325*** (0.045)
ind	-0.484*** (0.148)	-0.384*** (0.115)	-0.437*** (0.124)	-0.232* (0.128)
mar	0.846* (0.457)	1.264*** (0.186)	1.206*** (0.256)	0.949*** (0.235)
old	0.053*** (0.018)	0.028*** (0.009)	0.025*** (0.007)	0.013*** (0.006)
c	-0.010* (0.006)	-0.011*** (0.003)	-0.008* (0.004)	-0.006* (0.003)
tfp	0.050 (0.132)	0.057 (0.067)	0.010 (0.049)	-0.026 (0.049)
_cons	6.902*** (0.386)	7.233*** (0.180)	7.503*** (0.273)	7.869*** (0.234)
N	510	510	510	510
Pseudo R^2	0.634	0.672	0.691	0.706
Wald	9.53			

Notes: Data is calculated by Stata15.0. Weed out missing values. The standard error of bootstrap is enclosed in brackets.

***, **, * significant respectively at 1 percent, 5 percent, 10 percent level.

As shown in Table 3, the estimated results are mostly in line with the results of Table 2. Specifically, the contribution coefficient of the internal structure of human capital to economic growth is significantly positive in the 1 percent significance level except for 90 percent of the quantile. It shows that the internal structure of human capital has significantly positive effect on economic growth, which is close to the reality. Because the general human capital which is mainly made up of simple labor would gradually transform to the professional human capital with social development, then the internal structure of human capital would develop a uptrend along with economic development. In addition, the material capital and total workforce are significantly

positive at each quantile. The regression coefficient of the proportion of public service expenditure passes a 10 percent significance level and positive in 90 percent of the quantile, but has insignificant at 10 percent, 25 percent and 50 percent of the quantile. It demonstrates that the promotion of public service expenditure on economic growth is not significant, and it has not fully play its role in present period. The impact of trade openness on economic growth is markedly positive at each quantile. Industrial structure has the significantly negative effect on economic growth at 1 percent level which are in 25 percent, 50 percent and 75 percent of the quantile, while the coefficient of industrial structure only passes the 10 percent of the significant test in 90 percent of the quantile. Structure of ownership is positively correlated to economic growth, which passes a 1 percent significance test in 25 percent of the quantile, and the rest of them pass the significant test in the 1 percent significance level. It implies that the structure of increase the economic growth by the development of private enterprises. Proportion of the elderly dependent ratio has positively correlated relationship between economic growth at 25 percent, 50 percent, 75 percent and 90 percent of the quantile, because of the insufficient demand of household consumption. In this situation, the rise of proportion of the elderly population will actually increase in the consumption demand of the elderly,and it would drive to unleash new growth and stimulate the economy. While the rate of consumption is negatively related to economic growth with 1 percent significant level at 50 percent of the quantile, and the coefficient of cosumption rate passes the 10 percent significance level in 25 percent, 75 percent and 90 percent of the quantile, it also has a negative impact on economic growth. Rate of total factor productivity has a positive but not significant impact on economic growth at each quantile, showing that technical progress of production doesn't play the role of promoting the economic growth, the explanation of economic growth by the rate of total factor productivity is not obvious. So the improvement of rate of total factor productivity requires the progress of technology or the reallocation of resources.

In order to further compare the change of the internal structure of human capital on economic growth, this paper compares the regression coefficient and its confidence interval in different quantile with the coefficient of OLS estimation as a reference (see Fig.1).

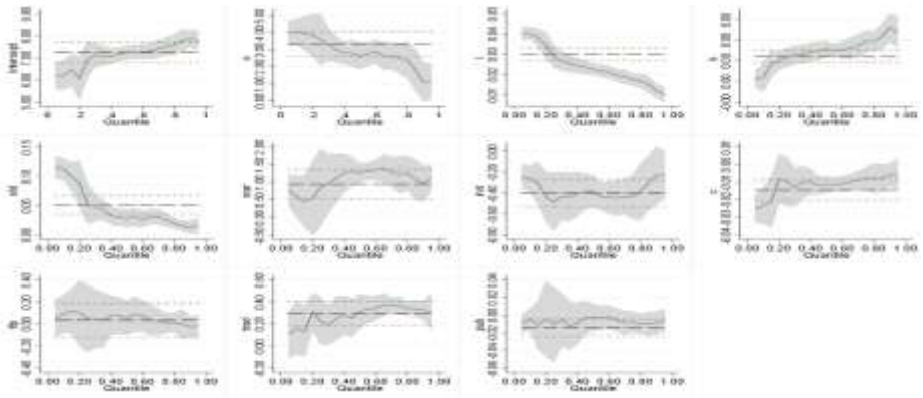

Fig. 1. The trend of regression coefficient in quantile regression.

According to the trend of regression coefficient in quantile regression model in Fig.1, the study shows that the regression coefficient of the internal structure of human capital generally has been declining with the increase of quantile, although it rises slightly after reaching 50 percent of the quantile. There is a clear demonstration, when the economy is at a low economic level, the more proportion of professional human capital, the promoting function of its economic growth is bigger. While the economy is at a high economic level, the promotion of professional human capital is gradually reduced with the rapid growth of economy. In addition, Fig.1 also illustrates that, for 95 percent confidence interval, the width of an interval for regression coefficient of internal structure of human capital from 10 percent of the quantile to 50 percent of the quantile is more narrow than the width after 50 percent of the quantile in the conditional distribution, which indicates the estimation of quantile regression coefficient in the intermediate value is stable, but it is more unstable near the endpoint of 90 percent of the quantile. In the control variables, the regression coefficients of the actual capital stock gradually increases from 10 percent to 90 percent of the quantile, and the positive effect of the actual capital stock on economic growth has been increasingly apparent with the economic development; The proportion of public service expenditure first ascends and then descends in cycle with the adding of the quantile, but the overall change extent is not apparent; The coefficient of owership structure and trade openness present like a "reverse U" which increase firstly after declining with the increase of the quantile. While the regression coefficient of industrial structure has an opposite trend. Proportion of the elderly dependent ratio and the total labor force are gradually decreasing, and its explanation to the economic growth is gradually weakened, but proportion of the elderly dependent ratio rises slightly after 90 percent of the quantile. The regression coefficient of consumption rate would increase with the quantile, while its absolute value presents downward trend. The regression coefficient of total factor growth rate periodically increases at the beginning, and decreases finally under the 95 percent confidence interval.

5 Discussion

In order to find a new approach to growth in China's transitional period, this paper has used the quantile regression as experiment to examine whether the internal structure of human capital encourages economic growth. Compared with the existing research literature, this paper extends the existing research mainly from the following two aspects: Firstly, the existing literature often considers the internal structure of human capital from the perspective of the year of education or education earning rate or structure of labor demand. However, the quantity of human capital at different level is also one of the important factors which affect economic growth. Therefore, this paper considers that the human capital could be composed of professional human capital level and general human capital by the difference of the proportion of educated population. Secondly, most of the existing literatures are based on the traditional mean method to study the influence of human capital on economic growth. In this paper, we use panel quantile regression method to describe the relationship between internal structure of human capital and economic growth in different quantiles. The results indicate that the positive influence of human capital structure on economic growth gradually decreases with the increase of per capita output. Due to the limits of time and condition, this paper has many deficiencies, such as we there are no discussion about the effect of internal structure of human capital on economic growth in different regions and the robust test in the study, so we could do further study on this issue in the future.

6 Conclusion

Based on the panel data of China's 30 provinces (except Hong Kong, Macao, Taiwan and Tibet) from 1998 to 2015, this paper gives an empirical research on the relationship between the internal structure of human capital and China's economic growth. The empirical results show that the improvement of the professional human capital level in the internal structure of human capital has significantly positive effect on economic growth, and its promotion would be gradually weakened with increasing the per capita output. Therefore, this paper puts forward the following suggestions: On the one hand, Chinese government should pay more attention to cultivating high-quality professional talent for enterprises and encourage small and medium enterprises to introduce professionals and motivate the employee's creativity on the base of meeting the development needs of all industries. It is helpful to embark on innovative activities and break through the bottleneck of further development of enterprises. On the other hand, Chinese government should speed up the transition of general human capital to professional human capital, in particular, providing more opportunities of further study for lower-middle class workers who engage in physical work, and encourage them to learn new science and technology, hence increasing the proportion of professional talents.

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Academic Patenting: How Universities Use Intellectual Property to Boost Research and Technology Transfer

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Abstract. Universities and other public research organizations are increasingly protecting their inventions. The rise in university patenting has occurred against a broader policy framework aimed at fostering a greater interaction between public research and industry in order to increase the social and private returns from public support to R&D. Making universities and other public research organizations more active in protecting and exploiting their IP means not only actively promoting faculty and student research, but also determining how best to pursue any relationship with business clients while protecting the public interest. The key question, however, is: which is the best channel for transferring the technology to the marketplace regarding to public interest? The current way research and innovation is handled by many Universities is not particularly likely to lead to success because. Privat sector become involved too late in the process and Universities do not get the market input that is essential prior to decided what basic research to translate into innovations. The key question, however, is: which is the best channel for transferring the technology to the marketplace regarding to public interest? It has been used a method of literature review of available sources exploring research studies and current website sources, where the experts' statements in this area are described, and a method of comparison and evaluation of their findings.

Keywords: University, Intellectual Property, Technology Transfer.

1 Introduction

Universities and other public research organizations are increasingly protecting their inventions. The rise in university patenting has occurred against a broader policy framework aimed at fostering a greater interaction between public research and industry in order to increase the social and private returns from public support to R&D. The aim of this paper is description of possibilities how universities can use their intellectual property to boost research and technology transfer to private sector. The most of universities's inventions will never emerge from "the Valley of Death." So why universities wants to holds on to its technology unless there are up-front payments that skews the cycle, puts burdens on start-ups when they need help and doesn't fuel the job growth and economic development potential? The current way research and innovation is handled by many Universities is not particularly likely to

lead to success because, companies become involved too late in the process and Universities do not get the market input that is essential prior to decided what basic research to translate into innovations [9].

Think of the Value Hierarchy as a pyramid with five levels. Each level represents a different expectation the company has about the contribution that its IP/IA function should be making to the corporate goals. Each higher level on the pyramid represents the increasing demands placed upon the IP function by the executive team and the board of directors. Like building blocks, each higher level relies on the foundation of the lower levels. Mastery of the practices, characteristics, and activities of the prior levels builds the foundation for greater increases in shareholder value at the next level [2].

In case of university can be speak about sixth level of pyramid. This level represents open access to university patents. The global movement for open access to publicly-funded research stems from the sensible proposition that if the government has used taxpayers' money to fund research, the publication of the results of that research should be freely-licensed [4]. Hundreds of universities around the world have adopted open access policies asking faculty to publish their research in open access journals or archive them in open repositories [3]. As the open access movement continues to grow and mature, it can be hoped to see open access allies on campus begin to take on their institutions' patenting policies. University patenting and licensing policies directly affect how researchers' outputs will be used in the field. The same arguments that have given way to the explosion of open access publishing also apply to patents—just as researchers shouldn't trust their work with publishers that don't have the public's interest at heart, their institutions shouldn't sell patents to trolls out for nothing but a quick buck or get „another money" from government. Instead, they should partner with companies that will bring their inventions to the public [3].

Fig. 1. The patent value hierarchy [2]

2 Methods

The authors used a method of literature review of available sources exploring research studies and current website sources, where the experts' statements in this area are

described, and a method of comparison and evaluation of their findings. In addition, the results of previous research are used to deduce the new technology transfer approach to make the most effective use of results in the private sector.

3 Analysis of Academic Patenting

3.1 Role of universities and university patenting

The general strengthening of intellectual property protection world-wide as well as the passage of legislation aimed at improving technology transfer are additional factors that have facilitated the expansion of patenting in academia. Encouraging universities to commercialize research results by granting them title to IP can be useful but it is not sufficient to get researchers to become inventors. The key is that institutions and individual researchers have incentives to disclose, protect and exploit their inventions. Given the diversity of research institutions and traditions, it is important that incentives are set at the institution level, but national guidelines can help bring about coherence and the sharing of good practices. As important as incentives is the need for research institutions to clarify IP rules and disseminate them among faculty, staff as well as graduate students- who are increasingly involved in public research activities. To bridge the gap between invention and commercialization, universities have established "technology transfer offices" (TTOs) that carry out a wide range of functions, from licensing patents to companies to managing research contracts. The majority appear to be dedicated on-site institutions and integrated into the university or research institution. Many of the TTOs are in their infancy; most are less than 10 years old and have less than five full-time staff. Still, the number of new TTOs is growing, to the order of 1 per year per institution. Income from licensing academic inventions remains quite small in comparison to overall research budgets. Academic patenting is thus more about boosting research and transferring technology to industry than about making a profit. A main barrier to the development of TTOs is access to experienced technology transfer professionals. Not only are the skills sets of such professionals in short supply but sometimes government employment rules and pay-scales prevent public institutions from being able to provide competitive salaries to such professionals. Governments are nevertheless trying to help universities build IP management capacity. One of the questions facing technology transfer managers and inventors is whether to license a technology or to create a start-up firm to commercialize it. Governments and university managers, especially in some European countries, have tended to favour start-ups as opposed to licensing strategies. Part of this stems from the rise in government funded venture funds that aim to promote new firm creation. The key question, however, is: which is the best channel for transferring the technology to the marketplace? The answer in fact depends on the technology in question, the market for such a technology, the skills set of the staff and researchers involved the invention, access to venture capital, and finally the mission of the institution. Certain “platform” technologies with a wide range of applications may be commercialized via

a start-up company for example while others may be licensed to larger firms with the business capacity to develop the invention further and integrate it into its R&D and business strategy. As academic inventions arise in areas closer to basic research, scientists and policy makers are also concerned that patenting certain inventions could block downstream research. One example is that of research tools, in which granting a patent could inhibit diffusion by increasing the costs and difficulty of use such tools in applied research. In response, the National Institutes of Health in the United States (NIH) have espoused a policy that discourages unnecessary patenting and encourages non-exclusive licensing (see link). Such guidelines are now being emulated by funding agencies and research institutions in other countries [1].

3.2 Technology Transfer Approach

Technology transfer is about relationships and collaboration among individuals and groups (industry, government, and academia) with varied interests [7]. Classical technology transfer approach: Research - invention developed - legal protection - identify partners negotiate - license. This model of university patenting has many disadvantageous: time consuming and at the expense of societal impact, limited possibilities getting idea to product and identify potential partners. Many great scientific breakthroughs cannot be commercialized through patenting. Some inventions are never licensed out due to unable to identify potential partners or invention is result of basic research and hasn't any commercial potential. Sometimes failed negations because potential partner finds inventions too high risk or terms have not been successful negotiated [5].

3.3 Valleys of Death of Technology Transferring

In technology transfer, the "valley of death" is the metaphor often used to describe the gap between academic-based innovations and their commercial application in the marketplace. Although traditional definitions of technology transfer often assume a smooth shift of intellectual property from university (or private) research laboratories to private or publicly held companies that commercially develop the technology, the valley of death suggests that the practice is anything but smooth. In fact, this rather grim metaphor implies that academic research is in some way cut off from the outside world [6].

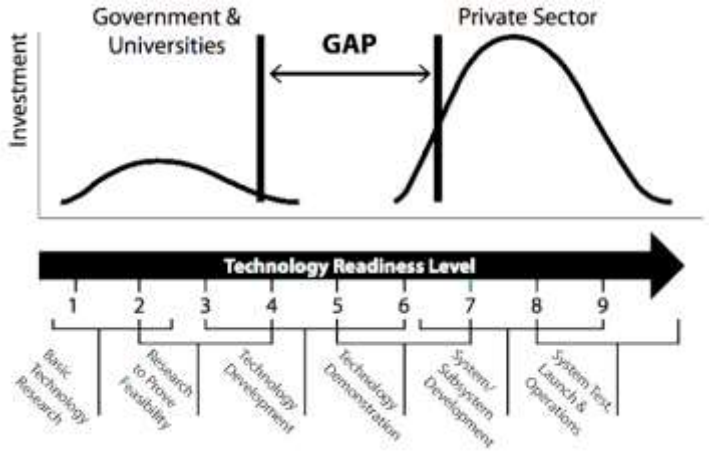

Fig. 2. The gap in manufacturing and innovation. [8]

4 New Technology Transfer Models

Many Universities do not properly invest in technology transfer and instead see technology transfer as a vehicle to return funds quickly, rather than viewing the licensing out of University innovations as a long term endeavor [8]. Universities find it very difficult to be successful in technology transfer because I believe they have adopted business models that have not been sustainable. It is very costly for an institute to go and file for patents and yet there are not very clear feedback loops that bring back to institutions to sustain these operations. So Universities quickly find it extremely expensive to sustain their own tech transfer offices, and they are under extreme pressure to produce funding early as opposed to making investments toward those activities and seeing those investments as long term [8].

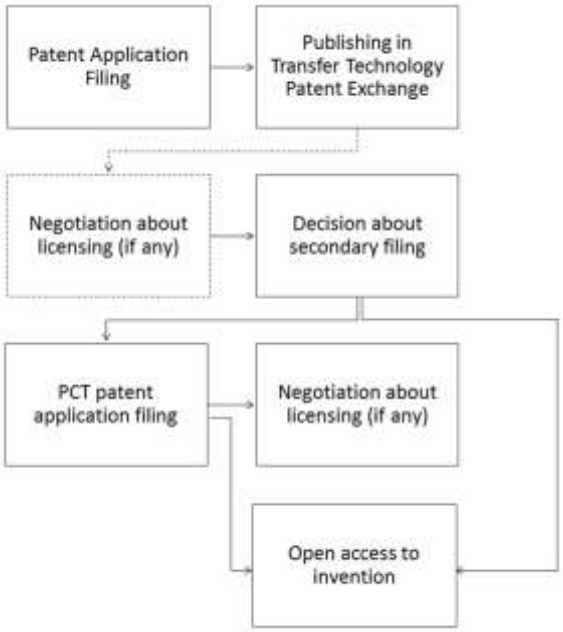

Fig. 3. New technology transfer approach.

New approach of university patenting in some country should be require to stimulate translational research with industry (Fig 3).

5 Conclusion

The way how to increase the commercial potential and overcame gap between research and production is publishing of invention as soon as is possible. The way to do is use own database designed to be modular so that transfer offices tailor their intellectual asset management solution to the unique needs of technologic transfer organization. It can be called as Transfer Technology Patent Exchange (TTPE) where transfer office is trying to find a partner for commercialization of invention. TTPE can be defined as informal database where the university can share as much information about invention as is possible before publishing in official databases. It can help transfer offices to identifying potential licensees during priority period. It can be very helpful for planning, budgeting and decision making about secondary filling during first year of patent application´s life. If some potential customer/partner will appear during priority period, on the base of negations, the patent rights can be sold or licensed. If any potential partner will not appear, the university should decide about PCT patent application filing or invention should be offer on the base of open access principles to all stakeholders, because keep patent protection only in one country has

absolutely no reason and it is only limitation for domestic entities, because inventions are on other territories freedom to operate.

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Social Software to the Benefit of the Elderly – Planning an Experiment

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Abstract. After an investigation on consumer thinking and behaviour with specific focus on adopting advanced technology by the elderly, we are proposing an experiment to evaluate the findings achieved so far. The plan involves designing and implementation of a new prototype social software with certain unique functions. Statistical research conducted with the help of the proposed software will involve collection of both soft data, such as experiences and opinions of application users collected in their natural settings within the software, and hard data consisting of statistics about usage of the software, such as interactions with other users. The data will be matched and compared in order to evaluate three hypotheses about the process of a technology evaluation. The paper is presenting a research-in-progress. Among the goals of the paper is to raise awareness of the specifics of developing a software with inexperienced elderly users on mind, and also to get a feedback regarding the outlined application and the intended experiments.

Keywords. Software Design, Social Networks, Social Software, Cognitive Science, Consumer Behaviour

1 Introduction

We were able to examine consumer thinking, behaviour and the forces behind, with specific focus on adopting advanced technology by the elderly [12] and to propose various models aimed to describe the reasoning behind, such as the model of acceptance [13] and model of appropriation [14]. One of our current goals is to evaluate our findings with a practical experiment using social software. First we evaluated existing social software, such as Facebook, Instagram and other rather niche systems. Because no existing social software meets the requirements on functions, user interface and usability in general, resulting from our research, several options were considered – such as to develop just a personalization façade or integrate more social software systems. But finally, we decided to transform our findings into a new prototype.

2 Technology to Improve Quality of Life of the Elderly

Smart technology, including social software, may help the elderly to overcome disabilities and enrich their social relations. We may name few examples. Some belong in the category of ambient appliances, either visual-based, such as a screen at the kitchen wall, or audio-based, from highly discrete, up to an open audio zone [4]. Such systems may significantly raise a feeling of closeness. Well-designed systems may trigger a great enthusiasm, such as when users of bulletin board prototype revealed personal items shared by their valued family members. [10]

But the same disabilities, which create an opportunity for smart technology aiming the elderly, make the task difficult. We have to consider impairments, such as *visual losses* (reduced visual acuity, loss in colour perception, increased sensitivity to glare), *cognitive losses* (declining performance of working memory and learning) or *motor skill impairments* (slower movements, poorer coordination, difficulties with fine motor actions). Related usability questions have been examined by other researchers. E.g. Becker [2] targeted usability of web by older adults, Lopes [5] examined suitability of interfaces for severely handicapped. Newell et al. [6] described different viewpoints and misunderstanding between prospective users, experts from web industry, and researchers during design of portal for older users. Based on the research, we may identify key usability-related properties:

Selected functionality: While gradual 'upgrading' is a trend, 'downgrading' may be more appropriate for users with impairments [10]. Not only the elderly appreciate simplicity, but it is generally preferred by most users, as shown e.g. in experiment with photo sharing system [3]. Overwhelming of any kind should be avoided. E.g. [4] showed, that people like to see short videos of their close, not the whole party. Users also welcome if they may act immediately, without waiting and remembering.

Coherence: Interaction patterns should follow uniform scheme through the whole system [9]. Further, the interface should be coherent with established living patterns. To support the feeling of coherence, designers may use known metaphors. E.g. Yousef [11] introduced model for evaluation of metaphors from the perspective of their cognitive and memory load and for their comparison.

Reliability: In the case of technology failure, especially inexperienced users doubt their own skills, which raise negative feelings, such as their anxiety [10]. System should be reliable to be acceptable.

3 Deep Needs of the Elderly

In order to be in harmony with our previous research, the software has to harmonize with the deep values cherished by the group of the elderly, namely social touch, autonomy with anticipated support, feeling of being competent, feeling of helpfulness and self-worth.

Social touch: Help the elderly to keep their social connections alive and healthy, with emphasis on several connections with strong positive emotional content rather than to a wide array of shallow "friends". The application should help to keep its

users aware of daily life of their close friends and family, provide them with feelings of closeness, ambient intimacy and affective awareness. The goal is to focus on relationships which already exist first, rather than building any new. The application should help to surrogate or re-establish natural social structures disrupted by distance, current pace of life, or by dehumanizing technology.

Autonomy with anticipated support: The application should help users to keep their autonomy, but enable close friends and the family to provide valuable and meaningful support e.g. with remembering daily routines, scheduled events, etc. The feeling of closeness should likely lead to a higher level of positively perceived emotional and anticipated support, not making the user feel unnecessary dependent. The application might be able to help its user to free his family and close friends from worries, e.g. if the user follows routines prescribed by a physician. The application should make its users feel, that it is under their control.

Feeling of being competent: The application should also help its users, to be competent within a local community and friends, including those of the same generation. Users should not be forced to pretend higher competences than they actually possess, but they should be able to exploit the abilities they have. The user interface should not be based on confusing metaphors, should not be excessively changing its layout, functions should be precisely defined, control elements should be connected with the functions in an understandable, stable and intuitive way. Feeling of competence could be further supported by higher adaptability and intelligent customization, but still keeping it as simple and usable, as possible.

Feeling of helpfulness and self-worth: The application should make its users feel helpful and important for their close, not necessary bringing new ways they support their close, but leveraging the actual ways e.g. via better communication. Users should also feel, that, they can influence others e.g. by sharing their opinions and comments, memories, experiences or even expertise.

The following sections briefly describe the architecture, main functions, and user interface of the indented system.

4 Architecture of the Prototype System

The system will be of three-tier architecture with a thick *back end*, providing most logic, and data stored in a database. The server part of the system will be developed mainly in Python language, which is suitable for rapid application development and easy prototyping. Server part of the application will be provided with a web interface for the purpose of management and configuration. Mainly for presentation and persistence, Python-based web2py application framework will be used.

As we consider the elderly our primary users, the *main client* part of the system should be adjusted to their needs. Various studies such as [1, 5, 8] suggest that for the elderly who are lacking previous experience with electronic devices, it is easier to operate a tactile device, such as a tablet, rather than a computer. Because the display has to be big enough to serve well people with either visual or touch impairments, we decided to create the main client as an application for Android-based tablets. The

native Android application has been chosen instead of a web application, because it allows better integration with the functions of the device, such as seamless support for touch-screen, offline mode, etc. To make it even more tightly integrated with the operating system and to provide even more coherent user experience, the application might be transformed into an android launcher application some day in the future.

A different *associated client* application, also created for the Android platform, will be aimed on members of the social circle of the primary user, such as his family members or friends. Different set of requirements applies there.

5 Main Functions of the Prototype System

A central concept of the suggested system is a *content feed.* The content feed allows the main client application to display a media element, either a picture, a short video, audio, a text or a combination (such as an article with a text and a picture) in a consistent way, one at a time. The user is given means to display the next provided content item and to move backward in the history. In this simplest setting, a new user is not required to learn any other functions besides moving forward and backward in the content provided by the feed. Usually, the first content pushed by the system to a feed of a new user, provides instructions how to use the basic functions of the application.

The set of functions available to the user (and the relevant user interface) is *adaptive*. New functions are gradually being enabled/added to the set of functions available to the user, as he gains more experience. In order to decide when to offer a new function to the user, the relevant algorithm will carefully assess the previous learning curve of the user. The goal is to avoid cognitive overload on the side of the user, but to provide an exciting experience with explorative feeling. Always when the system decides to offer a new function, the user has an option to either accept or reject the offer. If he grants the system to enable a new function, instructions on how to use the new functions will be provided in the content feed.

Feedback function is one of the first functions offered to the user. It allows him to rate the content displayed, in terms such as like/dislike. The feedback helps the algorithm on the backend side to adjust the contents of user's feed.

Regarding the sources of content, the backend side may combine various public online *content providers*, such as online encyclopaedia, news feeds, etc. with content created by users in his *social circle*, such as family members and close friends. The content from the circle members may originate either in the associated application. It happens either as a result of an action of its user, such as if a family member of a senior sends a picture or a text message. The associated application may trigger creation of a such content on its own, e.g. based on location of the device.

The backend part of the system may further process the received data. E.g. if it gets and information, that a member of a circle of one of the registered users changed its location, the algorithm may pull a relevant map and a weather data from the location and create a content item, which is pushed into the relevant content feed. So, the elderly user of the main client application gets an exciting content about his family

members or friends, providing a feeling of connectedness, even if they did not initiate it. Further, the back end may be connected to other popular social network systems through specific connectors, so whenever a circle member posts on a Facebook, Twitter or Instagram, the elderly user of the main client application gets the content as well.

Though the content feed combines data from various sources, they are all transformed in a form, which allows to have them displayed in a coherent way in the main client application.

As the user of the main client gains more experience, more functions may become suitable for him, such as creating his *own content* (a picture taken using a camera, composed message, recorded audio). The content may be processed on the back end in various ways, such as to be displayed in the associated client, sent as an e-mail, or published as a Facebook post.

Items a user likes may be listed in his *personal library*, in order to make them easily accessible. Further, user may be given means to *comment* a content to provide a feedback beyond simply liking/disliking. Any feedback of a user may be used both as an input for the algorithm responsible for the contents of user's feed, and shared with his social circle in various ways. So, by these means, advanced users are able to *interact* with others. More functions might be considered, such as a calendar and/or reminder. But any such an extra function should be offered at a time, when it is very much sure, that the user managed all the core function perfectly. For this, the application has to *collect* information about user's interaction with the application and search for patterns of behaviour which might indicate confusion.

Though a fully-fledged social software should have a well-thought-of and precisely crafted *security and trust model*, the suggested prototype system won't need it, because it won't be dealing with big numbers of users and it won't be open for registrations beyond the testing circle of persons. However, our plan is to accommodate functions and interface of the system to the principles of a community of trust described in some of our earlier papers [15]. While in other models, a functionality regarding trust primarily assists to distinguish who deserves user's trust and who does not, in the community of trust all users trust each other as default, so the model fulfils rather different purposes – promotes good activity, discourages from inappropriate behaviour and helps to keep the community clean. There is no need to "rate" fellow users for common interactions. Trust matters should be unobtrusive, doing their work beneath the surface and just giving users means to act, if something goes wrong. In the prototype application security, will be accomplished by following common principles of safe software and allowing only users whose trustworthiness has been granted out of the scope of the system, to get in.

6 User Interface of the Prototype System

As mentioned earlier, the main client application is meant for a touchscreen device with reasonably sized display, such as tablet. The layout should respect the following principles.

Static: Logical parts of the layout, such as the content, buttons, notifications, should keep their position as much as possible. Contextual changes of the UI layout should be limited as much as possible. Hidden parts which appear as a result of user's action, such as context menus, menus sliding from sides of the screen, etc. should be avoided. In the case a software keyboard is needed, its (dis)appearance should be well-thought-of to avoid confusion. Layout should not have to accommodate to different types of content, rather any kind of content should accommodate to the layout.

Coherent: The layout should be clear. Buttons and any other active parts of the layout should be easily recognizable by the consistent style, colour, label, etc. Coherent means also memorable. E.g. use colours to help users to remember ("red stands for voice recording, blue for writing").

Accessible: Should work well for people with various impairments. E.g. touch gestures should be rather avoided, because even a simple slide may confuse beginners and cause troubles to users with tremor or touch impairments. Accessible means also legible, to respect people with visual sensory impairment. The requirement may help to determine minimal font size, distances, etc. The accessibility parameters of the user interface may be even adjusted by the system, based on the feedback from the user.

Expansive: Often it has been recommended to make user interfaces concise. Rather than concise, the interface should be well-explained and "foolproof". Pictograms (icons) should be easy-to-understand even for total beginners, and used with caution. Textual explanation of functions, buttons, etc. should be always provided, at least for beginners. Graphical wizard might be a good concept for the purpose. Wizard guides user step-by-step to perform his action, typically in series of questions. E.g. in order to share or send a media to others, user might be required to click "interested" button first, since only an item a user is interested is likely to be intended for sending. Then a dialogue appears asking questions such as "Would you like to share the item to someone?", "Would you like to share it with your family?", "Would you like to share it to others?", etc. Similarly, to create content, rather than providing several buttons for various content types, user will click "create an item", than the system will ask the user series of questions about the content type and purpose.

Familiar: Familiar does not mean the same as for a user interface aimed on regular users of electronic devices. Concepts such as menus, sliders, windows, etc. are *not* familiar for the target user group. Different familiar concepts, such as a telephone, printed news, picture frame, display board, could be considered and examined.

Responsive: It means couple of things. First, the interface should work fast. This is one of the reasons why the application is designed rather as a think client and main logic should be executed on the server side, so the performance of the client device won't affect the behaviour of the application in a great degree. The application may add to the responsiveness e.g. by utilizing a cache and a buffer for the content loaded from user's feed. The interface should also provide sufficient feedback to the user to inform him what is going on. The interface should also accommodate neatly and seamlessly to different resolutions of target devices and to their portrait/landscape orientation.

Forgiving: There should always be an easy way back, to undo an unwanted action or to return to a default state.

7 Intended experiments

Though a substantive amount of work has been done to identify the needs of the elderly, to formalize them and put them in the context of current available technology, such as social software, or products of ambient intelligence, we based our conclusions mainly on third-party data so far. No research specifically aiming the validation of the models of consumer behaviour has been performed. Further, our goal is to validate the theory on a prototype of a real product. In order to fill-up the missing gaps in our knowledge, we designed to perform an experiment, which will help us to asses, whether models of acceptance and appropriation harmonize with decisions of users and whether a prototype application, built according to the deep design principles, is significantly beneficial for the relevant target group.

The prototype application will be tested with groups consisting of about 5 participants. We are planning to involve both participants without any previous experience with smart electronic devices, and those who have limited experience. The concept of deep design has been formulated as culturally, socially, and economically neutral. So, in order to reduce a potential cultural bias of our research, we decided to invite participants with a different background, namely from the USA, Philippines, and the Czech Republic. The main reason why we decided to involve these distinct regions, is their significant cultural, social, and economic difference. The size of the testing groups has been decided in harmony with respected recommendations for usability testing which suggest, that increasing the size of a testing group above 5 does not substantially improve the amount of information collected [7]. Larger trial may follow any time later.

The prototype application itself will ask participants questions relevant to the research goals. Users will rate e.g. how they feel about the application, how they assess their ability to operate it, etc. Similar data collection method has been developed at Penn State University, it is called *Dynamic Real-Time Ecological Ambulatory Methodologies (DREAM)* and its purpose is to assess ongoing behavior, experiences, physiology, and environmental factors in people's natural settings [16]. Such a natural data collection approach eliminates the bias caused by the arbitrary setting in which questionnaires are typically filled-up. The collected "soft data" will be used for further analysis and for comparison with "hard data" about the usage of the application (frequencies of interactions, response times, etc.).

Regarding the support, we are planning to make detailed record about each support case which will occur during the trial, because the support is one of external forces, which may affect results of appropriation as well as the perception of the application by the trial participants. The impact of the support will be observed and discussed in the conclusion of the trial. In order to achieve the outlined goals, three hypotheses have been formulated:

7.1 Testing the Model of Acceptance

We will test the following hypotheses:

Hypothesis H0: "Results of the *model of acceptance [13]* do not harmonize with decisions of users regarding the offer to participate on the application prototype trial".

Hypothesis H1: "There is no proof that results of the model of acceptance do not harmonize with decisions of users regarding the offer to participate on the application prototype trial".

Potential participant will be asked to assign weighs to the comfort sources recognized by the model (social touch, autonomy with anticipated support, feeling of being competent, feeling of helpfulness and self-worth). The purpose of the prototype application will be explained and briefly demonstrated to the potential participant and he will be asked to think whether to take part on the trial or not. His answer with any aired reasons will be recorded. If no reasons were provided, the participant will be asked to provide them. The participant will be asked to estimate, how the application might influence his comfort sources on a scale. Then he will be asked to estimate how much resources (time, effort, support) is he expecting to need to learn and use the application. He will be asked if he has anything more to say about the reasons for his decision regarding his participation on the trial. The fuzzy values provided in the questionnaire will be defuzzified on a scale and the model will be processed. The decision of the potential participant about the trial will be compared with the result of the model.

7.2 Testing the Model of Appropriation

We will test the following hypotheses:

Hypothesis H0: "The results of the model of appropriation [14] do not harmonize with decisions of users regarding their continuation in the application prototype trial".

Hypothesis H1: "There is no proof that the results of the model of appropriation do not harmonize with decisions of users regarding their continuation in the application prototype trial".

At the beginning of the trial the participants will be asked to rate model entry values, namely the initial enthusiasm and initial qualms. Regularly, preferably with a daily frequency, participants will be asked directly by the prototype system to rate their disappointment, bore, mastering, perceived utility, and level of appropriation (with brief and clear definitions of the terms displayed within the form). At the end of the trial, the values provided by participants will be defuzzified. The model will be executed with the values collected. Levels of calculated variables as well as key moments in the model execution, such as rejection or appropriation, will be identified. The results of the model will be compared with the level of "appropriation" users were expressing. The results of the model will be further compared with the frequencies and characteristics of participant's actions within the system – how many media elements the user shown each day, how many times he shared a content with others, how much content he created, etc. The goal is to check if there is any correlation between the activity and either perceived or calculated level of appropriation of the application.

7.3 Testing the Prototype Application

We will test the following hypotheses:

Hypothesis H0: "The prototype application is not significantly beneficial for the trial participants".

Hypothesis H1: "There is no proof that the prototype application is not significantly beneficial for the trial participants".

At the beginning of the trial the users will be asked to answer set of questions regarding the subjectively felt levels of comfort sources (social touch, autonomy with anticipated support, feeling of being competent, feeling of helpfulness and self-worth). The same or similar questions will be asked at the end of the trial. The questionnaire will be followed with a dialogue, where the participants will be asked further questions about how they feel about the prototype program, about the content they could consume or share during the trial, how they think the program influenced the levels of comfort sources, etc. Answers from the two questionnaires (entry-ending) will be compared. Answers, both quantitative and narrative from the follow-up dialogue will be analysed. The results of different participants will be compared and discussed. Any of the hypotheses and the suggested procedures may be further adjusted, based on pre-trial preparation.

8 Conclusion

The paper summarized certain findings on the acceptance of advanced technologies by the elderly, based on our previous research. As a main contribution, a social software respecting the findings has been outlined. The proposal covers architecture of the system and main functions and user interface of the client application aimed on the elderly users. The principles considered in the application design may provide a vital inspiration to researchers in various fields, such as software usability, consumer behaviour, gerontology, or social networks. Besides them, software developers may understand better, which aspects to consider in order to prepare products, which might touch the deep needs of the elderly, while avoiding some of the traps, in which such projects may easily get caught. Finally, an early experiment using the software is introduced. The goal of the experiment is to validate our models of technology evaluation and the prototype application itself.

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YouTube in Airlines Marketing

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Abstract. This research was motivated by growing significance of social media in the field of tourism marketing. Its aim was to find out and by using various metrics comparatively describe the way YouTube is used by airlines and compare YouTube channels of full service carriers (FSCs) and those of low-cost carriers (LCCs). Particular attention was paid to finding reasons why airlines YouTube channels are successful. It was decided to assess the top five FSCs and the top five LCCs according to the number of video views and the top eight airlines ranked by IATA based on the number of transported passengers. The comparison showed that FSCs build their YouTube channels more systematically, they offer a wider range of video topics and often sort out topics of their videos in a more detailed way. Significant metrics of YouTube channels show that FSCs surpass LCCs in many ways. With respect to the dominant position of YouTube regarding the number of visits to the site, it is possible to expect that airlines will further develop its usage, including investments into creating videos both emotionally motivating and featuring celebrities.

Keywords: Social Media, YouTube, Viral Marketing.

1 Introduction

Social media and potential ways of using them significantly change current marketing and bring about a lot of challenges for marketing managers [8]. According to [14, 16, 22, 23, 31, 33] among others, social media are widely used in tourism, particularly in order to share, search, compare and gather information, which links social media and marketing of tourism on many levels. Leung et al. [17] even label social media as a megatrend in tourism.

Social media in connection with other ICTs not only change the way journeys are experienced to being at home and at the same time on the way [29], but it also changes social relationships of tourism participants [28]. Social media also influence decision making of (potential) tourism participants. Typical examples are travel and tourism websites generated by users (e.g. TripAdvisor; destination marketing linked to it is described by [15] and review websites (the quality of TripAdvisor, Expedia, or Yelp websites was analysed by [30]. The eWOM (electronic word-of-mouth) makes social media significant particularly in tourism, where the customer cannot get to know the product beforehand [19]. Social media have thus become an important part of travel and tourism marketing for providers of tourism services and destination

management [7, 14]. There are several identified benefits of using social media for marketing, branding and awareness, such as acquiring new customers, gathering feedback from customers or community, raising awareness of community efforts and connections, building community networks, and fund raising [18]. Social media as a whole e.g. [14] as well as individual social media are viewed as a marketing tool (e.g. [20] for Facebook, and [6] for Twitter). Their efficient use improves competitiveness e.g. [14]. At the same time, tourism websites show a trend towards communication with users based on multimedia and more generally on graphics e.g. [32, 4], including a preference for sharing graphical content in social media [21]. Kim and Mattila [13] emphasized the significance of video sequences on hotel websites for potential customers who thus can learn beforehand about hotel services (airlines offer similarly complex services) and decrease the risk they run when buying services at a distance. Tussyadiah and Fesenmaier [27] documented that videos shared on social media often influence subconscious decisions of tourism participants about the choice of destination or tourism services – videos support fantasy and day-dreaming of tourism participants and evoke their memories.

For both full service carriers (FSCs) and low cost carriers (LCCs) quality marketing with a wide use of ICT, including social media, is typical. Due to the growing importance of social media and multimedia communication with potential clients, the presented research was aimed at the way YouTube is used by airlines. Particular attention was paid to the success rate of this communication and the reasons for that. A significant part of this work was pre-research that tested if the number of uploaded videos regardless of their content is one of the factors for YouTube channel success. This research shows that there is no statistically significant correlation between the number of daily uploaded videos and user interactions (likes, dislikes and comments). This paper will test several other variables and try to determine which of them are important in order to run a successful YouTube channel, specifically an airline one.

Research aimed at the way of presenting and typical features of airlines YouTube channel videos, the success rate of these videos measured by the number of views, factors causing this success rate, and finding out possible differences in both presenting and success rates between FSCs and LCCs. The following questions were asked:

- How important part of airline marketing does YouTube constitute?
- What is the typical content of airlines YouTube channel videos?
- Which airlines are the most successful in addressing YouTube users and why?
- What types of videos do airlines YouTube channel users prefer?
- What differences are there in using YouTube between FSCs and LCCs?

2 Methodology

In order to answer the research questions, following research method were employed: selection of a suitable referential research sample of FSC and LCC YouTube channels, the method for classification of types of airlines YouTube channel videos,

qualitative and quantitative research for assessing the portfolio of referential research sample of airline channels. As the referential research sample for the quantitative analysis there were selected:

- Five most frequently watched FSCs: KLM Royal Dutch Airlines, Turkish Airlines, Air France, Emirates and LATAM Airlines. The selection is based on the total number of views of all videos of the corresponding FSC.
- The same criterion was applied to determine five most frequently watched LCCs: WestJet, AirAsia, Pegasus Airlines, SpiceJet, JetBlue.

In order to classify types of used videos and for research of video portfolio (including the types of most frequently watched videos), the referential sample was supplemented with another six FSCs (American Airlines, Delta Air Lines, United Airlines, China Southern Airlines, Lufthansa, British Airways) and two LCCs (Southwest Airlines a Ryanair). The criterion of their selection was the number of transported passengers based on data by IATA ([9]).

In order to classify the types of videos presented by airlines, the main criterion was the content and the main feature that should attract the user's attention. Such an attribute was typically a celebrity featuring in an otherwise trivial plot of the video. The classification took into account the specifics of tourism participants' motivation in their selection of destination (strife for attractions, activities, experiences).

3 Theoretical basis

One of the most important ways how to make a firm or company grow nowadays is to influence social media in the right way and have a good relationship with customers and keep them in action. Khan and Vong [11] capture the role of social media in the current world precisely. In the contemporary society, social media are changing the way in which people create, share, and consume information.

Videos are a significant part of multimedia communication. Hautz et al. [5] came up with results that prove important for assessing the effectiveness of videos placed by tourism service providers and destination management on social media. They give evidence that social network users do not significantly prefer user-generated videos (UGVs) to agency-generated videos (AGVs). They also pointed out the quality of videos. In case of high-quality videos there is no significant difference in social network users' preferences. On the other hand, in case of low-quality videos users prefer UGVs. Therefore, videos posted on social media by service providers and destination management should be of high quality to be competitive with UGVs.

YouTube is the most widely used network for sharing and watching videos and according to Alexa [2], as of 1 May 2017, YouTube is the second most frequently used website only to Google.com. A statistical web Statista [25] states that since 2015, 400 hours of video content is loaded on YouTube every minute. These statistics show that the most watched type of video is music video, followed by beauty and fashion tips, personal video blogs and educational or instruction videos. In order to

utilize YouTube in targeted marketing, it is important to know the potential of viral sharing of various types of videos. Music videos, true story videos and celebrity videos have the highest potential for viral sharing [26]. Such videos may achieve 100 million views in less than ten days [26]. Camarero and José [3] concluded in their research of viral dynamics that the effectiveness of viral spreading is strongly influenced by the person´s integration in the social network, their relationships inside it and their relation to the shared content. The ways how to make a YouTube video viral are to give them +/- assessments, add comments to the video and there is also the YouTube recommendation system, related to the user´s former activities.

As Khan's [12] research shows, the most important motivations of passive YouTube users are relaxation, entertainment (in concord with [25] concerning music video preferences), and reading other user's comments. In order to assess YouTube users' activities in relation to marketing, it is necessary to consider various groups of users' motivation and activities. It is typical for a group of users looking for information that they enter their rating and comments but they neither share videos, nor upload their own ones [12].

4 Results

4.1 Classification of video types

There were determined 19 video types (in bold below) based on the content of airline company videos. One of the most significant topics approached in different ways is company introduction. This introduction may take the form of impression/relationship presentation of the company, or the history of the airline, or a summary of basic facts about the airline (company introduction). Regarding the destinations where the airline flies, there are presentations of destinations as groupings of attractions (destinations), activities in destinations, and the experiences of travellers in destinations. The way of providing services is linked to presenting often very creative safety videos (safety), presenting the quality of services, an offer of games and entertainment for passengers, explaining service technology, and experiences of airline passengers. Airline social responsibility, advertising campaigns targeted at the topical offer and presenting customer benefits are important for airline marketing, too. According to Statista [25], the audience rating of airlines YouTube channels is increased by celebrities, which also have, as Statista [26] maintains, high viral potential. High viral potential is also the basis for the utilization of music/music clips, and life stories on airlines YouTube channels. Travelling is also supported by travel tips. Another relatively frequent topic is employees and job offer (the topic of employees sometimes mingles with impression/relationship presentation of airline companies).

The overall frequency of individual video types is shown in Fig. 1, which compares FSCs with LCCs. The total average number of topics is in case of FSCs 11, whereas that for LCCs is 7.

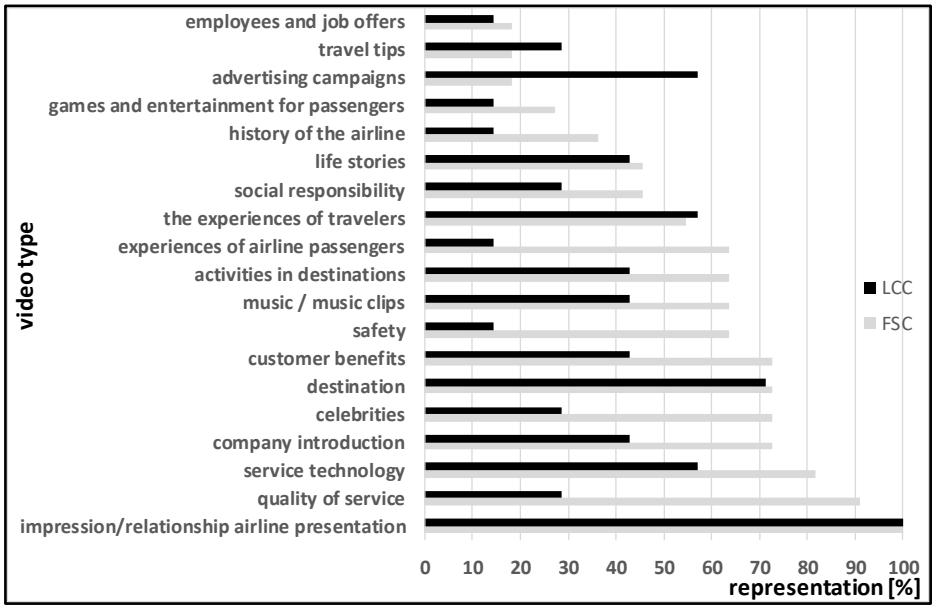

Fig. 1. Summary of various video types for FSCs and LCCs in percentages.

4.2 Research of airlines video portfolios on YouTube

The research of airlines video portfolios on YouTube, whose basic characteristics are shown in Table 1, was aimed at several topics:

- what types of videos are most popular with subscribers,
- what is distinctive about presented videos of individual airlines,
- whether there is any difference between FSCs and LCCs presentations,

The overview of the most popular types of airline videos on YouTube was based on the overall assessment of five most popular types of videos on YouTube of each carrier. The types of videos that are most popular with viewers are depicted in Fig. 2 (IRPC stands for impression/relationship presentation of the airline company), by their proportional representation among the five most popular videos. Impression/relationship presentation of the company is clearly dominant, as its share among the top five types of videos is 31% (all airlines present this topic).

Another interesting statistics shows the viewer ratings of the most frequently viewed video types in absolute numbers for all airline companies together (Fig. 3). This graph clearly shows the popularity of videos featuring celebrities as well as IRPC videos. These most frequently viewed video types may form a significant part of an airline company's total viewer ratings. For example, in case of Turkish Airlines the most popular videos make more than 50% of viewer ratings, and the most frequently viewed video of Air France comprises as many as 80% of the total viewer ratings.

Table 1. Basic characteristics of selected airlines video portfolios on YouTube as of 25th June 2017 (LCCs grey fields). Source: [24]

Airline	number of videos	number of video topics	view count [mil]	subscribers [th]	channel regist. from	oldest videos [year]	link to own website
KLM	549	17	113.4	108.6	2009	8	0
Turkish Airlines	318	11	512.3	163.7	2006	6	1
Air France	421	12	132.2	56.3	2011	5	1
Emirates	417	14	102.6	215.1	2006	5	1
LATAM Airlines	262	11	91.7	110.0	2005	3	2
American Airlines	395	10	13.6	44.7	2006	8	1
Delta Airlines	369	12	16.7	59.8	2006	1	0
China Southern Airlines	20	3	0.1	0.4	2014	2	0
United Airlines	164	10	10.0	26.0	2006	5	1
Lufthansa	321	11	26.7	36.8	2006	7	1
British Airways	381	12	45.5	91.0	2009	6	0
WestJet	381	9	92.4	62.0	2006	7	0
AirAsia	799	9	62.3	57.7	2006	6	1
Pegasus Airlines	184	5	34.8	12.8	2010	7	1
SpiceJet	81	4	32.2	7.0	2009	7	0
JetBlue	170	9	14.5	18.6	2006	6	1
Ryanair	306	7	10.6	17.6	2012	1	1
Southwest Airlines	566	8	7.8	23.8	2007	9	1

Comments: for “link to own website”: 0 Youtube not linked to the website of the airline, 1 linked to the website, 2 linked to only some regional website of the airline.

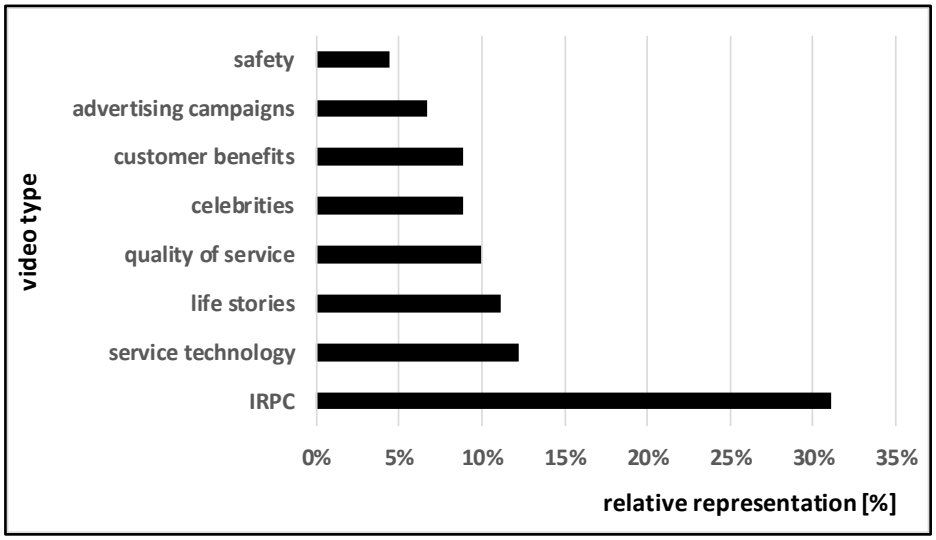

Fig. 2. The most popular types of airline videos on YouTube (as of 20th May 2017), according to their relative frequency of presence among the top five videos.

The concept, content, and emphasis on individual topics of videos on YouTube as well as the utilization of specific approaches differ among airline companies. There are several examples below (see also the discussion of YouTube channel success rate):

- KLM presentation on YouTube emphasizes the company services and its external relations. The public is included in YouTube channel creation by means of selfie videos, created as panoramic 360 degree views of visited destinations.
- Turkish Airlines emphasize the utilization of sport celebrities - football and basketball stars (Messi, Drogba, Kobe), life stories, and creating impression.
- Emirates offer (similarly to Southwest Airlines) 360 degree videos and panoramic views, emphasize the utilization of sport stars (football), and sport sponsoring. Safety videos, made in an interesting way, using teams of stylishly clad air hostesses on stadia, are popular, too.
- Air France typically focus on image and impression, offer a lot of animated cartoons aimed at children as well as adults, and provide explanations concerning their service technology.
- WestJet also use sport stars (baseball), and emphasize destinations in its presentation.

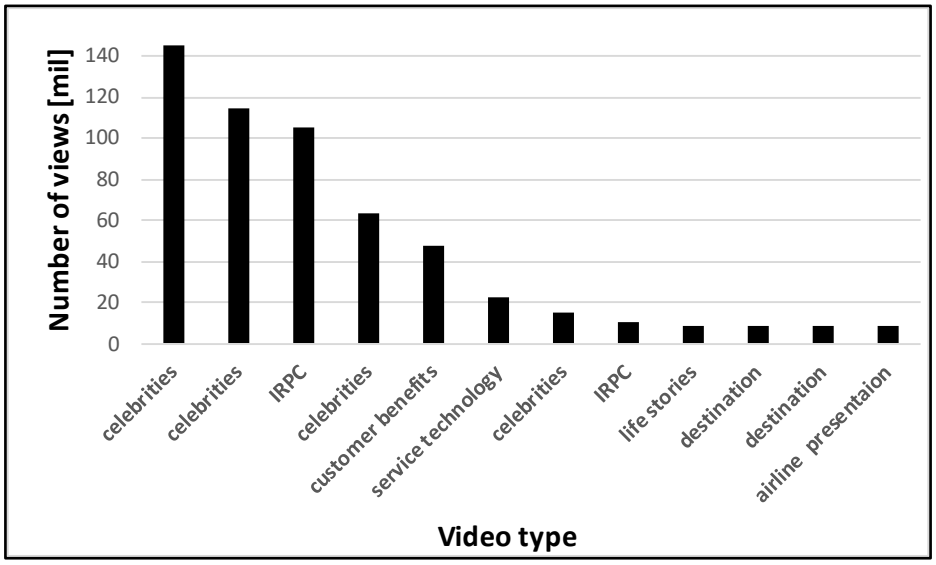

Fig. 3. Absolute viewer ratings of the most popular types of airline videos on YouTube as of 20th May 2017.

5 Discussion

Even though [2] states that as of 1st May 2017, YouTube was the second most used website, part of the eighteen analysed airlines see YouTube as a supplementary social medium for their marketing (one third of airline companies has no link between YouTube and their website). There are clear differences between the approaches of airline companies towards YouTube and their YouTube channels´ success rates. Good correlation is between the number of video types (which is a significant trait of good care of YouTube channels, see the discussion below), the number of registered video subscribers and the total number of video views.

An analysis of eighteen airline companies´ YouTube channels resulted in finding 19 distinct topics of videos. The topics are based on the following needs of airline companies (several topics meet more than one need), on the knowledge of quality marketing as well as potential customers´ expectations concerning the contents of airlines YouTube channels:

- Sort of provided services (service technology, safety, quality of service, games and entertainment for passengers).
- Need to establish a relationships with the carrier´s potential customers (company introduction, impression/relationship presentation of the company, customer benefits, airline social responsibility, history of the airline, experiences of airline passengers).

- Knowledge of event marketing effectiveness, as it is shown by Alagöz and Ekici ([1]), who analysed Turkish Airlines (experiences of airline passengers, activities in destinations, the experiences of travellers).
- Advice and support for travellers – emotional, factographic, relational (destination, activities in destinations, travel tips, the experiences of travellers).
- Knowledge of the potential of viral videos (as it was mentioned by [26], music videos, life stories and videos about celebrities) – airlines channel topics are therefore celebrities, life stories, music/music clips).
- Needs of airline company management (employees and job offers).
- Direct application of marketing communication (advertising campaigns).

In order to assess the success rate of airline companies in addressing YouTube users, the applied metrics was based on the total amount of video views on YouTube. This metrics was used as a basis for selecting the portfolio of airline company videos for further analyses. The most successful FSCs are Turkish Airlines, Air France, KLM, Emirates and LATAM Airlines, and their LCC counterparts are WestJet, AirAsia, Pegasus Airlines, SpiceJet, and JetBlue. At the same time, the biggest FSCs are not necessarily the most successful on YouTube. Among big airline companies, Emirates and Air France are successful, whereas other big airline companies like British Airways, Lufthansa, Delta Airlines, American Airlines, United Airlines, or China Southern Airlines are not successful on YouTube.

As total numbers of viewers of the most successful airline company YouTube videos depicted in Fig. 3 show, videos with sport celebrities (football, basketball, baseball) boast the top viewer ratings. Fig. 3 and particularly Fig. 2, showing the most frequently viewed video types on airlines YouTube channels, suggest that airlines can also easily achieve high viewer ratings with impression/relationship presentation of the airline company. High viewer ratings can also be achieved by quality and inventive videos about service technology and quality of service, about customer benefits, destinations and life stories. The claim by Statista [26] that videos about celebrities and life stories have huge viral potential was proved. On the other hand, another claim by Statista [26] that music videos also have huge viral potential was disproved, which may, according to the analysis, have to do with their low quality as well as with their different thematic focus in comparison with airlines YouTube channels.

The applied analysis assessed and compared the utilization of YouTube only for the most successful FSCs and LCCs and selected biggest FSCs and LCCs. The comparison had the following results:

- FSCs build their YouTube channels more systematically than LCCs, FSCs offer a wider range of video topics (Fig. 1) and they usually group their video topics more elaborately.
- FSC channels are better developed, and they have better results in all three significant YouTube channel metrics (range of topics, subscribers, total uploaded video views).
- The reason for higher viewer ratings of FSCs is the fact they use celebrities in their videos more frequently than LCCs (see Fig. 3).

- FSC videos have significantly more interactions per one thousand subscribers than LCC videos, FSC videos motivate their viewers to react by comments, likes or dislikes much more than LCC ones.

One of the bases of this study was to find suitable metrics for assessing the success rate of airlines YouTube channels. The total number of views on YouTube became a success criterion and at the same time one of two criteria for selecting airline companies whose YouTube channels were analysed (see discussion above). The other one was the total number of transported passengers as a metrics for determining the size of airline companies. The success rate of airlines YouTube channels is assessed by means of their current static characteristics (the number of subscribers), and the dynamics of their development (dynamics of their subscriber growth).

The pilot study assumption that the total number of videos on YouTube channel is not the decisive factor for the airlines YouTube channel success was confirmed. Prerequisites for the airlines YouTube channel success lie in selecting the most successful video topics (celebrities, impression/relationship presentation of the company), applying invention (interesting safety videos), and a suitable way of sorting the channel contents.

The study of success rate of airlines YouTube channels could have been more detailed if the authors had known the amount of money that the selected airline companies invested in marketing targeted on YouTube. Anyway, companies should primarily target on making successful video types, the amount of invested money may not be as significant as creating catchy contents, and the focus on stable growth with some irregularly viral videos.

6 Conclusion

This study shows that marketing and the use of social media in general is a very complex phenomenon, it needs practice and willingness to experiment. Social media marketing, in practice, is too complex to be managed and executed exclusively by a single individual or a department. This paper shows some connections and correlations of YouTube metrics for the selected top five FSC YouTube channels and their five LCC counterparts, based on the number of total channel views. It is important to create high quality contents capable of addressing the viewer´s emotions. The study shows that all companies create short videos (under 5 minutes). The best company contributions on YouTube were never longer than five minutes but the majority of them had around one minute. A significant aspect is to address the viewer´s emotions and motivate them to interact in the form of likes or comments. Another consequential fact is the utilization of sport celebrities in videos. Further research could aim at analysing how much airline companies invest in marketing and what number of subscribers is adequate. Another interesting and important area of interest could be to determine what videos of the selected airline companies went viral and why. Further research could also concentrate on typical strategies applied in creating airlines YouTube channels, on further elaboration of metrics for measuring

the success rate of airline YouTube channels, and on assessing the role of YouTube in airline company marketing strategies.

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How Industry-University-Research Cooperation Influences Innovation Efficiency in China

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Abstract. A provincial level balanced panel data set with 29 provinces and municipalities in China from 2009 to 2015 on the innovation production is used in this paper to analyze how industry-university-research cooperation influences innovation efficiency. Time-lag Stochastic Frontier Analysis models are applied and the results illustrates that cooperation between industries and universities takes a positive effect on innovation efficiency, the cooperation between industries and research institutions does not significantly influence innovation efficiency, and government funding for innovation has significant negative effect on innovation efficiency. The results also indicate that innovation efficiency in China in the sample years is not high; and is decreasing. The regional disparity of innovation efficiency is also obvious. Policy suggestions are presented in the conclusion of the paper.

Keywords: Innovation, Technical Efficiency, Industry-University-Research Cooperation.

1 Introduction

After more than 30 years of high speed GDP growth, China's GDP growth rate started decreasing from the first quarter of 2010. Some have placed the blame on the sluggish international economic environment; others refer to the fact that China's growth model has been changing from labor-intensive development to technology-intensive development, and innovation becomes an important driving factor. As the main bodies of innovation, industries, universities, and research institutes develop separately in a long time in China. The innovations of industries focus on new products intended to bring profits, while there always are lags between university innovations and market demands. The innovation of research institutes is in between. Less connection and cooperation among the three entities leads to the waste of research funding and high research costs for industries. Since 2006, the government of China has placed great emphasis on cooperation of industries, universities and research institutes. It is necessary to analyze how industry-university-research cooperation influences innovation efficiency.

Researchers have studied this topic from different aspects using different methods. Some studies analyze the factors that influence industry-university-research

cooperation from the qualitative aspect. Salomon [9] considered openness as the indirect reason promoting research achievement transformation; Bin Guo et al [2] analyzed the influence of project properties and participants characteristics. Some studies measure the efficiency of cooperation using different quantitative methods. Junhong Bai [6] measured Chinese regional innovation efficiency using Stochastic Frontier Analysis (SFA). Tin Liu and Wei Sun [7] evaluated the industry-university-research cooperation efficiency for the manufacturing industry in Shaanxi province. In brief, researchers have analyzed how industry-university-research cooperation influences innovation efficiency from various points of view using different methods and different indicators, but with inconsistent conclusions. The methods are DEA (Data Envelopment Analysis) and SFA mainly. The DEA method does not require the information on the form of production function, thus it has less constraints, and it can deal with a multi-output model. But DEA ignores the existence of random error, which may lead to unreasonable results. In the SFA method, the error term is composed of two parts: one is the random error term, and the other one is an inefficient error term used to measure the producers' efficiency. The result obtained from SFA method is more reasonable and more explicable. But SFA method requires specifying the functional form and a single output or a single-output index which is aggregated from multiple outputs.

At this time in China's economic transition and innovation-driven development pattern, it is important to update the data and to analyze how industry-university-research cooperation influences innovation efficiency since 2005, the year when the "innovative development strategy" was proposed.

In consideration of data availability, policy time-lag and innovation time-lag, a panel data of 29 provinces and municipalities from 2009 to 2015 has been selected.

2 Model Specification

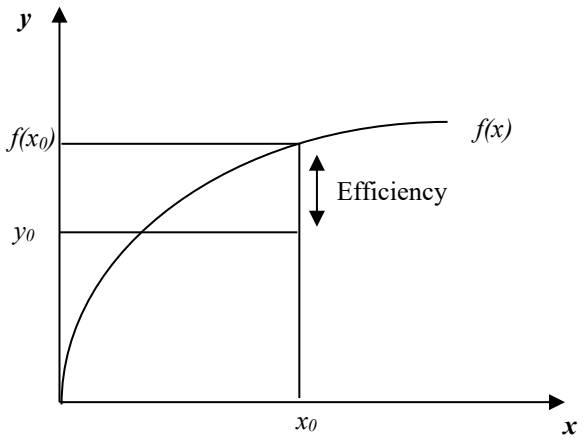

Fig. 1. Single input–single output production.

In traditional production theory, all producers are assumed to attempt to obtain the optimum outputs, but in the real world, not all of them can achieve this result. The concept of frontier is used to describe the optimum result that producers want to and can produce given the technology level, shown as $f(x)$ in Figure 1. Figure 1 is an example of single input–single output production, where x_0 is the observed input, and y_0 represents the observed output, which is the actual output produced by x_0. $f(x_0)$ represents the maximum output which can be produced by x_0. Thus efficiency is defined as the ratio of actual output to potential output, which is the distance between the outputs, $y_0/f(x_0)$, and which is always smaller than or equal to 1. The value of the distance is defined as the efficiency score. When it is equal to 1, the producer is defined as efficient, when it is less than 1, the producer is defined as inefficient.

Due to the existence of stochastic effects, the SFA method, which is used in this paper, separates the distance into two parts: random error and inefficient error. The model is specified as:

$$y_{it} = f(x_{it}, t)\exp(v_{it} - u_{it}) \qquad (1)$$

where i indicates the individual province and t indicates the time period. $f(x_{it}, t)$ indicates the maximum output (the frontier) which province i could theoretically achieve in time t, while y_{it} is the real output of province i in time t. The composed error term is used to measure the distance between maximum output and real output. v_{it} is the random error term, which captures all the random effects, such as the measurement error, the sampling error, and the specification error. u_{it} is the inefficient error term, which measures the provinces' efficiency. When the translog form is taken, equation 1 turns into equation 2

$$\ln y_{it} = \beta_0 + \sum_j \beta_j \ln x_{jit} + \frac{1}{2}\sum_j \sum_i \beta_{jl} \ln x_{jit} \ln x_{lit} + v_{it} - u_{it} \qquad (2)$$

The key point of the SFA model is to separate the inefficient error term from the composed error term. We use the model which considers the inefficient error term as follows:

$$u_{it} = \delta_0 + z_{it}\delta + w_{it} \qquad (3)$$

where u_{it} is assumed to be independently distributed and obtained by truncation (at zero) of the normal distribution with mean $z_{it}\delta$, and variance σ^2. z_{it} are the relevant influence factors which affect inefficiency. The sign of coefficient presents the influence of these factors. A positive sign indicates the negative influence on efficiency and a negative sign indicates the positive influence.

3 Data and Variables

3.1 Output Variable and Input Variables

When we select the indicators, we follow the industry-leading principle, which means the aim of industry innovation is to make profits. The SFA method requires a single output on the left hand side of the equation. To measure innovation output, three primary indicators are used, the number of patents granted, the number of new products exploited and sales revenue of new products. With regard to patents, for reasons of secrecy, industries may not apply for patents on some innovations; or, industries may apply for patents to prevent competitors from making the same innovation, but this does not mean the innovation can be converted to meaningful production in a short period of time. Thus, the number of patents granted is not an ideal indicator. The number of new products exploited cannot reflect the economic values of innovation. Sales revenue of new products is used as the output variable because this can reflect the real benefit of innovation for industries

The input variables contain two aspects, labor and capital. Full-time equivalent of R&D personnel is used as the labor input. A capital stock variable is needed to measure the capital input, and the appropriate indicator is the intramural expenditure on R&D, which has to be converted since it is a flow indicator. The method we use here is as follows:

$$K_{it} = (1-\delta) \times K_{it-1} + E_{it} \tag{4}$$

where K_{it} is the R&D capital stock of province i in time t, E_{it} indicates the intramural expenditure on R&D, and δ is the rate of depreciation, taking value 0.15. The meaning of equation 4 is that the R&D capital stock is the depreciated capital stock plus the new added intramural expenditure. The estimation of the capital stock in the base year (2009) is shown as equation 5.

$$k_{i0} = E_{i0} / (g + \delta) \tag{5}$$

where g is the geometric mean of the intramural expenditure on R&D.

3.2 Influence Factors and Assumptions

The purpose of this paper is to detect the influence of industry-university-research cooperation on industry-leading innovation efficiency, thus the influence factors should reflect the degree of cooperation between industries and universities and between industries and research institutions.

We use the ratio of intramural expenditure on R&D in higher education raised from industries to the intramural expenditure on R&D in higher education to measure the degree of cooperation between industries and universities. As Figure 2 shows, the

ratio is around 35% and is getting smaller in sample period. Theoretically, the cooperation between industries and universities should promote innovation activities.
Assumption 1: The cooperation between industries and universities has positive effects on innovation efficiency.

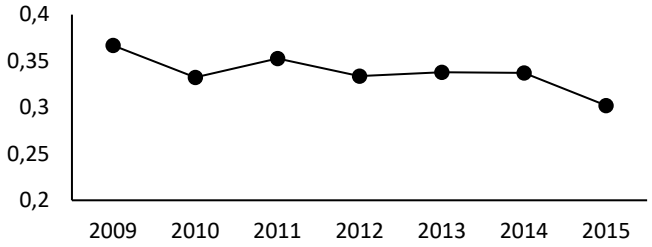

Fig. 2. The proportion of intramural expenditure on R&D in universities from industries.

The proportion of intramural expenditure on R&D in research institutions from industries is used to measure the degree of cooperation between industries and research institutions. As Figure 3 illustrates, the proportion is around 3.1% and the largest value is only 3.42%. The relationship between industries and research institutions is cooperators and competitors. On one hand, the cooperation could save research cost and avoid repetitive research. On the other hand, research institutions in China does not only do researches, they also engage directly in the market as the competitor for industries. According to the low degree of cooperation, we have the second assumption:
Assumption 2: The cooperation between industries and research institutions has negative effects on innovation efficiency.

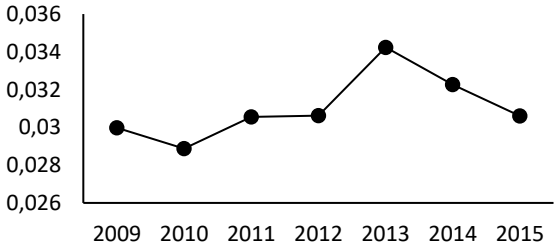

Fig. 3. The proportion of intramural expenditure on R&D in research institutions from industries.

In addition, government has a significant influence on regional innovation, through both policy support and the provision of funding. Therefore the proportion of regional intramural expenditure on R&D obtained from government is used as the control variable into the model to measure the degree of government participation in innovation. Figure 4 demonstrates the proportion of regional intramural expenditure

on R&D obtained from government and from industries. The primary source of intramural funds raised by industries, which is around 70%, and it is increasing slightly each year. The proportion of intramural funds from government is around 22% and is decreasing slightly each year. But the proportion varies greatly in different regions, which is not shown in Figure 4. The average proportion of intramural funds raised by government is 8.30% in Guangdong province, but 55.12% in Beijing. Both provinces are important regions for innovation, so we make the third assumption:
Assumption 3: Government support has insignificant effects on innovation efficiency.

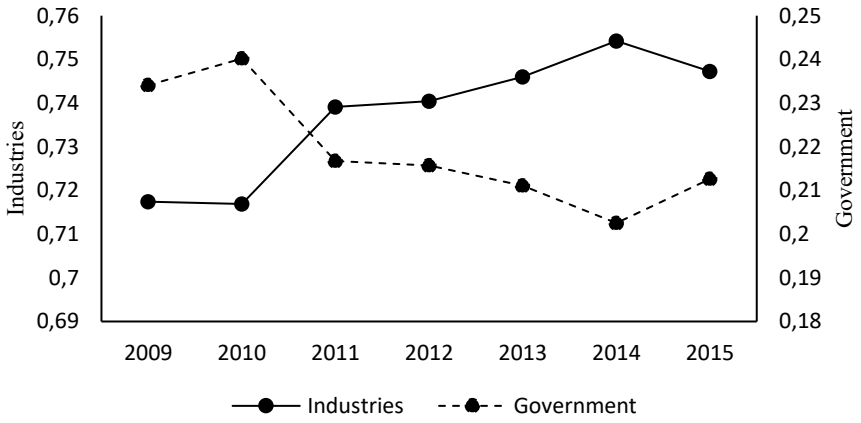

Fig. 4. The proportion of regional intramural expenditure on R&D obtained from government and industries.

3.3 Data Information

A provincial level balanced panel data set with 29 provinces and municipalities from 2009 to 2015 in China on the innovation production is used in this paper, with 203 samples in total. Two regions, Tibet and Ningxia are discarded, because of the missing data and a limited number of innovation activities. All the data are from the China Statistic Yearbook, the Statistical Yearbook of Scientific and the Technological Activities of Industrial Enterprises, and the China Statistical Yearbook on Science and Technology. The base year is 2009.

4 Results and Discussion

4.1 A Discussion of Influence Factors

One of the important features of innovation is the time-lag. The innovation activities themselves need time, the transformation from innovation to production needs time, and the transition from production to sales needs time, but due to competition, the

time-lag will generally not be too long. Three models have been developed, a no time-lag model (Model 1), a one-year time-lag model (Model 2), and a two-year time-lag model (Model 3). The results are shown in Table 1, where L is labor, K is capital stock, I-U indicates the cooperation between industries and universities, I-R indicates the cooperation between industries and research institutions, and G represents government participation in innovation.

Table 1. Estimation of Frontier and Influence Factors.

Variables	Model 1	Model 2	Model 3
Estimation of frontier			
Constant	0.3446***	0.5611***	0.7080***
	(0.0709)	(0.0885)	(0.1276)
K	0.5178***	0.3676**	0.4053**
	(0.1198)	(0.1474)	(0.4089)
L	0.4039***	0.5171***	0.5240**
	(0.1175)	(0.1435)	(0.2129)
KSQ	0.0050	0.1010	0.4410
	(0.2070)	(0.2863)	(0.3571)
LSQ	-0.2932	-0.2293	0.06757
	(0.2053)	(0.2896)	(0.3826)
KL	0.2603	0.0970	-0.5355
	(0.4104)	(0.5710)	(0.7281)
Estimation of influence factors			
Constant	1.1027	0.2951	0.4133
	(1.6254)	(0.5618)	(0.7729)
I-U	-0.8245	-0.7619**	-0.8094**
	(0.5386)	(0.3232)	(0.3340)
I-R	-0.0519	0.0991	0.1047
	(0.1023)	(0.1078)	(0.1237)
G	1.07575	0.8558*	0.7958**
	(0.7296)	(0.4361)	(0.3847)
sigma-squared	1.1927	0.9051**	0.7780**
	(0.7745)	(0.0053)	(0.3378)
gamma	0.9401***	0.9596***	0.9315**
	(0.0365)	(0.0271)	(0.0437)
Log value	-140.22	-122.72	-107.50

The significance of gamma illustrates that innovation inefficiency exists significantly in the sample regions. In Model 2 and Model 3, the significance of sigma-squared illustrates that the variance of innovation inefficiency is significantly different from zero. Both labor and capital show significant positive impact on innovation production in the three models.

With respect to the influence factors, no significant effect of three influence factors is seen in Model 1. But the time-lag models, Model 2 and Model 3, present a different

picture. The coefficient of the cooperation between industries and universities is significantly negative, which means that deeper cooperation between industries and universities has a positive influence on innovation efficiency. The result is the same as Assumption 1.

The coefficient of the cooperation between industries and research institutions is positive, which means that deeper cooperation between industries and research institutions has a negative influence on innovation efficiency, but insignificant. This is caused by the ambivalent relation between them, and the competition plays a more important role than cooperation. As we discuss above, the degree of cooperation between them is shallow. This result rejects Assumption 2.

The coefficient of the government participation in innovation is significantly positive, which means government support for innovation results in inefficiency. The government finding for innovation is focused on government oriented industries, but it may cause a crowding-out effect, resulting in decreasing investment from industries. Goolsbee [4] considers that government support increases the requirement of R&D personnel, which is inelastic. Therefore the result is that wages of R&D personnel increase but there is no effect on innovation production.

4.2 The Discussion of Innovation Efficiency

In this paper, a province is innovation efficient when it can obtain the maximum sales revenue of new products, otherwise, the province is inefficient. The higher the innovation efficiency score, the more efficient the province is. The highest value is 1 as discussed in section 2.

The average national innovation efficiency scores in each year are shown in Figure 5. Models 1 and 2 show the same ascending trend before 2011 and all three models a descending trend afterwards. Chinese government attaching more importance to innovation does increase the quantity of innovation production, but our results show that the innovation efficiency is decreasing in later years.

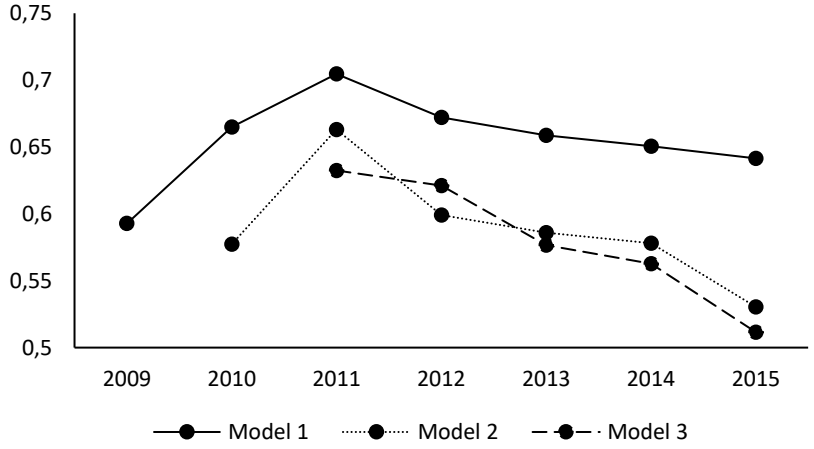

Fig. 5. The Average National Innovation Efficiency Scores in Each Year

The average regional innovation efficiency ranks are shown in Table 2.Chongqing, Zhejiang and Hunan are Top 3 innovation efficient regions in all three models. The last three are Qinghai, Heilongjiang and Shanxi. In general, provinces and municipalities in East of China are the most innovation efficient, and provinces and municipalities in West of China are the most innovation inefficient. The rank is almost the same as economic development level of these regions.

Table 2. The Average Regional Innovation Efficiency Ranks.

Region	Model 1	Model 2	Model 3	Location
Beijing	11	12	12	East
Tianjin	5	4	4	East
Hebei	22	21	17	East
Liaoning	13	15	15	East
Jilin	8	10	14	East
Heilongjiang	28	28	28	East
Shanghai	6	6	6	East
Jiangsu	7	5	5	East
Zhejiang	2	2	3	East
Fujian	19	20	19	East
Shandong	9	7	7	East
Guangdong	10	9	10	East
Hainan	20	17	22	East
Shanxi	27	27	27	Middle
Anhui	12	11	9	Middle
Jiangxi	15	13	11	Middle
Henan	21	22	21	Middle
Hubei	14	14	13	Middle
Hunan	3	3	1	Middle
Inner Mongolia	25	25	24	West
Guangxi	4	8	8	West
Chongqing	1	1	2	West
Sichuan	17	18	18	West
Guizhou	24	24	23	West
Yunnan	23	23	25	West
Shaanxi	26	26	26	West
Gansu	18	19	20	West
Qinghai	29	29	29	West
Xinjiang	16	16	16	West

5 Conclusion

This paper analyzes how industry-university-research cooperation influences innovation efficiency, by applying time-lag SFA models to a provincial level balanced panel data set with 29 provinces and municipalities from 2009 to 2015. The results illustrate that the innovation efficiency in China in the sample years is not high, and it is decreasing. The disparity of innovation efficiency among regions is obvious.

The cooperation between industries and universities takes a positive effect on innovation efficiency. But the degree of cooperation between them is not deep enough. This is partly because the university research does not match the requirements of industries and markets, and partly because the distribution of benefits is not reasonable. In order to enhance the cooperation between industries and universities, it will be necessary to develop various cooperation patterns to promote the transition from knowledge to production. Industries and universities can found company together where industries provide funds and universities provide technology. The government could also intervene by creating some intermediary agencies to build a bridge between industries and universities. In addition, some policies should be carried out to balance the benefit distribution, such as allowing university researchers to attend the research directly within industries and giving them more benefit.

The cooperation between industries and research institutions does not has a significant influence on innovation efficiency. This is because research institutions often engage directly in the market as the competitor for industries, but there is almost no cooperation between them. To a certain degree, this is a waste of scientific and technological research resources. Therefore, it would be better to make more rational distribution of research domains, avoiding competition and stimulating cooperation.

Government funding for innovation does not have a positive effect on innovation efficiency, which is not as we expected. What the government should do is to guide the layout of industries but not to attend the innovation activity directly.

Since the level of economic development varies among different provinces and municipalities, and the distributions of universities and research institutions is various, it is necessary to analyze the influences on innovation efficiency by industry-university-research cooperation in regions which have more universities and research institutions in the future studies.

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Challenging Stress and Scientific Research Performance of Faculties in China

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Abstract. The study adopts random sampling to investigate the quantity and quality of 1706 teachers' published articles in the six years before and after the implementation of the performance appraisal system in four research-teaching universities and teaching universities in a certain province in China. The researching findings show that performance appraisal gives rise to a challenging stress for research-teaching university and teaching universities teachers, which contributes to improving teachers' scientific research productivity and influence; influences of performance appraisal on different groups of teachers are significantly different. As for professors and associate professors, performance appraisal has significant influence on the quality of their scientific research but insignificant influence on the quantity. As for lecturers, it has significant influence on both quality and quantity of their scientific research. As for teaching assistants, it has no significant influence on both quality and quantity of their scientific research.

Keywords: Performance Appraisal System, Challenging Stress, Scientific Research Performance.

1 Introduction and research question

At the end of 2016, China has 2596 colleges and universities. Among them, 813 are the public universities offering degree programs, and 1783 are higher vocational colleges and other institutions. Comparatively, the quality of public universities is the higher than the other two kinds. These public universities include 39 research universities and 774 research-teaching or teaching universities. In 2016, the number of graduate students has reached 7.56 million which by all means makes China the biggest higher education country in the world. However, in terms of quality, China has a distance from a powerful country in higher education in the world. Hence, China has proposed the "985 project" and "211 project" which aims to support some universities to develop into world-class universities or a high-level universities by concentrating limited resources.

Faculty is the most important human capital in universities. That who has the highest quality teachers is who can take a lead in the fierce competition. That who can innovate teacher' creativities is who can improve the academic productivities of the university. As a matter of result, on the one hand, Chinese universities enforce the

attractive to the talent. On the other hand, universities have been establishing their performance appraisal systems, and the results of evaluation are the important basis for teachers' salary and reward.

However, after the implementation, the system was criticized and questioned by the majority of scholars. Some researchers pointed out that the performance appraisal which started in the business circles had been an obstacle to enterprise management, and the performance doctrine made Chinese enterprises get into trouble [2]. As academic organizations, universities should not implement the performance appraisal. According to the fact that the number of unqualified faculty accounted for only 1% to 2% of the total number after an appraisal cycle, some scholars drew the conclusion that at present, performance appraisal system of researching universities or researching and teaching universities in China did not achieve the function of screening and stimulating [12].

The existing literatures on the validity of the teacher performance appraisal system in universities mainly take research universities as research objects, other universities such as research-teaching universities and teaching universities are rarely involved. Seen from one's intuitive feelings, teachers from research universities have higher human and social capital and stronger academic self-discipline. The academic interest and the strong academic atmosphere are sufficient to enable them to pursue scholarly research as a career. There is no need to be restrained and stimulated by the appraisal system. However, most teachers in research-teaching universities and teaching universities regard academic research a vocation. Their initiative is not strong enough by the stimulation of internal awareness, which needs appropriate stress by an external system. So, is this feeling a reality? It needs empirical study.

The aim of the thesis is to study the validity of the teacher performance appraisal system in research-teaching universities and teaching universities in China. The present performance appraisal system is implemented according to the "top down" model at the same time taking the province as a unit, which means the time of implementing the system in universities of each province is the same while the starting point of time is different. The environment of the system is of great significance to the implementation influence, and "time" is an important environmental variable. Therefore, the thesis chooses four universities in China's central province as the research object and explores the validity of the performance appraisal system by analyzing the difference in academic productivity before and after the implementation of the system.

2 Research Hypotheses

A system has the function of punishment, so does the teacher performance appraisal system in universities. Punishment rules are bound to bring some stress to teachers and thus influence their academic life.

As early as the mid-twentieth century, Selye divided stress into eustress and distress according to the stress levels. Then, Lazarue and Folkman thought that stress

is not situational stimulation, individual characteristics or reflection, but interactions between situational requirements and abilities of handling the requirements. When the individual thinks that the requirements are beyond ones' ability, one will have the feeling of threat; when the requirements are within ones' ability, one will have the feeling of challenge [5, 6]. Cavanaugh put forward a two-dimension structural model of challenging–obstacle stress source on the basis of previous studies. The challenging stress source refers to the stress source which brings positive influence to the enterprise and the staff, including the following requirements, such as heavy workload, time stress, work scope and high responsibility. It can bring stress as well as growth, returns and benefits in the future, and it can also stimulate the sense of achievement. Therefore, it can bring positive influence. The obstacle stress source refers to the stress source which brings negative influence to the enterprise and the staff, including the following requirements, such as policies, complex and draggy official procedures of the organization, ambiguous roles and safety concerns. It can hinder an individual's growth and achievement of goals and bring negative influence [3].

In this study, we assume that the teacher performance appraisal system in universities is a challenging stress source whose requirements for teachers are within their abilities. Moreover, all costs teachers paid to achieve appraisal tasks will get higher returns. This kind of positive influence will promote the increase in the quantity of scientific research.

Based on the above analysis, Hypothesis 1 has been formulated as follows:

Hypothesis 1: The teacher performance appraisal system in universities contributes to increasing the quantity of scientific research.

Academic productivity includes not only the quantity of teachers' scientific research, but also its quality. Some researchers have pointed out that the teacher performance appraisal system forces teachers to struggle hard to complete tasks, which will easily lead to quick success as well as the pursuit of academic short-term effect and they tend to choose "hot" topics as research objects, and pay more attention to the quantity of published articles instead of the quality, and some of them even divide a complete academic research thesis into several papers to publish [10]. Under the stress of annual appraisal of scientific research tasks which must be achieved every year, teachers can only choose some short, steady, and fast projects. For those projects that need long-term basic research, teachers may want to research, but this kind of research seems to be a kind of "luxury" under such appraisal system, which teachers cannot afford [15]. This kind of fast-food research just "turns white paper into black paper", or even "white paper into waste paper". They have subject awareness but no problem awareness, fund awareness but no academic awareness, quantity awareness but no quality awareness [4].

Based on the above analysis, Hypothesis 2 is put forward as follows:

Hypothesis 2: The teacher performance appraisal system in universities is adverse to increasing the quality of scientific research.

How does an individual react when facing stress. In their Stress Handling Theory Folkman and Lazarus claim that individual will start a cognitive appraisal in the process of interactions with surroundings. In the primary appraisal process, one will

appraise whether the events, situations or problems are relevant to oneself, whether they are benign, positive or stressed [5]. If they have nothing to do with oneself, so do they to the whole staff; If the events, situations or problems are beneficial and positive, one will make good appraisal, such as getting a promotion opportunity; if they are threatening or harmful, one will make a bad appraisal, such as conflicting with the responsible person or being fired (Shi Yu, Liu Cong, Liu Xiaoqian, Shi Kan,2009). One will take further measures to deal with the events, situations or problems according to the primary appraisal. The measures include emotional handling strategies and problem handling strategies, which will influence the individual's mood or behavior. If one thinks the events have nothing to do with him, he will ignore them; if he thinks they are beneficial and within his ability and can be solved through efforts, he will challenge them with passion; if he thinks they are beneficial but beyond his ability, and no matter how hard he works, he still cannot relieve stress, or if the events themselves are obstructive, he will be evasive and do nothing [7].

Teachers in universities are divided into professors, associate professors, lecturers and teaching assistants according to the titles. Theoretically speaking, they have different human capital, social capital and achievement feeling for their job, and their cognitive appraisal of the stress source is different with respect to the performance appraisal system, thus their handling of and reaction to stress are different accordingly. Therefore, the study has put forward its third hypothesis as below:

Hypothesis 3: The teacher performance appraisal system in universities has different stimulating functions to professors, associate professors, lecturers and teaching assistants.

3 Research Methods and Results

3.1 Research Sample

The study chooses the teachers in four research-teaching universities and teaching universities in one of China’s central provinces as the research object. In the four universities, two of them are located in the capital city and the other two are located in local cities. The study adopts random sampling to select 1832 teachers in the four universities and then rules out 126 teachers whose teaching time is less than six years, and finally the total number of teachers in the sample is 1706. Their demographic characteristics are: 1075 male teachers, 631 female teachers; 261 professors, 567 associate professors, 850 lecturers, 28 teaching assistants; 361 Doctors, 1111 Masters, 234 Bachelors and others.

3.2 Definition of the Variable

The functions of university teachers include teaching, scientific research and social service, which are involved in their appraisal. According to the interviews the author had with the research subjects, the main appraisal index of teaching is “teaching

hours" and there is no regular appraisal index for teaching quality in the four universities. The appraisal of scientific research mainly involves quantity and quality of research projects, published articles, monographs, and patents. The appraisal of social service mainly includes attending academic conferences, department activities and so on. There are universities that do not take social service into the appraisal system. We also know from the interviews that after the Ministry of Education issued its Several Opinions on Improving the Quality of Higher Education in an All-round Way in 2012, many universities have taken numerous measures to improve the quality of talents training, including quickening the pace of introducing teachers and reducing the student-teacher ratio. Increasing the number of teachers naturally reduces the number of teaching hours, and this kind of change is far away from the expected result of the performance appraisal system. In other words, the performance appraisal system does not have much influence on teaching. At the same time, Yin Jingong and Wang Yingluo's research findings show that performance appraisal of teaching and scientific research can be replaced to a certain extent [11]. Therefore, the study just takes scientific research performance as the dependent variable to test the validity of the teacher performance appraisal system in universities.

The indexes for measuring scientific research performance include published articles, projects, patents and monographs. According to the general "Publish or Perish" rule in American academia, the direct manifestation of teachers' scientific research performance in universities is the quality and quantity of their published articles. In the study, when collecting and investigating the scientific research data on the research subjects, the author directly selects the articles published three years (2009, 2010 and 2011) before and three years (2012, 2013 and 2014) after the establishment of the performance appraisal system, including all papers published with the subjects as the first author in SCI, SSCI, H&ACI journals, domestic core journals and common journals. In analyzing the quality of the papers, those published in SCI, SSCI, H&ACI and domestic core journals are regarded as high-quality papers, and those published in common journals are regarded as common-quality ones. The demarcation of core journals and common journals is based on the periodicals directory published annually by the Peking University.

3.3 Research Results

The study adopts SPSS to analyze data, the results are as follows:

First, the number of articles increases significantly.

According to the statistics, before the implementation of the performance appraisal system, the average number of teachers' published articles is 2.57 in three years; after that, it is 2.95, which increases by 0.374 with a significant difference ($t=3.637$, $P < 0.01$). So Hypothesis 1 has been verified that the performance appraisal system in universities contributes to increasing the quantity of scientific research.

Table 1. Difference-test of quantity of teachers' articles before & after the implementation of the appraisal system (N=1706)

	Mean Value	Standard Deviation	SE Mean	T	df	Significance (bilateral)
after - before	.374	4.247	.103	3.637	1705	.000

Second, the quality of articles improves significantly.

Before the implementation of the performance appraisal system, the average number of teachers' published articles in core journals is 0.79 in three years. After that, it is 1.20, which increases by 0.41 with a significant difference ($t=7.402$, $P < 0.01$). So Hypothesis 2 has been rejected, thus indicating that the performance appraisal system forces teachers to publish high-quality articles.

Table 2. Difference-test of quality of teachers' articles before and after the implementation of the appraisal system (N=1706)

	Mean Value	Standard Deviation	SE Mean	t	df	Significance (bilateral)
after - before	.410	2.286	.055	7.402	1705	.000

Third, the changing tendency of the quantity and quality is different with respect to the scientific research of teachers with different titles.

To explore the differences in the quantity and quality of articles of teachers with different titles after the implementation of performance appraisal system, the thesis firstly tests the homogeneity variance of the quantity and quality of teachers' articles three years after the implementation of the system, which shows the difference is significant ($F=17.488$, $P < 0.01$) in the number of articles published by professors, associate professors, lecturers and teaching assistants. At the same time, the difference in the number of articles published in core journals is also significant ($F=17.488$, $P < 0.01$).

Table 3. Difference-tests of quantity and quality of articles published by teachers with different titles after the implementation of the system (N=1706)

	Square Sum	*df*	Mean Square	*F*	Significance
Quantity：					
Interdisciplinary	793.216	3	264.405	17.488	.000
Interclass	25732.930	1702	15.119		
Sum	26526.146	1705			
Quality：					
Interdisciplinary	359.592	3	119.864	22.1	.000

				31
Interclass	9218.045	1702	5.416	
Sum	9577.637	1705		

The homogeneity variance test just shows that there is a significant difference between the quantity and quality of articles of teachers with different titles after the implementation of the system. What influence the performance appraisal system has on professors, associate professors, lecturers and teaching assistants can be seen from Table 4: as for professors, the number of their articles published before and after the implementation of the system does not increase significantly (t=1.080 (P > 0.05), but the number of their articles published in core journals has a significant difference (t=3.637, P < 0.01). So does the number of associate professors' articles, with no significant difference in the number of articles (t = 1, P > 0.05) and with a significant difference in the number of articles published in core journals (t=2.414, P < 0.05). Of the four kinds of teachers, the number and quality of lecturers' articles have the same changing tendency, and the difference in the number of articles is significant (t=5.649, P < 0.01), and the same goes with their articles published in core journals (t=8.120, P < 0.01). On the contrary, the difference in the number of teaching assistants' articles is not significant (t=0.411 (P > 0.05), so does the number of their articles published in core journals (t=0.486 (P > 0.05). Thus, Hypothesis 3 has been verified.

Table 4. Difference-tests of quantity and quality of articles published by teachers with different titles before and after the implementation of the system（N=1706）

	Mean Value	Standard Deviation	SE Mean	*t*	*df*	Significance (bilateral)
Professors：						
after – before(quantity)	3.75	5.619	.348	1.080	260	.281
after – before(quality)	.479	3.240	.201	2.388	260	.018
Associate professors：						
after – before(quantity)	.173	4.116	.173	1	566	.318
after – before(quality)	.226	2.323	.098	2.414	566	.021
Lecturers：						
after – before(quantity)	.746	3.850	.132	5.649	849	.000
after – before(quality)	.528	1.897	.065	8.120	849	.000
Teaching assistants：						
after – before(quantity)	.143	1.840	.348	.411	27	.684
after – before(quality)	-.107	1.166	-.220	.486	27	.631

4 Analysis and Discussion

Firstly, the performance appraisal system improves the quantity and quality of scientific researches. According to “cognitive interaction theory”, the performance appraisal system is an external stimulation for teachers, and they will make a primary cognitive appraisal of the stimulation, such as its meaning and influence. When implementation of the system is directly related to their survival, they will make a cognitive appraisal again, that is, whether their ability can meet the requirements of the system; if they can, they will have the impetus to face the challenge and work hard [5]. As has been introduced above, the performance appraisal system follows the reform path of top-down with a strong mandatory, which is significant to teachers. It is not only directly related to their salary level and decides their quality of life, but also to the post employment and whether they can keep the job. Human behavior is the result of the comparison of cost and benefit. Before the implementation of the system, universities implement an identity management. Once a person becomes a teacher, he or she will be a teacher all their life. In addition, the salary of teachers is average. Therefore, seen from the perspective of survival rather than sense of academic achievement, it is of little benefit for teachers to engage in scientific research. At the same time, it needs high economic cost and time cost, that is, the costs of scientific research are much higher than benefits, which makes them lack motivation to engage in scientific research. After the implementation of the system, universities implement a post management on the basis of performance, and the salary of teachers differs a lot because of performance which becomes the baton to guide teachers’ academic activities. According to the interviews in the four universities, they adopt a trend prediction method to formulate the appraisal standard of scientific research, and confirm tasks in the appraisal period according to average output of teachers' scientific researches three years ago (2009, 2010 and 2011). So when teachers make the second cognitive appraisal, they can easily draw the conclusion of "jump and get". As a result, the performance appraisal system is a kind of challenging stress to them. Some teachers in the interviews said that the appraisal system is related to their job, and nobody dares to ignore it. And as long as they work hard, teachers can finish the task. When this kind of challenging stress arouses and stimulates teachers’ scientific research enthusiasm and impetus and transforms into academic activities, scientific research achievements will undoubtedly increase in both quantity and quality. In the same token, the emphasis on the quality in the performance appraisal system also makes teachers work hard to improve the research level.

Secondly, the system has different stimulating functions as to professors, associate professors, lecturers and teaching assistants. The data show that functions of the performance appraisal system for professors, associate professors, lecturers and teaching assistants can be divided into three types according to the quantity and quality. First, the quantity and quality do not change significantly, and teaching assistants are representatives of this type. Of the investigated 28 teaching assistants, most of them are art teachers although there are many other related professions. In addition, these teachers are mainly Masters, and few of them are Bachelors. Second, the quantity and quality change significantly, and lecturers are representatives of this

type. In this study, the quantity of lecturers' articles published in core journals has a significant difference before and after the implementation of the system. Third, there is no significant increase in the quantity, but the quality is improved significantly, and professors and associate professors are representatives of this type. However, the mean deviation of the number of professors' articles published in core journals is greater than that of associate professors' articles before and after implementing the system, which shows that professors pay more attention to publishing high-quality articles than associate professors.

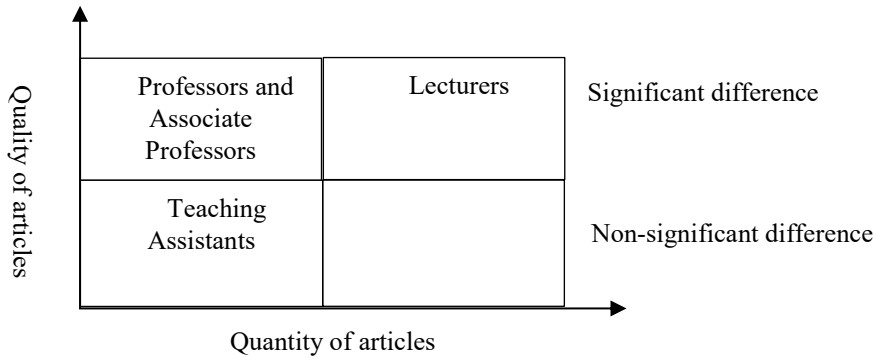

Fig. 1. Scientific changes of professors, associate professors, lecturers and teaching assistants

Human capital stock lifecycle theory points out that with the advance of time and aging, the increase in human capital stock is significant and persistent, and the personal working efficiency and ability is relatively high with the increase in marginal output [1]. For a teacher, when he just enters the academic field, he is in the starting point or the bottom of the profession (teaching assistants). With the growth of the age, scientific knowledge is accumulated day by day with higher academic achievements, and then he will be promoted to a new position (lecturer). When the process is repeated twice, he will reach the peak of his career (professor). This also means that when a teacher is promoted, his academic ability must be improved than ever. Human capital stock lifecycle theory explains the relationship between one's ability and age and reveals a diachronic and vertical relationship. But if the samples of the study are large enough, the theory is also applicable to the analysis of the cross-sectional data, namely the differences in the ability of teaching assistants, lecturers, associate professors, and professors. Obviously, due to the lack of accumulation, the ability of teaching assistants is the lowest of the four groups. The relevant data show that the teaching time of the 28 teaching assistants is seven years on average and they are mainly Masters. According to the appraisal documents of position titles of the sample universities, Masters will automatically improve as teaching assistants after working one year, and they have qualifications to become lecturers after two years. The main reason why they are still teaching assistants is that their academic ability is not enough. Therefore, even if there is a stress of performance appraisal, for them, "the

spirit is good, but the flesh is weak". For them, the system is not a challenging stress but an obstacle stress, thus their research performance has no significant difference before and after the implementation of the system. Some of the lecturers have a Doctor's degree, and the rest are promoted from a teaching assistant. For teachers with a Doctor's degree, the strict academic discipline in the period of doctoral study makes them develop a good scientific research quality. Topics of doctoral dissertation under the guidance of the doctoral supervisor make their research become the academic front, and their abundant energy and enthusiasm in academic exploration make the performance appraisal system a challenging stress. So they improve their scientific research productivity and influence at the same time. For other lecturers promoted from teaching assistants, the performance appraisal system is also a challenging stress because they gradually accumulate some experience in scientific research and improve the ability of scientific research on the academic road. For associate professors and professors, especially professors, they have reached the top of the career ladder and their salary can meet the basic survival needs, so they begin to pursue the sense of self value and professional achievements. The specific presentation form is to obtain higher academic prestige for the origin of the university is the community of scholars composed by scholars with high academic prestige and followers. The scholars with a high academic prestige are prototypes of university teachers [13], High academic prestige is the indispensable quality and fundamental characteristic of teachers. Academic people have already formed a consensus that different levels of performance cannot be replaced, namely accumulation of performance of teachers at the low level can never replace a high level of performance [14]. An article of high level can give teachers far more peer recognition and self-satisfaction than ten articles of low level. Some professors in the interviews point out those articles of high level contribute to improving academic prestige, while those of low level are harmful to academic prestige. Writing articles of high level takes time because soft fire makes sweet malt. Therefore, although the performance appraisal system is implemented, they stick to academic quality, which makes them give no attention to the quantity but the quality of articles.

5 Conclusion

The validity of the system is different with the different stimulating and restraining subjects. Generally speaking, teachers from research universities in China are in a good academic atmosphere, have higher academic capital, stress on and pursue academic prestige, and their academic discipline and awareness make them believe that their soul and destiny depend on whether he can make certain achievements in academic researches. The full mobilization of internal motivation makes the external performance appraisal system useless. However, teachers in research-teaching universities and teaching universities are mainly responsible for the heavy teaching tasks. Their relatively low cultural and social capital, and academic platform and scientific research conditions in universities, make it difficult for them to have an strange "euphoria" which is sniffy in the eyes of the outsiders and an ambition of

"thousands of years has passed before you come, and thousands of years in the future is waiting in silence" [8]. Academic activity is just a "vocation" for them to make a living rather than an "career". The lack of internal motivation needs the stimulation and restraint of the external system. Therefore, the performance appraisal system plays a certain role in stimulating teachers in research-teaching universities and teaching universities.

The present study has found that the performance appraisal system is a challenging stress for teachers in research-teaching universities and teaching universities in China which motivates teachers to improve their productivity and influence of scientific researches and has a positive influence on academics, so it is reasonable and necessary. At the same time, due to different scientific research abilities and career pursuits of professors, associate professors, lecturers and teaching assistants, the performance appraisal system has different influences on them: the scientific research influence of professors and associate professors has improved significantly, while their productivity has changed slightly; the productivity and influence of scientific research of lecturers have significantly improved; those of teaching assistants have not changes significantly. The conclusion offers the following suggestions for the improvement of the performance appraisal system: different appraisal indexes can be created according to different groups of teachers, such as designing the appraisal index of "quality of scientific researches" for professors and associate professors and the index of "both quantity and quality of scientific researches" for lecturers and no appraisal for teaching assistants.

The innovation of the study lies in the application of empirical methods to analyze teachers' performance appraisal system in research-teaching universities and teaching universities in China at the global level, using challenging stress theory to reveal the internal mechanism of the performance appraisal system for teachers instead of human and social capital theory used in existing literatures. The limitation is that the scope of the dependent variable is narrow, in that only the variable "article" is used to represent teachers abilities of scientific research. In fact, scientific projects, especially national projects can better manifest teachers' scientific research ability, and the narrowed independent variable may bring certain influence to the conclusion. Subsequent research will add more dependent variables to further test the reliability of the conclusion.

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Industry 4.0 and Labor Market in Iran as a Developing Country

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Abstract. Industry 4.0 is the description for the 4th industrial revolution that is based on the use of Cyber-Physical Systems (CPS) and originated in Germany. Industry 4.0 is especially beneficial in highly developed countries in terms of competitive advantage as wages are high. The aim of this paper is to find out the difference between the impacts that adoption of Industry 4.0 has on the labor markets in developing countries and advanced countries, and for this purpose Iran and Japan were selected for comparison. For a country like Iran that struggles with heavy unemployment, adopting Industry 4.0 is not wise, because the essence of industrial revolutions and specially the 4th one, is to reduce costs of production by eliminating or reducing the human interaction, in other words, automation; which would significantly affect the labor force, especially those occupied in the manufacturing and agricultural sectors. Iran has lots of problems with basic infrastructure, education, research and technologies that are needed for Industry 4.0. Adopting Industry 4.0 would have devastating effects on the Iranian labor market and specifically on the unemployment rate. It will be years before Iran could implement Industry 4.0. Japan has a much lower unemployment rate comparing to Iran, and unlike Iran has the needed infrastructure and science and technology for implementing Industry 4.0. Therefore, adopting Industry 4.0 by Japan would have some effects on the Japanese labor market but those effects wouldn't be as challenging as they are for Iran.

Key words: Industry4.0, Developing Countries, Iran, Labor force, Unemployment.

1 Introduction

The 1st industrial revolution took place in the late 18th century by utilizing water and steam to power mechanical production facilities. In the early 20th century the 2nd industrial revolution happened as mass production was introduced using electrical energy and relying on the division of labor. The 3rd industrial revolution is when information technologies and electronics were used for automation of production in beginning of 1970s.

Industry 4.0 (Industrie 4.0) is the description for the 4th industrial revolution that is based on the use of Cyber-Physical Systems (CPS) and originated in Germany. The

main aim of Industry 4.0 is to prepare the very strong German manufacturing industry for the future by integrated digitization, in order to be able to compete with USA, which is very dominant in the field of Information and Communication Technologies (ICT). [5]

The idea of industry 4.0 is appealing for other countries, and some of these countries are thinking about implementing Industry 4.0 in the near future, China is one of such countries. However, for developing countries, there are some challenges up the road towards implementing and using such advanced technologies as Industry 4.0, Iran would be a good example of developing countries in this matter.

The aim of this paper is to analyze how far Iran is from implementing such a thing like Industry 4.0 with the current science and technology policies, what would be challenging in that case, and also to describe and analyze the possible impacts that Industry 4.0 could have on the labor market in Iran and let's say in the developing countries in general, in comparison with advanced countries.

2 Methodology and Literature review

2.1 Methodology and Data

For the purpose of this paper, literature review, data analysis and synthesis, methods of description, comparison, SWOT analysis, and induction and deduction reasoning approaches are applied in order to compare Iran as a developing country to Japan as an advanced country, and to answer the following questions:

- How does Industry 4.0 affect the labor market and in particular unemployment rate?
- What is the difference between labor markets in Iran and Japan?
- What are the impacts of implementing Industry 4.0 on the labor markets of Iran and Japan?
- What factors appear to be challenging for Iran and Japan to adopt Industry 4.0?
- How far is Iran from being able to implement Industry 4.0?

The International Monitory fund (IMF), The World Bank (WB), and The Organization for Economic Co-operation and Development (OECD) didn't provide all the data needed to compare Iran with Japan or they didn't have comparable data. Therefore, relevant information and economic indicators about these countries were collected from the official webpage of the Central Intelligence Agency (CIA). Figures used in this paper however, are from Statista and are based on data from IMF and WB.

2.2 Industry 4.0

Industry 4.0 affects all areas of the industrial production process including order management, manufacturing, research and development, commissioning, delivery, utilization, and even recycling of the products. They note that the availability of

relevant information at any time and place is the basis for new opportunities, and in order to achieve this, all of resources that are involved in the process, such as humans, objects and systems, must to be integrated as an autonomously optimized value adding system that is self-organized and dynamic. [5]

Industry 4.0 is used for the following factors that are mutually interconnected: Integration, and digitalization of simple technical-economical relations to complex technical-economical networks, digitalization of offers of products and services, and it is used for new market models. Nowadays communication systems are interconnecting these activities. In industry 4.0, Internet of Things (IoT), Internet of Services (IoS), and Internet of People (IoP) would be the most promising communications technologies that would be in charge of communications between communication entities in order to utilize data. [12]

Cyber Physical Systems (CPS), are technical solutions that are connected by IoT. The aim of these systems is to reduce the gap between the physical and the digital domains. For this purpose smart solutions are needed on top of the infrastructure, such as the interaction between humans and physical systems. [5]

The main aim of Industry 4.0 is to optimize value chains, and for this purpose a dynamic production is implemented, which is autonomously controlled. This is where CPS are found to be especially helpful instruments to reach high levels of automation. CPS combined with other technologies such as microcontrollers, actuators, sensors, and means of communication create a smart factory. [2]

Germany has developed two models for digitization of industrial production, which are considered to be the most important models for the purposes of Industry 4.0, and they are called Reference Architecture Model Industry 4.0 (RAMI 4.0), and Industry 4.0 Component Model. [12]

With the current rate of advancements in science and technologies, the factory of the future would be like an interacting organism that is smart and is able to learn, unlike current factories which have a set of processes, machineries and a precise division of labor. [5]

2.3 Unemployment

The labor force is the total number of workers in the country, categorized as employed and unemployed. People who have jobs, are called employed and those who don't, unemployed. But of course, there are other people in the country, which don't fit neither one of the categories mentioned above (for example homemakers, retirees, and full-time students), these are considered as "not in the labor force". The unemployment rate is the percentage of the labor force that is unemployed. So, measuring the unemployment rate is basically the number of unemployed over the labor force multiplied by 100. Unemployment is one of obvious determinants of the country's standard of living. People who cannot find jobs or lost their jobs are not contributing to the country's production of goods and services. When a country keeps its workers as fully employed as possible, it would have a higher GDP and growth rate. [4]

2.4 Iran's policies towards science and technology

Based on the Iranian 20-year development plan, Vision 2025, it is clear that Iran's government desires to move from its resource-based economy to an economy that is based on knowledge. For this purpose Iran's policy-makers focused their attention to the country's human capital instead of industries in order to create wealth. Incentive measures were adopted firstly to increase the number of academics and university students, and secondly to stimulate problem-solving and industrial research. [1]

According to the author of "Evaluation of national science and technology policies in Iran", Iran is in a good situation in the world mostly in basic sciences like mathematics, physics, and chemistry, and has considerable achievements in science production but there is still a lot of potential in producing science. There are many underdevelopments when it comes to innovation, and Iran is considered to be very weak in management of knowledge and research. Knowledge-based industries and services have received little if no supports for their development. Based on such small support we cannot hope that Iran would be able to develop and export knowledge-based products and services in the near future. [3]

It seems unlikely that Iran would have a leading place in the world in science and technology with the conditions and underdevelopments that exist now. Iran has taken basic steps towards new and advanced technologies like nanotech, nuclear, and aerospace; but even thou they are in the Iran's 20-year plan, vision 2025, there are no evident results of these developments on people's lives. One reason for this is that the annual research budget in Iran is less than 1% of Iran's GDP and increasing, but highly unlikely to reach 4% of GDP by 2025, which is considered very low to improve weaknesses in fundamental research. With this low budget we cannot expect miracles in the field of research. [3]

Iran's educational system needs more attention; interaction of education with occupation has been the focus of Iran's science and technology planners and policy-makers for a little over a decade now, but serious and effective steps have not yet been taken. Courses and educational degrees have little or no regard for Iran's total scientific map and development of higher education in Iran has little regards for occupation, production, and society. [3]

Another problem is that intellectual properties are not protected strongly in Iran. Infrastructure and regulations for protection of intellectual properties are needed in Iran more than ever, to protect intellectual properties of other countries as well as domestic ones. This weak protection of intellectual properties limits the policies that already exist towards interaction and cooperation of Iran with other countries and regional and global centers in the field of science and technology as emphasized in vision 2025. These policies were evaluated as ineffective in the first place due to regional competition and political issues. Transfer of technology, capturing, design, and manufacturing knowledge is very low in Iran; low levels of cooperation and interaction of Iran with industrial countries based on political problems is the main reason behind this problem. [3]

Iran could use the scientific and technical capabilities of Iranian specialists who live abroad but policies towards it have produced no result yet. Unfortunately currently Iran has no policies or programs to attract foreign specialists. [3]

3 Results and discussion

Iran's Gross Domestic Product (GDP) was estimated to be $1.459 trillion in 2016 ($18,100 per capita) with a real growth rate of 4.5%; GDP was composed by 9.1 % from agriculture sector, 39.9% from industrial sector, and 51% from services sector. Among the main agricultural products we can name wheat, rice, sugar beets, fruits, nuts, and cotton. [8]

Petroleum, petrochemicals, gas, fertilizers, caustic soda, textiles, cement and other construction materials are considered to be some of the main industries. The government budget was $65.87 billion mostly from oil and gas exports and the rest from taxes with 1.6% deficit. [8]

Japan's Gross Domestic Product (GDP) was estimated to be $ 5.238 trillion in 2016 ($41,300 per capita) with a real growth rate of 1%; GDP was composed by 1.2 % from agriculture sector, 27.7% from industrial sector, and 71.1% from services sector. Among the main agricultural products we can name vegetables, rice, fish, poultry, fruit, dairy products, pork, beef, flowers, potatoes/taros/yams, sugarcane, tea, legumes, wheat and barley. [9]

Motor vehicles, electronic equipment, machine tools, steel and nonferrous metals, ships, chemicals, textiles, processed foods are considered to be some of the main industries. The government budget was $1.696 trillion with 5% deficit. [9]

In 2016 the population of Iran was estimated to be 82,801,633 inhabitants with a growth rate of 1.18% and median age of 29.4 years. From this number, 29.75 million (36% of the total population) are in the labor force, and there is a shortage of skilled labor. According to 2013 estimates, 16.3% of the labor force is occupied in agriculture, 35.1% in industry, and 48.6% in services sectors. Iran has continually suffered from high unemployment and underemployment and due to the lack of job opportunities many young educated Iranians were forced to seek jobs overseas. This has resulted in a significant brain drain. [8]

In 2017 population of Japan was estimated to be 126,451,398 inhabitants with a growth rate of -0.2% and median age of 46.9 years. 2016 estimates show that 65.93 million people (52% of total population) of Japan's population are in the labor force. According to 2015 estimates, 2.9% of the labor force is occupied in agriculture, 26.2% in industry, and 70.9% in services sectors. Japan has a relatively a low unemployment rate. [9]

3.1 Unemployment rate

Figure 1 shows the unemployment rate in the resent years as well as the forecasted unemployment rate for the following years. We can see that Iran has been

continuously suffering from a high unemployment rate and as the forecast shows this high unemployment rate will continue to be high in the near future.

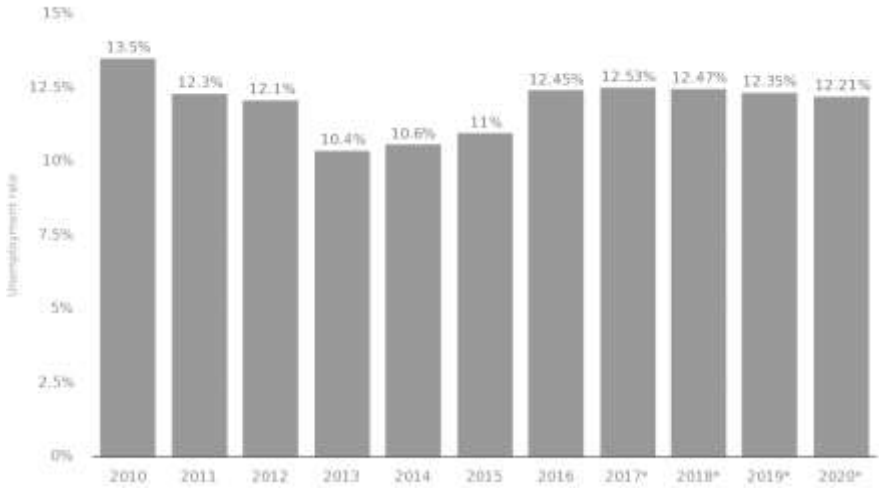

Fig. 1. Unemployment rate 2010-2020 in Iran [11]

There are many factors contributing to the unemployment rate of a country. In Iran, a large contributing factor to the total unemployment rate is the youth unemployment (ages 15-24), and was estimated in 2014 to be 24.0% in total, 21% male, and 42.8% female. [8]

Youth unemployment is currently the biggest socioeconomic concern in Iran. Religion and cultural issues and limitations could explain why female youth unemployment is significantly higher than male youth unemployment rate.

With the current unemployment rate and the positive population growth rate, and in the other hand, with the brain drain problem and lack of skilled workers in Iran, it is highly unlikely that the unemployment problem will be solved any time soon.

In the other hand Japan has a low unemployment rate that has been decreasing in the recent years, and it will be kept low according to the forecasts we see in figure 2.

One reason why the unemployment rate is low in Japan could be because Japanese policy makers have good policies towards keeping the unemployment rate as low as possible; but we cannot ignore the fact that Japan has a negative growth rate (Figure 4) and an older population than Iran. In 2016, the median age was 46.9 [9] in Japan, and 29.4 years [8] in Iran. Therefore, youth unemployment cannot be considered as a significant contributing factor in Japan's total unemployment rate if compared with Iran's unemployment rate.

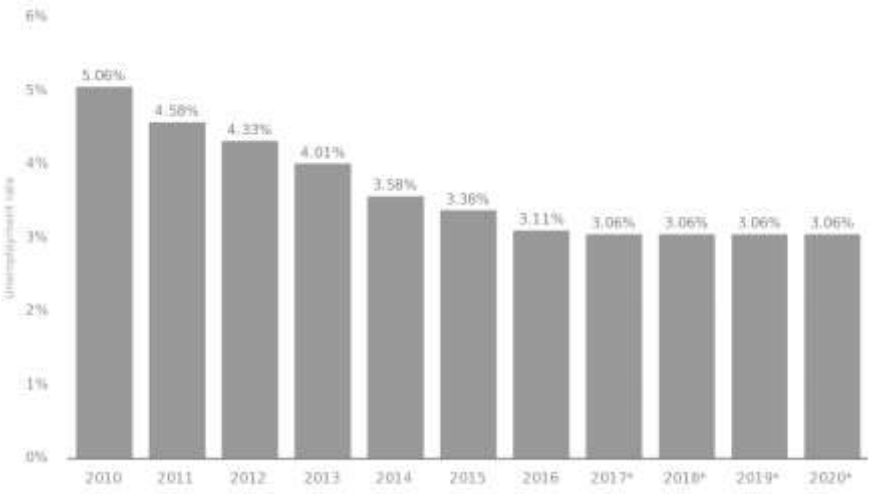

Fig. 2. Unemployment rate from 2010 to 2020 in Japan [10]

3.2 Population growth

Figure 3 shows that the population of Iran has been growing at a consistent, positive rate between the years 2005 and 2015.

With the positive growth rate, there will be more people joining the labor market every year increasing the number of people searching for jobs. This requires the policy makers to have and make better polices towards creating jobs and keeping the unemployment rate low, and if new job opportunities cannot be created accordingly, the unemployment rate will continue to be high and it might even increase.

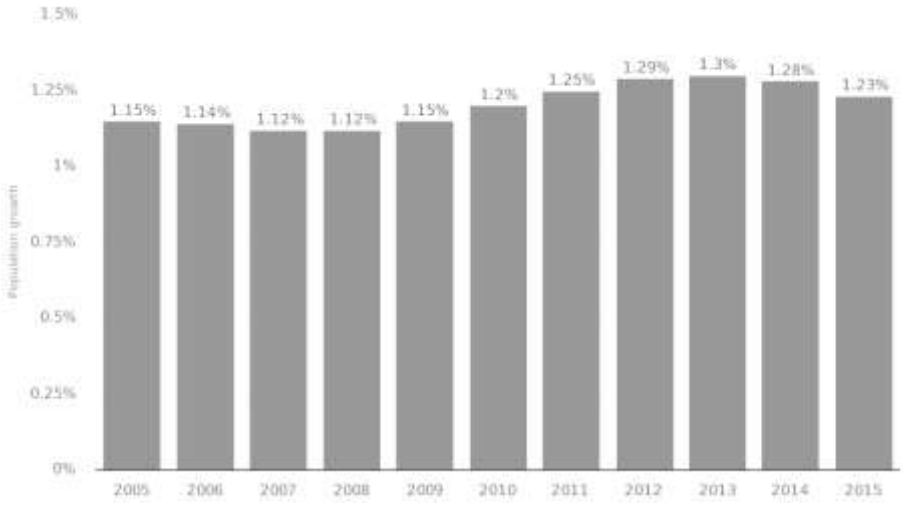

Fig. 3. Population growth from 2005 to 2015 in Iran [7]

In the case of Japan (Figure 4) however, we can see that the population is not growing at a steady rate, in the highest case Japan's population had a positive growth rate of 0.11% in 2007 and from 2011 Japan has had a negative growth rate. The impact of negative population growth in Japan's labor market, in the case that this negative growth continues in the near future, is that the labor market will get older and smaller every year, decreasing the unemployment rate slowly. However these changes are very small but still important.

Fig. 4. Population growth from 2005 to 2015 (compared to the previous year) in Japan [6]

With 35.1% of Iranian labor market occupied in the industrial sector making 39.9% of Iran's GDP, and 26.2% of Japanese labor market occupied in the industrial sector making 27.7% of Japan's GDP, it looks like Iran's industrial sector and GDP will be more affected by Industry 4.0 in percentage.

Attracting Iranian specialists has been unsuccessful and there are no plans to attract foreign specialists, so the problem of lack of skilled workers will continue in the next few years and this could also negatively affect the unemployment rate, unless necessary measures towards eliminating the problem are taken. Japan however, is not dealing with such a problem.

The education system of Iran needs some more attention from Iran's science and technology planners and policy-makers, they have to improve the scientific map and adjust the courses and educational degrees to be according to the occupation, production, and social needs.

With a budget deficit, Iran has not been able to support the research programs that are in vision 2025. Foreign Direct Investment (FDI) would be a suitable solution in this case to build the infrastructure and to improve research towards having a knowledge-economy. However this is also less likely to happen due to inconvenient international relations.

Improving the protection of intellectual property has a significant importance and needs the attention of policy makers; new rules and regulations must be made not only to protect the domestic intellectual properties but also those that belong to other countries. Doing so will help foreign countries feel protected and in return it would be possible that would increase their cooperation with Iran in different fields of science, technology, and research. In Japan intellectual properties are protected and there is a lot of scientific cooperation with other countries.

For a country that struggles with unemployment to this degree, adopting Industry 4.0 is not wise and not recommended, because the essence of industrial revolutions and especially the 4th one, is to reduce costs of production (good for Iran) by

eliminating or reducing the human interaction, in other words automation, which would significantly affect the labor force occupied in the manufacturing and agricultural sectors. Given the fact that more than half of the Iran's labor force is occupied in these two sectors, it would have a huge impact on the existing unemployment problem, and many people would lose their jobs. This doesn't mean that services sector wouldn't be affected; just the impact of it would be much larger on the agriculture and manufacturing sectors.

On the other hand, Iran has lots of problems with basic infrastructure, education, research and technology that are needed for Industry 4.0. Even if Iran didn't have an unemployment problem, eliminating these obstacles and providing preconditions for Industry 4.0 would take many years with Iran's current policies and international relations.

The labor force in Japan would be affected by adopting Industry 4.0 as well, but the difference is that first of all, they don't have unemployment problems like Iran; they have skilled workers and the science and technologies to support this change, a much higher budget and better international relations to help them with this transition.

3.3 SWOT Analysis

Based on the information and analysis above, the SWOT analysis was made for Iran and Japan to have a better perspective when dealing with Industry 4.0.

Iran

- Internal factors:
  - Iran has a large and young labor force (about 36% of the population).
  - There is a lack of skilled workers in Iran.
  - Relatively high unemployment rate.
  - Positive population growth rate.
  - Young population.
  - Intellectual properties are not protected strongly in Iran.
  - Very weak in management of knowledge and research.
- External factors:
  - Opportunity to attract FDI.
  - Opportunity to develop infrastructures.
  - Risk of increasing unemployment.
  - Weak international relations.
  - Risk of new international sanctions.

Japan

- Internal factors:
  - Japan has a large labor force (about 52% of the population).
  - Strong infrastructure.
  - Strong protection of intellectual properties.

  - Low unemployment rate.
  - Negative population growth rate.
  - Old population.
- External factors:
  - Strong international relations.
  - Opportunity to replace old workers.
  - Opportunity to increase competitive advantage.

4 Conclusions

Industry 4.0 is especially beneficial in highly developed countries in terms of competitive advantage as wages are high. [5] In developing countries such as Iran, wages are cheap, levels of unemployment are relatively high, and considerable developments are required in other basic infrastructures of such countries.

Industry 4.0 uses CPR to reach high levels of automation. Automation increases the unemployment rate regardless of how developed a country is. The only difference is how big the impact of this change would be on the economy of that country, and whether or not that country could cope with such a change. SWOT analysis show that implementing Industry 4.0 would involve more risks for Iran compared with Japan.

Iran has a relatively young population with a positive growth rate and unemployment challenges that are less likely to be solved any time in the near future. Adopting Industry 4.0 would have devastating effects on the Iranian labor market and specifically on the unemployment rate.

On the other hand, Japan has an older population and much lower unemployment rate comparing to Iran, and unlike Iran has the needed infrastructure and science and technology for implementing Industry 4.0. Therefore, adopting Industry 4.0 by Japan would have some effects on the Japanese labor market but those effects wouldn't be as challenging as they are for Iran.

In order to successfully manage to increase research and development in knowledge management and applied sciences and successfully manage to develop the infrastructure for using Industry 4.0, Iran has to take some serious steps towards developing better international relations and cooperation.

Better protection of intellectual properties, and making better policies and programs are needed to attract foreign specialists and Iranian specialist who live abroad. Brain drain is another problem Iran has that must be dealt with as soon as possible.

The research budget in Iran has to increase in order to increase research and development in the knowledge management and applied sciences. For this purpose Foreign Direct Investment is a suitable solution.

With the current position of Iran in science, technology, and economy, it will be years before Iran could, or better say should, implement Industry 4.0.

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Material Investments as a Factor of Restructuring Small Agricultural Holdings with Non-agricultural Activities

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Abstract. The aim of the study is to analyse material investments carried out between 2004 and 2015 by small agricultural holdings owners conducting at the same time non-agricultural activities and their plans regarding the future of their activities. The empirical material consisted of results of own survey-based research conducted in 2015 among farmers from Małopolskie Province owning agricultural holdings of 1–5 ha of arable land and conducting non-agricultural activities at the same time. Analysing the directions of devoting resources to investments, it was found that these persons usually invested both in agricultural and non-agricultural activities; some regularities of directions of devoting resources depending on the type of non-agricultural activity can be observed though. In general, more resources were devoted to non-agricultural activity. The research showed that both the nature of investment decisions of the farmers and their declarations demonstrate willingness to conduct agricultural and non-agricultural activities simultaneously.

Keywords: Small Farms, Non-agricultural Activities, Investments.

1 Introduction

Since the beginning of the 1990s, intense transformation processes polarising the spatial, production, and economic structure of agricultural holdings have been observed. These changes are a result of the changing position of agriculture in the economy and broad socio-economic changes taking place in Poland, including its rural areas [5, 8]. So far, science and economic practice have focused mainly on bigger holdings conducting marketable production and having potentially better developmental abilities. Less attention was paid to smaller and economically weaker holdings and the necessity of reducing their number was considered the main direction of restructuring of the agricultural sector in Poland [2, 6, 9].

Statistical data shows a systematic decrease in the number of small agricultural holdings in Poland. According to Eurostat, in 2013 there were 770 thousand holdings with less than 5 ha of arable land, whereas in 2010 there were over 823 thousand [1]. It is worth noting that they show high permanence and form dominant structures in many regions of Poland. Their permanence is a result of many noneconomic factors determining the behavior of the owners of these entities on one hand and of the fact that the owners usually also have non-agricultural or unearned sources of incomes,

which make small holdings, contrary to the big ones, resistant to different economic incentives and less vulnerable to increasingly frequent fluctuations on agricultural markets. Additionally, they are dependent on political changes and unstable agricultural policy to a lesser extent [4, 7, 10]. Therefore, they will surely prevail in many Polish regions for a long time to come.

Due to the economic weakness of many small agricultural holdings, some of their owners still look for opportunities to increase their incomes, choosing diverse strategies. Some decide to specialise or intensify agricultural production and focus on the segments allowing for a reasonable rate of return. These actions are usually accompanied by land extension, holding modernisation, starting cooperation with other entities on the market, which creates opportunities for the gradual accession of these holdings into the group of developmental and commercial holdings closely related with the market. The second group consists of agricultural holdings owners looking for alternative sources of income, such as employment or non-agricultural business activity of the farmer or their family. Diversifying income sources may lead to numerous benefits, but also to reduction of agricultural activity or, in extreme cases, to slow withdrawal from it leading to total liquidation of an agricultural holding [3, 9].

This study focuses on small agricultural holdings owners following the second path, i.e. diversify their incomes through non-agricultural activities. Their investment activity both in agricultural and non-agricultural activity is analysed. The investments may be considered one of the main determinants of development, both for agricultural holdings and non-agricultural entities, thus investment decisions are among the most important decisions made by these entities. The prospective competitiveness of agricultural holdings and non-agricultural entities, and thus the ability of income generation of farmers and their families depend on the accuracy of these decisions.

2 Research objective and methodology

The main aim of the study is to analyse material investments carried out between 2004 and 2015 by small agricultural holdings owners conducting at the same time non-agricultural activities and their plans regarding the future of their activities. The empirical material consisted of the results of own survey-based research conducted in 2015 on the development of non-agricultural activities of the owners of small agricultural holdings. The research included farmers from the Małopolskie Province owning agricultural holdings of 1–5 ha of arable land. The region was selected on purpose, as the Małopolskie Province has one of the most fragmented agricultural structures in Poland.

Due to the research subject, i.e. the analysis of investment activity of farmers conducting additional non-agricultural activity, a list of farmers owning holdings of 1–5 ha of arable land, who between 2004 and 2015 obtained investment aid from programmes carried out within the Common Agricultural Policy such as the Rural Development Plan for 2004–2016, Sectoral Operational Programme "Restructuring and Modernisation of the Food Sector and Rural Development 2004–2006", and/or

Rural Development Programme for 2007–2013 at least once was the assumed sampling frame. The research was conducted in several stages. During the first stage, 301 randomly selected farmers were included in the research. Among them, 80 farmers conducting non-agricultural economic activity were identified and qualified to the subsequent stages. The respondents came from 41 municipalities in 14 district of the Małopolskie Province.

3 Research results

Farmers owning agricultural holdings with 1–5 ha of arable land conducting non-agricultural business activities at the same time participated in the study. In Table 1, selected traits of the respondents and their agricultural holdings are presented. Men prevailed in the studied population. The largest group were persons between 30 and 40 years old (40% of all respondents) and the second largest group were persons between 40 and 50 years old (37.5%). Study participants were characterized by a relatively high level of education, as 73.7% have completed secondary or tertiary education, and only 26.3% have completed basic vocational education. Simultaneously, over half of the respondents had an agricultural education.

Farmers with diverse areas of arable land participated in the study. Almost 59% had over 4 ha of arable land, one fifth between 3 and 4 ha, 11% between 2 and 3 ha, and 10% up to 2 ha. All respondents conducted plant production. The dominant crops, i.e. crops with the biggest economic significance in a given agricultural holding included: cereals, vegetables cultivated outdoors and under covers were indicated the most often. At the same time, only 11.0% of the studied holdings conducted animal production, usually pigs.

In addition to agricultural activity, the respondents conducted non-agricultural activity (Table 2). It was mostly registered activity (91.2%). Only 8.8% respondents conducted rural tourism activity, which is a non-registered agricultural activity.

The majority of respondents provided services (67.5%), mostly concerning construction, services provided to agriculture, or rural tourism. Trading activity, mostly wholesale of fruits and vegetables, and production (food processing, metal products manufacturing, furniture production) was much less popular. The time of conducting such activity varied, but for 81.2% respondents it was over 2 years. Over three quarters of the respondents started their non-agricultural activities in 2004 and in the subsequent years. 52.5% did not employ anyone for purposes of their non-agricultural activity, which shows that it usually took on the form of self-employment. Usually, it was local or regional. Only 16.2% declared the whole country as their market.

Table 1. Selected traits of the respondents and their agricultural holdings

Selected traits		No. of answers	% of answers
Gender	woman	13	16.2
	man	67	83.8
Age of the respondent	over 30 to 40 years	32	40.0
	over 40 to 50 years	30	37.5
	over 50 years	18	22.5
Education of the respondent	basic vocational	21	26.3
	secondary vocational	34	42.5
	secondary general	3	3.7
	tertiary	22	27.5
	has agricultural training	44	55.0
	no agricultural training	36	45.0
Area of arable land in the holding	up to 2 ha	8	10.0
	over 2 to 3 ha	9	11.2
	over 3 to 4 ha	16	20.0
	over 4 ha	47	58.8
Dominant plant production	cereal	32	40.0
	potatoes	8	10.0
	vegetables	32	40.0
	cultivation under covers	27	33.8
	fruit trees and shrubs	6	7.5
	other crops	13	16.3
Animal production conducted	cattle for slaughter	2	2.5
	dairy cattle	3	3.8
	pigs	4	5.0
	horses	1	1.3

Table 2. Characteristics of non-agricultural activities of the respondents

Selected characteristics		No. of answers	% of answers
Length of the period of conducting non-agricultural activity	less than 2 years	15	18.8
	2 to 5 years	29	36.2
	over 5 years	36	45.0
Number of employees	no employees	42	52.5
	1 employee	24	30.0
	2 or more employees	14	17.5
Market of non-agricultural activity	local	34	42.5
	regional	33	41.3
	national	13	16.2

During the research, an attempt to identify all investment measures used by the farmers–entrepreneurs between 2004 and 2015 for the development of their agricultural or non-agricultural activity and the value of investment expenses incurred and subsidies granted was made. The relevant data is presented in Table 3.

Table 3. Basic characteristics of support granted to the respondents between 2004 and 2015 within the studied programmes

Programme, Measure	Subsidy amount	Subsidy value (thousands PLN)	Projects gross value (thousands PLN)
121 Modernisation of farms	35	3,818.6	9,295.9
123 Increasing the added value to primary agricultural and forestry production.	1	690.0	1,792.0
126 Restoration of agricultural land and production potential damaged by natural disasters and catastrophic events.	2	300.0	369.4
311 Diversification towards non-agricultural activity	65	5,727.7	14,201.1
312 Formation and development of micro-enterprises	9	1,915.3	4,344.2
Total of RDP 2007-2013	**112**	**12,451.7**	**30,002.7**
1.1 Investments in agricultural holdings	18	1,943.5	4,614.0
1.2 Setting up of young farmers	8	400.0	400.0
2.4 Diversification of rural activities and similar activities in order to ensure variety of activities or alternative sources of income	8	669.0	1,581.2
Total of SOP "Restructuring..." 2004-2006	**34**	**3,012.5**	**6,595.1**
RDP 2004-2006, Supporting semi-subsistence holdings	2	34.9	34.9
SAPARD, 1.1.2. Support for restructuring of processing and improving the marketing of fruits and vegetables	1	40.0	95.0
TOTAL, including:	**149**	**15,539.1**	**36,727.7**
agricultural activity development	65	6,497.0	14,714.2
non-agricultural activity development	84	9,042.0	22,013.5

80 studied beneficiaries obtained 149 investment subsidies of PLN 15.5 million in total, carrying out project the total value of which was PLN 36.7 million. Most of the subsidies were granted within the Rural Development Programme (RDP) for 2007–2013, which constituted 80.1% of the overall amount of support. Additionally, the beneficiaries obtained subsidies from the Sectoral Operational Programme "Restructuring and Modernisation of the Food Sector and Rural Development 2004–2006", the value of which was 19.4% of the overall amount of support. There were also two beneficiaries of the Rural Development Plan for 2004–2016 and one of the Sapard pre-accession programme.

The analysis of the structure of the subsidies showed that 65% subsidies for agricultural activities development for a total amount of PLN 6.5 million for carrying out projects worth PLN 14.7 million in total, and 84 subsidies for non-agricultural activities development for a total amount of PLN 9.0 million for the purposes of projects worth PLN 22.0 million in total were obtained in the studied period. This means that over a half of the subsidies allocated to non-agricultural activities development, which constituted 58.2% of all the support in value terms. It is worth noting that investment outlays on non-agricultural activity constituted 59.9% of total outlays, which can lead to a conclusion that they were usually more capital-intensive than investments made in agricultural holdings. The average value of a funded investment project was PLN 262.1 thousand for non-agricultural activity and PLN 226.4 thousand for agricultural activity. The largest subsidies of investment outlays were granted between 2007 and 2013 from the Rural Development Programme, whereby investments in agricultural holdings were co-financed mostly from measure 121 - Modernisation of farms, whereas non-agricultural activity support came mostly from the resources of measure 311 - Diversification towards non-agricultural activity.

The analysis of the structures of investment outlays on the development of agricultural and non-agricultural activities showed that they were similar (table 4). Among the expenses on agricultural activity, expenses on the purchase of machines, instruments, tools, and equipment prevailed (65.8% of overall subsidy value). Funds were also allocated for the extension or modernisation of holdings and increase in arable land. Farmers investing in non-agricultural activity development also spent their resources mostly on the purchase of machines, instruments, tools, and equipment. Another direction of spending were the extension or modernisation of holdings, construction of new facilities for the purpose of non-agricultural activity, and the extension or modernisation of residential buildings for rural tourism purposes and their equipment.

All respondents benefited from the subsidies within the studied programmes. 27.5% benefited from a donation granted within 1 measure and 57.5% obtained subsidies from two different measures. 15.0% obtained support three times. Therefore, one can conclude that the studied group of farmers was very active in terms of acquiring EU funds for investments.

Table 4. Value and structure of subsidies classified by categories of investment outlays incurred

Investment expense category	Investments in agricultural activity		Investments in non-agricultural activity	
	Subsidy value (thousands PLN)	Share in the total subsidy amount [%]	Subsidy value (thousands PLN)	Share in the total subsidy amount [%]
purchase of machines, instruments, tools, and equipment	4,275.1	65.8	5,829.6	64.5
increase of arable land	620.0	9.5	-	-
extension or modernisation of holdings	1,300.0	20.0	1,700.0	18.8
extension or modernisation of buildings for rural tourism purposes and their equipment	-	-	493.8	5.5
construction of a new building	-	-	888.7	9.8
purchase of a mean of transportation	-	-	130.0	1.4
agricultural holding land development	292.0	4.5	-	-
Purchase of animals	10.0	0.2	-	-
Total investment expenses	6,497.0	100.0	9,042.0	100.0

The development of agricultural activity by farmers owning small agricultural holdings may pose some risk of marginalising the importance of agricultural activity. Launching alternative types of activity may lead to the cessation of investments in agricultural activity and relocation of resources to activities providing higher revenue, the consequence of which may be the slow, several-stage liquidation of agricultural holding. However, research results show that the owners of small agricultural holdings usually tried to invest in both activities at the same time. 58.7% respondents made parallel investments in both types of activity. A little over one third of the studied group (36.3%) benefited from subsidies only for the development of agricultural activity and only 5.0% invested only in agricultural activity.

The analysis of directions of investments in different types of non-agricultural activities provided interesting conclusions (Table 5). Thus, it should be stated that conducting non-agricultural activities in a sector not related with existing agricultural activity and not based on any agricultural holding resources clearly encouraged farmers to invest only in non-agricultural activity. In this case, only 13.0% of farmers conducting non-agricultural activity invested also or only in their agricultural activity.

Table 5. Percentage of farmers investing in agricultural and non-agricultural depending on type of non-agricultural activity

Type of non-agricultural activity	Examples of activities of the respondents	Investment direction [% of answers]			Total
		agricultural activity	non-agricultural activity	agricultural and non-agricultural activity	
Activity not related with existing agricultural activity conducted outside own agricultural holding or in own agricultural holding without using its resources	construction services, furniture production, technical counselling, food production not based on processing own agricultural holding products	4.3	87.0	8.7	100.0
Activity not related with existing agricultural activity, but based on agricultural holding resources	accommodation and catering services, including rural tourism, diverse types of service provision or production	0.0	46.7	53.3	100.0
Related activity, connected with existing agricultural activity, based on agricultural holding resources	services supporting agriculture, rental and leasing of agricultural machines and instruments	8.7	8.7	82.6	100.0
Activities including activities preceding or following the existing process of agricultural production	wholesale of own agricultural products, processing of own agricultural products	5.3	0.0	94.7	100.0

Conducting an activity unrelated with the existing agricultural activity, but using the resources of agricultural holding, such as rural tourism activity, also resulted in investing mostly in non-agricultural activity, but encouraged farmers to simultaneously invest in agricultural activity to a greater extent. The farmers were encouraged to invest in agricultural holdings and non-agricultural activity in parallel usually by the activities that were related to agriculture, connected with the existing activity, or included activities preceding or following the existing process of

agricultural production. The percentage of farmers investing in both types of activities was 82.6% and 94.7%, respectively.

During the research, farmers' plans regarding their future agricultural and non-agricultural activities were also analysed. The answers show that all farmers who invested both in agricultural and non-agricultural activities between 2004 and 2015 want to keep developing these activities simultaneously. Among the farmers who invested only in the development of non-agricultural activities in the studied period, 65.5% plan to stop conducting agricultural activity and focus only on non-agricultural activity. The remaining 34.5% want to keep developing these activities simultaneously. The majority of persons who invested only in their agricultural holdings plan to keep combining the two types of activity and only one person wants to withdraw from agriculture. In general, a quarter of the respondents wants to stop conducting agricultural activity in favour of a non-agricultural activity, whereas three quarters of them plan to conduct both types of activity simultaneously, diversifying their sources of income.

4 Conclusions

Analysing the directions of devoting resources to investments carried out between 2004 and 2015 by small agricultural holding owners conducting non-agricultural business activity at the same time, it was found that these persons usually invested both in agricultural and non-agricultural activities A smaller group of respondents invested only in non-agricultural activity, whereas only a few persons invested only in their agricultural activity. However, it was found that larger investments were made in non-agricultural activities. In this area, more investments were carried out in terms of both number and value. Non-agricultural investments were usually more capital-intensive than investments in agriculture. The material structures of the incurred outlays were similar: thanks to investments, the respondents expanded their fixed assets resources, mostly machines, instruments, tools, and equipment. Outlays on new or existing farm buildings or other types of material investments were incurred much less often.

The directions of devoting resources to investments were determined by the nature of non-agricultural activity. It can be stated that close relation of non-agricultural activity with the holding encouraged investments in both types of activity more often, whereas conducting non-agricultural activity not related with agriculture and not based on agricultural holding resources was more likely to encourage farmers to invest only in non-agricultural activity.

As mentioned before, the diversification of sources of income thanks to non-agricultural activity may lead to a gradual reduction of agricultural activity, and in extreme cases, to the total liquidation of an agricultural holding. Research results show that obtaining a source of income thanks to investing in non-agricultural activity is a factor encouraging every fourth farmer to withdraw from agricultural activity in the future. This concerns mostly those who carried out investments in non-agricultural activity, so mostly persons conducting non-agricultural activity not related with

agriculture or agricultural holding. They will undergo a process of gradual reduction of agricultural activity, which may lead to withdrawing from it, ultimately leading to the total liquidation of a small agricultural holding.

However, three quarters of respondents do not plan to abandon their agricultural activities. They choose the strategy of development of non-agricultural business activity considering it an additional source of income. Therefore, it can be stated that for them, the non-agricultural business activity is a factor supporting the survival or even the development of an agricultural holding. Undertaking activities related with agriculture or agricultural holdings and using their resources contributes to the implementation of this strategy.

In light of research result, it can be concluded that the two areas of activity conducted by small holdings owners, i.e. agricultural and non-agricultural activity, are interconnected and material investments are a factor stimulating the implementation of two different strategies of restructuring small agricultural holdings. In the case of economically weak holdings, they allow farmers to withdraw from agricultural activity thanks to the development of non-agricultural activity. On the other hand, the operation and development of an agricultural holding usually depend on the possibility of support of agricultural activity through non-agricultural activity. In this case, they become factors allowing for the survival or even development of a small agricultural holding, assuring a non-agricultural source of income thanks to opportunities or resources acquired through non-agricultural activity.

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Prospects for the Development of Small Farms in Poland

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Abstract. The aim of the paper is to present the directions of changes in the group of small farms in Poland resulting from the influence of the instruments of the Common Agricultural Policy. The results of our own surveys, carried out on a representative group of 296 small farms in 2016, were used. The results of the empirical studies presented in this paper show that the assistance rendered to small farms within the framework of selected instruments of the Common Agricultural Policy was conducive to their transformation into modern entities, due to the support of their modernization processes, changes in the scale and structure of agricultural production, thus contributing to the economic strengthening of the farms. The investments concerned the extension of the land area and manpower resources in farms only to a small extent, but they resulted in a more efficient use of the resources obtained so far. Positive changes were also made in the degree of the yield of marketable agricultural output of the farms analyzed. Due to the great heterogeneity of small farms in Poland, in the future, they may step onto different paths of change, focusing on the development of agricultural activity, its continuation, or liquidation.

Keywords: Small Farm, Common Agricultural Policy, Prospect for Development

1 Introduction

The lack of a uniform definition of the notion of a small farm, both at the level of the European Union as a whole and in its individual Member States, constitutes a major problem which hinders both the analysis of data regarding a group of small farms and shaping of the policy for the group of farms. Defining and counting small farms is difficult as their size can be expressed either in physical units or with the use of economic terms [1, 5, 7, 10]. Both in the European Union and in Poland, the most commonly used criterion is surface area, i.e. the criterion based on the number of hectares of UAA (Utilised Agricultural Area) owned by the farm [2]. This is not a perfect criterion, primarily due to huge differences between farms among the EU countries and agricultural production areas, but it is relatively the easiest to use due to the availability of data.

It is most frequently assumed that small farms are those with less than 2 or, in a different take, less than 5 hectares of UAA. Statistical data indicate that in 2013, there were slightly more than 7 million small farms in the European Union with less than 5

hectares of agricultural land, including 2 million farms with less than 2 hectares of land. However, there are large differences between individual countries in the size of a group of small farms. In 2013, farms with less than 5 hectares of land accounted for 64.71% of all farms in EU-28, but in the EU-15, this percentage was only 45.82%, whereas in Member States that joined the EU in 2004, 2007 and 2013, the percentage was 77.80% of all farms. The new EU Member States are characterized by greater fragmentation of farms. In absolute terms, the largest number of small farms with up to 5 ha were found in Romania, Poland, Italy and Greece. In relative terms, the largest share of farms with up to 5 ha was in small States, such as Malta and Cyprus, as well as in Romania and Bulgaria. A high proportion of small farms in the total number of farms is not unique to the countries which joined the European Union in 2004, 2007 and 2013. Small farms predominate in the southern States of the EU-15, where a large proportion of them are farms with less than 2 ha. This situation is in stark contrast to the land structure of farms located in the north-western part of the EU-15 [3].

As a result of Poland's accession to the European Union in 2004, Polish agriculture and rural areas have been included in the system of support within the Common Agricultural Policy (CAP). The operation of farms in the single internal market and the implementation of the CAP instruments have resulted in favorable changes in the agrarian structure of farms. The number of farms in Poland has decreased while their average land area has increased. These changes, however, had different directions in the cross-section of particular groups divided on the basis of the size of the land owned. The number of farms in Poland is still strongly diversified depending on territory and, in spite of positive changes, there are still mini farms and small farms whose area of agricultural land does not exceed 5 ha [12].

Agriculture and farms in Poland are characterized by a large spatial variation in regional terms. This diversity is a result of numerous diverse factors, such as environmental, demographic or economic [8]. In the territorial system of the country, at least three agricultural subregions, based on the size of the farms, can be distinguished. The first subregion covers the south-eastern territories of Poland. These areas are characterized by heavily fragmented agriculture. It is home to a large number of small farms, frequently social or residential in nature, while the share of medium and large farms is small in the subregion. Another subregion covers the central part of Poland and the Lower Silesian and Podlaskie Provinces, in which the statistical farm owns between 8 and 16 ha of land. In contrast, the third subregion consists of provinces located in the western and northern parts of the country, and their land area is statistically the largest [6].

2 The purpose and methodology of research

The aim of the paper is to present the directions of changes in the group of small farms in Poland resulting from the effects of the Common Agricultural Policy (CAP) instruments. The results of our own survey which was carried out in 2016 on a representative group of 296 small farms in Małopolskie Province, were used. The main objective of the research was to identify the CAP instruments used by small

farms between 2004-2015, as well as to identify the changes made in the analyzed small farms under the influence of the instruments, in the scope of equipping them in production factors, the scale of production and directions of its use. Due to a wide range of the issues studied, empirical research was limited to selected instruments implemented within the framework of the Common Agricultural Policy which supported the investment activity of farms [11].

The relationship between the change in the share of production destined for the market of the farms analyzed in 2015 in relation to 2004, and the changes which occurred in these farms under the influence of the CAP in 2004 - 2015 in the resources of labor, land and livestock assets, was also analyzed. For this purpose, Pearson's correlation coefficient was estimated, as it allows for the estimation of the strength and type of relationship between two statistical features X and Y. This was calculated according to the following formula [4]:

$$r_{XY} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \sum_{i=1}^{n}(y_i - \bar{y})^2}} \quad (1)$$

where $x_i,\ y_i\ (i = 1,2...,n)$ is the realization of the features X, Y, respectively, while $\bar{x},\ \bar{y}$ - are the arithmetic mean of the features X, Y.

The reason for choosing the spatial scope of the research was the fact that the Małopolskie Province in Poland belongs to the group of regions with a very fragmented agrarian structure of agriculture. It is home to a large number of small farms, often social or residential in nature, while the share of medium and large farms is insignificant. The basic agriculture characteristics show that the position of the Małopolskie Province is worse compared to other parts of Poland. Apart from the large fragmentation of the agrarian structure of agriculture, the specificity of the Małopolska agriculture stems from agrarian overpopulation, a predominant lack of specialization in agricultural production, and a low level of the yield of marketable agricultural output and labor productivity in agriculture. The agriculture of the Małopolskie Province is characterized by a large spatial diversity, which is largely determined by environmental conditions. Good soil and climate conditions occur only in the northern and central parts of the Province, while in the southern part, none of the elements of the environment are favorable to agriculture [13].

Entities with the area of agricultural land of 1 to 5 ha (the size at the time of the survey) were subjected to the analysis as small farms. In defining small farms, the economic criterion was rejected due to the lack of possibility to obtain a priori, the data regarding the economic size of a farm when determining the population studied. However, the adoption of such assumptions led to the situation when also small-sized, but specialized farms have been included in the research. Still, it is worth noting that, in analyzing the problem of the state of agriculture and farms in Poland, it is

important to consider predominantly the size of the land owned, as it is the size of the land that exercises a decisive influence on the production and economic possibilities of numerous farms.

The probability sampling technique (random selection) was used in order to obtain a representative sample of small farm population units. In random sampling, stratified sampling was used. The sampling scheme applied and the sufficient sample size ensured the representativeness of the research results.

3 Changes in small farms under the influence of selected instruments of the Common Agricultural Policy

In analyzing the changes which occurred between 2004 and 2015 in the analyzed small farms under the influence of selected instruments of the Common Agricultural Policy, it must be stated that the influence of the instruments on the functioning of small farms in the area of production factors was rather one-sided and consisted mainly in the increase of the physical capital resources.

In the case of small farms, the expected effect of changes in the scope of the production factor (i.e. the land) is the enlargement of the area, which allows for production growth and creates the opportunity for some small and semi-subsistence farms to be transformed into more commercial farms, more closely linked to the market. A parallel, desirable scenario of changes is the reduction or withdrawal of a part of small farms from agricultural production with simultaneous taking over of their land by other farms.

The results of the research conducted indicate that, in the period between 2004-2015, the examined CAP instruments had a relatively small impact on the changes in the resources of the land owned by the farms subjected to analysis. Only 18.2% of farmers introduced changes in the resources of the land used, while in one case, the area of the farm was reduced, while the remaining farmers, i.e. 17.9% of the total respondents expanded the area of their agricultural land. The total extension of the area of agricultural land declared by the surveyed farmers was 41.1 ha. Taking only those farms which have expanded their area into account, it can be stated that the area of agricultural land owned by these farms increased by 3.7%, which is, on average, less than 0.8 ha per farm (among those which expanded the area of land), but it's only 0.14 hectares per farm, if we take the entire population analyzed into consideration. The results of the research of other authors also acknowledge the fact, that farmers are reluctant to changes in the land area of their farms [9].

The implemented CAP instruments had positive effects in the form of changes in the cultivation area in the examined farms. As many as 60.5% of farmers indicated that due to the investments made, they expanded their cultivation area. The total extension of the cultivation area was 136.6 hectares, which is an increase of 11.8% and 0.46 ha per one farm analyzed. With respect to the population of farms which expanded their cultivation area, the increase reached 18.7%, which was, on average, less than 0.8 ha per farm (of those which expanded their cultivation area). It should be emphasized that, when expanding their cultivation area, farms were more inclined to

launch specialized production which yields higher income, than to increase the production of industrial plants, or cereals and potatoes, which require a larger area of agricultural land for the production to be profitable.

The development activities, carried out in small farms under the influence of the CAP support, have led to an increase in the scale of not only plant production, but also animal production. Of 80 farms which carried out livestock production during the research, 67, i.e. 22.6% of the total number of farms analyzed, launched or developed this type of production in connection with the use of the CAP instruments. Most often, they increased the number of dairy cattle and pigs, as the breeding of these animals is most popular in small farms. A much smaller percentage of respondents indicated an increased number of slaughter cattle or poultry.

The analysis of changes in the labor force has shown that the support in the form of the Common Agricultural Policy instruments which are the subject of the analysis, did not contribute to significant changes in equipping farms in labor resources. During the period under analysis, almost 84% of farmers did not make any changes in the level of employment on their farms that would be a result of the implementation of the Common Agricultural Policy instruments. Only 15.5% of farmers increased their employment under the influence of the CAP, indicating growth in production and the extension of the area of crops as the most common reason for these changes. Of the respondents, 0.7% indicated that the employment on their farm was reduced. The farmers who increased the employment, mainly wage laborers which accounted for 63.2% of newly-employed workers, while 36.8% constituted family labor force. In the group of farms which declared an increase in the number of jobs, an average of 1.2 of new jobs per farm was created, which constitutes just 0.2 of new jobs per all of the small farms analyzed. Taking the results of the research into account, showing the more efficient use of land which resulted in an increase in the scale of production on the farm, it can be concluded that, as regards labor resources, small farmers have also striven to make more effective use of their labor resources without increasing employment on their own farms.

In order to carry out any economic activity, one must have appropriate assets, among which material resources play an important role. The size and quality of material resources are an important factor which determines the economic efficiency of using other production factors. When analyzing the changes which took place between 2004 and 2015 in the analyzed small farms in Poland under the influence of selected CAD instruments in the scope of the level of equipment of small farms in the physical capital, it was found that investments consisting in supplementing and modernizing the machinery park were among those most frequently implemented on the farms. Some of the respondents also used aid funds for the construction or modernization of farm buildings. Such expenditure was incurred by a total of 90.6% of the farmers surveyed. These investments, undoubtedly, contributed to the increase in the physical resources owned by the farms analyzed, and led to the growth and modernization of the production carried out on the farm, which may have an impact on their competitiveness on the market. The investments co-financed from the EU funds concerned an increase in the land owned by farms only to a small extent, which may be due to objective conditions, such as the lack of possibility to reimburse land

purchase costs, or the lack of possibility of purchasing them in the vicinity of the farm owned. This can be considered a disadvantage, especially in the conditions of high agrarian fragmentation of farms.

In the course of the research, the impact of selected CAP instruments on the directions of allocating agricultural production in the analyzed small farms was also determined. The relationship between the change in the share of production of the farms analyzed in the year 2015 in relation to 2004, and the changes which occurred on these farms under the influence of the CAP between 2004 - 2015 in terms of labor resources, land area and livestock assets, was also examined. The manner of distributing agricultural production has a major influence on the income of the farm, thus deciding not only on the personal income of a farm family, but also on the possibilities of undertaking development projects on the farm. Therefore, it is important whether and, if so, which part of the farm's production is destined for the market and which is stored for self-supply.

The research results show that in 2015, as many as 82.1% of the farmers surveyed declared that, compared to 2004, they increased the percentage of marketed production. In the case of 16.2% of farmers, the proportion between the production for self-supply and the production for the market did not change during the period under analysis. In contrast, only 1.7% of respondents indicated that, in percentage terms, a larger share of production was allocated to self-supply in 2015, than in 2004. It can, therefore, be concluded that the changes which took place in the period between 2004-2015 in the analyzed small farms have led, in most cases, to an increase in the degree of their connection with the market.

In order to determine, on the farms analyzed, the dependence between the changes in the share of production destined for the market in 2015 compared to 2004, and the changes which were made in these farms under the influence of the CAP in the period between 2004 - 2015 in labor resources, land area and livestock assets, Pearson's correlation coefficient was calculated.

The value of the correlation coefficient for variables describing changes in the following:

- X_1 - the number of workers,
- X_2 - the area of agricultural land,
- X_3 - the size of the land area destined for plant production,
- X_4 - the number of animals held,
- Y_1 - the volume of production destined for the market,

in comparison with 2004, is presented in Table 1.

The calculations have shown that a statistically significant positive correlation is only between the change in the land area destined for plant production and the change in the share of production destined for the market. The change in the share of the production destined for the market by small farms is not dependent on the change in the number of people working on the farm, or the change in its area of agricultural land, or the change in the number of animals held on the farm. Therefore, the use of land owned by the analyzed small farms affects the volume of sales on the market. The expenditures in the analyzed farms, co-financed by the CAP, contribute to a

greater and better use of the land owned by the farms, which, in turn, translates into an increase in the share of production destined for sale on the market, and may result in an increase in the degree of the yield of marketable agricultural output of small farms.

Table 1. The values of Pearson's correlation coefficient between the features analyzed.

Specification		**Quality**			
		X_1	X_2	X_3	X_4
Feature	X_1	1.000			
	X_2	0.224*	1.000		
	X_3	0.218*	0.348*	1.000	
	X_4	-0.033	-0.055	-0.141*	1.000
	Y_1	0.102	0.063	0.341*	0.009

* means a significant dependence with $\alpha = 0{,}05$.

And so, the use of aid funds within the framework of the CAP has contributed to numerous changes in farms. Among the most important changes observed in the period between 2004 – 2015 in the farms analyzed under the influence of the CAP, the respondents indicated changes related to the modernization of the machinery park (63.9%) and production growth (55.7%). In addition, it was pointed out that the CAP instruments constituted a stimulus for the extension or modernization of the farm infrastructure (27.7%) and implementation of new technologies and production methods (26.7%). For 25.0% of farmers, the CAP instruments have become a stimulus for undertaking non-agricultural activities. Farmers' activities undertaken in connection with the support received, often resulted also in the improvement in animal welfare and introduction of changes in the production structure, as indicated by 19.3% and 15.5% of respondents, respectively. Under the influence of the CAP activities, one in ten respondents chose to increase their professional qualification, while for nearly one in ten respondents, the money transfers created the conditions for increasing the area of the farmland owned. Launching cooperation with other farms in the field of distribution of raw materials or commodities, or changes related to increasing the level of environmental protection, employment growth or implementation of agri-environmental measures were mentioned most rarely as the result of the impact of the CAP. The negative impact of the CAP on the activity of small farms was also indicated. Negative changes caused by the analyzed CAP instruments included a reduction in employment and the reduction of the agricultural area. However, these changes were only indicated by several respondents.

4 The directions of changes in a group of small farms in Poland

When analyzing the changes occurring in the functioning of small farms in Poland on the basis of the subject literature and own research among small farms in the Małopolskie Province, it should be stated that there is not a sole appropriate direction of changes in the group of small farms in Poland, as the group is not homogeneous. For this reason, the changes will take various directions (Fig 1.).

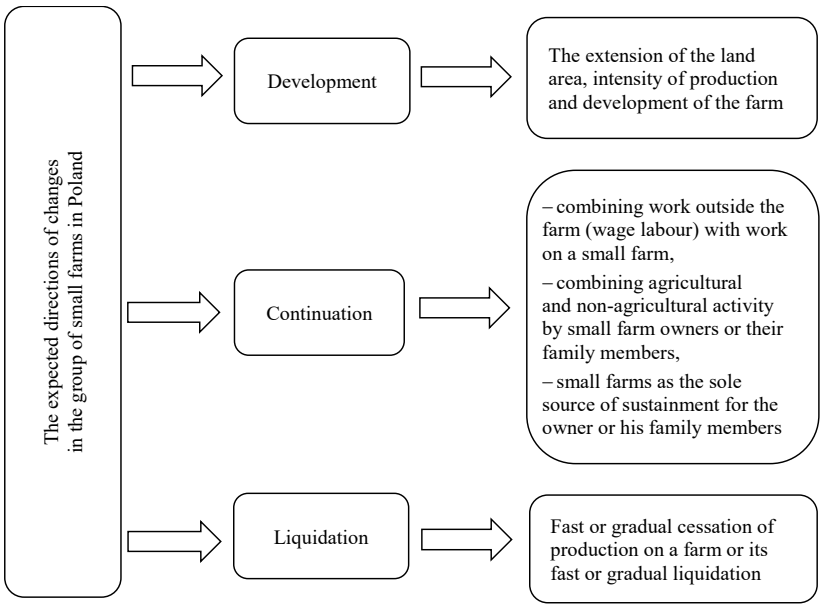

Fig. 1. The expected directions of changes in the group of small farms in Poland

Undoubtedly, the small farms which aim for development, will have a greater chance of surviving in the market and will be more capable of competing. As part of the development path, Polish small farms can implement a strategy of specializing in a given type of agricultural production, e.g. field vegetables, crops under shelter, fruit or organic production. Small farms can take the path of development by collaborating with other small farmers, e.g. by forming a group of farmers or a marketing group. In this way, they can improve their competitive position and increase their income. The production potential of small farms can also be increased by their owners by a means of modernizing and increasing the land area of the farm.

Among the group of small farms which will continue their current activity, there will also be farms which will provide only an additional source of income to their owners. Agricultural activities will be carried out to a limited extent, as their owners will continue or undertake paid work outside of agriculture. Other owners of small farms will diversify the activities of their small farms by implementing projects of

both an agricultural and non-agricultural nature. For some part of small farm owners, the farm will remain the sole source of sustainment for the owner and his family. Therefore, despite the lack of possibility for its development and low profitability, the activity of such farms will continue.

Undoubtedly, a part of small farms will be liquidated. This will be the case for those land users who will not see prospects for development of their farms and will seek sustainable income outside of them. And so, this type of small farms will gradually be liquidated as a result of the abandonment of agricultural production, and the land of such farms will be set aside or taken over by other farms. It should also be noted that the liquidation of small farms in Poland will also take place in connection with the lack of successors to the farm and the retirement or disability of their current owners.

Our own research has confirmed that changes in the group of small farms in Poland will take place in the indicated directions. Over the next five years, almost half of the analyzed farms (49.7%) plan to maintain production and maintain it unchanged, and so, they intend to continue their current activity. The respondents pointed to the current volume of production being adjusted to the size and capacity of the farm, as the main reason for this decision. The second largest group of respondents was farmers who plan to increase their farm production within the next five years, and so, they intend to expand their farms. They constituted 44.3% of the respondents. As the main reasons for this decision, they pointed to the possibility of subsidizing further investments on the farm in the time perspective of 2014-2020, mainly from the Rural Development Program for 2014-2020, as well as the possibility of increasing the land area owned by the farm. The group of respondents who plan to reduce or discontinue agricultural production in the future (liquidate the farm) was much smaller. Only 5.7% of the respondents plan to completely abandon agricultural production, which is most often caused by the lack of a successor to the farm, or the farmer's opinion that there is no prospect for development of such a small farm.

5 Conclusions

The situation in agriculture and rural areas in the last twenty years has been mostly influenced by Poland's preparations for accession and subsequent accession to the European Union. They were the stimulus for various types of processes aimed at adjusting Polish agriculture and farms to the EU standards and the rules of functioning in the single European market. Undoubtedly, the instruments of the Common Agricultural Policy, implemented in Poland, ensured a great support in the processes of changes. Still, despite many positive changes, Poland has remained a country with a diversified and fragmented agrarian structure with a large number of farms with less than 5 ha of agricultural land.

The results of the empirical studies, presented in this paper, show that the assistance provided to small farms within the selected instruments of the Common Agricultural Policy contributed to their transformation into modern entities due to the support of their modernization processes, changes in the scale and structure of

agricultural production, thus being conducive to the economic strengthening of these farms. Small farms invested primarily in the development of their machinery park, as well as the construction and modernization of farm buildings, thereby increasing the resources of the physical capital at hand. Only a small share of investments concerned the extension of the land area; still, they resulted in a more efficient use of the land previously owned by small farms. The same conclusion should be drawn with regard to the changes which have taken place in these farms in the area of labor resources. Positive changes have also occurred in terms of the degree of the yield of marketable agricultural output of the farms analyzed, most of which increased the share of production destined for the market.

Due to the great heterogeneity of the group of small farms, they may pursue different paths of changes in the future, focusing on the development, continuation or discontinuation of their agricultural activities. The relative advantage of these paths in particular regions of Poland will be diversified due to a number of factors. The factors may include external factors which are beyond control of individual farms (e.g. regional environmental and economic conditions, the current economic situation in the agricultural sector and agribusiness), and internal factors which are directly related to particular farms. These include the production resources available to the farm, the age and level of education of its owner, the matter of having or not having a successor to the farm.

It is worth noting that not all the owners of small farms in Poland will include work on the farm in their plans for the future. Therefore, it is crucial to encourage owners of small farms to sell or lease their land to those farms which have the potential of development and carry out the activities, aimed at consolidating land. The persistent relatively high level of unemployment and rural inhabitants' low professional qualification, unadjusted to the needs of the market, also poses a significant development problem for rural areas in Poland. It limits the opportunities of finding employment outside agriculture. Therefore, it is crucial to support rural inhabitants not only in the agricultural sector, but also in the sphere of obtainment of new skills and undertaking non-agricultural activities. It will serve to create new jobs unrelated to agriculture, and will help farmers engage in non-agricultural business activities. Also, the support of education activities and advisory services in the field of agriculture will also play an important role as it will contribute to the improvement of human capital in rural areas, as well as to a more efficient management of farms.

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Be a Learning Organization – The Pilot Study of Organizations in the Czech Republic

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Abstract. The learning organization model carries many benefits to organizations that apply it. The success of the transition to a learning organization can be controlled with the Dimensions of Learning Organization Questionnaire by Marsick and Watkins. Similarly, it is possible to determine with this questionnaire the stage of the learning organization. The aim of this study is to find out how many IT organizations in the Czech Republic apply the learning organization concept and to suggest ways to make effective and competitive organization (transition to a learning organization). The pilot study of 20 students (combined form of engineer study of Information Management) shows some interesting results. Most of the organizations achieved more than half points at the Likert scale. When comparing dimensions of learning organization between each other, there is a significant difference between some dimensions (dimension 2 vs.3 and 6 vs. 7). We can say that Czech organizations are inclined to learn, and many of them apply the principles of learning organization in practice.

Keywords: Learning Organization, DLOQ, Learning Organization Benefits, Dimensions of Learning Organization.

1 Introduction

The concept of learning organization is beneficial for organizations, especially because it enables them to have more flexibility, competitiveness, achievement of wanted results as well as to survive longer then their rivals [5, 10]. Learning in organizations enables them to keep abreast with improvements in the business environment and developments [8]. Based on a continuous learning environment in a learning organization, the culture of learning organization has a positive impact on organizational performance and innovation [8, 12]. Due to this, it is better for organizations change to the learning organization. This transition to the learning organization is a difficult process when it is first necessary to find problem areas and causes that can create barriers to better results [3]. The goal is to achieve changes as long-term planning, strategic vision, teamworking, cooperation, communication, a positive attitude towards change and innovation etc. [3].

1.1 Individual, Group and Organizational Learning

In the typical learning organization, the learning is a part of organizational strategy. The individual learning is very important for organizations and learning at the individual level is completed in the development of the entire organization. It is necessary to point out that organizational learning is not a simple sum of individuals' learning. Crossan, Lane and White connect the importance of individual, group and organizational learning as a foundation for the entire organization. This claim is based on basic pillars: [1, 2, 9]

1. Organizational learning involves the tension between adaptation to new learning (exploration) and exploitation of already learned (exploitation).
2. Organizational learning takes place on several levels, individual, group and organizational.
3. These three levels are linked by socio-psychological processes: intuition, interpretation, integration and institutionalization (4I).
4. Cognition affects action and vice versa.

The model of learning organization that supports the Dimensions of Learning Organization Questionnaire highlights on the importance of continuous learning at the system level. The model highlights the continuous learning for teams and organizations. [4]

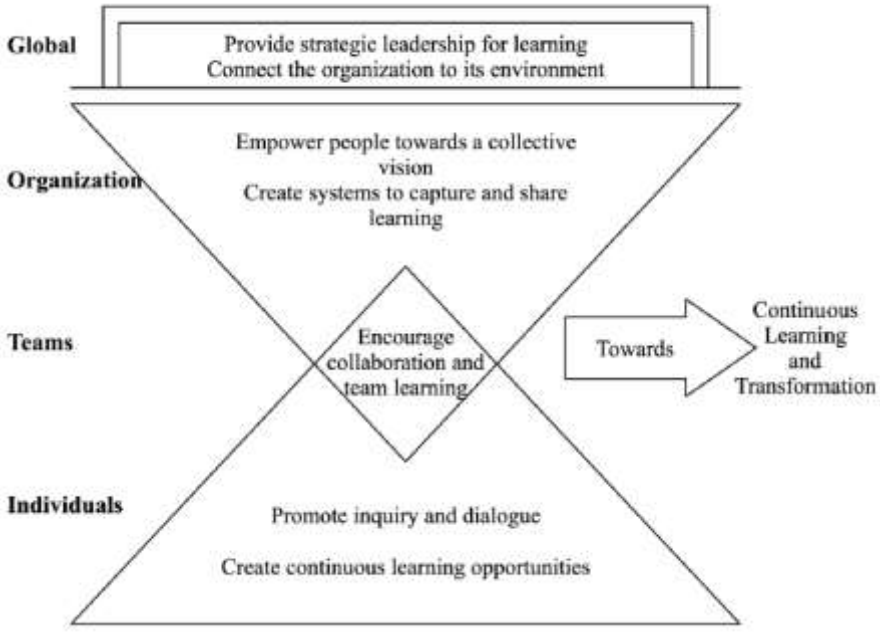

Fig. 1. Learning organization action imperatives [4]

1.2 Measurement of Learning Organization

There are many tools for measurement and diagnostics of learning organizations, depending on the number of learning organization definitions. One of them is Marsick and Watkins definition of learning organization and their seven dimensions that characterize companies seeking to become learning organizations (Table 1). [4, 7]

Table 1. Definitions of Constructs for the Dimensions of the Learning Organization Questionnaire [7]

Dimension	Definition
D1: Create continuous learning opportunities	Learning is designed into work so that people can learn on the job; opportunities are provided for ongoing education and growth.
D2: Promote inquiry and dialogue	People gain productive reasoning skills to express their views and the capacity to listen and inquire into the views of others; the culture is changed to support questioning, feedback, and experimentation.
D3: Encourage collaboration and team learning	Work is designed to use groups to access different modes of thinking; groups are expected to learn together and work together; collaboration is valued by the culture and rewarded.
D4: Create systems to capture and share learning	Both high- and low-technology systems to share learning are created and integrated with work; access is provided; systems are maintained.
D5: Empower people toward a collective vision	People are involved in setting, owning, and implementing a joint vision; responsibility is distributed close to decision making so that people are motivated to learn toward what they are held accountable to do.
D6: Connect the organization to its environment	People are helped to see the effect of their work on the entire enterprise; people scan the environment and use information to adjust work practices; the organization is linked to its communities.
D7: Provide strategic leadership for learning	Leaders model, champion, and support learning; leadership uses learning strategically for business results.

KEY RESULTS	
Financial performance	State of financial health and resources available for growth
Knowledge performance	Enhancement of products and services because of learning and knowledge capacity (lead indicators of intellectual capital)

Before transition to learning organization, during and after the transition is possible to use the Dimensions of Learning Organization Questionnaire (DLOQ) to capture the employees´ opinion and to find out whether is the process of transition to learning organization necessary or whether is the process successful. The DLOQ allows us to measure important changes in climate, culture, systems and structures of organization that affect whether individuals learn. The basis of the DLOQ is made up of seven dimensions and on performance outcomes (sensitive to learning) [4]. The full version of DLOQ consists of 43 questions but it is possible to use an abbreviated version of the original questionnaire with 21 items. The shorter version of DLOQ has reliability as same as the full version [7, 11].

The aim of this study is to find out how many IT organizations in the Czech Republic apply the learning organization concept and to suggest ways to make effective and competitive organization (transition to a learning organization).

2 Methods

The anticipated implementation of this study is during December 2017 – January 2018 and it will be realized as a questionnaire survey. For this study the shorter version of DLOQ (21 questions, 7 dimensions) will be used [6, 7]. The dimensions will be measure on a 6-point Likert scale (Table 2). To ensure the validity of the questionnaire, translation to the Czech language and back-translation to English was performed by two independent translators. After that a pilot study was conducted to verify the understanding of the questionnaire. The pilot study was carried out among 20 students of combined form of engineer study of Information Management. After the pilot study, a final version of DLOQ was created by using the docs.google.com. Some additional information was added into the questionnaire (size of the organization, position in the organization). The respondents for this study were selected by company size (number of employees) and their focus (IT). Due to the lower representation of small and medium enterprises focused on IT, companies from all over the Czech Republic will be approached. The target number of respondents is approximately 300.

The obtained data will be analyzed in the Microsoft Excel or IBM SPSS with use of non-parametric tests, alpha level 0.05.

Table 2. Example of 6-point Likert scale [7]

Question	Almost Never					Almost Always
In my organization, leaders continually look for opportunities to learn.	1	2	3	4	5	6

3 Results

Given that this study is currently underway, the results of the pilot study are presented. The pilot study was attended by a total of 20 students (combined form of engineer study of Information Management). These respondents are active in the following spheres: software development, telecommunication, IT, electronics production, e-commerce, sales, law, healthcare, advertisement, state administration, work with kids, transport and logistics, sport and energy and heating.

The data from pilot study were analyzed using Microsoft Excel 2016.

The basic characteristics of respondents are shown in Table 3.

Table 3. The basic characteristics of respondents

	Number of respondents (n = 20)	% of respondents (n = 20)
Gender		
Male	11	55
Female	9	45
Age		
21-30	14	70
31-40	4	20
41-50	2	10
Size of the organization		
Up to 50 employees	10	50
Up to 250 employees	4	20
Up to 500 employees	1	5
More than 500 employees	5	25
Position in employment		
Line worker	13	65
Boss	7	35
Learning in relation to work		
0 hours per month	1	5

1-10 hours per month	12	60
11-20 hours per month	3	15
21-35 hours per month	3	15
36 and more hours per month	1	5

The answers of respondents were evaluated depending on seven dimensions of learning organization (Table 1). None of the dimensions were rated less than 3 points, from which we can conclude that organizations in the Czech Republic are in favor of learning support. The worst ratings got the dimensions number 4 (Create systems to capture and share learning), average score 3.70 and dimension 6 (Connect the organization to its environment), average score 3.90. The best rated dimension was dimension number 2 (Promote inquiry and dialogue), average score 4.67 (Figure 2).

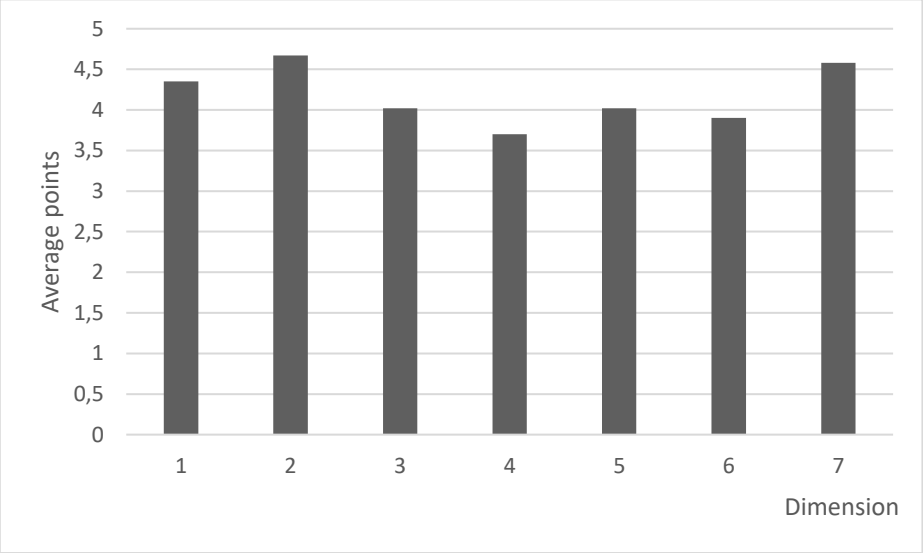

Fig. 2. Average points for seven dimensions of learning organization

When comparing dimensions between each other, there is a significant difference between the dimensions number 2 and 3 (p value at the alpha level 0.05 is 0.0015) and between the dimensions number 6 and 7 (p value at the alpha level 0.05 is 0.0022).

When compare the questions, more than 5 points was reached by two questions (n = 21), the maximum points between 4 and 5 reached twelve questions (n = 21) and the minimum of 3 to 4 points reached only 7 questions.

There is no significant difference between the length of employment and the average score of concretely organization (p value at the alpha level 0.05 is 0.25). The maximum number of points was achieved by the company of more than 500 of employees (average score 5.62), the minimum number of points was achieved by the

company of 251 to 500 employees (average score 3.0). Three organizations (sector healthcare, software development and the state administration) reached only 2.71 – 3.00 points and their employees stated, that they spend less than 10 hours of learning per month.

4 Discussion and Conclusions

The situation concerning learning organizations in the Czech Republic is according the results of the pilot study quite good. The low rating of some criteria can be explained by the relatively high variability of respondents participating in the study. It is necessary to take account that the pilot study was conducted across different sectors and therefore the results of certain sectors can be different.

Surprising results have been achieved with specific organizations when three organizations from healthcare, state administration and software development spheres were rated less than 3 points. It needs to be considered, that other respondents from the same sectors rated their organizations with higher score. This can be justified by the fact that respondents came from different organizations. Another explanation is based on the relationship between the worker and the environment and on education. If the worker is uncommunicative and is not involved into the run of the company, it's hard for him to work in a team and support the learning organization.

All the low ratings came from the line workers and it is likely that the answers would be different if the same questions were answered by managers. Therefore, specific companies will be in the future research marked at the questionnaire and for each company will be obtained the results from two points of view – from the view of line workers and from the view of managers. This allows to obtain an objective assessment of each organization. For more representative results will be this study repeated at the larger sample and across one sector – concretely from the CZ–NACE sector 62 Activities in the field of information technologies and 63 Information activities.

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