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CONTENT

Introductory Word	7
Review Proceedings	8
Comparison of Multiple Criteria Decision Making Approaches: Evaluating eGovernment Development	10
Eva Ardielli	
The Current Generations: The Baby Boomers, X, Y and Z in the Context of Human Capital Management of the 21st Century in Selected Corporations in the Czech Republic	25
Jiří Bejtkovský	
Perception of Sexual Minorities among Contemporary University Students	46
Dana Gálová, Jan Gregor, Libuše Turinská	
Analysis of the Disparities Between the Regions Of the Czech Republic	59
Jaroslav Jánský	
Greenwashing and its Impact on Slovak Consumers	68
Margaréta Nadányiová	
Inventory Management Theory: a Critical Review	79
Lukáš Polanecký, Xenie Lukoszová	
Women's Entrepreneurship in Transition Economies such as the Czech Republic	90
Martina Rašticová, Monika Bédiová	
Evaluation of the Impact of Public Support from the Point of Convergence Criterion	104
Lucie Sobotková, Martin Sobotka	

Effect of Non-Investment Measures upon the Stability of Agricultural Enterprises in the South Bohemian Region	123
Jarmila Straková, Petra Pártlová, Jan Váchal	
Determinants of Employment and GDP Resilience in the Context of an Economic Crisis: Evidence from EU Countries and Regions	140
Ondřej Svoboda, Petra Applová	
Practical Comparison of Results of Statistic Regression Analysis and Neural Network Regression Analysis	156
Marek Vochozka	
The Influence of Selected Factors on Overall Job Satisfaction	169
Václav Zubr, Marcela Sokolová, Hana Mohelská	

Dear readers,

let us present to you the second issue of Littera Scripta journal (Economics, Management, Marketing, Linguistics, Pedagogy, Education, and History) of year 2016. We are pleased that the authors sent vast numbers of contributions. After demanding review-process we chose 12 of them to be published.

As we had already announced, our goal for future is the inclusion of Littera Scripta into prestigious Scopus database. During October our journal went through the evaluation process by the Elsevier, which administers the database Scopus. It was so-called pre-evaluation, which is provided as a precursor prior to the requests for inclusion in this database. We received an evaluation report which summarises areas which should be optimized. In preparing the journal for inclusion in the Scopus database, we are mainly to focus on acquiring quality foreign authors and reviewers. We believe that our efforts will be successful.

We would like to thank all the authors, reviewers and editorial board members, who help maintain the high quality of the published articles. Finally, we would like to thank you, the readers, who retain your loyalty to Littera Scripta journal.

On behalf of the editorial board, wish all of you Merry Christmas and look forward to further cooperation in year 2017.

Mgr. Zdeněk Caha, MBA, Ph.D.
Doc. PhDr. František Stellner, Ph.D.

20th December, 2016, České Budějovice

REVIEW PROCEEDINGS

In issue 2/2016 12 reviewed articles written by 19 authors from 9 institutions were included.

Articles

Number of articles received: 23

Number of articles rejected in 1st round of review proceedings: 5

Number of articles rejected in 2nd round of review proceedings: 0

Number of articles agreed to be published: 18

Review conclusions

Number of reviews delivered: 46

- from which was reviewed by reviewer with Doc. or Prof. degree: 7

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Comparison of Multiple Criteria Decision Making Approaches: Evaluating eGovernment Development

Eva Ardielli

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Abstract

This paper focuses on the comparison of selected multiple criteria decision making (MCDM) methods for the evaluation of eGovernment development. Multiple criteria evaluation of alternatives is regarded as the basis of MCDM problems. The methods are defined as a set of techniques which aim to rank options, from the most preferred to the least preferred, with a view to supporting decision makers in their selection of the most appropriate alternative under uncertain circumstances. The application of the methods in practice therefore has great potential. As interest in the application of selected MCDM methods has grown, it has also come to encompass the issue of eGovernment development in terms of its ability to modernize public administration. The research in this article is based on the results of the following MCDM methods: WSA; TOPSIS; and MAPPAC. These methods are compared in terms of their applicability and reliability for the purpose of evaluating eGovernment development.

Keywords: comparison, eGovernment, MAPPAC, MCDM methods, TOPSIS, WSA

Introduction

Multiple criteria decision making (MCDM) approaches are important as potential tools for analysing complex problems because of their inherent ability to examine various alternatives according to various criteria for the possible selection of the best preferred alternative (Dincer 2011). The application of MCDM methods has great potential, in particular where it is necessary to select an appropriate option from various alternatives. MCDM problems are common in everyday life, they affect the decision making both in the private and public sectors alike (choosing an appropriate option, supporting business decision making, determining strategy or policy). Získal (2002) states that businesses, like state authorities, make similar objective decisions with certain goals in mind. In such cases, the goals are defined, which makes it possible to

utilize MCDM methods to determine the best alternative for future realization. However, in real life, within the business and public decision making context, MCDM problems are more complicated and usually on a large scale (Xu and Yang 2011).

This paper looks at the application of MCDM methods for evaluating eGovernment development. The goal of the presented research is to compare the results of selected MCDM methods, namely the TOPSIS method (Technique for Order Preference by Similarity to Ideal Solution), WSA method (Weighted Sum Approach) and MAPPAC method (Multi-criteria Analysis of Preferences by means of Pair Actions and Criteria comparisons), with the purpose of generating an overall ranking of the examined alternatives on the basis of a synthesis of the different MCDM approaches. The MCDM methods were applied to the area of eGovernment development to demonstrate their potential use and to evaluate the current state of eGovernment in EU countries.

Mohammed and Ibrahim (2013) and Kettani and Moulin (2015) state that in practice, the evaluation of the state of eGovernment is an important factor in the selection of appropriate measures for further progress in the field of eGovernment and for putting forward recommendations for the development of eGovernment in a country. In this research, the state of eGovernment was evaluated on the basis of selected eGovernment indicators as monitored by various international institutions (European Commission, Eurostat and the United Nations). The data published by these international institutions in 2014 makes it possible to conduct a complex evaluation of the state of eGovernment in 2013. More up-to-date information was also available from the European Commission in the form of its “eGovernment Benchmark” studies for 2014 and 2015 (European Commission 2014 and 2015), which were published as part of its European Information Policy. However, other selected eGovernment indicators for 2014 or 2015, as monitored by Eurostat and the UN, have not been published yet, or there is a break in the series. The input data for the conducted research therefore included the results of the “eGovernment Benchmark” study from 2014 (EUROPA 2014), which contained data for 2013, data processed by Eurostat for 2013 (EUROSTAT 2016) and data obtained by the UN in 2013 and published in 2014 (UNPACS 2016). The empirical research involved the application of the TOPSIS, WSA and MAPPAC methods to the results of the selected criteria for the 28 countries of the EU in order to evaluate the state of eGovernment. These methods were used because they represent a suitable tool for the creation of a ranking where a large number of alternatives exist. The empirical part of this paper was processed using SANNA (System for ANalysis of Alternatives) software (see also Jablonský 2009).

MCDM Methods and Potential Applications

MCDM as a discipline has a relatively short history. The development of the MCDM discipline is closely related to the advancement of computer technology. The widespread use of computers and information technologies is generating huge quantities of information, which makes MCDM increasingly important and useful (Xu and Yang 2001).

According to Triantaphyllou (2000) and Zavadskas, Turskis and Kildiene (2014), MCDM is described as a set of methods which enables the evaluation of various alternatives under different decision making criteria. The aim of MCDM is, on the basis of a stated set of alternatives (options) and number of decision making criteria, to provide an overall ranking of alternatives, from the most preferred to the least preferred (Liou and Tzeng 2012).

According to Jablonský and Urban (1998), the multiple criteria evaluation of alternatives is the basis for MCDM problems. As described by Dincer (2011), MCDM methods are both an approach and a set of techniques. MCDM methods provide a systematic procedure to help decision makers choose the most desirable and satisfactory alternative under a given set of circumstances (Yoon and Hwang 1995). Hwang and Yoon (1981), reviewed many methods for the multiple criteria evaluation of alternatives. In general, a MCDM problem is described using a decision matrix. On the assumption that there are m alternatives to be assessed based on n attributes, a decision matrix ($m \times n$) can be created, whereby each element Y_{ij} is the j -th attribute value of the i -th alternative.

There are two types of MCDM methods. The first is compensatory, and the second, non-compensatory (Hwang and Yoon 1981). As described by Xu and Yang (2001), non-compensatory methods do not permit trade-offs between attributes. An unfavourable value for one attribute cannot be offset by a favourable value for other attributes. Examples of these methods include the Dominance method, Maxmin method, Maxmax method, Conjunctive constraint method, and the Disjunctive constraint method. In contrast, Yang (2001) states that compensatory methods permit trade-offs between attributes. A slight decline in one attribute is acceptable if it is compensated by an improvement in one or more other attributes. Compensatory methods can be classified into the following 4 subgroups (Hwang and Yoon 1981):

- Scoring Methods (e.g. Simple Additive Weighting method, AHP);
- Compromising Methods (e.g. TOPSIS);
- Concordance Methods (e.g. Linear Assignment Method);
- Evidential Reasoning Approach.

As stated by Jablonský and Urban (1998) and Xu and Yang (2001), the application of the multiple criteria evaluation of alternatives has great potential in practice. The methods are already commonly used for making evaluations in different sectors. For example, Dincer (2011) analysed the economic activity in 2008 of the EU countries and candidate countries. For the purpose of generating alternative rankings, the TOPSIS and WSA methods were applied. Kuncová (2012), in addition to the using the aforementioned methods, also applied the PRIAM method to compare e-commerce in EU countries. Like Dincer (2011), Ardielli (2015) used the TOPSIS and WSA methods to evaluate the state of eGovernment in the Czech Republic. In a similar vein, Ardielli and Halásková (2015) assessed EU countries using the TOPSIS method.

Evaluating eGovernment Development

eGovernment is one of the most important trends in the modernization of public administration across EU countries (Demmke, Hammerschmid and Mayer 2006). The evaluation of the state of eGovernment is a necessity in terms of its impact on the effective implementation of future actions and measures in the field of eGovernment across EU countries. This point is well documented in research into eGovernment conducted by numerous authors. Mohammed and Ibrahim (2013), analysed the existing indexes of eGovernment to demonstrate their common components and attributes with a view to composing a comprehensive framework for the evaluation of eGovernment. Máchová and Lněnička (2015), compare the structure of selected frameworks, identify core criteria and put forward their own framework for the evaluation of eGovernment, one which respects current trends in public administration.

However, eGovernment is not only about important current trends in the modernization of public administration, but also about making international comparisons, as discussed by West (2004) and Bannister (2007). Many organizations monitor eGovernment as part of their activities, but the approaches utilised differ considerably across organizations. One of these organizations is Eurostat. Eurostat processes and evaluates data from the area of eGovernment. Up to and including 2013, the assessment was based on measuring the interaction of citizens and businesses with public administration. The evaluation framework has since changed and now includes policy indicators which assess eGovernment activities on the basis of an individual's use of websites or user satisfaction of eGovernment websites. The European Commission's approach to the evaluation of eGovernment is based on an evaluation of the effectiveness of its European Information Policy (European Commission 2014 and 2015). At the international level, the UN has developed benchmarks for the evaluation of eGovernment. It has developed a Composite Index of eGovernment and an Index of eParticipation with which to evaluate eGovernment (UNPACS 2016). Unfortunately, the eGovernment data generated by these organizations are not consistent with each other. They monitor different time periods, use different methodologies for collecting, collating and processing data, as well as focus on those sub-areas of eGovernment which correspond to the specific needs and purposes of their own organization.

Materials and Methods

In this paper all EU countries (EU-28) were analysed on the basis of selected eGovernment indicators using the TOPSIS, WSA and MAPPAC methods. The TOPSIS method is based on the selection of the alternative that is closest to the ideal solution and furthest from the baseline solution (see Shih, Shyur and Lee 2007). It arranges the alternatives according to the relative distance from the baseline (hypothetically worst) alternative (Chen and Hwang 1992). The result of this method is an overall ranking of the alternatives. The WSA method is based on the principle of utility maximization. It ranks the alternatives according to their total utility, which takes into account all the selected criteria (Fiala 2008). The MAPPAC method is based on paired comparisons of

the alternatives, whereby each pair of individual criteria results in a decision on which of the two objects is the more important, or whether they are indistinguishable in terms of the selected criteria (Matarazzo 1991). A comparison of the selected methods was carried out on the basis of eGovernment data for 2013 for all 28 EU member states. The final list of alternatives (EU-28 countries) and criteria (9 eGovernment indicators) for the research were sourced from indexes monitored by three international organizations, namely:

- indexes monitored by European Commission: User Centric Government (UCC), Transparent Government (TG), Citizen Mobility (CM), Business Mobility (BM) and Key Enablers (KE);
- indexes monitored by the UN: Online Service Index (OSI), eParticipation Index (EI); and
- indexes monitored by Eurostat: Individuals Using Internet (IUI) and Enterprises Using Internet (EUI).

The research was based on a dataset generated from multiple data sources (see European Commission (2014), UNPACS (2016) and Eurostat (2016)). Due to the fact that the eGovernment Index, monitored by the United Nations, was not up-to-date, the comparison was made on the basis of a dataset for 2013. All criteria carried equal weight. The TOPSIS, MAPPAC and WSA were used to provide a comprehensive ranking of the alternatives, from the best to the worst. TOPSIS applies the simple concept of maximizing the distance from the nadir solution and minimizing the distance from the ideal solution (Özcan and Çelebi 2011). Under the TOPSIS method, the decision matrix of a MCDM problem is normalised. Calculations are subsequently made of the weighted distances of each alternative from the ideal solution and the nadir solution. The best solution is judged to be that which is relatively close to the ideal solution and far from the nadir solution (Hwang and Yoon 1981). The ideal solution represents that which provides the maximum benefit as determined on the basis of a composite of the best performance values in the matrix. The nadir solution represents that which provides the least benefit, which is a composite of the worst values in the matrix. The proximity of the alternatives to the ideal solution d_i^+ and the nadir solution d_i^- can be obtained using the square root of the squared distances in the imaginary attribute space given in equation (1) (see Thor, Ding and Kamaruddin 2013):

$$d_i^+ = \sqrt{\sum_{j=1}^r (w_{ij} - H_j)^2} \quad (1)$$

where for all $i = 1, 2, \dots, m$; and $j = 1, 2, \dots, r$.

Similarly, the separation from the nadir solution d_i^- is given in equation (2):

$$d_i^- = \sqrt{\sum_{j=1}^r (w_{ij} - D_j)^2} \quad (2)$$

where for all $i = 1, 2, \dots, m$; and $j = 1, 2, \dots, r$.

The most preferable alternative is the one which is closest to the ideal solution and the farthest from the nadir solution.

Application of the TOPSIS method involves the following steps:

- design of the criteria matrix;
- transformation of the minimum criteria to maximizing type;
- transformation of the matrix;
- determination of the ideal and basal alternatives (formula 1 and 2); and
- calculation of the relative distance from the ideal alternatives and basal alternatives using formula (3):

$$c_i = \frac{d_i^-}{d_i^+ + d_i^-} \quad (3)$$

where $i = 1, 2, \dots, m$.

The alternatives are subsequently sorted in descending order of the c_i values. Those alternatives with the highest values for an indicator are considered to be viable solutions to the problem.

The WSA method is based on a linear utility function. The method generates a complete ranking of the alternatives according to their total utility. This method is based on the construction of a linear utility function on a scale of $\langle 0 - 1 \rangle$. The worst alternative is given a utility value of 0 and the best alternative utility value of 1. The application of the WSA methods involves the following steps:

- design of the criteria matrix;
- transformation of minimum criteria to maximizing type;
- determination of the perfect (the best) and basal (worst) alternatives;
- calculation of the utility value of each alternative;
- calculation of the total utility value of each alternative according to the following formula (4):

$$u(a_i) = \sum_{j=1}^k v_j r_{ij} \quad (4)$$

where $u(a_i)$ is the total utility value of the alternative, a_i , r_{ij} are the normalized values from the previous step, v_j is the weight of j -th criteria, and k is the number of criteria.

The MAPPAC method encompasses both the criterion matrix and the weights of the criteria. The method splits the alternatives into several preference groups. The MAPPAC method uses a normalized multiple criteria matrix $C = (c_{ij})$, where the r -th row corresponds to alternative a_r and the s -th row corresponds to alternative a_s . The paired comparison of the alternatives is processed first. On the basis of the results there are two possible relationships between the alternatives, either preference (alternative a was rated better than alternative b) or indifference (alternative a and alternative b were assessed in the same way). This method allows for the presence of fuzzy relations, which

allows it to take into account the uncertainty associated with the measurement, or arising from the different nature of the criteria, for the assessment. In the last step, the preferences are aggregated, resulting in a final ranking. The row totals of the aggregated matrix π are calculated according to equation (5):

$$\sigma^l(a_i) = \sum_{j=1}^p \pi(a_i, a_j), \quad i \in J^l \quad (5)$$

The alternatives with the highest σ^l values are ranked the highest. The set of alternatives is reduced and a new set of alternatives A^l is created. The set of indexes of alternatives from A^l are subsequently marked as J^l . The procedure is repeated for m steps, where m is the number of indifference classes in the arrangement above.

A similar procedure is followed to generate the values of $\tau^1, \tau^2, \dots, \tau^n$, where n is the number of indifference classes in the arrangement below, using equation (6):

$$\tau^t(a_i) = \sum_{j \in J^t} \pi(a_j, a_i), \quad i \in J^t, \quad t = 1, 2, \dots, n. \quad (6)$$

The overall ranking of the alternatives is achieved by averaging the serial numbers of the alternatives in the arrangements (equations 5 and 6). The best alternative is that which has the lowest overall serial number.

The WSA, TOPSIS and MAPPAC were selected because they have the same input requirements and the decision maker cannot intervene in the course of the calculations. This enables an objective comparison to be made of the resulting ranking of alternatives.

Results

The empirical results of the TOPSIS, MAPPAC and WSA methods are presented below. The input data characterize the extent of on-line services (UCG), government transparency (TG), availability and usage of online services abroad by citizens and businessmen (CM and BM), availability of key enablers (KE), quality of services on governmental websites (OSI), eParticipation (EPI) and the individuals and businessmen which use the internet in relation to public administration (EUI and IUI). The results indicate the level of eGovernment in the 28 member states of the EU in 2013. On the basis of the results, it is possible to determine the ranking of each country, from the best to the worst according to the selected method, in terms of how eGovernment functions. The results are presented in Table 1, 2 and 3.

The R.U.V value describes the relative distance of the alternative from the basal alternative c_i . The assessment of the state of eGovernment in EU countries according to the TOPSIS method put Estonia in first place ($c_i = 0.73013$), followed by the Nordic countries of Finland and Sweden. The countries at the bottom of the rankings were Croatia, Bulgaria, and the worst Romania ($c_i = 0.12061$). The percentage difference between the best and the worst country was very significant at 84 %.

Table 1: Results of eGovernment evaluation of EU countries using TOPSIS method (2013)

Rank	Country	R.U.V	Rank	Country	R.U.V
1	Estonia	0.73013	15	Belgium	0.48378
2	Finland	0.71536	16	Luxembourg	0.45683
3	Sweden	0.65817	17	Germany	0.44439
4	Malta	0.65637	18	Slovenia	0.43254
5	Denmark	0.63536	19	Cyprus	0.39826
6	The Netherlands	0.61149	20	Italy	0.39460
7	France	0.59456	21	Poland	0.34856
8	Austria	0.59062	22	Greece	0.28150
9	Latvia	0.58488	23	Slovakia	0.27202
10	Portugal	0.56566	24	Czech Republic	0.25731
11	Spain	0.53813	25	Hungary	0.24677
12	United Kingdom	0.52095	26	Croatia	0.23673
13	Ireland	0.51587	27	Bulgaria	0.23231
14	Lithuania	0.49228	28	Romania	0.12061

Source: European Commission (2014), UNPACS (2016) and Eurostat (2016), own calculations

The evaluation according to the WSA method (see Table 2) puts Estonia in first place (utility value = 0.76420), very closely followed by Finland (utility value = 0.75017) and Malta a distant third (utility value = 0.72445). The three countries ranked the worst were Bulgaria, Hungary and Romania. It is noteworthy that the utility value for Romania (0.08234) is significantly lower than for Hungary (0.23937), ranked second worst. The utility value is an indication of how bad Romania fared in the surveyed period with respect to eGovernment.

Table 2: Results of eGovernment evaluation of EU countries using WSA method (2013)

Rank	Country	Utility	Rank	Country	Utility
1	Estonia	0.76420	15	Belgium	0.51378
2	Finland	0.75017	16	Luxembourg	0.48088
3	Malta	0.72445	17	Germany	0.46898
4	The Netherlands	0.69854	18	Italy	0.45661
5	Sweden	0.67785	19	Slovenia	0.44506
6	France	0.66747	20	Poland	0.39806
7	Denmark	0.66503	21	Cyprus	0.39759
8	Portugal	0.64115	22	Czech Republic	0.29504
9	Austria	0.63607	23	Slovakia	0.29252
10	Latvia	0.61455	24	Croatia	0.27933
11	Spain	0.60944	25	Greece	0.27515
12	United Kingdom	0.60877	26	Bulgaria	0.24091
13	Ireland	0.59662	27	Hungary	0.23937
14	Lithuania	0.57342	28	Romania	0.08234

Source: European Commission (2014), UNPACS (2016) and Eurostat (2016), own calculations

The output of the MAPPAC method provides a list of rankings according to preferential classes. In Table 3, it is possible to see the alternatives in the ranking according to the average serial numbers from the top and bottom. It is evident from the results that the first two alternatives (Estonia, Finland) are also single element indifference classes. Their rank is therefore clearly given. They were simultaneously ranked in the same position from the top and from the bottom. The average serial numbers for France and Sweden were the same, so they are ranked the same. They belong to one class of indifference. For third place, there was a sorting match. From the top, the Netherlands was ranked third, whereas from the bottom Malta was ranked third. The worst three countries with regards to eGovernment were, once again, Hungary, Bulgaria and Romania (all were ranked in the same position from the top and from the bottom).

Table 3: Results of eGovernment evaluation of EU countries using MAPPAC method (2013)

Class	Country	Rank from top	Rank from bottom	Class	Country	Rank from top	Rank from bottom
1	Estonia	1	1	12	Belgium	15	15
2	Finland	2	2	13	Luxembourg	16	16
3	The Netherlands	3	4	14	Slovenia	18	17
4	France	5	5	15	Germany	17	19
	Sweden	4	6	16	Italy	19	18
5	Malta	10	3	17	Cyprus	20	20
6	Denmark	6	8	18	Poland	21	21
7	Portugal	8	7	19	Czech Republic	22	23
8	Austria	7	9	20	Greece	24	22
9	Latvia	9	13	21	Croatia	23	25
	United Kingdom	11	11	22	Slovakia	25	24
10	Spain	14	10	23	Hungary	26	26
	Ireland	12	12	24	Bulgaria	27	27
11	Lithuania	13	14	25	Romania	28	28

Source: European Commission (2014), UNPACS (2016) and Eurostat (2016), own calculations

To obtain an overall ranking for the EU countries based on the consolidated results of the three selected MCDM methods, it was necessary to determine the final overall arrangement of the alternatives. To achieve this, the results obtained using the MAPPAC methods required minor adjustments with regards to the evaluation order. Those alternatives in the same indifference class were therefore rated on the basis of their average serial number. The next step was to calculate the average ranking of the alternatives, which is equal to the arithmetical average of the individual rankings according to the individual MCDM methods. The results are presented in Table 4.

The synthesis of the results from the selected MCDM methods acknowledge that the highest ranking countries in the EU with respect to eGovernment are Estonia, Finland

and Sweden. This result fully corresponds with the final rankings under the TOPSIS method. In joint fourth position were Malta and the Netherlands. Malta ranked fourth and third under the TOPSIS and WSA methods respectively, whilst the Netherlands ranked fourth and third under the WSA and MAPPAC methods respectively. The countries ranked the worst with regards to the state of eGovernment were Hungary, Bulgaria and Romania (the same result as under the MAPPAC and WSA methods) and Croatia (under the TOPSIS method).

Table 4: Final ranking of EU countries according to the selected MCDM methods (2013)

Rank	Country	TOPSIS	WSA	MAPPAC	Rank	Country	TOPSIS	WSA	MAPPAC
1	Estonia	1	1	1	15	Belgium	15	15	15
2	Finland	2	2	2	16	Luxembourg	16	16	16
3	Sweden	3	5	4	17	Germany	17	17	18
4,5	Malta	4	3	6,5	18	Slovenia	18	19	17,5
4,5	The Netherlands	6	4	3,5	19	Italy	20	18	18,5
6	France	7	6	4	20	Cyprus	19	21	20
7	Denmark	5	7	7	21	Poland	21	20	21
8	Portugal	10	8	7,5	22	Czech Republic	24	22	22,5
9	Austria	8	9	9	23	Greece	22	25	23
10	Latvia	9	10	10	24	Slovakia	23	23	24,5
11	Spain	11	11	12	25	Croatia	26	24	24
11	United Kingdom	12	12	10	26	Hungary	25	27	26
13	Ireland	13	13	12	27	Bulgaria	27	26	27
14	Lithuania	14	14	13,5	28	Romania	28	28	28

Source: European Commission (2014), UNPACS (2016) and Eurostat (2016), own calculations

The Czech Republic, within the context of the evaluation of eGovernment, achieved the highly unsatisfactory position of 22nd in the overall ranking. Under the MAPPAC method, the result was only slightly better (19th position). However, under the TOPSIS method the result was even worse (24th position). In the country there are clearly very serious shortcomings in the implementation of digital public services. A policy that promotes the use of electronic services in public administration is therefore required because eGovernment is a useful tool for cost reductions in public administration. Moreover, eGovernment and eServices are of huge benefit to residents in the form of time savings. This area therefore remains a major future challenge for the Czech Republic.

Discussion

It is evident that despite all the differences the three selected MCDM methods gave the EU countries relatively similar rankings. The best placed countries according to the evaluations of all three selected methods were Estonia and Finland. In a similar vein, all

three methods ranked Romania last. The proposed computing algorithm for each of the selected methods varies according to the operating concept. The WSA method is based on the principle of the weighted average. The TOPSIS method presents the idea of distance-based decision making. The MAPPAC method belongs to a group of methods that make assessments based on a preferential matrix (Thor, Ding and Kamaruddin 2013). Each of these methods require cardinal information about criteria and enable the arrangement of alternatives. Under the WSA method, the criteria are sorted according to the decreasing value of the utility function, whereas under the TOPSIS method they are sorted by the distance from the basal alternatives. The TOPSIS method takes into account the range of values of the criterion, and unlike the WSA method, does not favour extreme values. The results are therefore sometimes slightly different. The advantage of the MAPPAC method is that it does not require the matrix to be normalized, which avoids any impact on the results from utilising the technique. Despite the differences in the operating concepts, these MCDM methods have great potential for increasing the effectiveness of the evaluation of eGovernment.

When evaluating the applicability and relevance of the used methods (TOPSIS, MAPPAC and WSA), the TOPSIS method provides the most objective evaluation of eGovernment. The reason for this is that the method is relatively simple and is able to reflect the large scale of eGovernment data with its different units and criteria. (This is not the case with the WSA method, which always exalts extreme values before average values, or with the MAPPAC method, which fails to give unambiguous results.). It is the directness of the TOPSIS algorithm, which creates no complications in the calculations, that enables it to be applied to large-scale datasets. On the basis of the final ranking, it is possible to compare the final score of each alternative and determine the ideal solution, which makes the decision making process more flexible. In contrast, the only output from the MAPPAC method is a ranking of the alternatives. The TOPSIS method is also favoured by other authors for the same reasons stated above (Ekmekcioglu, Kaya and Kahraman 2010; Thor, Ding and Kamaruddin 2013; Kuncová and Doucek 2013).

The synthesis of the applied MCDM methods for the ranking process also produced successful results that closely reflected those obtained under the TOPSIS, MAPPAC and WSA methods separately. The obtained results are consistent with those of other authors (see Schwab 2013; European Commission 2015; UNPACS 2016; Kuncová and Doucek 2013). According to the DESI Index (see Europa 2015), the highest ranking countries in terms of digital public services were Estonia, Denmark and Finland, with the lowest ranked being Romania and Bulgaria. The Czech Republic came in on the 24th position.

On the basis of the comparison of the outputs of the applied MSDM methods, the TOPSIS method is regarded as the most useful tool for assessing a government's macroeconomic themes. However, it can also be applied at the microeconomic level e.g. for the management of a company (Olson 2004) or as an evaluation tool for procurement (San Cristóbal 2012). Finally, for verification purposes, the results of any MCDM method

should always be checked against those of another MCDM method e.g. AHP, PRIAM, or any other.

Conclusion

In general, there is no single solution for the multiple criteria evaluation of alternatives. Any resultant solution is influenced by the selection of scales and the applied methodology. To verify the results, it is necessary to apply at least one additional MCDM method. The methods for the multiple criteria evaluation of alternatives can be used at many different levels because of their general character and the independence of the decision making content. There are numerous methods for the multiple criteria evaluation of alternatives, each based on different principles. In this research, three selected MCDM methods, namely TOPSIS, WSA and MAPPAC, were applied to eGovernment data. The results of the applied methods contributed to the assessment of eGovernment development in the EU member states.

Any dissimilarities in the comparison of the results from the different methods can be attributed to the fact that each of the methods is based on a different principle: maximizing benefits (WSA); distance from the ideal alternative (TOPSIS); and the use of the preferential function (MAPPAC). The different methods were chosen deliberately. The final ranking therefore reflected the different approaches and ensured objectivity.

The TOPSIS method exhibited the highest potential for the evaluation of eGovernment development; it provides accurate results with minimal effort.

This paper points out that methods for the multiple criteria evaluation of alternatives can be applied to the exploration and evaluation of eGovernment development. A synthesis of the outcomes of the different MCDM methods further clarified the position of the EU member states in terms of eGovernment development.

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The Current Generations: The Baby Boomers, X, Y and Z in the Context of Human Capital Management of the 21st Century in Selected Corporations in the Czech Republic

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Abstract

This paper focuses on the current generations: the Baby Boomers, X, Y and Z in the context of human capital management of the 21st century in selected corporations in the Czech Republic. The turbulent developments as a result of industrialization, modernization and globalization has created differences between generations. The aim of this article is to compare the selected characteristics of each generation of employees in Czech corporate practice and to reflect on whether there are more efficient means for personnel managers to handle them accordingly. This article presents some of the results of quantitative and qualitative research conducted in selected companies in the Czech Republic. The research group that took part in the questionnaire survey included 182 human resources professionals from selected Czech companies with responsibility for 3,182 employees. The research results reflect the differences in the perceptions of HR professionals and the employees themselves with regards to the selected characteristics attributed to each generation. As a result, key motivational factors could be identified and prioritized for each generation. The HR professionals perceived Generation Z to be employees that are not very loyal and lack emotional intelligence. However, they are perceived to possess high levels of Internet literacy and the ability to adapt quickly to new technologies, which enables them to operate more efficiently.

Keywords: age groups, baby-boomers, employees, Generation X, Generation Y, Generation Z, generational differences

Introduction

It is probably axiomatic to state that the greatest resource available to companies is human capital. Effective employees make for effective productivity. Poor work on the part of the employees can have disastrous consequences for companies (Tziner and

Birati 2015). The world of the 21st century is experiencing an unprecedented rate of change. The ability to anticipate and adapt to these changes is the only way for companies to guarantee their continued success and to remain competitive. To enable management to predict market developments, increase productivity, work with both traditional and new tools for human resources, retain employees when searching for new ones is difficult, it is necessary to know and understand the needs and goals of employees and work with them accordingly. In addition, it is necessary to put aside the myths and prejudices linked to human resources and to actively promote diversity.

In recent years, a range of human resource management concepts have emerged. These concepts include human resources management ethics (Winstanley, Woodall and Heery 1996; Greenwood 2002), human resources diversity management (Shen et al. 2009), high involvement human resources management (Guthrie 2001), flexible employment (Guest 2004), family-friendly human resources management (Bagram and Sader 2007) and work-life balance (Bardoel, De Cieri and Mayson 2008). These concepts address the wishes, needs and interests of employees from different perspectives (Shen and Zhu 2011).

According to Hansen and Leuty (2012), the term generation typically refers to a group of individuals (employees) who share common work experiences or life experiences. The unique life experiences introduced during formative years inevitably contribute to the values of the individuals of each generational cohort. Current discussions point to the presence of four distinct generations that are working (living) today: Baby-boomers, Generation X, Generation Y and Generation Z.

Every employee is not only unique in terms of their skills, education, needs, values and expectations, but also in terms of their age and personal know-how. These differences deepen all the more even within generations. Today's labour market is made up of employees that belong to the generation of baby-boomers, Generation X, Generation Y and Generation Z, and in the future, Generation Alpha.

Evidence suggests that there are marked differences in the expectations and motivators across these generational cohorts. For example, Glass (2007), found that Generation X and Generation Y have an entirely different view on the world of work than baby-boomers and traditionalists. Not only do members of Generation Y look different with their body piercings, tattoos and electronic gadgets, but they also behave and think differently too (Crumpacker and Crumpacker 2007).

A longitudinal study of job mobility revealed that during the first ten years in the labour market, a typical young worker will be employed by seven companies. Others have found that young workers change careers three or four times in that same period (Morrison, Erickson and Dychtwald 2006).

According to Messarra, Karkoulou and El-Kassar (2016), the differences between the four generations are likely to have arisen between individuals or groups because of differences in values, expectations, needs, workplace practices, and personalities, which, in turn, could produce conflicting actions and preferences. The poor management of such

differences or conflicts in the workplace can have adverse effects on the level and frequency of future conflicts and can therefore negatively affect productivity, job performance, and organizational commitment.

While having a diversity of ages in the workplace can be beneficial, companies and employees alike have observed differences in the way in which these four generations function in the workplace. Companies are now faced with the challenges of integrating different generations in the workplace, as well as with the complexity of creating environments to attract and satisfy these workers (Hansen and Leuty 2012).

How can these generations understand what unites them, why they differ, in what possible ways personnel can work with them, as well as learn lessons for the future?

The aim of this article is to compare the selected characteristics of each generation in Czech corporate practice through a content analysis of domestic and foreign secondary sources, with a subsequent reflection on how personnel managers can work more effectively with these different generations of employees.

The Silent Generation (Traditionalists)

The silent generation refers to those people who were born between 1925 and 1946. These individuals are described as being very loyal (loyal and patriotic employees), with a lot of faith in institutions, and often with the plan of working for one organization for a long time. Most value earning money and saving money and as a result, they have become a wealthy generation. They view work as a duty and an obligation (Adams 1998; Eisner 2005; Hansen and Leuty 2012; Knight 2014; Zemke, Raines and Filipczak 2000).

Baby-boomers (Boomers)

The term baby-boomers is derived from pop culture and refers to the American generation. In the past, sociologists were not preoccupied with research into this generation in Czechoslovakia. Baby-boomers are those people born between 1946 and 1960 (Gardiner, Grace and King 2015; Knight 2014; McNeese-Smith and Crook 2003; Stuenkel, de la Cuesta and Cohen 2005; Zemke, Raines and Filipczak 2000). They are characterized as loyal to their employers, dedicated and workaholics, who accept direction (Kupperschmidt 2000; Wieck 2005; Apostolidis and Polifroni 2006). Boomers tend to be individualistic, self-absorbed, cynical, and focused on social causes; they have strong social skills, are excellent networkers, but lack technical skills (Adams 1998; Eisner 2005; Beutell and Wittig-Berman 2008). In Czechoslovakia at the time, this generation experienced the following historical events and milestones: 1945 – liberation; 1946 – post-war elections; 1948 – nationalization and educational reform; 1953 – monetary reform.

Generation X (Xers)

Generation X (Xers) is a designation for a generation of people in Western Europe or the USA. The term, "Husak's children" (in Czech: Husákovy děti), is more typical for Czechoslovakia/the Czech Republic. However, these terms are not exactly the same. The advent of single-parent homes and dual-income families is considered to be the most influential factor on the development of Generation X (Knight 2014; Leiter, Jackson and Shaughnessy 2009). They are the original latchkey generation. Born between 1960 and 1980 (Gardiner, Grace and King 2015; McNeese-Smith and Crook 2003; Stuenkel, de la Cuesta and Cohen 2005; Zemke, Raines and Filipczak 2000), children from this generation were sent to participate in after-school programmes or returned home to an empty house (Lancaster and Stillman 2005; Wieck 2005). Xers became resourceful and independent. They tend to seek balance between their work and personal lives and are motivated by consistent work values (Lancaster and Stillman 2005; Stuenkel, de la Cuesta and Cohen 2005). Having grown up in the presence of computers, Xers are adept with technology, synthesizing diverse information to gain knowledge and understanding (Stuenkel, de la Cuesta and Cohen 2005). Xers are characterized as being independent, seeking emotional security, preferring informality, and having more entrepreneurial skills than baby-boomers (Howe and Strauss 2007). Xers appear to value their work-life balance, growth opportunities, and positive work relationships more highly than boomers or Generation Y; they love freedom and room to grow (Eisner 2005; Beutell and Wittig-Berman 2008; Shen Kian, Wan Yusoff and Rajah 2013; Wan Yusoff and Shen Kian 2013). In Czechoslovakia at the time, this generation experienced the following historical events and milestones: 1968 – Prague Spring; between 1969 and 1985 – normalization; 1977 – Charter 77; 1980 – Solidarity movement.

Generation Y (also often referred to as Millennials or as the Next Generation)

Generation Y is the first "global" generation. The people from Generation Y have similar characteristics and attributes irrespective of their country of origin. Generation Y refers to people who were born between 1980 and 1995 (Horváthová, Bláha and Čopíková 2016; Knight 2014; Zemke, Raines and Filipczak 2000). Martin (2005) suggests that Generation Y employees may be prepared to make long-term commitments to companies, however, that can mean one year. In a cross-cultural study, Murphy, Gordon and Anderson (2004), found similarities across generations, but noted that members of Generation Y are not prepared to work as many hours as baby-boomers or traditionalists do, irrespective of their cultural origin. The following is said of Generation Y (Smola and Sutton 2002; Eisner 2005; Morrison, Erickson and Dychtwald 2006; Shaw and Fairhurst 2008; Cugin 2012; Shen Kian, Wan Yusoff and Rajah 2013; Wan Yusoff and Shen Kian 2013): (1) 'connected' 24 hours a day; (2) work is just one priority in life, not the priority; (3) want minimal rules and bureaucracy; (4) prefer openness and transparency; (5) favours an inclusive style of management, team orientation; (6) expect to be empowered; (7) want daily feedback and thrive on a rush of new challenges, opportunities and being pushed to the limits; (8) seek a portable career and greater

degrees of personal flexibility; (9) want education and development, but it needs to be relevant, interactive, personalized and entertaining; (10) want a positive work climate; (11) positive, polite and energetic. In Czechoslovakia/the Czech Republic at the time, this generation experienced the following historical events and milestones: 1986 – Chernobyl, Challenger; between 1987 and 1991 – Perestroika; 1989 – the Velvet Revolution, collapse of the Eastern Bloc, start of the Internet; 1992 – privatization programme; 1993 – the breakup of Czechoslovakia.

Generation Z (also often referred to as Generation M or as Post-Millennials)

The people who form Generation Z do a lot of things differently to the baby-boomers, Generation X or Generation Y. Generation Z are those people born between 1995 and 2010, roughly. The following ideas have been put forward to attract and retain this next generation of employees. They include: (1) having advanced manufacturing technology in the company that is less than five years old, leveraging big data, having older workers with experience, and digitizing everything; (2) installing the latest versions and subscribing to interim maintenance updates of all software packages; (3) being socially responsible – culturally, philanthropically and environmentally; (4) refreshing the company brand and marketing techniques (Knight 2014; West 2014; Zemke, Raines and Filipczak 2000). Those members of Generation Z, who are about to join the workforce, mostly born after 2000, are also referred to in literature as the mobile generation. They have grown up with technology, the world-wide web, mp3 players, short messages, mobile phones, PDAs, YouTube, iPads, and other media technologies (Kapil and Roy 2014). Generation Z are self-confident, happy, fit into the team spirit and are more interested in social activities than the previous generations (Ozkan and Solmaz 2015). Generation Z are also (West 2014): (1) well-integrated with technology; they are often referred to as "digital natives"; (2) social media savvy; (3) multitaskers; (4) concerned about the environment; (5) influenced by their friends about products and brands; (6) smart, with the ability to process a lot of information quickly.

Within the next five years, Generation Z will constitute a fifth of the workforce. This is a group of people that grew up with wireless technology. Workers from this generation of young adults tend to be innovative and creative, wanting to make an impact on society. They want to advance and grow professionally, and are willing to use internships and learning experiences to do this. Generation Z are also more interested in working for a cause or company that they are passionate about, and may be willing to be paid less to do so. If a company has the intention of attracting a young, talented workforce, it must therefore offer competitive salaries and benefits; otherwise they will find an employer who does meet their demands. They also have higher expectations of their relationship with their bosses. Even though they are fluent in a world of social media, text messages and email, they would much rather have genuine conversations and connections with those higher up. Additionally, this generation is very project-oriented, ready to run with whatever is given to them. However, they prefer extensive feedback and input from those higher than them. Generation Z has a great amount of drive, talent, and ambition to bring

to the table. They are not above working hard for their paycheque. They are loyal and are able to drive through innovations to match the changing times. They are willing to grow and progress quickly and do so with the intention of making an impact on the company they work for from the beginning. This means that these companies must be willing to work hard for their attention, offering adequate salaries and benefits in order to attract talented young adults to their doorstep (McGraw 2014). In the Czech Republic at the time, this generation experienced the following historical events and milestones: 2001 – terrorist attacks in New York; 2004 – the Czech Republic joined the European Union; 2008 – global financial crisis; 2013 – Islamic State; 2014 – migration wave; 2016 – Brexit.

Generation Alpha

The dates of birth range between 2010 and 2025. Their formative years will take at least 30 years. They are or will be the children of Generation X, Generation Y and Generation Z. Five predictions have been made for Generation Alpha (Schawbel 2014): (1) they will be the most entrepreneurial generation so far; (2) they will be the most tech savvy generation ever and will never have known a world without social networking; (3) they will primarily shop online and have less human contact than previous generations; (4) they will be extremely coddled and influenced by their Generation X and Generation Y parents; (5) they will be more self-sufficient, better educated and prepared for big challenges.

The upper and lower age thresholds for sorting individuals into generations are not a convention or a fixed parameter. Some authors even set the thresholds in such a way that the age cohorts overlap. It is therefore up to the individual researcher to devise their own system of thresholds. It is, however, important that the categories within the research do not overlap.

On the grounds of an analysis of domestic and foreign expert resources, one hypothesis (H1) and two research assumptions/questions (RQ1 and RQ2) were formulated.

H1: The perception of the selected characteristics of each generation of employees is the same in employees as it is in HR professionals in selected Czech companies.

RQ1: Which factors are considered by each generation of employees as significant and important for their motivation?

RQ2: Which challenges, positive or negative, do HR professionals see emerging for Generation Z in the labour market?

Materials and Methods

The conceptual framework presented in this paper is based on literature from the fields of strategic management, human resource management – diversity management, age management and knowledge management. The data for this paper were obtained from both primary and secondary sources. The data were processed using commonly used scientific methods e.g. analysis, synthesis, comparing and others. The research was conducted in 2015. The aim of this article is to compare the selected characteristics of each generation in Czech corporate practice through a content analysis of domestic and

foreign secondary sources, with a subsequent reflection on how personnel managers can work more effectively with these different generations of employees. The partial objectives of this article include answering the research hypothesis and the research questions/assumptions (H1, RQ1 and RQ2) relating to the strategic management of human resources in selected Czech companies. This article presents some of the results of quantitative and qualitative research conducted in selected companies in the Czech Republic. The aim of the research included: (1) determining whether generational diversity is a feature of today's modern workplace; (2) identifying the basic characteristics of each generation with regards to the management of selected Czech companies and the employees themselves; (3) identifying what motivates each generation of employees to perform work; (4) pondering the challenges faced by HR managers and the management of companies with regards to working with the individual generations.

The HR managers, professionals, specialists or leaders of selected Czech companies, as well as employees, were presented with the research hypothesis and assumptions/questions. The research techniques used included a questionnaire survey, observation and semi-structured interviews.

In total, 182 selected Czech companies participated in the quantitative and qualitative research. The basic research dataset was drawn from the list of the 100 most admired companies in the Czech Republic, as compiled by Czech Top 100. This list was subsequently merged with the list of the largest Czech companies by sales volume and the database of Business for Society, the sponsor of the TOP Responsible Company award. The structure of the companies in the dataset is given in Table 1.

The companies which participated in the questionnaire survey represented a wide range of industries and sectors, namely: construction, educational services, engineering, finance and insurance, food, healthcare, chemical, ICT, telecommunications, tourism, trade, transportation, and others.

Table 1: Structure of the companies in the dataset

Company category	Staff headcount	Turnover or Balance sheet total	Absolute frequency	Relative frequency
Large	≥ 250	≥ € 50 million or ≥ € 43 million	62	34.06 %
Medium-sized	< 250	≤ € 50 million or ≤ € 43 million	88	48.35 %
Small	< 50	≤ € 10 million or ≤ € 10 million	24	13.19 %
Micro	< 10	≤ € 2 million or ≤ € 2 million	8	4.40 %
Total	X	X	182.00	100.00 %

Source: Author

The research group, which consisted of 182 employees responsible for the human resources management of 3,182 employees in the selected Czech companies, agreed to complete an anonymous questionnaire survey. The questionnaires were distributed in paper form, in five versions. The questionnaire results served to test the research hypothesis and assumptions/questions. The selection of this form of research tool made it possible to include a wide range of respondents. The first version of the questionnaire survey was targeted at the HR managers, professionals, specialists or leaders in the selected Czech companies. The second, third, fourth, and fifth versions of the questionnaire survey were targeted at their employees (Baby-boomers, Generation X, Generation Y and Generation Z respectively). In total, the questionnaires contained twenty questions: closed format questions (closed-ended bipolar questions, closed-ended dichotomous questions, closed-ended importance questions, closed-ended Likert questions – with the 5-point Likert scale, closed-ended leading questions, closed-ended rating scale questions); and open format questions.

Where circumstances permitted, twenty employees (five employees from each generation) in each company were asked to complete the questionnaire survey. The employees were selected on the basis of a proportional subset, with the same percentage share of employees chosen to represent each generation, which is a form of probability-based random selection. The generational structure of the respondents is presented in Table 2.

Table 2: Generational structure of the respondents

Generation	Years	Gender		Absolute frequency	Relative frequency
		Female	Male		
Boomers	1946 – 1960	426	482	908	28.54 %
Generation X	1961 – 1980	441	461	902	28.35 %
Generation Y	1981 – 1994	410	481	891	28.00 %
Generation Z	1995 – 2001	183	298	481	15.11 %
Total	X	1,460	1,722	3,182	100.00 %

Source: Author

The methods for evaluating the data were based on the research objective and the type of investigated data. The validity of the research hypothesis was verified by utilizing McNemar's test of symmetry. The null research hypothesis was determined as follows: "H1-0: the responses to the selected characteristics of employees from respondents are symmetrical". The alternative research hypothesis was determined as follows: "H1-A: the responses to the selected characteristics of employees from respondents are unsymmetrical". The calculation was made using the following equation:

$$\chi^2 = \sum_{i < j} \sum \frac{(n_{ij} - n_{ji})^2}{n_{ij} + n_{ji}}, (1)$$

Categorical data were obtained during the analysis of the questionnaire survey. The acquired data were evaluated using the statistical computer program R. The computer program R is a programming language and software environment for statistical analysis, graphical representation and reporting. If the p-value is $< \alpha$, the H1-0 research hypothesis is rejected in favour of the H1-A research hypothesis, whereby, on these grounds, the H1 research hypothesis would be rejected. Value $\alpha = 0.05$. The results of the McNemar symmetry tests for the selected characteristics of the employees in the selected Czech companies are presented in Tables 4, 5, 6 and 7.

The research group for the semi-structured interviews included 48 employees responsible for human resources management (HR managers, professionals, specialists or leaders) in the selected Czech companies (see Table 3). The managers were chosen using a combination of several types of intentional selection; in particular, judgment-based selection supplemented with chain and quota selection.

Table 3: Structure of HR managers, professionals, specialists or leaders

Company category	Absolute frequency	Relative frequency
Large	10	20.84 %
Medium-sized	22	45.83 %
Small	12	25.00 %
Micro	4	8.33 %
Total	48.00	100.00 %

Source: Author

On the basis of the semi-structured interviews, more general categories were defined with which to cover statements made by the research group, including the elimination of repeated claims in their responses. The findings were subsequently summarized and interpreted.

Results

The results of the statistical processing of the data collated through the conducted research are presented in this section.

Research hypothesis – H1: The perception of the selected characteristics of each generation of employees is the same in employees as it is in HR professionals in selected Czech companies.

Eight characteristics were defined in connection with the perception of each generation of employees in the selected Czech companies, whereby the level of consistency of the responses of the HR managers, professionals, specialists or leaders and employees was investigated. The responses of the employees were assumed to be the same as those of their HR managers. The validity of the H1 research hypothesis was subsequently verified by utilizing McNemar's symmetry test.

The results of the McNemar symmetry tests for the selected characteristics of the employees in the selected Czech companies are presented in Tables 4, 5, 6 and 7.

Table 4: Verification of the H1 research hypothesis by means of McNemar's symmetry test for baby-boomers

Baby-boomers (Boomers)			
Characteristics	Number of respondents (N)	McNemar's chi-squared	p-value
Experience	3364	28.6317	4.031e-03
Loyalty	3364	8.9029	6.028e-02
Reliability	3364	38.4628	3.907e-04
Willingness to continue education	3364	25.0698	6.522e-05
Adaptability to technological changes	3364	71.9502	3.018e-08
Lower self-confidence	3364	22.5432	2.299e-02
Slower pace of work	3364	44.7136	2.543e-06
Tendency to stereotype	3364	28.0793	6.602e-03

Source: Author

Table 4 contains data generated on the basis of McNemar's symmetry test, which characterizes and verifies the H1 research hypothesis for baby-boomers. On a 5 % significance level, the H1-0 research hypothesis was rejected in favour of the H1-A research hypothesis. The responses of the employees were the same as those of their HR managers, with the only characteristic not to be rejected being loyalty. All the other characteristics of the baby-boomer generation were rejected. This is sufficient evidence with which to reject the H1-0 research hypothesis accordingly. It can be stated that the data obtained from the respondents were unsymmetrical.

Table 5: Verification of the H1 research hypothesis by means of McNemar's symmetry test for Generation X

Generation X (Xers)			
Characteristics	Number of respondents (N)	McNemar's chi-squared	p-value
Ability to work faster and more efficiently	3364	38.4456	3.066e-04
Ability to work under minimal supervision	3364	8.1136	5.812e-02
Flexibility and adaptability	3364	26.0974	2.019e-03
Willingness to take risks	3364	40.5973	8.049e-06
Egotism (self-interest)	3364	35.0147	4.182e-04
More loyal to their profession than to their employer	3364	24.8557	4.098e-03
Do not recognize traditional values, lack ethics	3364	23.6428	5.541e-05
Scepticism	3364	25.5912	6.933e-03

Source: Author

Table 5 contains data generated on the basis of McNemar's symmetry test, which characterizes and verifies the H1 research hypothesis for Generation X. On a 5 % significance level, the H1-0 research hypothesis was rejected in favour of the H1-A research hypothesis. The responses of the employees were the same as those of their HR managers, with the only characteristic not to be rejected being the ability to work under minimal supervision. All the other characteristics of Generation X were rejected. This is sufficient evidence with which to reject research hypothesis H1-0 for Generation X accordingly. It can be stated that the data obtained from the respondents were unsymmetrical.

Table 6: Verification of the H1 research hypothesis by means of McNemar's symmetry test for Generation Y

Generation Y			
Characteristics	Number of respondents (N)	McNemar's chi-squared	p-value
Flexibility and speed	3364	24.7351	2.038e-03
Language skills required to perform a job	3364	8.6151	4.243e-02
Online skills	3364	6.4423	8.182e-01
Work-life balance	3364	8.1772	4.238e-02
Ambitious	3364	20.9981	3.099e-03
Expect to be paid for what they do, not how much time spent	3364	25.3007	5.818e-05
Low level of loyalty	3364	28.9675	6.512e-05
Require frequent feedback and training	3364	26.4873	5.036e-05

Source: Author

Table 6 contains data generated on the basis of McNemar's symmetry test, which characterizes and verifies the H1 research hypothesis for Generation Y. On a 5 % significance level, the H1-0 research hypothesis was rejected in favour of the H1-A research hypothesis. The responses of the employees were the same as those of their HR managers, with the only characteristic not to be rejected being online skills. All the other characteristics of Generation Y were rejected. This is sufficient evidence with which to reject research hypothesis H1-0 for Generation Y accordingly. It can be stated that the data obtained from the respondents were unsymmetrical.

Table 7: Verification of the H1 research hypothesis by means of McNemar's symmetry test for Generation Z

Generation Z			
Characteristics	Number of respondents (N)	McNemar's chi-squared	p-value
A detailed career plan	3364	32.1679	5.934e-04
Language skills required to perform a job	3364	9.0911	4.551e-02
Multiculturalism	3364	18.7802	3.482e-03
Online skills	3364	5.2864	8.128e-01
Lack of emotional intelligence	3364	23.1117	4.077e-03
Low level of loyalty	3364	34.5203	2.048e-04
Need for freedom, independence and strong individuality	3364	4.983	6.218e-01
Want some fun in the workplace	3364	15.7935	3.092e-03

Source: Author

Table 7 contains data generated on the basis of McNemar's symmetry test, which characterizes and verifies the H1 research hypothesis for Generation Z. On a 5 % significance level, the H1-0 research hypothesis was rejected in favour of the H1-A research hypothesis. The responses of the employees were the same as those of their HR managers, with the only characteristics not to be rejected being online skills and the need for freedom, independence and strong individuality. All the other characteristics of Generation Z were rejected. This is sufficient evidence with which to reject research hypothesis H1-0 for Generation Z accordingly. It can be stated that the data obtained from the respondents were unsymmetrical.

For the selected characteristics of employees (Baby-boomers, Generation X, Generation Y and Generation Z), the level of consistency of the answers of the HR managers and of the employees differed. The H1 research hypothesis was therefore rejected on the grounds of the evidence obtained. It can be stated that the data obtained from the respondents were unsymmetrical.

Research question – RQ1: Which factors are considered by each generation of employees as significant and important for their motivation?

The employees from across the generations in the selected Czech companies identified the following factors as being significant and important for their work motivation: (1) interesting basic wage or salary; (2) good relationships in the workplace; (3) financial

bonuses for the work done; (4) company car or mobile phone for private purposes; (5) flexible modes of work; (6) job security; (7) corporate actions and events; (8) degree of decision making; (9) possibility of career advancement; (10) possibility to design and implement own ideas; (11) possibility of self-realization; (12) new work challenges; (13) continuous growth in their financial evaluation; (14) pleasant working environment; (15) sick days or personal days; (16) fair system of remuneration; (17) technical equipment and facilities in the workplace; (18) public praise for good performance; (19) educational courses, training and workshops; (20) foreign internships; (21) feedback on work performance; (22) life insurance, pension insurance, or other insurance. Of these factors, the five most important for each generation are presented in Table 8.

Table 8: The five most important factors of job stimulation of each generation of employees in the selected Czech corporations according to their intrinsic motivation

Generation	Factors of job stimulation	Generation	Factors of job stimulation
Baby-boomers (Boomers)	Job security	Generation X (Xers)	Fair system of remuneration
	Good relationships in the workplace		Possibility of career advancement
	Pleasant working environment		Flexible modes of work
	Fair system of remuneration		Educational courses, training and workshops
	Sick days or personal days		Good relationships in the workplace
Generation Y	Fair system of remuneration	Generation Z	New work challenges
	Educational courses, training and workshops		Financial bonuses for the work done
	Flexible modes of work		Possibility to design and implement own ideas
	Financial bonuses for the work done		Flexible modes of work
	Possibility of career advancement		Foreign internships

Source: Author

Research question – RQ2: Which challenges, positive or negative, do HR professionals see emerging for Generation Z in the labour market?

The addressed HR professionals consistently indicated that in practice it was necessary to have a differentiated approach to each of the generations of employees. It was accepted that each generation honours different principles and values, which is reflected in their expectations and attitudes to work, behaviour, performance and career-building. They defined Generation Z as individuals characterized by information technologies and multiculturalism.

It should be noted that the current experience of the addressed HR professionals with regards to Generation Z is not very rich yet. This is mainly due to the fact that the individuals were only born between 1995 and 2010. In their search for answers to the research question RQ2, HR professionals therefore had to draw on their companies' limited experience with employing this generation in the form of temporary jobs, various local types of short-term employment contracts, internships, part-time employment contracts, and, in rare cases, full-time employment contracts. The facts about Generation Z presented below were obtained from semi-structured interviews with HR professionals. The questions posed were: closed-ended bipolar questions, closed-ended dichotomous questions, closed-ended Likert questions and open format questions, the absolute frequency of specific variables/characteristics and the relative frequency of specific variables/characteristics. So far, employees of Generation Z are considered to: (1) not be very loyal; (2) lack emotional intelligence; (3) want to enjoy their freedom and be their own bosses; (4) not be able to concentrate for a long time. On the positive side they are considered to have: (1) high levels of Internet literacy; (2) broad work experience – a large number of Generation Z were studying/had studied at school whilst holding down part-time jobs or internships; (3) the ability to adapt quickly to new technologies, and therefore operate more efficiently. Another characteristic feature noted by the HR professionals was the fairly high degree of self-confidence compared to other generations. This finding may be both challenging and disappointing for the HR professionals. With regards to employee motivation, HR professionals advocate the fact that each employee is unique and that it is necessary to get to know every single one in order to positively affect their motivation. They also fully understand that in order for their companies to maintain their competitive advantage they must employ the correct human resources strategy to reach out to, acquire, stabilize and minimise the departure of employees, in particular those of Generation Z. The issue for HR professionals is therefore how to effectively deal with these issues and the characteristics they consistently attribute to employees of Generation Z, of whom they say they are more realistic than optimistic, more environmentally focused, more sensitive to being rewarded or receiving appreciation for the slightest success, more communicative, more cooperative, and who expect more support and guidance from staff of other generations. On this basis, and in order to define more general categories of responses, semi-structured interviews were conducted. The findings were subsequently summarized and interpreted.

Discussion

According to Oh and Reeves (2011), generational differences are widely discussed in the popular press, business-oriented books, conferences, workshops and so on. However, the nomenclature used to label the generations is not standardized. There is also significant disagreement among various authors about the year spans for each generation. It is also important to acknowledge that there is a great deal of variance among the distinguishing characteristics within any given generation. It is therefore unjustified to assume that if a person was born in 1985, they will possess most of the characteristics of Generation Y, or that someone born in 1960, and who is therefore categorized as a late baby-boomer, is not as technologically aware as a person born into Generation X or Generation Y.

The age structure of the respondents in this research was determined by comparing the work of several authors, such as Horváthová, Bláha and Čopíková (2016), Gardiner, Grace and King (2015), McNeese-Smith and Crook (2003), Stuenkel, de la Cuesta and Cohen (2005), West (2014), and Zemke, Raines and Filipczak (2000).

According to the results of the research conducted for this paper, it can be stated that the perceptions of the selected characteristics of employees of each generation is not the same among the employees and HR managers of the selected Czech companies. Indeed, the HR professionals tend to perceive the employees in terms of their: (1) work performance; (2) productivity; (3) preconceptions and prejudices of the characteristics of every generation or those of the external labour market. Despite these differences in perceptions, the results of the research also show that there is conformity among the two groups in their perceptions that: Baby-boomers are loyal; Generation X are able to work under minimal supervision; Generation Y possess high levels of online skills; and Generation Z, in addition to possessing high levels of online skills, have a need for freedom, independence and strong individuality.

Moore, Grunberg and Krause (2015) describe Generation Z employees as being willing to challenge authority and having the desire for autonomous and independent work. They value achievement and success, as well as challenges, personal improvement, innovation, and creativity in their work. They also prefer collaborative work more than Generation X employees, as well as favour a more formalized work culture than Generation X and Y employees. This thesis is confirmed by the results of the research presented in this paper.

According to the Deloitte Millennial Survey (2016), two-thirds of Millennials (Generation Y) expressed a desire to leave their organizations by 2020. This confirms the opinions of the HR professionals who took part in this research. They consistently pointed to the low level of loyalty of Generation Y. This evidence shows that companies must therefore adjust how they nurture loyalty among Generation Y or risk losing a large percentage of their workforces.

The perception of selected characteristics of each generation of employees is also tackled by Kupperschmidt (2000), Howe and Strauss (2007), Beutell and Wittig-Berman (2008), Cogin (2012), West (2014), Gardiner, Grace and King (2015), and others. In these studies the focus is more on the evaluation of the complex characteristics of the individuals belonging to the generation in question, rather than an evaluation by a superior or self-

evaluation, as presented in this paper. In this lies the novelty and uniqueness of the contribution this paper makes.

The extent to which the selected characteristics are present in the employees in the selected Czech companies remains a question. The only (correct) approach is for the HR professionals to view and treat each employee as an individual. This implies that HR professionals, should, in particular, discard their preconceptions and prejudices, which is also confirmed by Chum (2012). Within this context, the companies would be well advised to actively implement the concept of Age Management. The aim of this philosophy/concept is to encourage efficient and targeted work with all age groups of employees in order for a company to generate profits, maintain its competitiveness and prosper (Bejtkovský 2015; Bejtkovský 2013). An example of the importance of this can be found in a study conducted by Mohani, Hashanah and Noor (2010). Their study of Japanese electrical and electronics manufacturing companies revealed that older executives with more work experience showed higher levels of motivation than younger executives.

Conclusion

Today's workforce includes at least four generations spanning more than 60 years: The Baby-boom generation, Generation X, Generation Y and Generation Z (Cogin 2012).

Companies are now faced with the challenges of integrating different generations in the workplace, as well as the complexity of creating environments to attract, stimulate, motivate and satisfy these employees accordingly. Understanding the generational differences may be a tool that managers can use to generate more employee productivity, loyalty, innovation and corporate citizenship.

The aim of this article is to compare the selected characteristics of each generation in Czech corporate practice through a content analysis of domestic and foreign secondary sources, with a subsequent reflection on how personnel managers can work more effectively with these different generations of employees. The results of the research presented in this paper shows that the level of consistency of the answers of the HR professionals and of the employees involved in the study differed for the selected generational characteristics. Despite these differences in perceptions, the results of the research also show that there is conformity among the two groups in their perceptions that: Baby-boomers are loyal; Generation X are able to work under minimal supervision; Generation Y possess high levels of online skills; and Generation Z, in addition to possessing high levels of online skills, have a need for freedom, independence and strong individuality.

The presented results also show that there has been a shift away from job security towards a rewards based system and new professional challenges. This is a reflection of the characteristics that the HR professionals consistently attribute to employees of Generation Z, of whom they say they are more realistic than optimistic, more environmentally focused, more sensitive to being rewarded or receiving appreciation for

the slightest success, more communicative, more cooperative, and who expect more support and guidance from staff of other generations.

The main research weakness is that the terminology used to label the generations is not standardized; the range of labels used by authors to identify the various generations is very wide.

The main contribution this paper makes is to identify what differences there are, if any, in how HR professionals and employees themselves view selected characteristics attributed to various generations of employees. In so doing, this paper has helped to define the key factors that motivate different generations of company employees (the employees in the selected companies in the Czech Republic). The results presented can be said to be in line with the current state of knowledge and research in the field.

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Perception of Sexual Minorities Among Contemporary University Students

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Abstract

Although the topic of sexual orientation and homosexuality is no longer considered taboo and the social status of LGBT individuals has improved significantly in the last few decades, prejudice, intolerance and homophobia are still deeply rooted in parts of our society. The aim of the empirical research conducted at a specific college was to analyse students' attitudes towards sexual minorities. The data were gathered using an anonymous online questionnaire in February 2016. In total, 350 respondents participated in the questionnaire survey. The research results indicate that the attitudes of college students towards homosexuals and lesbians is very liberal. However, the issue of sexual minorities remains a topical one. This preliminary research study should be followed up by other empirical studies.

Keywords: different sexual orientation, homosexuality, minority, gay, lesbian, bisexual, transgender (LGBT)

Introduction

In the former Czechoslovakia, the issue of sexual minorities was of little public and scientific interest under the totalitarian regime. Regime change at the turn of the 1980s – 1990s brought a significant change in social attitudes toward this minority, when the availability of information (including professional literature) improved significantly, and many organizations and movements were set up to fight for the rights of sexual minorities to be treated as equals with their heterosexual counterparts. The organizations included for example GI, Lambda, Logos Praha, Ucho Olomouc, STUD Brno, CODE 004, Gales, etc. (Procházka 2002).

In the Czech Republic, the Act on Registered Partnership came into force in 2006. The act establishes and regulates the cohabitation of two persons of the same sex (according to the latest statistical data from SOHO and GI, 2,322 same sex couples – 1,525 gay couples and 797 lesbian couples – have registered their partnership). In June 2016, § 13 paragraph 2, which obstructed the adoption of children by couples in registered partnerships, was repealed. (The Constitutional Court of the Czech Republic described the regulation as discriminatory and contradictory to the right to dignity and respect).¹

A number of empirical studies conducted after 1989 in the Czech Republic (Weiss and Zvěřina 1997; Weiss, Procházka and Zvěřina 1998; Janošová 2000; Vaculík and Červenková 2007) showed increasing tolerance towards sexual minorities. These findings have since been confirmed through regular surveys conducted by the Centrum pro výzkum veřejného mínění (hereinafter referred to as PORC - Public Opinion Research Centre). The most recent surveys have focused on the issue of the rights of same-sex couples to get married or to adopt children. As can be seen in Table 1, Czech society is becoming increasingly liberal, in particular with regards to the issue of the adoption of children by same-sex couples.

Table 1: The rights of same-sex couples to register a partnership, get married, adopt children

Lesbians and gay men should have the right to (time comparison in %)										
	2005	2007	2008	2009	2010	2011	2012	2013	2014	2015
	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-
... register a partnership	61/30	69/24	75/19	73/23	72/23	72/23	75/21	72/23	73/23	74/22
... get married	38/51	36/57	38/55	47/46	49/45	45/48	51/44	51/44	45/48	49/47
...adopt children	19/70	22/67	23/65	27/63	29/60	33/59	37/55	34/57	-	-
... adopt the	-	-	-	-	-	-	-	-	58/32	59/33

¹ For the time being, the amended version of the law does not allow the adoption of a child by both partners, but only by one of the registered partners.

biological child of their partner in a same-sex partnership										
... adopt children in institutional care	-	-	-	-	-	-	-	-	45/48	44/49

Note: sum of “strongly agree” and “agree” responses, and “disagree” and “strongly disagree” responses. Remaining percentage refers to the sum of the “neutral” responses for the individual questions in every year.

Source: CVVM SOÚ AV ČR, v. v. i., *Naše společnost*

Despite this positive trend, the issue of sexual minorities has always aroused – and still does – sharp and contradictory reactions. Hostility and negative attitudes towards gays and lesbians are deeply rooted in the past and still remain within society to this day (Šipošová, Heretik and Ondrisová 1999). According to a number of surveys (Weis, Procházka and Zvěřina 1998; Adamczyk and Pitt 2009; Collier, Bos and Sandfort 2012), education, living standards, political orientation, place of residence, religion, being acquainted with a homosexual, and age play a significant role in the support sexual minorities now enjoy within society.

Unlike previous surveys focused on the attitudes of Czech citizens towards sexual minorities, the authors focused on a group of students at a specific college. The objective of the survey was to analyse their personal attitudes towards sexual minorities and evaluate how tolerant they are in terms of the issue of sexual minorities. This research is the first of its kind in the Czech Republic and should be followed up with other empirical studies (for example, with regards to the analysis of the most significant predictive factor of the attitudes towards homosexuality, comparative analyses, and the attitudes of LGBT individuals themselves).

Methodology

The empirical research was conducted in February 2016 at the Institute of Technology and Business in České Budějovice (ITB) by means of an anonymous online questionnaire created by the authors of the article. 1,260 full-time students (due to the age proximity of the respondents) were approached to take part in the survey. In total, 350 students (149 male and 201 female) participated in the survey. The questionnaire consisted of 15

questions focused on determining the level of the respondents' awareness of the issue of homosexuality and mapping their personal attitudes towards sexual minorities. The data obtained through the survey were statistically evaluated and processed using a spreadsheet programme, and are presented in graphical form in Appendix 1.

Table 2: List of questions included in the questionnaire.

QUESTIONNAIRE
1. What is "homosexuality"?
2. In your opinion, what are the causes of different sexual orientation?
3. Are homosexuals more likely to commit deviant sexual acts?
4. Does a homosexual teacher threaten the moral education of children and young people?
5. Was the topic of homosexuality discussed in the context of your primary/ secondary school education?
6. Should this topic be involved in school curricula?
7. A person whom you respect turns out to be gay/ lesbian. Will it influence your relationship with them?
8. You see two men / women holding hands in the street. Do you mind?
9. Do your parents resent homosexuality?
10. Is there a significant difference between love between a man and a woman and love between two men/ women?
11. Are homosexuals discriminated against in our society?
12. Are the movements fighting for the rights of homosexuals necessary? Do they have a positive effect?
13. Should homosexuals have the right to get married?
14. Should same sex couples have the right to adopt children?
15. Are you male / female?

Results and discussion

The majority of the respondents believe that:

- Homosexuality is an alternative form of sexuality;
- Sexual orientation is caused by a genetic predisposition;
- Homosexuals are not more likely to commit deviant sexual acts;
- Gay/ lesbian teacher does not represent a threat to the moral education of children and young people;

- They did not encounter the topic of homosexuality within their primary / secondary education;
- This topic should be included in school curricula;
- Finding out that a person whom they respect is gay/ lesbian would not affect their relationship with them;
- They do not mind seeing two men/ women holding hands;
- Their parents do not have a negative attitude towards homosexuals;
- Love between a man and a woman does not differ significantly from love between two men or two women;
- Homosexuals are discriminated against in society;
- Movements fighting for the rights of homosexuals are necessary and have a positive effect;
- Homosexuals in the Czech Republic should have the right to get married;
- Homosexuals in the Czech Republic should have the right to adopt children.

More detailed analysis of the data collected

The overwhelming majority of respondents (83.6%) consider homosexuality to be an alternative form of sexuality caused by a genetic predisposition (64.8%). This corresponds with the assumption that homosexuality, as well as other sexual orientations, is not a matter of personal choice, and that it is not a disease, disorder or deviation. It is a natural variation of human sexuality. David (2014) states that, "asking a person to act contrary to their sexual orientation is perverse. It would be like forcing heterosexuals to live in a homosexual partnership."

There is no consensus among scientists about the causes of homosexuality. Janošová (2000) says, "... homosexuality and other sexual orientations have not been to the extent so as to be able to give a satisfactory and unambiguous answer explaining the causes of their origin. Theories concerning the origin of homosexuality are very diverse, and depend also on the scientific discipline the scientist bases their investigation on. Some of the hypotheses are complementary, some are contradictory." The most likely theory is linked to biological factors i.e. genetic predisposition and prenatal development. The influence of the environment only seems to play a more significant role in the case of predisposed individuals, and then only until the age of three (Brzek and Pondělíčková-Mašlová 1992). The majority of responses in the questionnaire seem to be in accordance with this theory. Almost 65 % of the respondents believe that having a different sexual orientation is caused by a genetic predisposition, whereas only 17% and 11.8% respectively, believe that it is caused by the influence of the environment or a mental disorder.

Approximately three quarters of all respondents (70.5%) believe that homosexuality does not increase the risk of deviant sexual acts nor that a gay or lesbian teacher threatens the moral education of children and young people (76.1%). Most students (61.6%) did not encounter this topic during their primary and secondary education, and more than half (51.6%) think the topic of homosexuality should be included in the

school curricula. Schools therefore seem to be failing on this issue. However, according to similar surveys, families are failing to address the issue too. The main source of information in this case are still peers (Weiss and Zvěřina 1999; Jarkovská and Lišková 2013).

Some of the respondents (9.7%) admitted that the sexual orientation of a person they respect would influence their relationship with them. However, almost 84% of the respondents are of a different opinion. Furthermore, research conducted in the past has confirmed the assumption that having personal contact with a person who does not hide their different sexual orientation positively influences the attitudes of heterosexuals towards sexual minorities (Ondrisová et al. 2002; Vaculík and Červenková 2007).

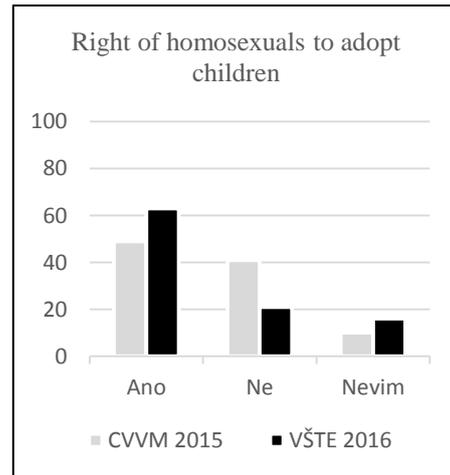
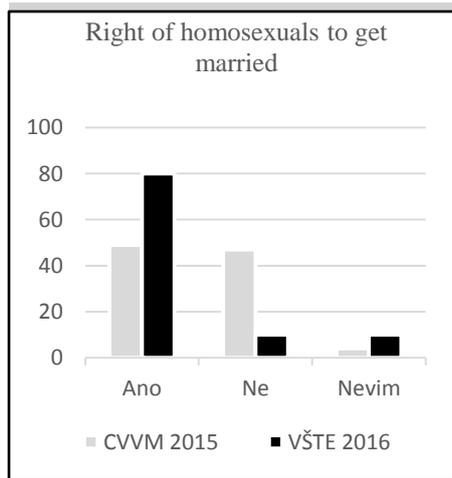
The responses to the eighth question confirmed an already well known fact: public displays of affection between two gay men are less acceptable than those between two lesbian women (18.9% compared to 0.9%). According to Janošová (2000), female homosexuality (lesbianism) is socially more acceptable than male homosexuality. However, about three quarters (75.6%) of respondents do not see either of these public displays of affection as offensive. The perception of homosexuality also seems to be an intergenerational problem as more than a quarter of the respondents' parents (26.5%) find homosexuality upsetting, whereby mothers (1.2%) seem to be more tolerant than fathers (14%).

Despite the specifics of the relationships of gays and lesbians (Sváková and Ondrisová 2003), most respondents (61.5%) believe that the love between two men (two women) does not differ significantly from the love between a woman and a man.

Almost two thirds of the respondents (64.7%) believe that homosexuals are discriminated against in society, and 38.5% of them consider movements that fight for the rights of homosexuals as being essential and that they have a positive impact.

Compared to a nationwide survey, there was a significant difference in tolerance concerning the right of homosexuals to get married. Whilst the results of a nationwide survey indicate that just under half of the respondents (49%) agree with the right of homosexuals to enter into marriage, amongst students there is a much higher level of tolerance (80%). A similar difference of opinion was observed concerning the issue of the adoption of a child by same-sex couples, the most divisive topic with regards to the issue of the equality of sexual minorities. According to the results of a PORC survey, 41% of the respondents oppose the adoption of children by homosexual couples, whilst only one-fifth (21%) of the ITB students were of the same opinion.

Figures 1 and 2: Comparison of PORC and ITB survey results on the right of homosexuals to get married and adopt children.



Legend: Ano – Yes, Ne – No, Nevím - I don't know, CVVM – Centrum pro výzkum veřejného mínění (Public Opinion Research Centre), VŠTE - ITB

Source: PORC, own research

The relatively high level of tolerance shown by the ITB students on this issue is consistent with the global trend of a permanent rise in gay and lesbian parenting, as evidenced by a number of research studies on this topic (Weiss, Procházka and Zvěřina 1998; Cahill, Battle and Meyer 2003; Sokolová 2009; Ross et al. 2009; Moore and Stambolis-Ruhstorfer 2013; Gates 2015).

Conclusion

The issue of different sexual orientations is a topical issue and a subject of social science research. The presentation of the results of such research and surveys can become, inter alia, an important part of predicting the attitudes and behaviour of younger generations.

The results of the survey conducted at the Institute of Technology and Business in České Budějovice confirmed that college students have a high level of tolerance towards sexual minorities. A comparison with similar surveys conducted in the last few years in the Czech Republic confirmed that young and educated people in the Czech Republic are one of the most tolerant groups in terms of their relationship to sexual minorities. It is therefore likely that this trend will continue to grow in the future.

This preliminary research study should be followed up by further empirical research into the causes of the intolerant attitudes of some students towards sexual minorities, as well as into the differences in perception of different sexual orientations in various types of educational institutions. Additional research should also focus on comparing teachers' and students' attitudes towards sexual minorities, both in the Czech Republic and abroad, as well as into the attitudes of those people with a minority sexual orientation.

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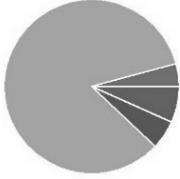
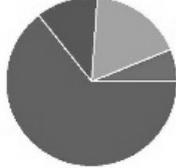
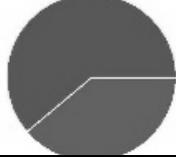
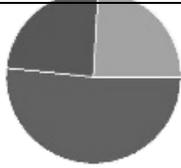
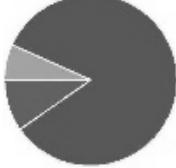
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Appendix 1 (detailed summary of the results):

1. Homosexuality is			
a/ a disease	23	6.6 %	
b/ a deviation	19	5.5 %	
c/ an alternative form of sexuality	291	83.6 %	
d/ other	15	4.3 %	
2. In your opinion, what are the causes of homosexuality?			
a/ genetic predisposition	225	64.8 %	
b/ mental disorder	41	11.8 %	
c/ influence of environment	59	17 %	
d/ other	22	6.3 %	
3. Homosexuals are more likely to commit deviant sexual acts			
a/ yes	27	7.7 %	
b/ no	246	70.5 %	
c/ don't know	76	21.8 %	
4. Can a homosexual teacher threaten the moral education of children and young people?			
a/ yes	31	8.9 %	
b/ no	265	76.1 %	
c/ don't know	52	14.9 %	
5. Was the topic of homosexuality discussed within the context of your primary/secondary education?			
a/ yes	134	38.4 %	
b/ no	215	61.6 %	
6. Should this topic be involved in school curricula?			
a/ yes	179	51.6 %	
b/ no	84	24.4 %	
c/ don't know	84	24.4 %	
7. A person I respect turns out to be homosexual. Does this affect your relationship?			
a/ yes	34	9.7 %	
b/ no	291	83.4 %	
c/ don't know	24	6.9 %	
8. There are two men / women holding hands in the street....			

a/ I do mind	16	4.6 %	
b/ I don't mind	264	75.6 %	
c/ I do mind two men holding hands	66	18.9 %	
d/ I do mind two women holding hands	3	0.9 %	
9. My parents resent homosexuality			
a/ yes	91	26.5 %	
b/ no	201	58.4 %	
c/ only my mother	4	1.2 %	
d/ only my father	48	14 %	
10. Love between two men/ women is not different from love between a man and a woman			
a/ yes	56	16.1 %	
b/ no	214	61.5 %	
c/ don't know	78	22.4 %	
11. Are homosexuals discriminated against in our society?			
a/ yes	224	64.7 %	
b/ no	70	20.2 %	
c/ don't know	52	15 %	
12. Movements fighting for the rights of homosexuals are important and have a positive impact.			
a/ yes	134	38.5 %	
b/ no	85	24.4 %	
c/ don't know	129	37.1 %	
13. Should homosexuals in CR be allowed to get married?			
a/ yes	277	79.6 %	
b/ no	35	10.1 %	
c/ don't know	36	10.3 %	
14. Should homosexuals in CR be allowed to adopt children?			
a/ yes	218	62.5 %	
b/ no	75	21.5 %	
c/ don't know	56	16 %	
15. I am			
a/ a man	148	42.4 %	
b/ a woman	201	57.6 %	

Appendix 2 (glossary):

Bisexuality – approximately balanced sexual and romantic attraction to people of both sexes, homosexual and heterosexual orientation at the same time. Bisexuals find both sexes equally attractive (Capponi, Hajnová and Novák 1994).

Coming Out – process of realization, acknowledgement and acceptance of one's own sexual orientation (Zvěřina 2003).

Heterosexuality – sexual and erotic attraction to people of the opposite sex (Capponi, Hajnová and Novák 1994). "Sexual orientation towards people of the opposite sex; there are three areas: a) sexual orientation, b) sexual behaviour including romantic relationships and partnerships, c) identity i.e. self-perception as a person with a certain sexuality; those areas are not always consistent..." (Smetáčková and Braun 2009).

Homophobia – negative or even hateful attitude towards people that belong to a sexual minority. "Fear of homosexuality and homosexuals, which can lead to aversion, hostility or even hatred and can become the basis for rejecting, ridiculing or harming behaviour towards homosexuals or people who are assumed to be homosexuals; currently, the term homophobia is used to refer to the abovementioned feelings and behaviour towards all people who are not heterosexuals..." (Smetáčková and Braun 2009).

Homosexuality – erotic and sexual attraction to people of the same sex. Like all other types of sexual orientation, it is considered constant, lifelong, not caused by the person and not a matter of choice (Brzek and Pondělíčková-Mašlová 1992).

Lgbt (Lbt) – people with a minority sexual orientation. It is a general term used for homosexuals, bisexuals and transsexuals.

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Analysis of the Disparities Between the Regions of the Czech Republic

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Abstract

The aim of this paper is to evaluate the development potential of the regions of the Czech Republic. The evaluation of regional development is based on the assessment of regional disparities through the application of development potential indexes. These indexes are used for analysing the environmental and social and cultural conditions in the regions of the Czech Republic, as well as for ranking the regions in terms of quality of life. For the calculation of the development potential indexes, multivariate analysis-factor analysis methods were applied to identify the variables that have the strongest influence on a region's overall evaluation.

Keywords: Region, development potential index, differentiation of natural conditions, quality of life

Introduction

The strategy for sustainable development in the Czech Republic is divided into three pillars, namely the environment, social and economic. The strategic targets under the environmental pillar are focused on the removal or the elimination of the disparities between regions, but also between the municipalities within each region. This is achieved in coordination with the strategies under the social and economic pillars. Regional development is further influenced by a range of factors that have an impact on quality of life (Vad'urová and Mühlpachr 2005; Hampl 2007).

The issue of the evaluation of disparities in the socio-economic and socio-geographic development of social systems has been covered in various papers. The results show that the extent of the regional disparities is not yet a major problem, but that the long-term trend is alarming because most of the indicators are of a divergent character (Kutscherauer 2011). However, a new perspective on the evaluation of development disparities respects the socio-economic and socio-geographic differentiation of social systems (Viturka 2010). The global recession had an impact on the economic performance of the regional economies. The dynamics within the regions started to stagnate, which resulted in the economic performance of the regional economies being spread out further across the EU (Suchý, Kološta and Kožiak 2015). The socio-economic indicators of regional inequalities include: registered rate of unemployment; registered rate of unemployment among women; average monthly wage; number of job applicants (referred to 1000 economic active inhabitants); and the registered number of long-term job applicants (referred to 1000 economic active inhabitants) (Bucher 2014).

Competitiveness, in relation to the overall socio-economic level of a region, is perceived as the capability of a region to succeed in competition with others (Wokoun and Krejčová 2013). At the municipal level, one of the approaches for determining disparities is the level of information provision to residents living in the area of the municipality (Bachman 2010). Within this context, attention should also be given to comparing the limited means extended to regions under regional policy (Hána and Macešková 2010). Feřtřová and Tmelová (2011) conducted spatial analysis at the municipal and micro-regional level of the structure of unemployment, whereby it was found that a combination of economic factors (on the labour market) and social factors (with regards to the labour force) disproportionately affected certain socio-demographic groups of inhabitants.

The data on the estimated regional price levels in the Czech Republic are taken from published research outcomes, which are complemented with additional microeconomic data on the incomes of workers and retired people (Bajgar and Janský 2015).

The Czech Republic covers an area of 7.9 million hectares, of which 4.3 million hectares is farm land and 2.6 million hectares are covered by woods. The landscape structure is as follows: mountains 12%, highlands 34%, plateaus 50% and lowlands 4%. The areas dedicated to agricultural and non-agricultural purposes is fairly balanced for the whole Czech Republic, but the ratio varies substantially within the regions, which affects the quality of life in the regions (Jánský and Kupčák 2008; Jánský 2011; Jánský 2015).

The aim of this paper is to evaluate the development potential and rank the regions of the Czech Republic. This evaluation is based on the application of calculated development potential indexes, which include an assessment of the role of diverse environmental and social and cultural conditions, for the assessment of regional disparities. Economic performance indicators are also used. The development potential indexes are used to quantify environmental and social and cultural conditions in order

to rank the regions. The economic performance indicators are subsequently incorporated to generate a comprehensive development potential index.

Materials and Methods

Development potential indexes were used to assess the development potential of Czech regions. The impact of environmental and social and cultural conditions on quality of life were evaluated through it.

To create the indexes, multidimensional analyses in the form of factor analyses were conducted. The analyses enabled the identification of those variables that have the biggest impact on the overall situation (Hebák 2005). The variables (indicators) identified and selected through the factor analyses were divided according to subindex solutions. The most suitable variables were chosen from these factors to define the index by which the regions were to be ranked. These variables were then normalized

$$\frac{x_i - \bar{x}}{s_x}$$

according to the relation $\frac{x_i - \bar{x}}{s_x}$ (Dufek and Minařík 2009). The steps that followed only took these normalised variables into account. They were subsequently weighted. As a result, partial indexes for each region were obtained. A minus sign was used to identify a variable with a negative impact. For the generation of the development potential index it was also important to take into consideration the different levels of the analysed regions.

Results and discussion

The creation of the development potential index for environmental conditions in Czech regions

In total, 58 indicators were identified for the evaluation, of which 21 were used for the calculation of the development potential index through factor analysis. The selected indicators were as follows:

- non-investment costs into environmental protection (CZK/inhabitant)
- economic contribution from environmental activities (CZK/inhabitant)
- waste production (tonnes/inhabitant)
- investments into environmental protection (CZK/inhabitant)
- air and climate protection (CZK/inhabitant)
- waste water management (CZK/inhabitant)
- other waste (CZK/inhabitant)
- protected areas (m²/inhabitant)
- non-forested land (m²/inhabitant)
- non-agricultural land (ha./inhabitant)
- forested land (ha./inhabitant)
- water areas (ha./inhabitant)

- built-up areas (m²/inhabitant)
- other areas (m²/inhabitant)
- agricultural land (m²/inhabitant)
- vineyards, hop-fields (m²/inhabitant)
- gardens, fruit orchards (m²/inhabitant)
- meadows (ha./inhabitant)
- arable land (ha./inhabitant).

Table 1 shows the rankings for all the Czech regions (Ranking 1) and all Czech regions except the capital city of Prague (Ranking 2) on the basis of the calculated development potential indexes (Indexes 1 and 2) respectively.

Index 1 consisted of four indicators that were normalised and weighted according to expert opinion in order to obtain the partial development potential index for environmental conditions. The indicators used were: investments into environmental protection (in CZK/inhabitant - weight 0.35); non-investment environmental protection costs (in CZK/inhabitant - weight 0.3); non-agricultural land (in ha./inhabitant - weight 0.25); and meadows (in ha./inhabitant - weight 0.1) (Jánský et al. 2012).

The weights accorded to the indicators by experts for all three forms of calculated development potential indexes were verified over a long period of time in cooperation with selected representatives from the regions, mayors of municipalities in micro-regions, as well as representatives from other institutions. This specifically involved four micro-regions across three regions of the Czech Republic, namely the micro-regions of Podluží (South Moravian Region), Hranicko (Olomouc Region), Běleč and Lučina (both in the Pilsen Region). The verification process resulted in two sets of weightings, which is indicative of the complexity and diversity of the opinions during the set up, and therefore in two indexes and rankings.

Table 1: Development potential index for environmental conditions

Region	Index 1	Ranking 1	Index 2	Ranking 2
Capital of Prague	088562	2	-----	-----
Central Bohemia	0.10722	5	0.25132	5
South Bohemia	0.22408	3	1.29472	1
Pilsen	0.21608	4	0.28363	4
Karlovy Vary	0.07226	6	-0.49668	10
Ústí nad Labem	0.91889	1	0.22248	6
Liberec	0.01550	7	-0.82168	13
Hradec Králové	-0.08714	8	0.73030	2
Pardubice	-0.20377	10	-0.30899	8
Vysočina	-0.48466	12	0.09626	7
South Moravia	-0.09142	9	0.40584	3
Olomouc	-0.59321	14	-0.67024	12
Zlín	-0.49484	13	-0.53188	11
Moravia and Silesia	-0.48461	11	-0.45507	9

Source: Author

Index 2 evaluates all the regions with exception to Prague. The following normalised indicators were used and weighted: arable land (in ha./inhabitant – weight 0.25); economic contribution from environmental protection activities (in CZK/inhabitant – weight 0.4); water areas (in m²/inhabitant – weight 0.35).

The creation of the development potential index for social and cultural conditions in Czech regions

In total, 55 indicators were identified, of which 12 were applied to the calculation of the development potential index through factor analysis. The selected variables were as follows:

- Density of population (inhabitants/km²)
- Share of urban population
- Education structure-high school education with leaving exam
- Tertiary education structure
- Employment rate
- Economic activity rate
- Unemployment rate
- Average monthly wages in agriculture
- Disposable income in households (CZK/inhabitant)
- Paid-out social allowances (CZK/inhabitant)
- Average old-age pension (in CZK)
- Number of flats built per 1000 inhabitants

Table 2: Development potential index for social and cultural conditions

Region	Index 1	Ranking 1	Index 2	Ranking
Capital of Prague	2.91997	1	-----	-----
Central Bohemia	0.18221	2	1.39415	1
South Bohemia	0.06944	4	0.22933	4
Pilsen	0.12187	3	0.79481	2
Karlovy Vary	-0.55869	12	0.44133	3
Ústí nad Labem	-1.02827	14	-0.02429	7
Liberec	-0.18943	9	0.14208	5
Hradec Králové	0.06677	5	0.00962	6
Pardubice	-0.12834	7	-0.54445	10
Vysočina	-0.15407	8	-0.68984	11
South Moravian	0.05606	6	-0.09731	9
Olomouc	-0.42299	11	-0.88637	13
Zlín	-0.21086	10	-0.72495	12
Moravia and Silesia	-0.72366	13	-0.04412	8

Source: Author

Under Index 1, all the Czech regions were assessed. Once again, four indicators were normalised and weighted according to expert opinion in order to obtain the partial

development potential index. The indicators were: density of population (inhabitants/km² – weight 0.25); tertiary education structure (weight 0.25); employment rate (weight 0.25); and disposable income (CZK/inhabitant – weight 0.25).

Once again, Index 2 evaluates all the regions with exception to Prague. In this case, the following three indicators were normalised and weighted: economic activity rate (in %age - weight 0.33); disposable income (CZK/inhabitant - weight 0.33); average old-age pension (in CZK - weight 0.33).

The creation of the aggregate development potential index for the regions of the Czech Republic

The aggregate development potential index combines the indexes for environmental, social and cultural conditions with economic performance indicators for the regions.

On the basis of expert opinion two indexes were created, whereby for Index 1 the same weights for all the computed sources was maintained, and whereby for Index 2 the following weights applied: environmental conditions (weight 0.2); social conditions (weight 0.4); economic performance (weight 0.4).

Table 3: Aggregate development potential index (excl. capital city of Prague)

Region	Index 1	Ranking 1	Index 2	Ranking 2
Capital of Prague	-----	-----	-----	-----
Central Bohemia	1.006924	1	1.170251	1
South Bohemia	0.647463	2	0.52586	2
Pilsen	0.426685	4	0.460468	3
Karlovy Vary	-0.32041	9	-0.28904	9
Ústí nad Labem	0.179918	5	0.173587	5
Liberec	-0.29083	8	-0.18819	8
Hradec Králové	0.080389	6	-0.04862	7
Pardubice	-0.53882	12	-0.59132	12
Vysočina	-0.35361	10	-0.44787	10
South Moravia	0.442592	3	0.455307	4
Olomouc	-0.77758	13	-0.80847	13
Zlín	-0.53429	11	-0.54124	11
Moravia and Silesia	0.031566	7	0.129275	6

Source: Author

Conclusion

The regions were evaluated according to their absolute rank in the respective development potential indexes, whereby the disparities were recorded with an increasing negative index value.

The negative index value indicates the level of existing disparities in terms of the partial indexes (indicators used for the index calculation). From the point of view of social disparity, an acceptable index value is up to -0.5, as emerged from the evaluation in the regions, municipalities in the micro-regions, and in other research work. A higher positive index value means that there are no disparities or that they are very low.

With regards to the environmental conditions, Index 1 indicates how important the impact of Prague is on the overall rankings of the regions. Under Index 2, the highest performing regions are South Bohemia, Hradec Králové and South Moravia. The final value of the index was significantly influenced by the weightings accorded to the specific indicators by experts.

When evaluating the capital city of Prague on the basis of the partial development potential index for social and cultural conditions, Prague significantly surpasses the other regions. In the evaluation of the disparities, it is clear that the position of the capital city of Prague is (as is the case in other capitals in Europe) incomparable to the other regions of the Czech Republic. The research therefore confirms that it is more useful to compare European cities for this very reason.

Regional disparities are considered to be socially undesirable differences in the level of environmental, social and economic development between regions. Regional policy, which targets specific regional problems and addresses potential development areas, is therefore an important support tool for driving improvements in infrastructure, economic growth, and better territorial planning. A precondition for this is a clear statement of priorities and a concentration of means in the regional development strategies of the Czech Republic.

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Greenwashing and its Impact on Slovak Consumers

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Abstract

Greenwashing represents a barrier to economic development because people become more sceptical of environmental initiatives. It uses time and resources that could be better spent with a greater regard for the environment. The principle of greenwashing involves companies trying to give the impression that they do more for the environment than they actually do. This paper deals with the characteristics of greenwashing, defines different types of greenwashing, looks at the sins of greenwashing and introduces the Greenwashing Index. An integral part of this paper is an evaluation of a market survey into the impact of greenwashing on Slovak consumers. On the basis of the results of the survey, measures are put forward to eliminate the negative effects of greenwashing on (not only) Slovak consumers.

Keywords: greenwashing, environment, company, Greenwashing Index, consumer, advertisement.

Introduction

The environment and the protection thereof is a highly discussed topic. As the standard of living is gradually increasing there is an increasing awareness for the need to maintain and improve the environment people live in. Many companies use this growing awareness and the importance that is attached to the environment to their advantage; they create a false picture and image of their company and its products (Krizanova, Majerova and Zvarikova 2013; Rypakova and Rebetak 2015). Whilst the issue of greenwashing is now only just coming to the attention of the world's media, the phenomenon is not new at all. Large numbers of companies have a history of promoting their green credentials through green PR and promotion. This strategy is used to divert consumer's attention away from the real impact of its activities and products.

Theoretical Basis of Greenwashing

Greenwashing took root in the 1970s when the growth of the environmental movement brought awareness of ecological damage to the general public (Greenpeace 2016). The very concept of greenwashing was derived from word "whitewashing" which can be defined as a coordinated attempt to hide unpleasant facts, especially in a political context (EnviroMedia Social Marketing 2016). Greenwashing means and also assumes the same as whitewashing, but from an environmental point of view, namely misleading consumers and public opinion. Companies have a tendency to promote themselves and their products as representing responsible consumer choices which are friendly to the environment. At the same time, they focus on informing customers of the lower impact they have on the environment, although this is not entirely true (Hernik 2014; Rahman, Park and Chi 2015; Willness, Zerr and Jones 2012).

The independent organization Greenpeace defines greenwashing as a cynical use of environmental themes for the purification of the inappropriate behaviour of companies (Greenpeace 2016). For many years the organization has tried to protect the environment not only against greenwashing. They point to the improper and fraudulent practices of companies that lead to the deception of consumers.

According to Grant (2007), greenwashing means "*doing something normal and making it look greener.*" He develops and maintains the concept and suggests that greenwashing relates to particular companies, in particular those that have a tendency to promote their products as natural, whilst their products are only genetically modified or contain added antibiotics.

In the past, greenwashing was limited to the use of advertising as the instrument with which companies sought to manipulate public opinion (Bowen and Aragon-Correa 2014; Marquis, Toffel and Zhou 2016; Nyilasy, Gangadharbatla and Paladino 2014). Over time the instruments have developed to include a wide range of business activities such as the publication of various environmental reports, educational programmes, and the organization and sponsorship of events. Regardless of where and in what form greenwashing occurs, its aim is to mislead consumers and public opinion into believing that a company has given due consideration to the environment for all the activities it undertakes, with the aim to continuously improve (Elving and Steenhuis 2014; Masarova, Stefanikova and Rypakova 2015).

The global non-profit organization BSR defines four types of greenwashing (Horiuchi 2009):

1. **Misguided greenwashing** - this category includes companies that are making significant efforts to be more environmentally friendly. Their efforts are not very effective and they often use claims such as "environmentally friendly" in their communications.
2. **Unsubstantiated greenwashing** - this category includes companies that at first glance seems to be doing their job commendably, providing their arguments based on substantiated data. However, closer examination reveals that the

companies have not done it to protect the environment, but purely for their own benefit.

3. **Greenwash noise** – this category includes companies who say they are "green" without having sufficiently substantiated their arguments for saying so. The corporate statements are not convincing, not even to consumers.
4. **Effective environmental communications** - this group is the goal for all companies. They do everything to improve the environmental and social performance over the different functions of the company and they are able to communicate this effectively.

In recent years, there has been a large increase in the number of cases of greenwashing. The Canadian company, Terra Choice, on the basis of research it conducted, categorized false and misleading claims about the environment to develop a list of sins, entitled "**The seven sins of greenwashing**" (Terra Choice 2007; Terra Choice 2009; Horiuchi 2009):

1. **Sin of the hidden trade-off.** A claim suggesting that a product is 'green' based on a narrow set of attributes without attention being paid to other important environmental issues. Paper made from sustainably grown and harvested forests, for example, is not necessarily better for the environment. Other important environmental issues in the paper-making process, such as greenhouse gas emissions, or chlorine use in bleaching may be equally important.
2. **Sin of no proof.** An environmental claim that cannot be substantiated by easily accessible supporting information or by reliable third party certification. Common examples are facial tissues or toilet tissue products that claim various percentages of post-consumer recycled content without providing evidence thereof.
3. **Sin of vagueness.** A claim that is so poorly defined or broad that its real meaning is likely to be misunderstood by the consumer. 'All-natural' is an example. Arsenic, uranium, mercury, and formaldehyde are all naturally occurring, and poisonous. 'All natural' isn't necessarily 'green'.
4. **Sin of worshipping false labels.** A product that, through either words or images, gives the impression of having a third party endorsement where no such endorsement exists; fake labels, in other words.
5. **Sin of irrelevance.** An environmental claim that may be truthful but is unimportant or unhelpful for consumers seeking environmentally preferable products. 'CFC-free' is a common example; it is a frequent claim despite the fact that CFCs are banned by law.
6. **Sin of the lesser of two evils.** A claim that may be true within the product category, but that risks distracting the consumer from the greater environmental impacts of the category as a whole. Organic cigarettes are an example of this, as are fuel-efficient sport-utility vehicles.

7. **Sin of fibbing.** Environmental claims that are simply false. The most common examples are products that falsely claim to be Energy Star certified or registered.

The Greenwashing Index is an online portal that allows consumers to publish advertisements that may contain elements of greenwashing. Other consumers can then read the advertisement, subjectively evaluate the claims and write their comments. The site, which asks consumers to raise awareness about misleading green advertising, is gradually helping to eliminate the negative impact of greenwashing and is preventing the misleading of public opinion. The Greenwashing Index is an automated tool that records the responses to five statements on the relevance of the marketing claims in the advertisements (EnviroMedia Social Marketing 2016):

1. The advertisement misleads with words.
2. The advertisement misleads with visuals or graphics - usage of green or natural images in a way to make the consumer think that the product or company is more environmentally friendly.
3. The advertisement makes a green claim that is vague or seemingly unprovable.
4. The advertisement overstates or exaggerates how green the product, company or service actually is.
5. The advertisement leaves out or masks important information, making the green claim sound better than it is.

Companies are constantly trying to acquire new customers for their "organic" and "green" products and arouse interest through their efforts to be seen as environmentally friendly. Some companies really do it, and not only for greater profits and consumer interest. In contrast, there are businesses that mislead consumers and public opinion whilst promoting their green credentials, i.e. they are greenwashing. The main goal of the Greenwashing Index is to educate consumers about how to "read" an advertisement and encourage them to decide for themselves if what they're seeing is greenwashing. It also seeks to generate a better-informed public and forces manufacturers to be accountable for the sustainable practices they claim to follow (EnviroMedia Social Marketing 2016).

Materials and Methods

Over time, greenwashing has become a widespread phenomenon, not only abroad, but also gradually in Slovakia too, although for the majority of Slovaks it is still a big unknown. Research conducted by Terra Choice revealed that up to 95% of the products presented to the public as "green" were just cases of greenwashing. The research involved 5,296 products, of which only 265 were truly "green" as claimed by the producers (Terra Choice 2010). This number is very small compared to the total number of investigated products, which proves how often manufacturers use greenwashing.

The research referred to above focuses on the examination of greenwashing on a global scale. What is the situation in Slovakia? How do Slovak consumers perceive

greenwashing and do they possess enough information about it? To find the answers to these questions, a market survey was conducted.

The aim of the market survey was to determine: consumer awareness of greenwashing and its impact on Slovak consumers; the impact on consumers' personal experience with the phenomenon; whether consumers are interested in "organic" products and why; whether consumers are influenced by advertising and the claims of manufacturers.

The survey was conducted in February 2016 on a sample of 130 respondents aged 15 years and upwards. The respondents were selected at random, whereby the size of the sample group was influenced by the lack of willingness of the interviewed people to complete the questionnaire. The reason may be the fact that the addressed respondents did not have enough information on the issue.

The survey was conducted on the basis of the personal and electronic questioning of consumers from all over Slovakia. The questionnaire consisted of two identification questions and an additional twelve questions on greenwashing and green consumer behaviour.

The answers provided an insight into consumers' awareness of the concept of greenwashing and its impact on consumers. It also helped to establish whether consumers trust the advertising claims of producers and the extent to which they are interested in and purchase "organic" products and products friendly to the environment despite the negative impact of greenwashing.

Results

Of the 130 respondents that participated in the survey, 85 respondents were female (65%) and 45 respondents were male (35%). The majority of respondents (110 i.e. 85%) were aged 19-25 years. The reason for this may be the fact that this age group possesses the most information about greenwashing, so they are more willing to complete a questionnaire on the topic. On this basis, it must be concluded that it is not possible to accurately apply the results of the survey to other age groups.

The results of the survey indicate that the concept of greenwashing is still unknown among consumers. They have not come across it yet. Only a small percentage of respondents (27%) knew what greenwashing was, whereby the majority knew about it from print media and television (60%). Only 11% of the respondents had personal experience of greenwashing. After an explanation of what greenwashing is, consumers subsequently came to the conclusion that they had come across it personally (32%) or through family and friends (4%). However, the largest percentage of respondents (42%) could not acknowledge it because they did not know that it was a case of greenwashing. Some of the respondents who had personally experienced or heard about greenwashing from friends, stopped buying such products (48%) or became more interested in the topic (31%). None of the respondents But neither of them did not warn manufacturers that they are committing greenwashing and some of them absolutely did not deal with it. Consumers are of the opinion that manufacturers are only environmentally friendly and

"green" to a certain extent and only as much as they present themselves externally. It is sad that the majority of respondents (78%) agreed with this response, but it is true. Advertisements do not affect consumers to a great extent because they purchase advertised products only after recommendations from family or friends. This may be due to the fact that in their opinion, companies only want to attract consumers to purchase their products through misleading advertising (82%). They do not consider "organic" and "light" products as healthier or of higher quality (75%). They think that these arguments are used by manufacturers only for effect and therefore for deliberately misleading consumers (39%). On the other hand, approximately the same number of consumers are not influenced by the descriptions on products and buy products without looking at the manufacturer or whether the product is "light" or "organic" (36%). The prices of products are the main criterion for consumers when it comes to deciding which product to buy (85%). In total, 59% of respondents said that "organic" products are unnecessarily overpriced and are not willing to pay more for them. The price is not only criterion that determines whether a consumer purchases a product. The second most important factor is the composition of the product and the manufacturer (71%). Consumers notice "organic" and "light" products (12%) and recyclability (7%) the least. The main reasons consumers buy "organic" products is that do not contain artificial additives (65%), are only made from natural ingredients (52%) and taste healthier and better (55%). On the other hand, the main reason for not buying these products is their high price (80%), which discourages most consumers from buying them. In addition, there is distrust of "organic" products and their manufacturers (51%), as well as a lack of awareness about the benefits of these products (43%).

Discussion

Although greenwashing is a relatively unknown issue in Slovakia, that does not mean it absent there. It is therefore important to avoid it. Consumers currently have the disadvantage that they are not well informed about greenwashing and they cannot recognize it in the advertisements and campaigns of companies. They know that something in the advertisement is not appropriate, but they do not associate it with greenwashing. Unfortunately, they also do not report advertising by manufacturers that contains misleading information or hold the Council for Advertising to account.

Based on the survey results, the following measures are suggested to eliminate the negative effects of greenwashing on consumers (not only) in Slovakia. These measures are focused on the age group (19 – 25 years), but a significant part of them can also be used to target other age groups too.

Increase awareness of greenwashing through the media

According to the market survey, most consumers who have come into contact with greenwashing, heard and read about it through the media.

One option is to make TV stations take an interest in the issue and get them, through a variety of reports, programmes and discussions, to tackle specific examples of

greenwashing in conjunction with experts who are knowledgeable in the field. They can give consumers advice over the phone or by e-mail on what, and what does not, constitute greenwashing. Consumers may be interested because it concerns products which they may (have) come into contact with, and as a result they may gain information on greenwashing.

Reports on greenwashing are rare and on the whole are only published in professional journals and newspapers which are read by specific groups of people. It would therefore be appropriate to ensure that similar articles are published in the daily press or other newspapers that are more likely to be read by consumers. This should include the publication of those products and companies that mislead consumers, a consumer oriented questions and answers section, as well as analyses of specific products to determine whether they are really green or there is the suggestion of greenwashing.

The Internet also provides a huge array of options for increasing awareness of greenwashing, especially through social networks, blogs or discussion forums. Using the links that exist between people through social networks would be a captivating way to provide basic information on greenwashing. Raising consumer awareness in this way would almost be guaranteed; the publication of posts and articles about specific companies and products almost automatically garner reactions from people, who then give their opinion, share it, and thereby notify other people in their surroundings. After all, all of us pay attention when it is made public that a manufacturer has been caught misleading consumers because we do not like to be deceived and buy products that do not correspond to the promoted parameters.

Increase awareness of greenwashing through education

Children and young people are a vulnerable group susceptible to the influences of advertising. It is therefore important to start informing them about such issues in schools. Students are already being taught about environmental pollution and its negative impacts; the inclusion of the issue of greenwashing would therefore be appropriate. Interestingly, a number of respondents in the survey indicated that they had been informed about greenwashing in school and thought that it had been useful. It is therefore important to educate young people about this phenomenon because it affects them even if they are not fully aware of it. Lectures given by experts could form part of the educational process. The experts could provide information on greenwashing, present concrete examples of misleading products and have open discussions with students. Through the students, even parents can learn about the issues and seek further information. They can then make informed decisions about the products they purchase and reduce their consumption of those products that are known to be misleading or that are the subject of greenwashing.

Elimination of greenwashing by companies

It may seem that eliminating greenwashing by companies is the simplest measure, but it is very difficult to force them to do so. Even if they are warned and pull their

advertisements, they tend to come back to the market with new products, new advertising and greenwashing. For the most part, companies are purely interested in winning consumers over to buy their products, in gaining the largest market share and building a reputation. However, utilising greenwashing to gain status and reputation can have quite the opposite effect. When it is brought to consumers' attention on social networks or through other media that they are the subject of greenwashing, it can do a company great harm and cost them customers. Companies should therefore eliminate their "green" claims in the marketing and sales practices for their products and use it only when it is supported by relevant evidence.

Legislate against greenwashing

The reason why companies increasingly use greenwashing is that they can knowingly mislead consumers with impunity. In order to prevent this practice and to protect consumers, it would therefore be appropriate to legislate against it by incorporating it into Slovak law. This could be done by extending current Consumer Protection Law. Companies that are subsequently found guilty of greenwashing would be punishable with a fine.

Black list companies engaged in greenwashing

It would be possible to draw up a so-called "black list" of companies, from both at home and abroad, that use greenwashing tactics. Large companies, for example Coca Cola, Pepsi Cola, Shell, Mattoni, Toyota and Citroën, commonly use greenwashing to market their products. It would be appropriate to publish the black list in the media so that consumers can see which companies are misleading them most often. Consumers can then verify which company is, or is not, on the black list and make an informed decision as to whether, or not, to continue buying their products. Consumers could also be given the opportunity to contribute their findings on other companies and products that they feel are misleading. These findings could be obtained through consumer surveys or discussions in which they are involved.

Conclusion

If a business wants to be successful and maintain its good name, it needs to offer products that do not mislead consumers. Quite the contrary, it should provide accurate information at all times and avoid greenwashing. As the results of our survey show, it is necessary to provide more information on this issue to consumers (not only) in Slovakia. Doing so would increase overall awareness of what constitutes greenwashing and how to subsequently avoid it. It is also important to speak more about greenwashing in the media. This could help to expose those companies which resort to greenwashing to market and sell their products.

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Inventory Management Theory: a Critical Review

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Abstract

It was carried out by studying available Czech and foreign scientific references, which serve as the basis for mapping the approaches to inventory management as well as research into more complex inventory theory models. The paper deals with the inventory theory itself and describes the formation of quantitative models as tools for optimizing inventory under certain conditions the models have been derived from. The paper also discusses an issue most frequently raised in terms of the inventory theory, i.e. optimization of costs related to the costs of holding stock, which follows the analysis of demand for commodities the selected stock is produced from. Thus, the issues of inventory theory and demand for final product are closely related. Results suggest the use of the “Mathematica” platform and modelling demand of the stochastic nature.

Keywords: supply chain, inventory theory, demand, deterministic models, stochastic models

Introduction

Since the 20th century, an emphasis has been put on continuous increase in efficiency of business activities. The development of operational research methods and their implementation with the use of modern information technologies has contributed to reducing corporate costs. One of the ways of how to achieve their reduction is the optimization of logistics activities, which also includes inventory management theory (Bowerson and Closs 1996).

The current market situation could be described as a competitive environment resulting from frequent economic changes and intensive relationship networking within the supply chains (Bazan, Jaber and Zanoni 2016). The concept of Supply Chain Management

first appeared in the mid-1990s (Sixta and Žižka 2009). Kuncová (2009) states that the supply chain management is currently one of the most developing areas. For most companies, entering these supply chains has been becoming a routine, gradually imposed by the market and the conditions of such companies. An essential condition in this context is to use the latest technologies for a quick information and data interchange between customers and suppliers. Mutual cooperation and collaboration of the supply chain members, including sharing information, are the driving factors ensuring a higher competitiveness in the market as well as a larger scope of activities in the market both for the companies and the whole chains (Lee, Chan and Langevin 2016). Due to the continuously growing customers' demands, the limiting and decisive factor is not only the price or quality of the product, but also lead time, services provided by the producer and/or the customers' relationship to the company and the product(s). As a result of these requirements, companies currently engage more in the supply chains and their mutual cooperation can generate far more benefits than their mutual competitiveness (Basl, Majer, Šmíra 2003). The main objective of the supply chain management is to stay one step ahead of the competitors and a great emphasis is also put on the information involving demand (the number of items sold, sellers' expectations, predicting customers' behaviour, various marketing actions, competition). An important role of the inventory theory is to satisfy the demand and determine its further development as well as to ensure an adequate quantity of the goods (Daněk and Plevný 2005).

In the supply chain, inventory (or stock) has an important role from a commercial point of view. There is a wide range of factors affecting the supply chain, such as the stock level throughout the whole supply chain (and not only in a particular entity), costs related to storing and maintaining the inventory, in particular their minimization in the whole supply chain, and at the same time, the pursuit of maximum demand satisfaction (Samal and Pratihar 2014). Inventory management is an important element both in the management of individual companies and the supply chains as such. Regardless of whether the inventory refers to raw materials, material, semi-finished or finished products, it is an element which influences the operations of companies and supply chains, and should therefore be given adequate attention. Owing to frequent uncertainties in the market development, fluctuating demand or production and changes in lead times, the inventory management as such may be very complicated (Emmett 2008). There is no universal model, with a wide range of factors affecting the inventory stock, and thus the situation here is closely related to the ability to predict the future consumption induced by future demand (Bartmann and Beckmann 1992). The future demand varies in the course of time and is covered by the production, which, by contrast, remains constant, and any changes that do occur are step changes rather than incremental ones. In this case, the inventory serves to compensate for the differences between the productive potential and the demand volume (Lukáš 2009). The goal of the paper is to critically review methods of Inventory management theory. The scope of this paper is based on collection of methods which were derived from a comprehensive work of Lukáš (2005a, 2005b, 2009, 2012, and 2016) who deals with probability models in

detailed fashion. The value added is in comparison of the method which is based on the comparison of practical usefulness and academic value measured by publications.

Materials and Methods

A detailed mathematical analysis of the deterministic and stochastic models is conducted to classify and identify the methods. Current usability of the methods is measured by their publication frequency in databases, such as “Web of Science, ProQuest, Scopus, and ScienceDirect“. Based on the classification of such models, the study examines the application of cost models, stochastic demand and also the approaches within the deterministic models. The authors focus on the models concerning the field of operational research, specifically the inventory theory. The operational research can be characterized as a set of relatively independent areas aimed at the analysis of various types of decision problems. The inventory theory as such is one of the operational research areas.

The authors have used the methods known as mathematical programming methods (mainly linear and nonlinear programming, stochastic programming and dynamic programming), which are essential for the research and analysis here. The methods used also include simulation procedures and techniques.

Other objective is a detailed mathematical analysis of the deterministic and stochastic models and the identification of their current usability by means of publication outcomes in scientific databases, such as “Web of Science, ProQuest, Scopus, Web of Knowledge, ScienceDirect“. Those models are predominantly the outputs of specific platforms, such as “Matlab, Mathematica“, more specifically by means of m-files, or the programmes for Inventory Control or Stochastic Inventory Control.

In order to carry out this study, the authors used a method of analysis and synthesis of selected articles and papers, available from the aforementioned databases. The authors mainly drew their attention to the works by Lukáš (2005a, 2005b, 2009, 2012, and 2016), and by Bowersox, Closs (1996), Bazana, Jaber and Zaroni (2016), and by Lee, Chan and Langevin (2016).

Results

In this part classification of the inventory theory models is presented. The business sector representatives will be able to use this classification to optimize their inventories as well as their subsequent warehouse inventory management.

Tab. 1: Publications of models of inventory theory

	Deterministic models		Stochastic models	
	Constant	Combined	Single-product	Multi-product
Publications in databases	-	- +	+	++
Applicability in practice	-	- +	+	++
Mathematica – software	-	-+	+++	+++
Matlab – software	-	-+	+	++

Source: Authors' own compilation

Table 1 lists the models of inventory management theory, which can be modelled using mathematical tools and the necessary software. The authors present two basic descriptions of demand, which also separate and refer to the two models of inventory theory - "Deterministic models" and "Stochastic models." The authors focused on the publications of each model in various scientific databases to verify the availability of scientific studies by individual authors. Based on this analysis, they discovered that the highest number of published sources, while also applicable to business practice, is represented by the models of stochastic demand description, with multiple-product models being the most usable in terms of their variability as well as being the most customizable to modelling capabilities by responding to different situations that may arise on the market in various sectors. Essentially, this is demand for certain goods available on the market for given manufacturing companies, which thus ensured continuity of production even over a period with certain unforeseen situations, e.g. traffic problems during shipment and transport of goods necessary for the production cycle and production procurement.

Within a practical context, there are only a few situations that would correspond to a purely deterministic model. If they do occur, it is either in combination with another model of stochastic nature, or as an approximation of the stochastic model with very little dispersion. Also, the deterministic models usually serve as the fundamental basis of complex, stochastic models of inventory management. The above table also shows that on analysing the scientific studies, the authors most frequently came across the use of modelling platforms (software) that the studies' authors applied to modelling appropriate situations in the form of the "Mathematica" platform. In comparison with the "Matlab" platform, this software is easier to use and is characterized by its variability. Additionally, models describing the stochastic demand (specifically the multi-product ones) are the most common variant of modelling in this platform. These aspects of applying individual platforms are quite the measure of usability (applicability) of modelled situations in the form of a particular model in practice, where the situations are modelled on data of specific companies and capture their desired optimization conditions.

Discussion

The main contribution of this part should be the analysis, characterisation and derivation of the inventory theory models, which the business sector representatives will be able to use to optimize their inventories as well as their subsequent warehouse inventory management.

Inventory theory models

The knowledge and character of demand are very important for the whole inventory management. There are basically three demand modelling methods. One of them is the deterministic demand model, where its explicit expression is known. The demand function may not only be a linear demand function, but also the polynomial of general degree n function, or any other known function. It merely depends on the real situation to be modelled (Lukáš 2005).

As for the deterministic inventory models, the demand function may either be estimated or approximated. These inventory models are based on the assumptions that both the demand volume and procurement cycle are predetermined. Knowing the exact volume of needs to be met out of inventories, even notwithstanding the random variations in deliveries from suppliers, it is pointless to create any safety stock. Therefore, all of the deterministic models only optimize certain inventory turnover ratio and a cost optimum is searched only by means of storage costs and one-off costs to replenish inventory (Jablonský 2007, Lukáš 2005, Kořenář 2002, Lysina 2000).

Deterministic demand function as a model

In order to solve these models, (rather than the simulation methods) other optimization techniques are preferably used. For example, to solve the deterministic model with a constant need, the Harris-Wilson formula may be applied for determining (calculating) the optimal supply. Other deterministic inventory models include the EOQ (Economic Order Quantity) model, which is based on periodic replenishment at uniform demand and constant rate of supply (Lukáš 2012):

$$CN(q) = VN + FN = c_1 * \frac{q}{2} + c_2 * \frac{Q}{q} \quad (1)$$

Here, an order size, or order quantity (q), is the model variable. Therefore, to find out the function's minimum value, the first derivative (according to q) may equal to zero. Calculating (determining) the optimal order quantity (q^*) formula may then be obtained as follows:

$$q^* = \sqrt{\frac{2 * Q * c_1}{c_2}} \quad (2)$$

complemented by the following formula for determining the total minimum cost:

$$CN^* = \sqrt{2 * Q * c_1 * c_2} \quad (3)$$

Based on these data, it is also possible to obtain the optimal replenishment cycle length (or time) (t^*):

$$t^* = \sqrt{\frac{2 * c_2}{Q * c_1}} \quad (4)$$

and the reorder point (rp^*), which indicates at which level of items in stock an order is to be placed to replenish that particular stock at a given (or desired) point – i.e. when running out of inventory:

$$r_p = (Q * L) \bmod q \quad (5)$$

Modifications of this model include the "Model of delayed demand satisfaction", which allows even for a temporary shortage of stock and delayed demand satisfaction, the "EPL (Economic Production Lot-Size)" model, where the make-to-stock production phase and the use-up-the-stock phase (or only the latter) follow each other, and the "Model of quantitative rebate", when the calculation also includes quantitative rebates from suppliers (Giri, Chaudhuri 1998):

$$VN_t = c_1 * \frac{q-z}{2} * t_1 + c_3 * \frac{z}{2} * t_2 \quad (6)$$

Here, the number of order cycles is given again by the ratio of total demand to the order quantity, i.e. Q/q . Fixed costs may then be obtained by multiplying the number of orders with the c_2 constant (cost per order). Consequently, the total annual cost of inventory may be obtained in the following manner:

$$CN = VN + FN = c_2 * \frac{Q}{q} + \left(c_1 * \frac{q-z}{2} * t_1 + c_3 * \frac{z}{2} * t_2 \right) * \frac{Q}{q} = \left(c_1 * \frac{q-z}{2} * t_1 + c_2 + c_3 * \frac{z}{2} * t_2 \right) * \frac{Q}{q} \quad (7)$$

The above function is of four variables, which through mutual substitution may be reduced down to two, i.e. the order quantity (q) and the unsatisfied inventory size or quantity (z). Partial derivative (Ter-Manuelianc 1980, Jablonský 2007) will result in the optimal order quantity and the unsatisfied demand size (or quantity):

$$q^* = \sqrt{\frac{2 * Q * c_2}{c_1}} * \sqrt{\frac{c_1 + c_3}{c_3}} \quad (8)$$

$$z^* = q^* * \frac{c_1 + c_3}{c_3} \quad (9)$$

The optimal order quantity is therefore derived from the value obtained in the basic EOQ model by multiplying both of the constants dependent on the storage costs (c_1) and the costs associated with shortage of stock (c_3). However, if the c_3 costs are disproportionately higher than the storage costs (which could often be anticipated, particularly when recognizing the customer's potential loss), then this constant approximately equals one and the shortage of stock is basically not considered. As a result, it is the return to the basic EOQ model.

Stochastic inventory models differ from the deterministic ones only in the character of demand. Whilst demand is fixed in the deterministic models, demand in the former is of stochastic (probabilistic) nature, which means it is a random variable with a probability distribution. The stochastic models represent a certain demand, where its explicit expression is known. The demand function may include not only a linear function, but also a function with a polynomial of general degree n , or any other known function. It is merely dependent on the real situation to be modelled (Kořenář 2010).

As for the static stochastic modelling, the main prerequisite here is the impossibility of further inventory replenishment. Therefore, these are situations, where over a certain period it is necessary to satisfy the needs from the stock that can be created only once. If the generated stock is lower than the actual need, certain costs from a shortage of stock will emerge. On the contrary, provided that the generated stock is higher than the actual need, some additional costs will be incurred again, for after the end of the period, the stock will not be usable (e.g. a Christmas tree retailer).

Static stochastic demand description as a model

These are models often used for a single replenishment, mostly with sporadic demand (i.e. Lumpy Demand). The aim of these models is to find the lowest value of the total cost for the delivery of $q = x_i$ volume. The lowest value may be obtained by searching progressive values:

$$E(N(q = x_{i-1})) \geq E(N(q = x_i = q_0)) \leq E(N(q = x_{i+1})) \quad (10)$$

By determining three values in $E(N(q))$ *pro* $q = \{x_{i-1}, x_i, x_{i+1}\}$, a local minimum is obtained, thus the lowest actual cost for $q = x_i$. The mean value for $E(N(q))$ may be determined through (Lukáš, 2005):

$$E(N(q)) = C_1 \sum_{j=0}^{i-1} (q - x_j) p(x_j) + C_2 \sum_{j=i+1}^n (x_j - q) p(x_j) \quad (11)$$

Dynamic stochastic demand description as a model

The most common assumption is that the demand distribution in a given period follows a normal distribution with a mean value (μ_Q) and a standard deviation (σ_Q). Likewise, demand during a particular lead time (L) is normally distributed with a mean value (μ_L) and a variance (σ_L), where:

$$\mu_L = L * \mu_Q \quad (12)$$

$$\sigma_L = L * \sigma_Q \quad (13)$$

Owing to the probabilistic nature of demand, all of the available inventories may not necessarily be used up during the lead time, but two cases may occur - upon the arrival of the ordered goods, there are still some items in stock, or there is a shortage of stock during the lead time. One way to find out is to determine the level of safety stock.

The safety stock level (or quantity) can be determined in many ways (Kutiš, 2004), with the majority of them working with the assumption of stochastic lead time. The following text merely indicates determining the minimum safety stock based on demand during a constant lead time (L). Assuming that during the acquisition (lead) time the demand has a normal distribution with a mean value (μ_L) and a variance (σ_L) and knowing a probability (γ), which corresponds to a value of the distribution function of a standard normal distribution (z_γ), then the following should apply:

$$w \geq z_\gamma * \sigma_L \quad (14)$$

The new reorder point (r_w) can then be obtained by increasing the original point (r_{p^*}) by a value of safety stock (w), thus reading:

$$r_w = w + (Q * L \text{ (mod } q)) \quad (15)$$

where the *mod* function represents a particular remainder after the whole number division.

Another option is to exactly determine the safety stock level with the help of lead time, but this procedure is not suitable for a lead time shorter than one period. The functions then take the following form:

$$w = z_\gamma * \sigma_Q * \sqrt{L} \quad (16)$$

$$r_w = L * \mu_Q + w \quad (17)$$

In this case it is possible to obtain the optimal order quantity in a similar way to the deterministic EOQ model, which is:

$$q^* = \sqrt{\frac{2 * \mu_Q * c_2}{c_1}} \quad (18)$$

The total costs are also similar. However, it is necessary to extend them by the costs of safety stock holding:

$$CN^* = \sqrt{2 * Q * c_1 * c_2} + c_1 * w \quad (19)$$

Conclusion

This study described selected issues of supply chains and summarized the basic management concepts that have evolved over time and have had an influence on forming the methods for supply chain management in the view of the inventory theory. Inventory management may use either the already developed mathematical models or some of the managerial control concepts mentioned here, and last but not least, the simulation models as well. The most familiar mathematical model is the EOQ (Economic Order Quantity) model, which defines the methods for determining both the order quantity and lead time in order to minimize the inventory costs. It is also possible to use a variety of methods to estimate demand. Most frequently, they encompass certain predictions based on the trends and developments in the previous period (i.e. using

statistical methods and estimates), or on the econometric models, which include the most important factors affecting the demand at given time and region. Additionally, this paper points out the possibility of using simulation models, thus generating a particular demand on the basis of pre-selected probability distributions and parameters for selected periods. For the real use of this approach, it is necessary to choose the distributions whose parameters are comprehensible to those having any impact on inventory management.

The most covered inventory theory methods (models) in scientific studies are multiple-product models with stochastic demand description. To name but a few Czech authors engaged in this area, doc. Lukáš and dr. Hofman and their scientific studies deserve to be mentioned, as listed in the references. When considering the foreign authors, who present their results in scientific studies discussing the stochastic demand description models, there is a large number of them, e. g, Lee, Chan, Langevin “Integrated inventory-transportation model by synchronizing delivery and production cycles“, Samal and Pratihar – “Optimization of variable demand fuzzy economic order quantity inventory models without and with back ordering“.

According to their assessment of the above analysis, the authors recommend the use of the “Mathematica” platform, which is not difficult to control and serves as the basis for modelling various situations in terms of a product demand. This platform is certainly suitable for companies that will resolve certain issues via this platform. The authors suggest modelling demand of the stochastic nature, where usability is at a higher level and it is possible to model different situations that the market may offer with regards to demand, which may not be exactly determined, and thus can react to the actual conditions possibly occurring on the market, irrespective of their susceptibility. Using these models, the issues can be solved not only in businesses operating in the Czech Republic, but also in multinational companies worldwide.

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Women's Entrepreneurship in Transition Economies such as the Czech Republic

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Abstract

The main aim of this study is to provide an overview of the approaches, forces and attitudes toward women's entrepreneurship in transition economies, in particular in the Czech Republic, using comparative analysis and descriptive statistics.

Entrepreneurial activity is believed to be a fundamental force in the transformation of societies and economies of former communist countries towards free markets and democracy. The democratization of Central and Eastern Europe brought with it a new economic force, the female entrepreneur, which has seen more and more women starting, owning, and managing significant numbers of small businesses. However, little attention is actually paid to gender differences between entrepreneurs. Moreover, the social context inherited from the former socialist period appears to affect both the attitudes and behaviour of entrepreneurs, of men and women alike, and the attitudes of society at large towards entrepreneurship. This paper summarizes the scientific approaches to research in the field of women's entrepreneurship in transition economies and represents the initial phase of a project aimed at developing successful businesswomen in the Czech Republic.

Keywords: women, entrepreneurship, business, transition, economy

Introduction

Researchers have identified many reasons for why entrepreneurs start businesses. The primary theories that have been developed in this field categorize the motivation for starting a business as having pull and push factors (Hakim 1989; Schjoedt and Shaver 2007). Push factors are elements of necessity. These include insufficient family income, dissatisfaction with a salaried job, difficulty in finding work and the need for a flexible work schedule because of family responsibilities. Pull factors relate to independence, self-fulfilment, entrepreneurial drive, a desire for wealth and social status. Women are

seen as experiencing more complexity in making career choices because of their need to balance employment, childcare, and housing. Fulfilling multiple roles requires women to consider time and space constraints when making economic and social decisions (Gilbert 1997). This highlights the influence of the socio-cultural context and suggests that differences in motivation may be due to social factors. Gender role socialization experiences teach young girls what roles are appropriate, or not. These experiences are seen as constricting career choices, compromising career potential (Gottfredson 1981) and influencing women's beliefs, attitudes and self-conceptions. These factors ultimately affect their work interests and choices.

Vodochodský further reflects on the main changes for women caused by the egalitarian socialist policy. The rapid increase in the number of economically active women implied that women became independent of men – economically, socially, and psychologically. They became almost self-sufficient in supporting themselves and their families. Their level of education improved and many became qualified. Havelková points out that women in the 1950's were taking jobs and, to a greater extent, becoming teachers while completing and improving their education and skills (Havelková 1993). Female authors emphasise that women in the socialist era became more independent, self-sufficient, and self-assured. Due to the new system, they also very quickly gained control over their own bodies by being relieved of their "*reproductive duties*" due to the availability of contraception and abortion. Women could also easily disengage from marriage and attempts were made to free them from everyday chores by offering relevant services (e.g. cleaner's, laundries, and crèches), even though these were not everywhere, and not always of sufficient quality (see below).

However, most authors agree that under socialist emancipation, the metamorphosis of the traditional household was not achieved and that women still took on the majority of tasks and duties. More independence and self-confidence notwithstanding, women were still under continual psychol and physical strain, fatigue, and stress resulting from the "*double load*" of a paid job plus domestic chores. Jiřina Šiklová characterizes the situation as follows: "In the socialist era, at least two generations of women experienced the impossibility of mastering the dual roles – keeping the household running and being employed – suffering feelings of guilt and permanent frustration from not being able to cope with either of these tasks to their satisfaction. Although crèches and kindergartens were available, other household services as well as public transport for commuters were of poor quality and women trying to fulfil both roles were not doing as well in their jobs as men." (Šiklová 1997a).

Pay differences between men and women also persisted. Gender inequalities also barred women from advancing into leading positions and the overall structure of professions remained the same. This also applied to government, politics and the "management" of socialist enterprises. Women were present, but in fewer numbers and often occupying lower positions. Éva Fodor (2002) states that, in the socialist era, women were assigned professions and offices not only different from but also inferior to those of men (Vodochodský 2007). "Even though gender free on the surface, the ideal communist

subject was equipped with pronounced masculine qualities and women could never have come up to this standard. In particular, due to their reproductive duties, which the creators of the socialist social policy had not cast any doubt on, women could never be considered equally reliable and committed to the communist cause as men. For this reason, their enforced presence in the world of labour and politics could only be segregated and second-rate." (Fodor 2002).

The turbulent political and social events that took place in Europe in the early 1990's brought with it new job opportunities for all. Young Czechs travelled abroad and people were given the chance to build a career regardless of their political affiliation. Unfortunately, it is clear from more recent research conducted by Czech authors that the gender role division within families, even to this day, remains mostly traditional (Rašticová 2014).

It should be noted that women themselves are also showing reluctance to give up their traditional role as mother and homemaker. For many of them, having their own business and a flexible work-life balance, is becoming a big challenge.

Materials and Methods

The main aim of this study is to provide an overview of the approaches, forces and attitudes toward women's entrepreneurship in transition economies like the Czech Republic.

This paper represents the initial phase of a project aimed at researching the development of successful businesswomen in the Czech Republic. For this purpose it is necessary to research the conditions and factors which have influenced female entrepreneurship in the past and today. Various methods were used, mostly intercultural and historical comparative analysis and descriptive statistics to fulfil the aim of the presented paper.

Results

A. Historical roots of women's position

A review of literature reveals that all entrepreneurs have their own perceptions of what success means to them. They can regard themselves as successful, although, looking from the outside and using traditional financial measures, their businesses may have attained different levels of success (Simpson, Tuck and Bellamy 2004). A difference exists between male and female entrepreneurs in the perception of what indicates success (Halkias et al. 2011). Men are assumed to measure success using quantitative criteria (Buttner and Moore 1997; Still and Timms 2000) such as job creation, sales turnover and profitability. In contrast, studies suggest that women perform less well on quantitative measures. The reason that is often put forward for this is that women do not enter business for financial gain but for pursuing intrinsic goals. These intrinsic goals include the need for independence and a fulfilling life outside of the domestic

sphere. As a result, women mostly strive to achieve self-fulfilment and accomplishment through self-employment (Cliff 1998; Fasci and Valdez 1998).

Small and medium-sized enterprises have played and continue to play a significant role in the former planned-economies of Central Europe (Arendarski et al. 1994; Ivy 1996). They are considered critical engines of economic growth and stability for these transforming economies. The economies concerned include the member countries of the "Visegrad" group, namely Slovakia, Hungary, Poland and the Czech Republic. There can be no doubt that the changes that have affected the economies of these nations over the past ten or more years have been sweeping and fundamental. The period has been characterized by the rise of an entrepreneurial class the likes of which have not been experienced in these countries before. "The creation of entrepreneurs is fundamental to the entire process of transition," according to Forst (1996).

While entrepreneurship is viewed as a key element in economic development and fundamental to the successful transition of these economies, the cultural context and history of free enterprise in these nations may affect the nature and extent of entrepreneurial motivation in both men and women (Fogel and Zapalska 2001). The Velvet Revolution (November 1989) marked the beginning of a transition in the Czech Republic to a free-market economy and privatizations. Many small and medium-sized enterprises have been established since then and women own or are partners in a significant number of them.

As women entrepreneurs tend to use a relational approach to management and leadership, one might argue that their business concerns and goals are mainly intrinsic and not financial. Brush (1997), Cuba et al. (1983), and Rosa et al. (1994), all found that women tended to pursue intrinsic goals rather than financial goals. Women ranked self-fulfilment as a top reason for becoming self-employed (Moore and Buttner 1997). They are also concerned with customer satisfaction and social responsibility (Chaganti and Parasuraman 1996).

B. Structural conditions of women's work and the creation of women's entrepreneurship under socialism

Women and men alike viewed the Germans and the Soviets as enemies during the long years of domination. Consequently, the struggle for human rights and national independence took precedence over that of women's rights (Havelková 1993). True, women bore more than their share of hardships under those regimes. The National Socialists were dedicated to the traditional German view of a woman's place being "Kuche, Kirche und Kinder." During the Soviet years, women bore the double burden of working fulltime and looking after their families, when the shortage of consumer goods and household appliances made this particularly onerous. The unfulfilled promises of "socializing housework," while women were used as the cheapest available labour force, made them increasingly cynical and reinforced their aversion to politics, both national and international (Vrabková 1997).

Under such conditions, family responsibilities provided women with an acceptable excuse not to join the Communist party. At the same time, the severe repression of all Czechs under these regimes reinforced the feeling of solidarity between women and men, much as is the case for African Americans who have struggled against racism in the United States. As Šiklová (1997b) says, “most of the men working by our side were not self-confident bosses but people similarly ‘downtrodden’ by the overprotective party and the government. Thus men were not rivals but humble partners.” Finally, unlike women in many other countries, Czech women have had relatively little need to resist pressures from religious groups to limit their reproductive rights. Again, the reason must be sought in history. Although the Catholic Church enjoyed something of a renaissance as a centre of resistance to Communism, its role remains less central than in neighbouring countries (including Slovakia). Even the church takes a rather relaxed attitude towards these issues in the Czech Republic. As Heitlinger (1993) noted “abortion was the most commonly used form of contraception in the Czech Republic; it is estimated that every third pregnancy is aborted.” When the government became concerned about this, it appointed a committee that included representatives of women’s and church groups, medical and legal organizations, relevant ministries and of parliament. The Czech Conference of Catholic Bishops consented with others that “in a situation when there are 189,000 abortions performed annually, it would be impossible to suddenly reduce the number to zero” (Heitlinger, 1993). Agreement was also reached that fees for abortions should be increased substantially, but contraception would be made available at no cost. The bitter conflict over these issues, which played a large role in the creation of women’s movements in other countries such as Germany, Poland, and Romania (Fuszara 1993; Harsanyi 1994; Tikow 1993), was therefore largely avoided in the Czech Republic.

One question that arises in those countries that previously had centrally planned economies, concerns the potential for entrepreneurial activities during the socialist period to “breed capitalism” (Kornai, 1992). Although in Central and Eastern European countries private entrepreneurship lost its major role within planned economies, there were different forms of private entrepreneurship that co-existed in parallel to state ownership, as well as entrepreneurship within state enterprises. In this regard, we can distinguish between the formal and the grey economies (consisting of the second and the illegal economy), the “boundaries” of which frequently changed following political trends that led to the liberalisation and restriction of private ownership and entrepreneurship (Welter 1996a).

The formal economy included state enterprises, co-operatives and legalised private businesses such as the craft enterprises in Poland or the so-called business work partnerships in Hungary. In the Czech Republic, from 1982, state employees could rent space from their employer to collectively produce their own products and services. Many of these private initiatives eventually became working brigades for state enterprises who performed overtime work (Laky 1985).

The term “second economy” refers to any form of unlicensed but tolerated private entrepreneurial activities. This includes unlicensed activities in the private sector that were not officially recorded, as well as the clandestine use of state property (e.g. raw materials, machines, labour, services) for private business activities (Dallago 1990). It can also be applied to the so-called “parallel circuits” of state firms and cooperatives that were motivated by the search of official enterprises for ways to meet planning targets. In the Soviet system, this resulted in the creation the “*tolkachi*”, employees of state enterprises who were responsible for trying to secure external resources (Kerblay 1977).

In other words, entrepreneurial behaviour within state owned enterprises during the communist period was a necessary response to the constant shortage of materials. The socialist period was also characterized by the illegal economy made up of the quasi-criminal activities within state enterprises (bribes, theft of resources) and also criminal private activities. However, in some countries (such as the former Czechoslovakia and the former Soviet republics) the illegal economy actually included any kind of private business activity. Even though the transformation process changed the rules for these entrepreneurs, some forms of entrepreneurship survived. These forms of entrepreneurship merged into the new private business sector during the transition period and provided a distinctive entrepreneurial experience. Both the state and private entrepreneurship that existed under socialism provided a “seedbed” for small business activity in both the formal and informal economies. Entrepreneurship within state organisations contributed to the development of the so-called *nomenclatura* businesses in some countries. Many directors and managers of state-owned enterprises, as well as former politicians (the *nomenclatura*), used their “parallel 250 David Smallbone and Friederike Welter circuits” to privatise “their” enterprises or to establish new businesses (Dallago 1997; Kusnezova 1999; Lageman 1995).

Examples of this include the Soviet “*Komsomol* economy”, whereby a number of business organisations under socialism were established within the youth organisation (Gustafson 1999), and the “spontaneous privatisation” that occurred in Hungary in 1988/89 (Frydman et al. 1998), another source of *nomenclatura* entrepreneurs. Formerly legal private enterprises such as craft enterprises in Poland or private businesses in the form of cooperatives that emerged in the late eighties in the Soviet Union (Chepureenko 1998), continued to exist during the transition period. This is in spite of the fact that many of these entrepreneurs experienced difficulties in adjusting to the requirements of a market economy. The existence of the entrepreneurship that was tolerated during the former socialist period (which in the Czech and Slovak Republic also included illegal private entrepreneurship) manifested itself during the transition period. Once legislation abolished the legal and administrative barriers to private firms, large numbers of people registered new businesses. The legislation enabled them to operate on an equal basis with state owned companies (Grabowski 1993; Kuczi and Vajda 1992).

In countries such as Poland and Hungary, this occurred during the so-called initial phase of entrepreneurial development in the 1980s (Piasecki and Rogut 1993) starting with the law on cooperatives in 1988 (OECD/CCET, 1998). This happened later in the former Soviet republics. In those transition economies with a strong pre-war tradition of private entrepreneurship (such as Poland and Hungary) a number of entrepreneurs during the transition period originated from former entrepreneurial families. These entrepreneurs had either been self-employed in the second economy, or had occupied leading positions in state enterprises during the socialist period (Szelenyi 1988).

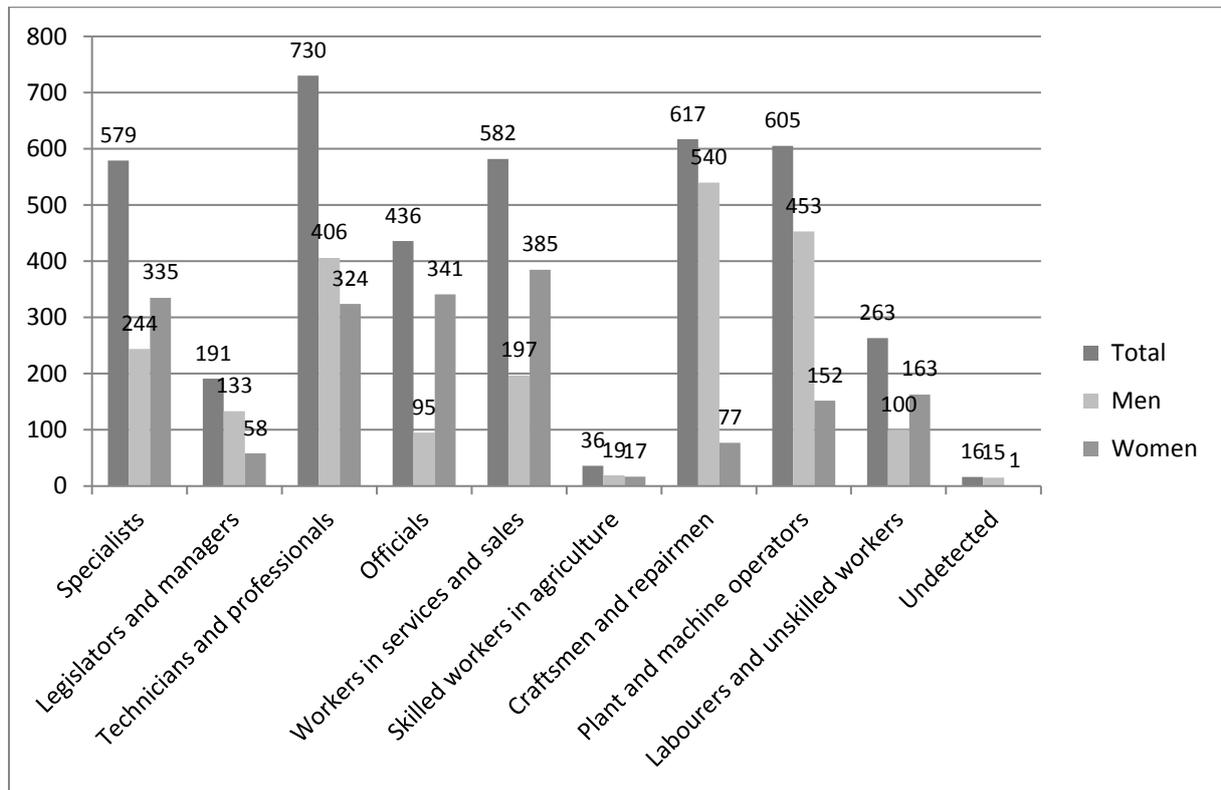
In this regard, it is important to stress the differences in the starting points from which private enterprise developed during the transition period in different countries, as well as the differences in the processes that operated during the transformation period. Entrepreneurship appears to have developed more quickly in countries where reforms proceeded smoothly and quickly (Mugler 2000) and where there was a strong presocialist industrial tradition for it. For example, in the former Czechoslovakia industrialisation and private entrepreneurship go back to the beginning of the 19th century (Benacek 1997) which favoured the quick development of entrepreneurship after socialism. In contrast, in Russia, which was an essentially agrarian society prior to the socialist period, the State played a stronger role in the development of entrepreneurship (Ageev et al. 1995; Paradis 1998). For example, at the beginning of the 20th century the Russian government tried to introduce entrepreneurship into the Russian economy by providing entrepreneurs with subsidies and donations, thereby creating "*bureaucratic entrepreneurship*" (Kusnezova 1999).

C. The number of women entrepreneurs in the Czech Republic has doubled in the last 20 years

It is an eternal dilemma: Go into business or be an employee? Although the number of entrepreneurs is growing, the decision to register for a trade license may be the result of societal and economic conditions. In the Czech Republic, nearly 290,000 women now run a business, of which 41% are 45-59 years old. Noteworthy is the fact that more than 11.2% of businesswomen are 60 years old or over. The smallest category of women entrepreneurs is formed by the very young. Young women looking for entrepreneurial careers are often afraid to reconcile their working life and the education of their children and also have a greater fear of failure or a lack of experience. In addition, they may also lack the finances with which to start a business and have less access to credit. The latter may be in part due to the fact that women entrepreneurs make up less than 33% of the total number of entrepreneurs. However, since 1993, when there were only 123,600 women entrepreneurs, their numbers have more than doubled. There are now eight times more women entrepreneurs in the group 50-59 years old than 20 years ago. In the past, the number of young women between 15 -19 years of age was higher. In 1993, this category consisted of 1,800 women (1.5% of the total). After that, the number of very young businesswomen decreased. The reason for this trend is thought to be their

desire to pursue and complete higher education. The biggest business boom in the number of women entrepreneurs came in 2011 (Strasilova 2015). Figure 1 shows the classification of employees in 2013 according to gender on the basis of the International Standard Classification of Occupations of the Czech Republic (ISCO CZ). Figure 2 shows the classification of entrepreneurs in 2013 according to gender and on the basis of ISCO CZ.

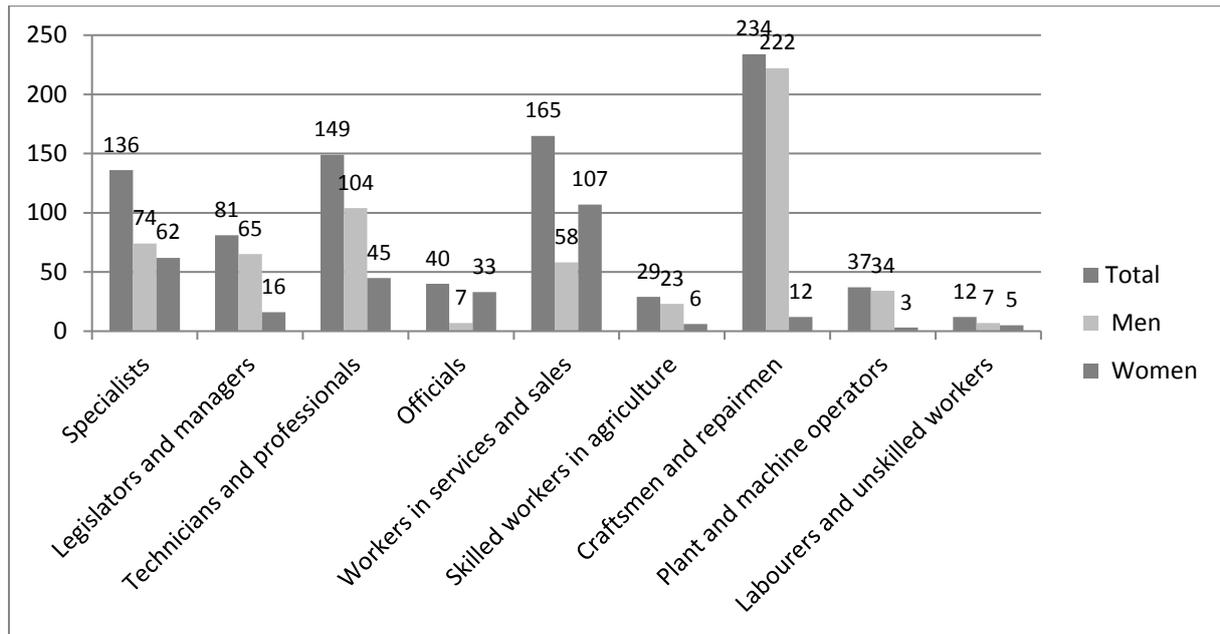
Figure 1: Employees by ISCO CZ (in thousands)



Source: modified by authors according to:

<http://www.statistikaamy.cz/2014/06/pocet-podnikatelek-se-za-20-let-zdvojnasil/>

Figure 2: Entrepreneurs by ISCO CZ (in thousands)



Source: modified by authors according to:

<http://www.statistikaamy.cz/2014/06/pocet-podnikatelek-se-za-20-let-zdvojnasil/>

Discussion and conclusion

Even though the number of women involved in business in the Czech Republic is significantly lower than for men, the upward tendency is apparent. There are many reasons why woman decide to start their own business and also many reasons why women succeed in business.

A few quotations from successful female entrepreneurs (www.entrepenista.com) describe the reasons, motivations and hopes of women in business.

"Entrepreneurship has given me freedom. At work I used to have assurances: work and money, but I have been living for freedom since my childhood. Entrepreneurship has allowed me to realize a number of ideas, dreams and things that I always wanted to do. It allows my ideas and dreams to come true. The thing I love about entrepreneurship is that I can manage my own time." Alice Kris, founder and creative director of the organization "Women for Women".

"Entrepreneurship has given me an opportunity to express myself: my passions, thoughts and beliefs. Every day I am thankful that I can do what I want, plus it's a service to people. I am also happy that it pays because if I had to earn money by doing something that is boring for me, it would probably prevent me from doing what I like and what I do. It is thanks to entrepreneurship that I can improve myself in terms of self-discipline, empowerment and the willingness to take risks." Lucie Kolaříková, psychologist, trainer and coach.

"Whatever you do, be different – that was the advice my mother gave me, and I can't think of better advice for an entrepreneur. If you're different, you will stand out." Anita Roddick, founder of The Body Shop.

“If you are committed to creating value and if you aren’t afraid of hard times; obstacles become utterly unimportant. A nuisance perhaps; but with no real power. The world respects creation; people will get out of your way.” Candice Carpenter, founder of iVillage.com.

“Aerodynamically the bumblebee shouldn’t be able to fly, but the bumblebee doesn’t know that so it goes on flying anyway.” Mary Kay Ash, founder of Mary Kay Cosmetics.

“If we had no winter, the spring would not be so pleasant; if we did not sometimes taste adversity, prosperity would not be so welcome.” Anne Bradstreet, America’s first published poet.

“Striving for excellence motivates you; striving for perfection is demoralizing.” Harriet Braiker, author and stress management expert.

“How wonderful it is that nobody need wait a single moment before starting to improve the world.” Anne Frank, writer.

It is apparent that family and childcare are even today a priority for women of all generations. However, the role of being a wife with professional and business ambitions is not void of the dimensions of being a mother, educator and creator.

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Evaluation of the Impact of Public Support from the Point of Convergence Criterion

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Abstract

The article deals with the ex post evaluation of the impact of drawing funds from operational programmes to achieve convergence in the field of tourism after the Czech Republic became a member of the EU. The evaluation of the achievement of convergence or divergence among regions is based on the beta and sigma convergence indicators which enable the evaluation of the development of time series of relevant indicators (in this case, indicators in the field of tourism). This evaluation was carried out within the regions brought together under NUTS II. The investigation is the result of evaluation indicators showing the achievement of convergence within the regions in only a few cases. Convergence was therefore not proven in all cases. In some cases, there was even a tendency towards divergence among the regions. In addition, the relationship between the aid granted and the annual growth of the chosen indicators was not achieved in all cases. This indicates that relevant local factors carry more weight and have a greater impact on an area than drawing support from EU funds.

Keywords: convergence, divergence, regional operational programme, EU subsidies,

Introduction

Every policy is associated with a specific goal it is trying to achieve. This is no different in the case of the regional policy of the European Union (EU). The objective of this policy is better viewed as a cohesion policy. To achieve cohesion among countries (and regions), it is necessary to set up mechanisms that encourage such cohesion. The EU links the question of cohesiveness with the process of convergence. For the programme period 2007 – 2013, the process of convergence was not only implicitly expected, but was also explicitly mentioned among its main objectives. As was the case in previous years, the effort to achieve convergence is the result of the general objectives of the EU, which is the reduction of regional disparities and disparities among citizens.

The aim of this article is to assess the situation in the Czech Republic in the tourism industry after the Czech Republic became a member of the EU and to assess the impact of subsidies in this area. The results of the assessment should either confirm or reject whether the convergence process among regions is a reality or not. The analysis is performed with the help of statistical indicators that are able to capture basic tendencies in the field of tourism in regions and compare the situation between regions. The state and development of tourism in the individual regions of the Czech Republic is and has not been unitary. It is therefore assumed that the achievement of convergence in this area is possible and that this can be captured and evaluated statistically.

Regional policy and the convergence objective

Since the 1990s, one of the central objectives of the policies of European countries at national and transnational level has been to develop and instigate mechanisms for achieving social cohesion. This cohesion results in the stability of the political system, provides security and generates economic performance. On the contrary, a lack of social cohesion, in other words weak social bonds and low solidarity within communities, may lead to increased pressure on expenditures from public budgets (Tuček et al. 2006).

To achieve convergence cohesion is required in three areas - economic, social and territorial. Two key concepts can be applied to meet this target, namely that of the concept of convergence and that of the concept of integration. These basic concepts are interrelated. Without the implementation of convergence, cohesion would be just a political concept. However, it is only possible to create cohesion through the creation of formal institutions and rules.

This brings us to specific policies, both at European and national levels. In these terms, regional policy has grown in importance with the ongoing process of enlargement. Regional policy generally focuses on the mitigation of the differences in development between regions of the EU member states. This reflects the aforementioned notion of convergence. Valášková (2013) states, that the aim of the implementation of cohesion policy in the regions in the first programme period (1989 – 1993) was economic and social cohesion and the reduction of disparities, which is often interpreted as support for the convergence of the European regions. Monfort (2008) adds, that, in particular, economic convergence is a major factor in the assessment of the effectiveness of the entire cohesion policy of the EU.

The need to achieve convergence among the regions of the EU is also evident from the formulated objective of the regional policy of the EU for the programming period 2007 – 2013, simply entitled “convergence”. This objective arises from a Communication of Commission (COM 2005), according to which the main objective is to promote convergence in order to achieve higher potential economic growth rates. This objective should be seen within the context of the EUs efforts to tackle the large disparities that exist within the Union due to its rapid expansion. The policy is also driven by the expectation that it will contribute to the competitiveness of the Union as the whole.

General approaches to convergence

Prior to evaluating the achievement of convergence it is necessary to define what is meant by convergence. However, this raises a fundamental issue because no specific definition of convergence exists. Nevima and Melecký (2011), state that the term is used in various forms dependent on the type of analysed problem. In general, convergence is associated with the reduction of differences between two or more variables over time. To a certain level it is therefore a process of approximation (differences in variables over time tend towards zero).

Minařík, Borůvková and Vystrčil (2013), highlight the original concept of convergence (late 1980s and 1990s) that was derived only for the area of economic growth. The approach was based on the neoclassical growth model, whereby poorer countries or regions tended towards faster growth than richer countries, which over time automatically led to the convergence of income levels or productivity per head (Barro and Sala-i-Martin 1992). This is the result of the flow of capital from those regions with high wages to regions with low cost labour, with work also moving in the same direction (Armstrong and Taylor 2000).

The process of convergence is very closely associated with the efficiency of economies (in terms of GDP and its evaluation over time). However, the process of convergence is not only bound to the performance of an economy. The concept and the idea of convergence can be transferred to other areas (Minařík, Borůvková and Vystrčil 2013). Some authors, for example, assess price convergence in connection with ongoing regional integration processes (Žďárek 2011), others relate the process to demographic indicators (Minařík, Dufek and Sojková 2009), and others still to food consumption in the tourism sector (Mak, Lumbers and Eves 2012).

Convergence as an indicator can be perceived in many forms. For example, convergence can be seen in both absolute or relative forms (Žďárek 2011). In absolute (unconditional) terms, convergence represents the process whereby economies converge in terms of the value of one (common) analyzed indicator (so-called steady state) regardless of the default status. In contrast, in relative (conditional, weak) terms, convergence represents a situation where countries with different initial indicator values approach each other, but do not achieve a single shared status. Relative convergence can be evaluated in the form of beta-convergence and sigma-convergence (Armstrong and Taylor 2000). The beta-convergence approach follows that of the aforementioned approach by Barra and Sala-i-Martina (1992), whereby poorer regions grow faster than richer regions.

The concept of beta-convergence is directly related to the neoclassical growth theory (Solow 1956), which makes two basic assumptions associated with productivity, in particular that capital is subjected to declining profitability. The growth process, which leads to improved economic standing, which is characterized by the growth rate, does not though only depend on the exogenous rate of technological development and the growth rate of labour. Diminishing returns implies that the growth rate of poor

countries should be higher and that their income (or GDP) per capita should catch up with that of the richer economies. This approach shows that there is a negative relationship between the growth in income per capita (over several decades) due to the level of income per capita in the base period (Armstrong and Taylor 2000).

This approach can be generalized on the basis of the assumption that the referenced units within a certain time interval approach each other when the units with low values in the initial period show faster growth than those units that have higher values in the initial period. The opposite of this process is divergence (Armstrong and Taylor 2000).

In contrast, sigma-convergence represents the more conventional approach to the measurement of inequalities. While beta-convergence focuses on capturing the potential catch-up processes, sigma-convergence works only with the appearance of disparities between individual searched subjects over the course of time. Both of these concepts are closely related. It is possible to conclude that beta-convergence is a necessity, but not an insufficient condition for the realization of sigma-convergence (Monfort 2008).

Armstrong and Taylor (2000) describe sigma-convergence as a simple measure of the variance in income per capita between regions at a specific time. It is possible to talk about convergence if the size of the scattering of income per capita between regions decreases over time. The approach can be expressed in general terms, whereby convergence is determined if the variability of the values of the searched variable (usually after logarithmic transformation), measured by standard deviation, systematically decreases over time. If this is not the case, there is talk of divergence (Minařík, Borůvková and Vystrčil 2013).

For both methods it is necessary to take into consideration that the results can be influenced by, for example, outlying units, which can skew the results. Another characteristic feature is the existence of a relationship between the two approaches. If the conditions for beta-convergence are met, then sigma-convergence applies. However, this does not apply vice versa; sigma-convergence can exist even without beta-convergence.

Methods of convergence evaluation

The concept of beta-convergence requires the verification of the initial and final values of selected variables. As a rule it is recommended to conduct a logarithmic step for the values, which can subsequently be used to eliminate asymmetric divisions and for the zooming in of outliers. For the selected variables, the geometric mean had to be determined according to the following relation:

$$\log \bar{k} = \frac{1}{n} (\log y_n - \log y_0), \quad (1)$$

where:

\bar{k} – the average growth coefficient of the variable unit over the reference period

y – the variable

n – the number of periods.

Part of the analysis was the construction of a plane graph where the x axis included the values $\log y_0$ and the y axis corresponded to the values $\log \bar{k}$. Once completed, it was possible to perform a linear regression to determine the convergence or divergence of the values.

The equation of linear regression with a dependent and independent variable was as follows:

$$\log \bar{k} = \alpha + \beta \log y_0, \quad (2)$$

where:

α, β – parameters of the regression line

The equation was determined on the basis of the method of least squares. The essential tendency to convergence or divergence could be derived from the direction of the function. If the slope was negative ($\beta < 0$), the tendency was towards convergence, whereas a positive regression line ($\beta > 0$) showed a tendency towards divergence.

The regression line was then added to the index of determination in order to determine the significance of the convergence or divergence.

In the case of sigma-convergence the detection comes from all partial periods of the interval. Once again, it is recommended to take logarithms of the variables. On the basis of the prepared data, the standard deviation for each partial period could be specified. After the construction of the plane graph (the x -axis measured the time interval analysis, y -axis contained the calculated standard deviation over time) it was possible, on the basis of the progress of the generated curve, to determine convergence or divergence of the given indicators. If the curve showed a declining trend it could be concluded that the analyzed variables had converged. The opposite reflected the divergence of the variables.

Analysis of selected development indicators in the field of tourism

Analysis of drawing subsidies for the promotion of tourism

The analysis was focused on the evaluation of the impacts of investment in the area of tourism within the cohesion regions that fall under NUTS III and which could draw EU funds after acceptance by the Member States. Each of the cohesion regions support the area of tourism as well, but to differing degrees. On the whole it can be said that the investments focused on the development of tourism infrastructure and on marketing activities.

Analysis of convergence

The evaluation of the process of convergence or divergence in the regions after drawing down funds to support projects in the field of tourism can be performed through the evaluation of the development of selected indicators. The choice of indicators for this analysis took into account the partial goals relevant to the area of support targeted by the EU funds. These indicators are monitored by the Czech Statistical Office.

Another reason for selecting the chosen indicators was that they in essence describe the state of tourism infrastructure, including accommodation, across the various regions, as well as the success of a region in promoting tourism activities. The selected indicators were the:

- number of beds – the total number of beds for guests only; only beds serving tourists are included, occasional beds are not included;
- number of establishments – the number of collective accommodation facilities (an establishment must have at least five rooms and ten beds used for the purpose of tourism and which offers temporary accommodation to guests (including children) for the purpose of a holiday, trip, spa treatment, business trip, training, course, congress, symposium, children’s school in nature, summer and winter children camps, etc.);
- number of guests - a guest in an accommodation establishment is a person (the owner/personnel living on site are not included) who uses the services of an accommodation establishment for their temporary stay.

All the regions of the Czech Republic were included in the analysis (with the exception of the capital, Prague) because they were all able to draw grants in support of tourism. The evaluation of convergence was performed on the basis of a comparison of development indicators for two periods – the situation prior to the Czech Republic joining the EU and after its entry in 2004. The process of convergence (divergence) was therefore studied for the time series 2004 - 2013 (or 2012, where the Czech Statistical Office was not able to provide newer data due to the transition to a new methodology for calculating the relevant indicator). This time series includes two operational programme planning periods, namely 2000 – 2006 and 2007 – 2013.

The aim was to compare basic development trends prior to the Czech Republic’s entry to the EU when there was no aid, and after its entry to the EU when subsidies to promote tourism were implemented. To evaluate the impact of aid, it was not sufficient to simply observe the current trend because this would only prove the actual situation (the actual convergence or divergence) and would not prove whether the current situation had arisen as a result of drawing down funds.

The basic requirement for the assessment of the impact of aid on the convergence/divergence of regions is a long enough time series that would enable the development trends for the selected indicators to be captured. A number of factors made it difficult to meet this requirement and therefore to perform and interpret the analysis. In 2013, the Czech Statistical Office carried out an extensive review of its data and decided to discontinue its continuous time series for any given year. Another sticking

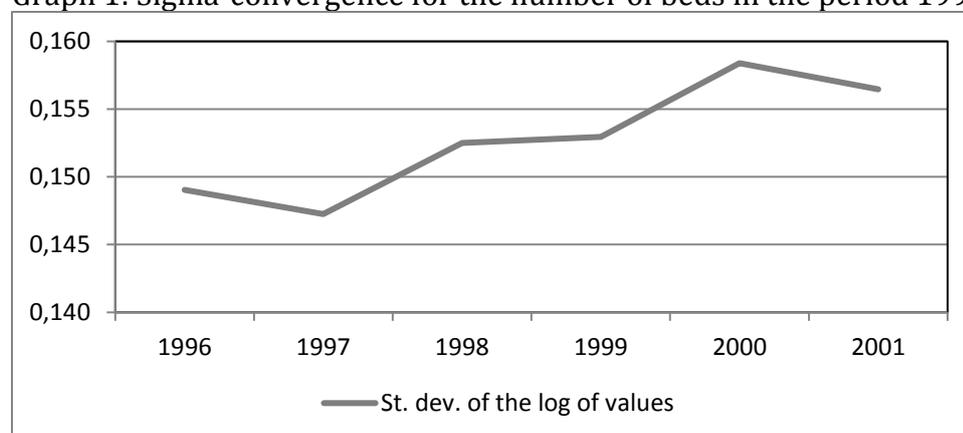
point was the short time series of values for indicators at regional level for the period prior to the Czech Republic's entry to the EU. The regions in the Czech Republic, as they are today, were only formed in 2000, which reduced the comparative period prior to the country's entry to the EU to a period of four years. In this context, the analysis of this period was considered for information purposes only and did not significantly interfere with the analysis and interpretation of the results.

For the analysis of the convergence/divergence process, data on the selected indicators were used that were retroactively generated by the Czech Statistical Office for the period 1996 – 2001. For the trend analysis of the selected indicators, outputs from statistical databases were used. The analysis results were further supported by an analysis of quarterly time series for the number of stays at accommodation facilities.

The data for the analysis were generated on the basis of both approaches for convergence measurement, namely beta-convergence and sigma-convergence. However, the interpretation and the conclusions drawn, taking into consideration the methods' approaches to data analysis, were based on the analysis of sigma-convergence. The values of the examined data for the individual indicators revealed that during the course of the time series the process of convergence was not singular, i.e. during a particular reporting period there were tendencies towards convergence and divergence (see Minařík, Borůvková and Vystrčil 2013). The analysis of sigma-convergence reveals this development because the listed processes are evaluated throughout the entire reference period, whereas beta-convergence only uses the initial and final values of the explored data.

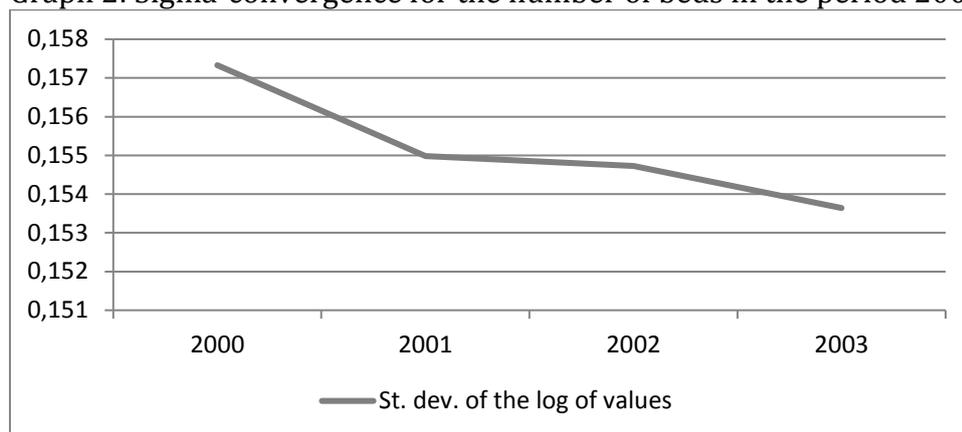
It is on the basis of the above stated problem with regards to the evaluation of beta-convergence, that it was decided to evaluate sigma-convergence. The individual results of sigma-convergence, based on the logarithmic calculations of the individual values of the selected indicators and the subsequent evaluation of the development of the standard deviations of the parameters, are presented in the following graphs. Graphs 1, 2 and 3 depict the development of the number of beds in accommodation facilities across individual regions.

Graph 1: Sigma-convergence for the number of beds in the period 1996 - 2001



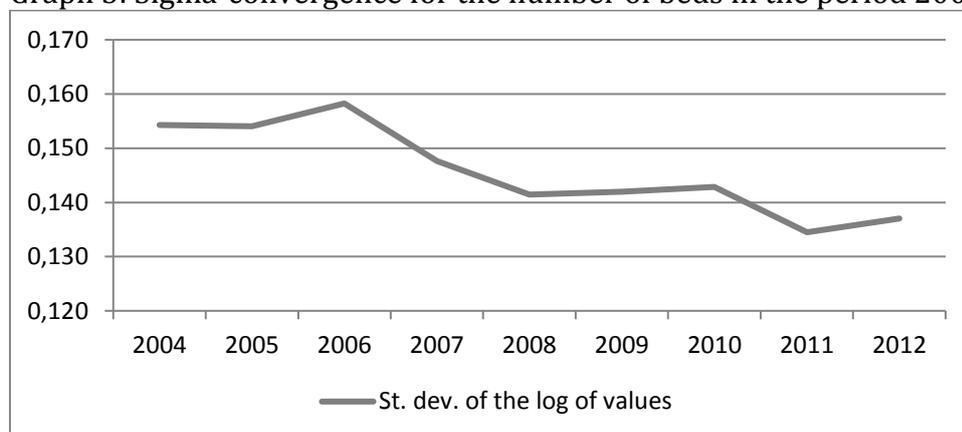
Source: Authors; Czech Statistical Office

Graph 2: Sigma-convergence for the number of beds in the period 2000 - 2003



Source: Authors; Czech Statistical Office

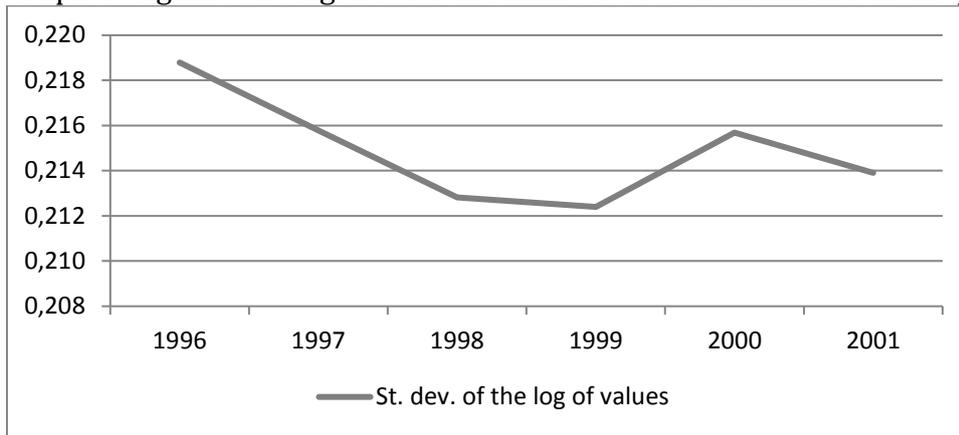
Graph 3: Sigma-convergence for the number of beds in the period 2004 - 2012



Source: Authors; Czech Statistical Office

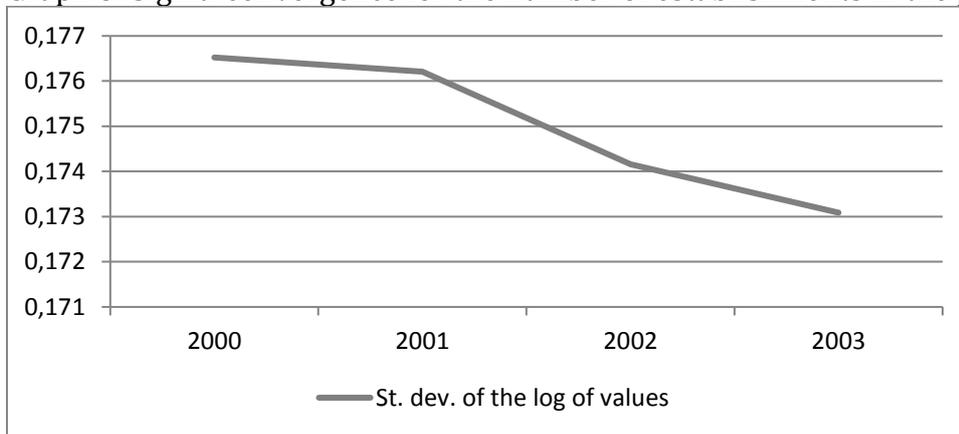
The analysis of the number of beds in the regions reveals through sigma-convergence that in the period 1996 – 2001 there was a tendency towards divergence (see Graph 1). After entry to the EU it is evident that the Czech regions began to promote themselves, resulting in the analyzed indicator showing a predominant tendency to converge (see Graph 3). On the basis of the development of this indicator (the number of beds) it could be concluded that European subsidies had a positive impact on the convergence of the regions in terms of the of the tourism industry (as mentioned above, Graph 2 is only for illustrative purposes to overcome the slack between the monitored periods). It is not possible to draw a similar for conclusion for the number of tourist facilities in the regions (see Graphs 4, 5 and 6).

Graph 4: Sigma-convergence for the number of establishments in the period 1996 - 2001



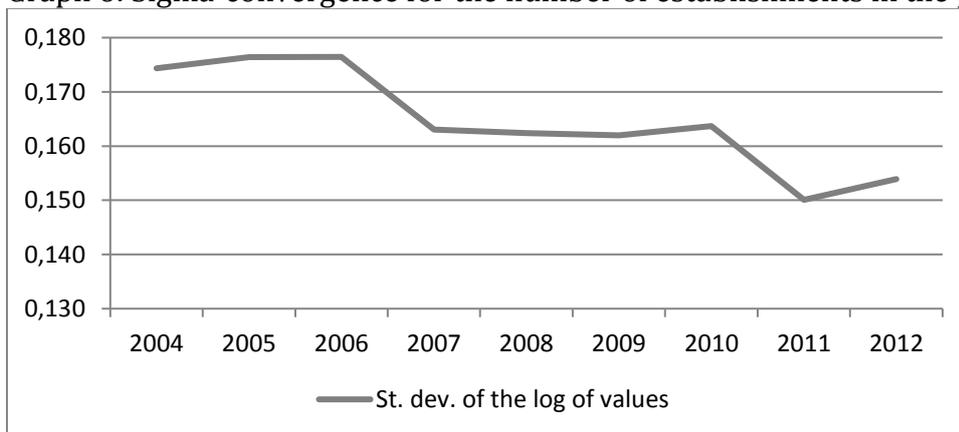
Source: Authors; Czech Statistical Office

Graph 5: Sigma-convergence for the number of establishments in the period 2000 - 2003



Source: Authors; Czech Statistical Office

Graph 6: Sigma-convergence for the number of establishments in the period 2004 - 2012



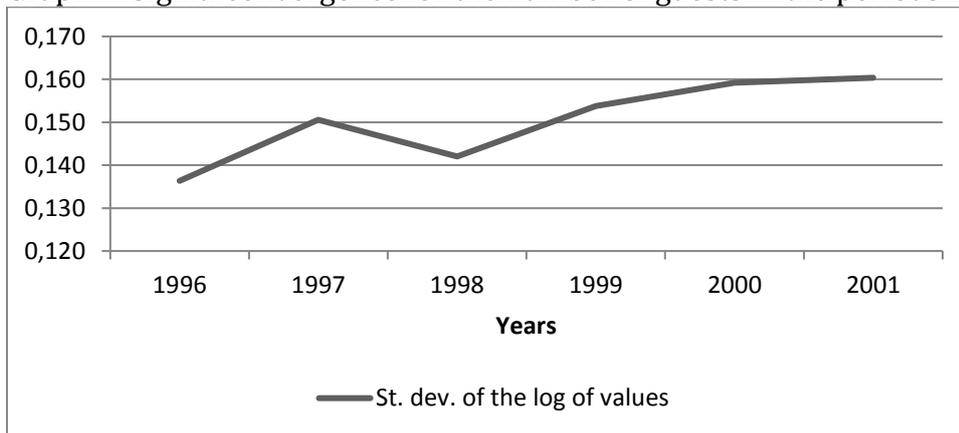
Source: Authors; Czech Statistical Office

According to the results, the sigma-convergence process confirmed the ongoing convergence among regions after the Czech Republic joined the EU; the regions started drawing funds from operational programmes targeting tourism (see Graph 6). However,

the strength of the convergence or divergence cannot be clearly established for the period prior to joining the EU (see Graph 4). Once again, it is important to point out that the period 2000 - 2003 (see Graph 5) is presented only for informative purposes because the values span a time discrepancy between the monitored periods.

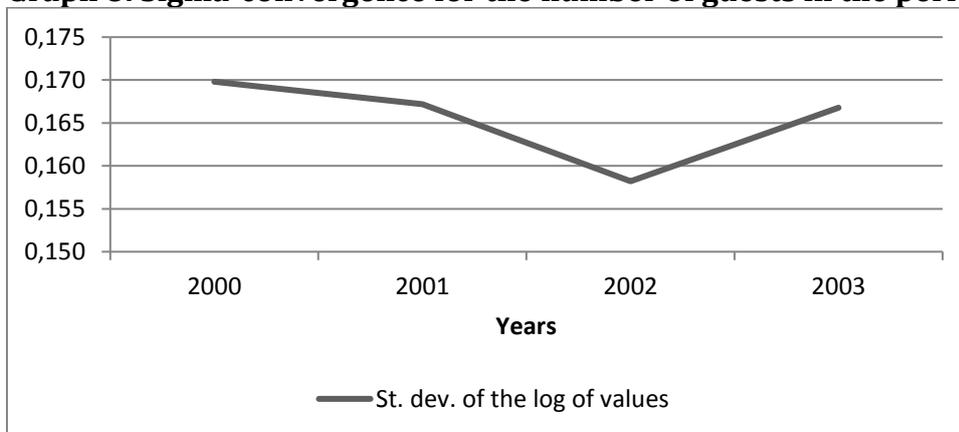
The evaluation was completed with an analysis of the last indicator i.e. the number of guests in the individual regions (see Graphs 7, 8 and 9).

Graph 7: Sigma-convergence for the number of guests in the periods 1996 - 2001



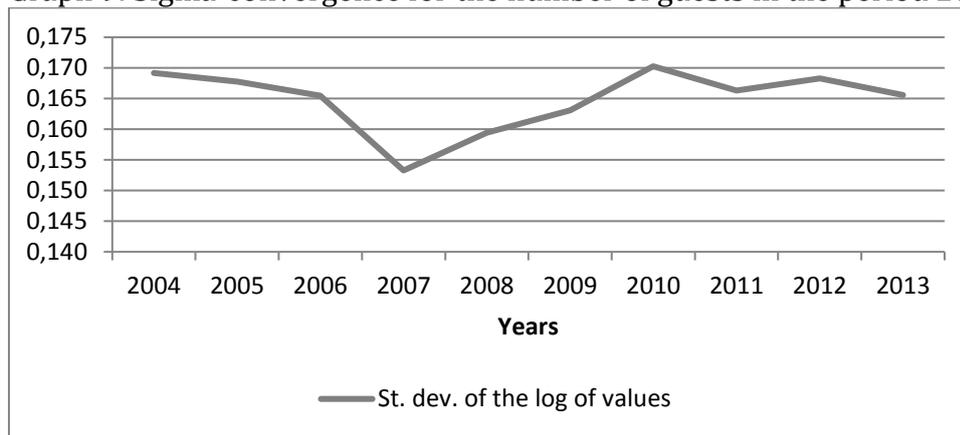
Source: Authors; Czech Statistical Office

Graph 8: Sigma-convergence for the number of guests in the period 2000 - 2003



Source: Authors; Czech Statistical Office

Graph 9: Sigma-convergence for the number of guests in the period 2004 - 2013



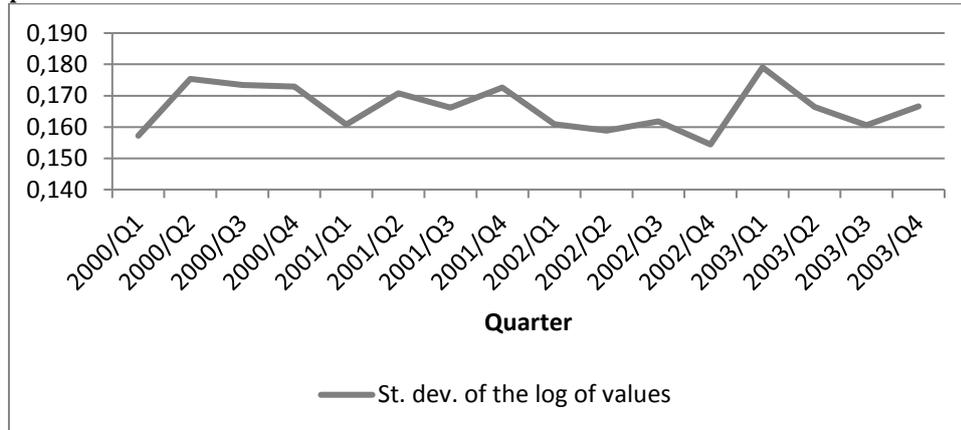
Source: Authors; Czech Statistical Office

In the case of the number of guests, the development trend for the period 1996 – 2001 shows a tendency towards divergence among the regions. After 2004 (see Graph 9), the indicator appears to show a tendency towards both convergence and divergence. It was therefore not possible to draw a conclusion about the two processes over the whole period under examination.

The annual data analysis showed only a limited convergence or divergence process among the regions of the Czech Republic in the field of tourism (see, for example, the ambiguous progress in the case of the number of guests in accommodation facilities). In order to provide further clarification, and in the knowledge that the Czech Statistical Office also provides data on a quarterly basis on bulk traffic accommodation and therefore the number of guests, an additional analysis was carried out. Two time periods were evaluated on the basis of these data, namely the period prior to the Czech Republic joining the EU (2000 – 2003), and the period after its entry (2004 – 2013).

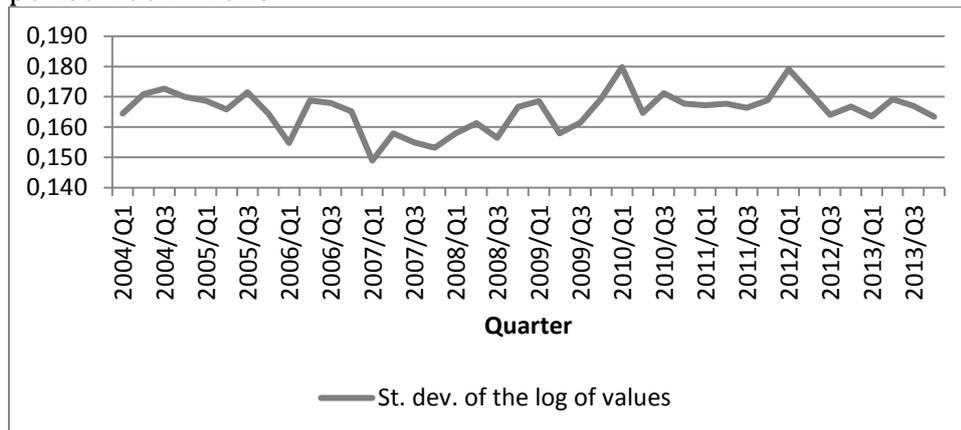
The data indicators for bulk traffic accommodation facilities were first examined in terms of the basic characteristics of the time series. The data showed strong seasonal fluctuations. For this reason the time series was adjusted to compensate for the seasonal variations. The indicators were then subjected to the analysis of convergence. The outputs of the sigma-convergence analysis for the quarterly data on the number of guests is presented in Graphs 10 and 11.

Graph 10: Sigma-convergence for the number of guests – quarterly time series for the period 2000 - 2003



Source: Authors; Czech Statistical Office

Graph 11: Sigma-convergence for the number of guests – quarterly time series for the period 2004 - 2013



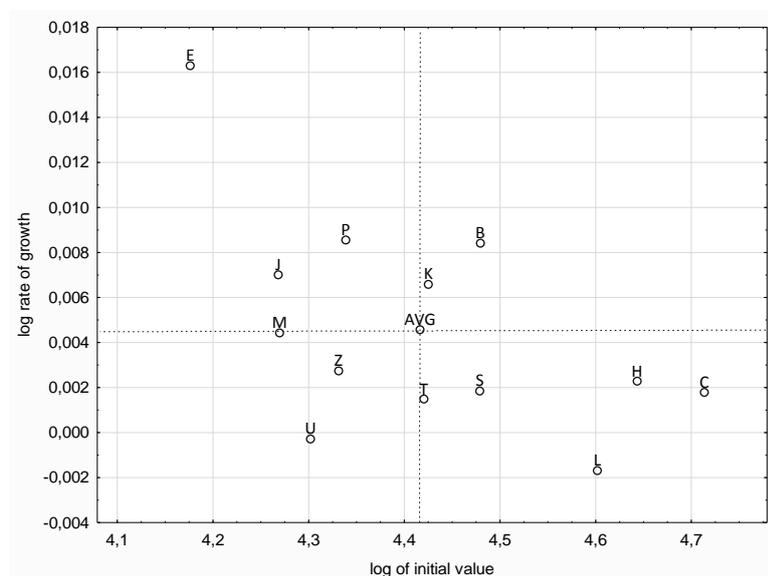
Source: Authors; Czech Statistical Office

The inclusion of the quarterly data allows comparisons to be made between the two consecutive periods. When comparing the graphs for the number of guests in accommodation facilities in the regions, it is possible to conclude that after the Czech Republic joined the EU, the disparities between regions stabilized over the course of time. In terms of convergence or divergence between the regions, the situation essentially remained unchanged. The standard deviation fluctuated at approximately constant values. The variability between the regions was therefore also constant.

The sigma-convergence only demonstrated the convergence process among regions for the indicator that reflects the capacity of the accommodation facilities after the Czech Republic joined the EU. The analysis was therefore supplemented with a beta-convergence analysis. The goal was to determine which regions had convergence or divergence tendencies. Beta-convergence in this case provided a broader view of the issue because it depends only on the initial and final values of the monitored indicators.

In this case, it is helpful to graphically represent the regions in a correlation diagram, whereby the area is divided on the basis of the average reference values (the initial values and the growth rate of the indicator over time). This gives rise to four quadrants. Those regions with a tendency towards convergence are situated in the second and fourth quadrants. These are the regions with a lower initial indicator value, but high growth over time, as well as those regions with a higher initial indicator value and slow growth over time. In contrast, those regions with a tendency towards divergence are situated in the first and third quadrants. If there is no evidence of either tendency, the monitored regions are more scattered across all four quadrants. Graphs 12 and 13 demonstrate the allocation of the regions with regards to the average values observed in the form of the geometric mean.

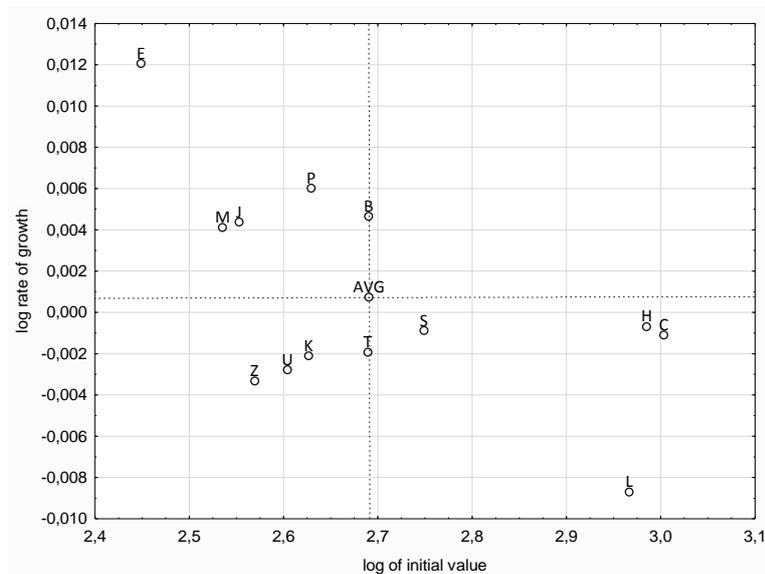
Graph 12: Correlation diagram for the number of beds in the period 2007 – 2013



where: B – South-Moravian Region; C – South-Bohemian Region; E – Pardubice Region; H – Hradec Kralové Region; J – Vysočina Region; K – Karlovy Vary Region; L – Liberec Region; M – Olomouc Region; P – Plzeň Region; S – Central Bohemia Region; T – Moravian-Silesian Region; U – Ústí Region; Z - Zlín Region; AVG – average value.

Source: Authors; Czech Statistical Office

Graph 13: Correlation diagram for the number of establishments in the period 2007 – 2013

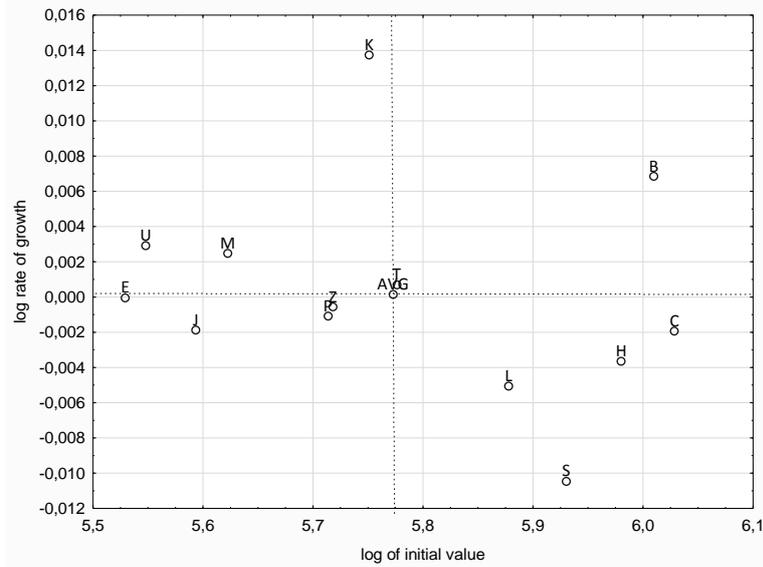


Source: Authors; Czech Statistical Office

The deployment of the regions in the correlation diagrams is similar in both cases (see Graphs 12 and 13). The convergence tendencies are associated with the predominant representation of the regions in the second and fourth quadrants. In this case, the deployment of the regions confirms the general characteristics of the individual regions. For example, the Pardubice Region (in the second quadrant) is struggling with a low level of tourism, however with the high annual increase in values it can be expected that this situation will gradually improve. Similarly, for example, in the programme document of the Moravian-Silesian Region for the period 2007 – 2013 it states that the tourism sector is insufficiently utilized, even though the potential of the region is considerable. The reasons for this are the low level of traffic and information infrastructure for tourism (especially in the border areas), the lack of supply of good quality services and products, and last but not least, the uncoordinated marketing efforts. The programme document also states that there are sufficient numbers of cultural, industrial and technical attractions, but that the funds are missing to modernize and increase the attractiveness of these monuments (see Office of the RC MS 2011).

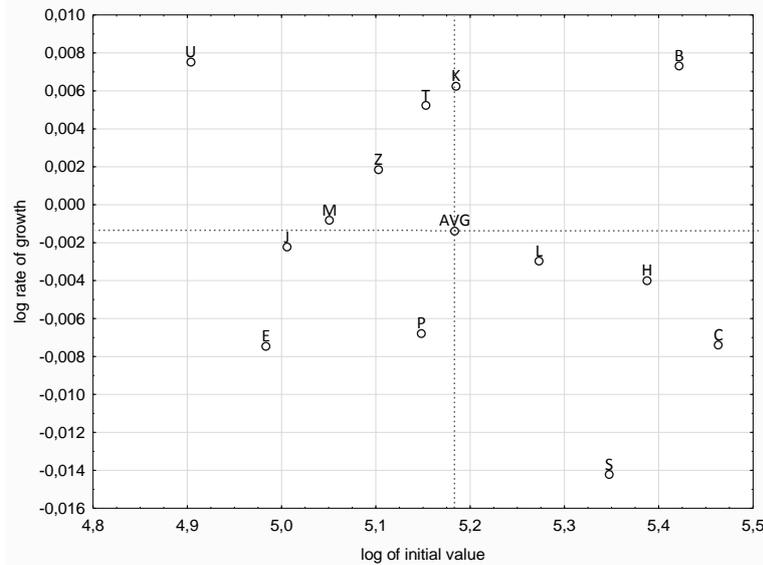
Graphs 14 and 15 are correlation diagrams which show the deployment of the regions with regards to the number of guests in accommodation facilities during the period 2007 – 2013 on the basis of an annual and quarterly time series.

Graph 14: Correlation diagram for the number of guests in the period 2007 – 2013 – annual time series



Source: Authors; Czech Statistical Office

Graph 15: Correlation diagram for the number of guests in the period 2007 – 2013 – quarterly time series



Source: Authors; Czech Statistical Office

In both cases, the ambiguity of the tendency towards convergence or divergence was demonstrated by the high dispersion of each region around the average value of the reference indicator. The diagrams also allow us to track those regions that have a tendency to contribute towards convergence in the field of tourism and those regions with the opposite tendency.

Evaluation of convergence at regional level

Achieving convergence among the regions (or even in certain areas) is not automatic. Nevima and Melecký (2011) conducted research to determine whether convergence had been achieved under NUTS II in the Czech Republic, Hungary, Poland and Slovakia. According to their findings, convergence between many of the regions was confirmed. However, they also found evidence that a process of divergence had also been initiated.

The analysis in this article was made on the basis of the assessment of statistical indicators which describe the developments in the Czech Republic (with the exception of the capital, Prague) in the field of tourism after the country joined the EU. After 2004, each of the given regions drew funds for support for various areas of tourism. The goal of these subsidies was to directly fulfil the defined objective of “convergence”.

The evaluation through sigma-convergence showed a tendency towards building the infrastructure for tourism. With regards to the attendance of the regions, there was little evidence to show whether there was a process of convergence or divergence.

The evaluation also set out to determine what the direct impact of drawing down funds from operational programmes has had in the area of tourism. The situation was therefore examined in the periods both prior to, and after, aid programmes were initiated. The evidence shows that a change in the trend was only recorded in selected cases.

Smrčková, Vlček and Cveňgroš (2008) asked the question: What actually determines the success of convergence? They suggest that the source of failure to converge may lie in a certain inefficiency in national cohesion policies (e.g. interconnection of incentives, the absence of regional policy with clearly defined objectives, etc.). The failure at regional level can also be associated with the inadequate restructuring of the local economy or with the inability to effectively draw and make use of structural funds. Investments in infrastructure are an essential condition for development, however this may not be sufficient for the development of more distant regions. Successful convergence does not depend on the volume of released funds, but more significantly on the environment into which these resources flow.

The impact on convergence from the findings depends on the period for which the convergence was proven. Within this context we can refer to the findings of Rodrigues-Pose (2000), who notes that regional development is a process, which is reflected, in particular, over the long term. However, the level of economic development of regions is all too often assessed over the short term. For this reason, it is not therefore possible to uncover all the possible future impacts on local economic activities or economic growth. It is therefore necessary to be careful when drawing conclusions with regards to the evaluation of the achievement of convergence.

Conclusion

The aim of this article was to analyse the process of convergence i.e. the process through which the EU seeks to achieve coherence among individual states and regions. The process of convergence requires cohesion three areas - social, economic and territorial. For analysis purposes the situation surrounding tourism was chosen because it was supported by means of subsidies from EU operational programmes under NUTS II which were focused on developing cohesion among regions.

The convergence of the regions was only recognized in particular cases. For example, in the Pardubice, Plzeň and Vysočina regions it was not possible to enumerate according to the number of beds or the number of establishments, which is an indication of the high increment in the searched variables. In contrast, the South-Bohemian, Liberec, Hradec Králové and Central Bohemia regions, which can be considered as developed, showed slow-downs in growth and the same trend in the number of guests (the Ústí and Olomouc regions indicated rapid growth in this case).

In some cases the analysis did not clearly confirm the achievement of convergence. For example, on the basis of all three chosen indicators, the South-Moravian Region overtook the other regions due to its high initial value and high growth. In contrast, the Zlín and Ústí regions fell behind in terms of the number of beds and the number of establishments, as did the Pardubice Region in terms of the number of guests.

These conclusions confirm the results of other authors, i.e. it is not possible to empirically connect the instruments (subsidies) with the aim (convergence). On this basis, it is therefore necessary to establish which factors can start the process of convergence. If the answer to convergence is linked to drawing funds from EU programmes, it is necessary to take this into consideration.

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Effect of Non-Investment Measures upon the Stability of Agricultural Enterprises in the South Bohemian Region

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Abstract

The contribution deals with parametrization of multifunctional potential of enterprises with non-investment measures, including basic subsidy programs applicable in the programming period 2007 – 2013, using a set of agricultural enterprises in the South Bohemian region. Models of non-investment measures have been proposed, including basic subsidy programs, which have been, due to the expected increase of subsidies in 2014 – 2020, increased by coefficients in the interval 1.1 – 1.3. At the same time, we applied degression of the payments in three variants and based on the size category of the agricultural enterprise. The proposed models of non-investment measures investigated changes in solvency or financial health of the agricultural enterprises in 3 production categories typical for the South Bohemian region (mountain type, potato-oats type, potato type).

Key words: non-investment measures, multifunctionality, subsidies, enterprise solvency, financial health

Introduction

“Multifunctionality“, a significant element in the current agricultural policy, has been totally misunderstood in global discussions conducted in OECD by delegations from other continents. Initially, the term was difficult to explain and difficult to translate. It was only in 1998 when multifunctionality was included into the official language of the Organization for Economic Cooperation and Development (VÚZE, 2002). The concept has been understood differently by different authors. Miškolci (2005) generally defines multifunctionality as a characteristic of economic activity and in connection with agriculture it is perceived as multiple functions provided for by agricultural activity. Durand and Huylenbroeck (2003) deal with multifunctionality of agriculture in the context of association with multifunctional commodity and non-commodity outputs in agricultural production. Prestegard (2005) associates the multifunctionality concept

also with the function of national food security, benefits for the environment and sustainability of rural regions. Van der Ploeg and Roep (2003) describe multifunctional agriculture as multiple activities. Recent conceptual models of multifunctional agriculture stress the potential of processes from the bottom up and links between social and environmental systems that support multifunctionality (Manson and al. 2016).

Seják, Dejmal and Cudlínová, (2005), Hrabánková et al. (2007) describe two basic opinion groups in respect to multifunctionality. On one side there are USA and other countries promoting free trade (Australia, New Zealand, South Africa, Canada and the biggest exporters from Latin America and countries in Southeast Asia) and holding the opinion that multifunctionality of agriculture is already included in the concept of sustainable agriculture and therefore it should not be used to justify additional national interventions and subsidies in agriculture. On the other side, there is a group of countries that recognize multifunctionality of agriculture and the need to respect values such as healthy food, biodiversity of landscape, cultural heritage, respect to clean environment and sustainable rural living (EU, Japan, Korea, Island, Norway, Switzerland and many other countries). In order to understand decision of the farmers it is very important to take into account the type of multifunctional activity, type of agricultural enterprise and its location (Hassink, Agricola a Thissen 2016).

In a liberalized system multifunctionality evokes the question how the activities should be evaluated and how non-market function of agriculture should be included into the gross national product because market prices of agricultural products do not encompass activities associated with multifunctionality of agriculture. The program of "Rural development" offers suitable methods to effectively and in an integrated manner complement classical tools of agricultural policy and, particularly, to ensure multifunctionality in key categories (McLaughlin and Mineau 1995).

In the Czech Republic the need of multifunctional agriculture is recognized in the official agricultural policy and it is included in the overall concept of the economic policy. According to the Concept of Agrarian Policy of the Czech Republic, multifunctional agriculture is agriculture which, apart from traditional commodities (private goods) allocated by the market, produces also the so-called non-commodity outputs (Concept of Agrarian Policy 2004). The objective of multifunctional agriculture is to ensure sustainable development of countryside in integration with agriculture, forest and water management and thus to achieve adaptation of the Czech agriculture to the European model through multifunctional competitive agriculture and forest management in the regional scope, while improving quality of rural infrastructure (Váchalová et al. 2003).

A multifunctional character of agriculture undoubtedly contributes to the sustainability objectives, particularly through its social-economic and environmental functions (Pillarissetti, Lawrey and Ahmad 2013). Research efforts seeking to support development of policies for multifunctional agriculture cannot focus on filling of gaps in knowledge

and technologies but they should concentrate mainly on the process of knowledge utilization (Rossing et al. 2007).

To assess the financial health of companies there is (alongside the financial analysis) a big number of variety of methods, approaches and tools that enable a comprehensive view of business performance (Kislingerová 2007, Froněk, Jelinek and Medonos 2007). Gurčík (2002), Chrastinová (1998), Kopta (2006), Novák (2008) are some of the authors dealing with an objective evaluation of financial-economic situation of agricultural enterprises. Also the research teams from research institutes such as ÚZEI can be mentioned. Novák (2008) states that the objective evaluation of the financial-economic situation of agricultural enterprises requires finding a suitable method that would respect interrelationships among the factors determining this level as much as possible, both in short and long terms. For a comprehensive assessment of business he proposes five-financial and five non-financial indicators respecting the specificities of agricultural production, namely financial indicators (capital returns, cost profitability, level of indebtedness, current liquidity, turnover of total assets) and non-financial indicators (quality of the management, used production technologies and equipment, the structure of production, ownership structure and enterprise relationship to the environment, surroundings and society). Rating using so called non-financial indicators is subjective, however, according to Novak (2008) it represents a more comprehensive and structured look at various aspects of agricultural enterprises.

Kopta (2006), in his contribution to the research project MSM 6007665806, discussed methods of prediction of financial distress of agricultural enterprises and the level of their meaningful level. The research shows that the appropriate index from the group of bonity or bonity-proprietary indicators achieving a better explanatory power is Gurčík 's index, whose composition of used ratios reflects the specifics of agricultural enterprises better. Out of the bankruptcy indicators the index of financial health under the operational programme whose success in identifying bankrupting enterprises amounted to 73 % seems to be appropriate. The causes of the failure of the other indexes according to Kopta (2006) are related mainly to:

- agricultural production specifics (dependency on natural conditions, variability of input prices, etc., which causes typical especially for businesses producing in low-lying areas, focusing more on crop production),
- improper composition of financial indicators not reflecting the specifics of agricultural production (this cause can be solved by adjusting the weights assigned to individual indicators),
- construction of individual indexes (use of non-standardized partial indicators), (Kopta 2006).

In early 2012 the agency of ČEKIA (based on the rating) noted that business in the agricultural sector still belongs to the riskiest in our country. They said that almost every second company (48.8 %) operating in agriculture is endangered by bankruptcy and that decline threatens 123 % other firms. Reactions of professional

public on these published results were quite critical. Havel (2012) following these results literally said that "rating based on a compilation unilaterally arranged negative media data has absolutely no meaningful potential". He stressed that in 2011 the agriculture of the Czech Republic reported the highest ever profit of about 13.5 billion CZK, mainly due to higher prices of most of major agricultural commodities. He said that farming is also the only sector which can annually count on considerable amounts of subsidies, the amount of which is about 35 billion CZK, which represents about a quarter million CZK converted a person. This condition certainly does not predict vision of bankruptcies.

Material and methods

The tested set included 452 agricultural enterprises from the South Bohemian region, all of them legal persons, which operate on most of the farming land in the South Bohemian region. For the testing purposes the enterprises were in cooperation with the Czech Statistical Office (ČSÚ) divided based on the prevailing character of their land into production districts typical for the South Bohemian region as follows:

- Mountain category (47 enterprises),
- Potato-oats category (83 enterprises),
- Potato category (166 enterprises),
- Beet category (3 enterprises).

After filtering off the data we eliminated enterprises in the beet category due to their low number, enterprises dealing mostly with non-agricultural activities and enterprises with insufficient economic data and data about the received subsidies that we needed for the analysis of their financial health in 2010; the final set consisted of 214 agricultural enterprises. In respect to subsidy programs we took into account basic subsidy programs applicable in the programming period 2007-2013 (i.e. payment from SAPS, LFA, agro-environmental measures, Natura 2000 and Top-Up). For the set of agricultural enterprises defined in this manner we have proposed models of non-investment measures, including applicable subsidy programs (agro-environmental measures), and we applied mathematical-statistical models to the tested group of 214 enterprises. Financial health of agricultural enterprises was then calculated using solvency models (solvency index, Gurčík's index).

As the subsidy programs are expected to increase in the following programming period in 2014 – 2020 the basic rates in the models were increased by coefficients 1.1, 1.2 and 1.3. At the same time, we applied degression of payments for the categories of enterprises with 500 - 1000 ha and over 1000 ha, in contrast with the anticipated increase of payments for the category of enterprises up to 500 ha. Based on the described adjustments we investigated how solvency of the enterprises changes in the individual production categories.

The agricultural enterprises (214) were divided based on the rate of tillage (0 - 20 %, 21 - 50 % and over 50 %) and multiplied with rates of the proposed subsidies for the corresponding category allocated to the given measure. With regard to the partial calculations of financial health with the selected solvency models (solvency index and Gurčík's index) it was necessary to adjust the indicators, such as total revenues with newly proposed subsidies, with the newly proposed agro-environmental measures and also with the price coefficient (average price index of agricultural production, including the price increase of the inputs in 2011 and 2012), but also the profit before tax. The following formulas indicate the adjustments:

$$Z' = V' - N$$

$$V' = (V - \text{Dot}_{\text{existing}}) * k_{\text{cen}} + \text{Dot}_{\text{newly proposed}}$$

where:

- V' revenues adjusted with a price coefficient and change in the subsidies,
 $\text{Dot}_{\text{existing}}$ subsidies - existing
 $\text{Dot}_{\text{newly proposed}}$ subsidies - newly proposed
 N costs
 k_{cen} price coefficient (average price index of agricultural production, including the price increase of inputs in 2011 and 2012).

The proposed models of non-investment measures, including subsidy programs.

Mountain category

Tab. 1: Mountain category – variant 1 – Rate of tillage 0 - 20 % (59 % from the total category of agricultural land in this category)

Subsidy programs	Subsidy - 2012 CZK/ha	Coefficient		
		1.1	1.2	1.3
APS	5 387	5 925	6 464	7 003
LFA	4 213	4 634	5 055	5 476
Grassland, pastureland	2 824	3 106	3 388	3 671
Permanent grassland non- fertilized - ECO regime	4 602	5 062	5 522	5 982
Payment for ruminants	630	693	756	819
Payment for a born calf	1 400	1 540	1 680	1 820
Total CZK/ha	19 056	20 960	22 865	24 771

Source: Authors

Table 2: Mountain category - variant 2 - rate of tillage 21-50 % (36 % from the total category of agricultural land in this category)

Subsidy programs	Subsidy - 2012 CZK/ha	Coefficient		
		1.1	1.2	1.3
SAPS	5 387	5 925	6 464	7 003
LFA	4 213	4 634	5 055	5 476
Grassland, permanent grassland (meadows and pastureland)	2 358	2 594	2 830	3 065
Payment for ruminants	630	693	756	819
Payment for a born calf	1 400	1 540	1 680	1 820
Total CZK/ha	13 988	15 386	16 785	18 183

Source: Authors

Tab. 3: Mountain category - variant 3 - rate of tillage over 50 % (5 % from the total category of agricultural land in this category)

Subsidy programs	Subsidy - 2012 CZK/ha	Coefficient		
		1.1	1.2	1.3
SAPS	5 387	5 925	6 464	7 003
LFA	4 213	4 634	5 055	5 476
Grassland, permanent grassland (meadows and pastureland)	2 358	2 594	2 830	3 065
ECO - arable land	3 909	4 300	4 691	5 082
KTPM - cows kept in the system with market production of milk	1 399	1 538	1 678	1 818
Total CZK/ha	17 266	18 991	20 718	22 444

Source: Authors

Potato-oats category

Tab. 4: Potato-oats category - variant 1 - rate of tillage 0 - 20 % (8 % from the total category of agricultural land in this category)

Subsidy programs	Subsidy - 2012 CZK/ha	Coefficient		
		1.1	1.2	1.3
SAPS	5 387	5 925	6 464	7 003
LFA	4 213	4 634	5 055	5 476
Grassland, permanent grassland (meadows and pastureland)	2 358	2 594	2 830	3 065
Permanent grassland non-fertilized - ECO regime	4 602	5 062	5 522	5 982
Payment for ruminants	630	693	756	819
Payment for a born calf	1 400	1 540	1 680	1 820
Total CZK/ha	18 590	20 448	22 307	24 165

Source: Authors

Tab. 5: Potato-oats category - variant 2 - rate of tillage 21-50 % (5 % from the total category of agricultural land in this category)

Subsidy programs	Subsidy - 2012 CZK/ha	Coefficient		
		1.1	1.2	1.3
SAPS	5 387	5 925	6 464	7 003
LFA	4 213	4 634	5 055	5 476
Grassland, permanent grassland (meadows and pastureland)	2 358	2 594	2 830	3 065
KTPM - cows kept in the system with market production of milk	1 399	1 538	1 678	1 818
Total CZK/ha	13 357	14 691	16 027	17 362

Source: Authors

Tab. 6: Potato-oats category - variant 3 - rate of tillage over 50 % (87 % from the total category of agricultural land in this category)

Subsidy programs	Subsidy - 2012 CZK/ha	Coefficient		
		1.1	1.2	1.3
SAPS	5 387	5 925	6 464	7 003
LFA	4 213	4 634	5 055	5 476
Grassland, permanent grassland (meadows and pastureland)	2 358	2 594	2 830	3 065
EKO - arable land	3 909	4 300	4 691	5 082
KTPM - cows kept in the system with market production of milk	1 399	1 538	1 678	1 818
Bio-strips per ha of arable land	202	222	242	263
Intercrop per ha of arable land	262	288	314	341
Total CZK/ha	17 730	19 501	21 274	23 048

Source: Authors

Note: bio-strips , intercrops are related only to the category of arable land

Potato category

Tab. 7: Potato category - variant 1 - rate of tillage 0 - 20 % (2 % from the total category of agricultural land in this category)

Subsidy programs	Subsidy - 2012 CZK/ha	Coefficient		
		1.1	1.2	1.3
SAPS	5 387	5 925	6 464	7 003
LFA	4 213	4 634	5 055	5 476
Grassland, permanent grassland (meadows and pastureland)	2 358	2 594	2 830	3 065
Payment for ruminants	630	693	756	819
Payment for a born calf	1 400	1 540	1 680	1 820
Total CZK/ha	13 988	15 386	16 785	18 183

Source: Authors

Tab. 8: Potato category - variant 2 - rate of tillage 21-50 % (1 % from the total category of agricultural land in this category)

Subsidy programs	Subsidy - 2012 CZK/ha	Coefficient		
		1.1	1.2	1.3
SAPS	5 387	5 925	6 464	7 003
LFA	4 213	4 634	5 055	5 476
Grassland, permanent grassland (meadows and pastureland)	2 358	2 594	2 830	3 065
KTPM - cows kept in the system with market production of milk	1 399	1 538	1 678	1 818
Bio-strips per ha of arable land	202	222	242	263
Total CZK/ha	13 559	14 913	16 269	17 625

Source: Authors

Note: bio-strips, intercrops are related only to the category of arable land

Tab. 9: Potato category - variant 3 - rate of tillage over 50 % (97 % from the total category of agricultural land in this category)

Subsidy programs	Subsidy - 2012 CZK/ha	Coefficient		
		1.1	1.2	1.3
SAPS	5 387	5 925	6 464	7 003
LFA	4 213	4 634	5 055	5 476
Grassland, permanent grassland (meadows and pastureland)	2 358	2 594	2 830	3 065
KTPM - cows kept in the system with market production of milk	1 399	1 538	1 678	1 818
Payment for a calf of meat type	700	770	840	910
Bio-strips per ha of arable land	202	222	242	263
Intercrop per ha of arable land	262	288	314	341
Total CZK/ha	14 521	15 971	17 423	18 876

Source: Authors

Note: bio-strips, intercrops are related only to the category of arable land

Degression of payments in 3 variants and depending on the size of the agricultural enterprises.

Tab. 10: Degression type I

Size of the enterprise	Degression I (in %)
≤ 500 ha	0
500 - 1000 ha	- 5
> 1000 ha	- 10

Source: Authors

Tab. 11: Degression type II

Size of the enterprise	Degression II (in %)
≤ 500 ha	+ 15
500 - 1000 ha	- 10
> 1000 ha	- 15

Source: Authors

Tab. 12: Degression type III

Size of the enterprise	Degression III (in %)
≤ 500 ha	+ 20
500 - 1000 ha	- 20
> 1000 ha	- 20

Source: Authors

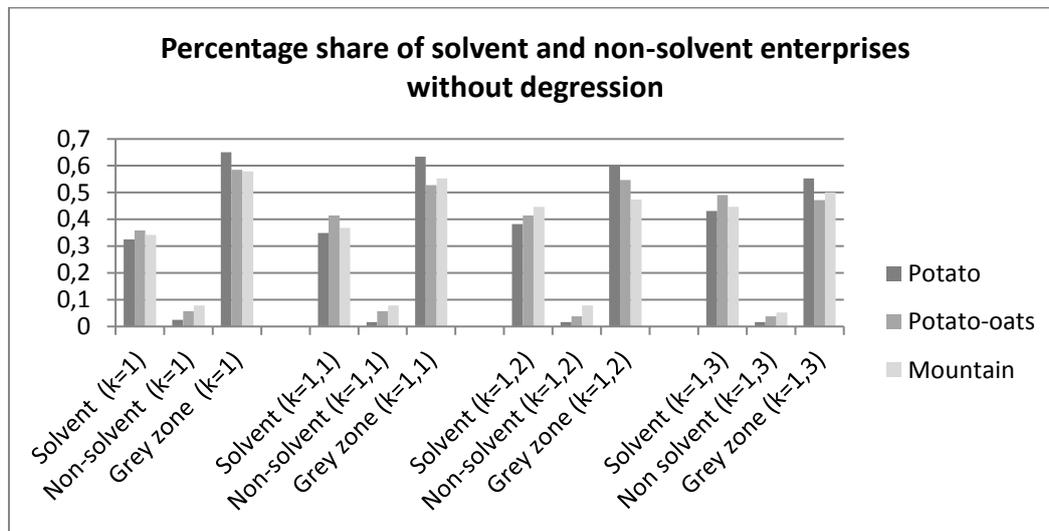
Results and discussion

The following results present application of degression and progression of the proposed models of non-investment measures on the individual production categories and their effect on financial health of agricultural enterprises (legal persons) with the use of solvency models (Gurčík's index and solvency index). The comparison figures have been developed at two basic levels:

- Modulation of the production potential of the enterprises with coefficients for increase of subsidies in the range 1.1 – 1.3, without and with application of size degression of the enterprises (comparison figures I),
- Modulation of the production potential of the enterprises as a result of degression in the range of degression I to III, with modulation of the variants with coefficients of subsidy increase 1.1 – 1.3.

Comparison figures I – without depression

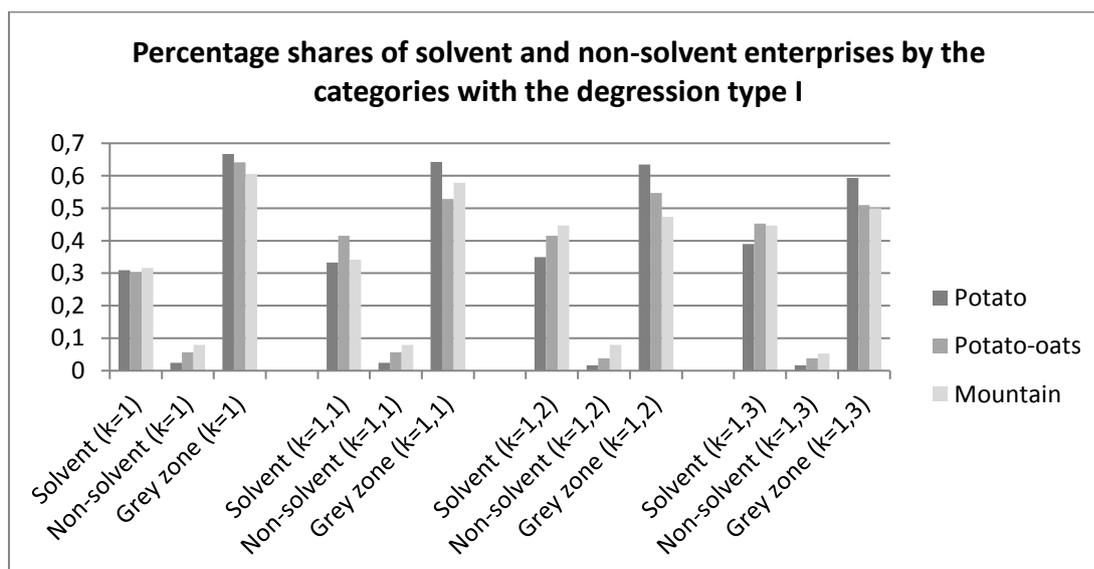
Figure 1: Comparison of percentage shares of solvent and non-solvent enterprises by the individual categories – without depression



Source: Authors

Results in the figure 1 indicate that the percentage share of solvent enterprises demonstrates a slight linear increase in relation to the coefficients 1.1 – 1.3 with a concurrent slight decrease of non-solvent enterprises, but with the opposite trend. The grey zone follows the trend of decreasing number of non-solvent enterprises. From the viewpoint of the modeled frequency of solvent and non-solvent enterprises without depression for the size of the enterprises, the most favorable variant is the one with k=1.3.

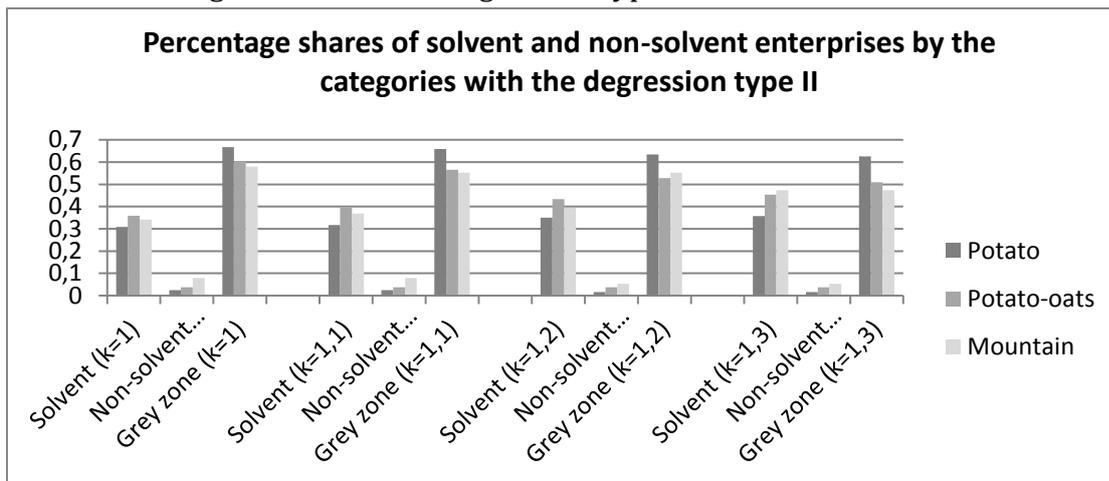
Figure 2: Comparison of percentage shares of solvent and non-solvent enterprises by the individual categories – with the depression type I



Source: Authors

Solvency results for the type I depression (Figure 2) indicate similar behavior for the set of the enterprises as the variant without depression, the only difference being that the increase of solvency of enterprises as a result of coefficient of subsidy increase (1.1 – 1.3) is more moderate, due to the depression applied for the medium and big enterprises (-5 to -10 %). From the viewpoint of the modeled frequency of solvent and non-solvent enterprises with the depression of type I for the size of the enterprises the most favorable variant is again that one with $k=1.3$.

Figure 3: Comparison percentage share of solvent and non-solvent enterprises by the individual categories – with the depression type II

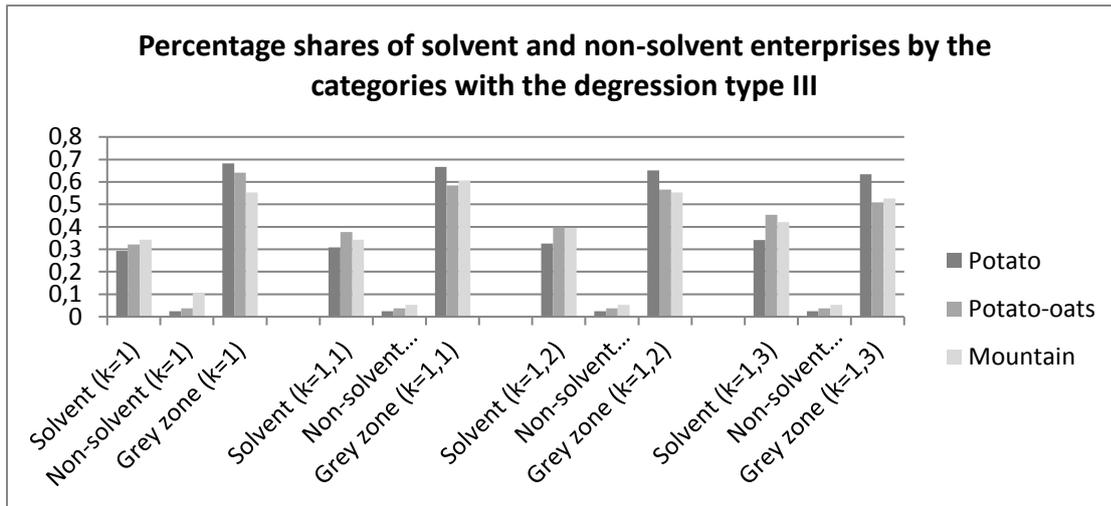


Source: Authors

Generally we can conclude that solvency results with the depression type II are similar to the two variants described above (see Figures 1 and 2), the only difference being that the increase of solvency of enterprises with the growing coefficients is even more moderate than in the previous cases as a result of the applied depression for medium and big enterprises (-10 to -15 %) with regard to their representation in the tested set of enterprises.

The type II depression, as shown by the Figure 3, can be in comparison with the other depression types identified as the most suitable variant with an effect on financial health of enterprises, nevertheless the expectation of significant increase of solvency for enterprises up to 500 ha has not been confirmed as the increase was 15 %; the explanation may be in the relatively low representation of enterprises in this size category in the tested set and also in the function of the enterprises, where their overheads, including administration costs, probably exceed their preferential terms of 15 % in the proposed models of non-investment measures, including subsidy programs. From the viewpoint of the modeled frequency of solvent and non-solvent enterprises with the type II depression for the size of the enterprises the most favorable variant is the one with $k=1.3$, equally as in the previous variants.

Figure 4: Comparison percentage shares of solvent and non-solvent enterprises by the individual categories – with the depression type III

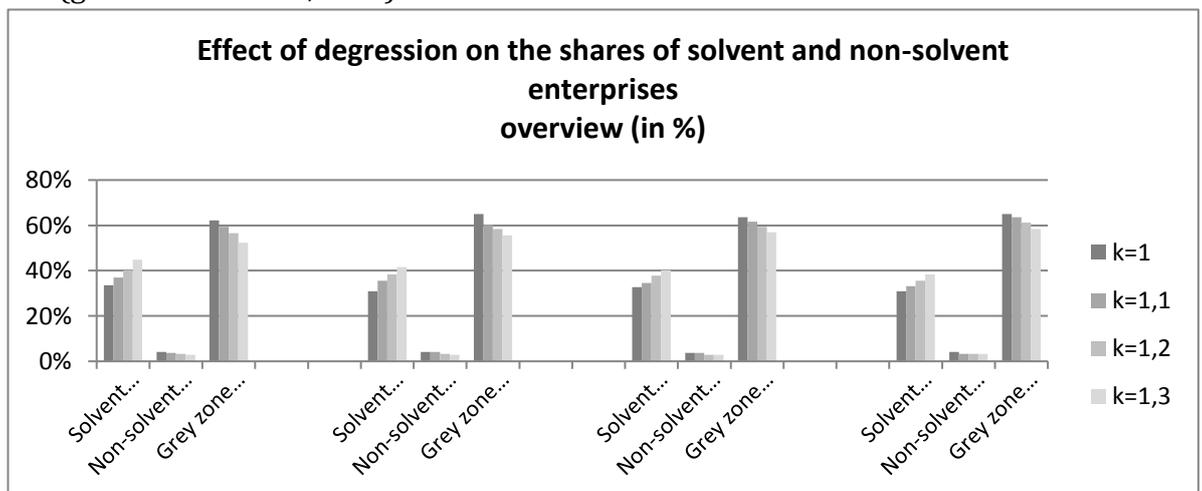


Source: Authors

For this type of depression the development trends of the financial health of the enterprises are similar, despite the significant preferential treatment of the enterprises up to 500 ha, specifically by 20 % for the proposed models of non-investment measures, including subsidy programs, with a concurrent significant reduction for the medium and big enterprises category, equally by 20 %. For the mountain category, with a slight prevalence of enterprises up to 500 ha, the solvency results were the same as in the previous case, nevertheless the increase or decrease of solvency in comparison with the variant k=1 was the least distinct in this category in comparison with the other categories, with regard to the slight prevalence of enterprises up to 500 ha. From the viewpoint of the modeled frequency of solvent and non-solvent enterprises with the type III depression for the size of the enterprises the most favorable variant is the one with k=1.3.

Comparative summary Figure II

Figure 5: Effect of the depression on frequencies of solvent and non-solvent enterprises (general overview, in %)



Source: Authors

The following can be concluded from the overall testing of the effect of degression for the size of enterprises on their production potential using the coefficients 1.1 – 1.3, as documented in Figure 5.

The biggest number of solvent enterprises was found for the basic variant, which is an expected result because in this case no degression for the size was applied and only the subsidy programs were increased by the coefficients 1.1 – 1.3.

For the type II degression there was a positive combination of the size categories of enterprises, particularly for the mountain and potato–oats production categories, which have a higher representation of enterprises up to 500 ha than in the potato category.

A question arises about suitability of size degression when planning new subsidy programs for the new programming period; it is not possible to draw general conclusions but we can guess that it is necessary to use a differentiated approach in case of any type of degression based on the production categories and percentage representation of the individual size categories of enterprises.

Conclusions

The following measures can be concluded from the results:

- The necessity of subsidy programs for stability of agricultural enterprises in the investigated production categories has been positively confirmed.
- The implementation of subsidy programs in the set of enterprises suggests that the proposed models correspond to real needs of enterprises operating in the individual production categories.
- The application of subsidy models with increase of coefficients (1.1 – 1.3) in the tested set of enterprises has shown the principal effect of their targeted allocation in comparison with their size (it was not demonstrated that a higher subsidy automatically improves financial health of an enterprise).
- The dominant payments from the entire subsidy system and non-investment agro-environmental measures are payments per area, as they address the enterprise as a whole and they address its natural, i.e. the basic, production potential, which turns out to be the central precondition of the overall prosperity and sustainability of the enterprise.
- In general we can conclude that the increasing of subsidy models with the coefficients 1.1 to 1.3 resulted in a slight linear increase of solvency; in the potato and potato-oats categories this effect was not so conclusive, probably due to the higher intensity of farming. It is very probable that there will be a higher impact of the factor of input/ output prices in the agricultural production.
- From the viewpoint of size degression we can make a general conclusion that modulation of this prepared preferential treatment of enterprises up to 500 ha did not bring positive results and again it has shown the necessity to focus on production categories and not to allocate subsidies without differentiation in terms territorial and soil-environmental aspects.

- The application of size degression most strongly indicates the grey zone which can be explained by the already mentioned necessity of structural changes in agricultural enterprises and correction of the ratio of inputs and outputs.
- The model verification suggests a potential negative effect of size degression on development of animal husbandry. Managers of family farms and of some legal persons also expressed their opinions to the effect they may limit animal husbandry as a result of the disadvantaged position of the farms over 500 ha, as their overheads are the highest and the ratio of input/output prices is the least profitable.
- Generally we can conclude that the size degression may be effective as long as it is applied in a targeted and differentiated manner; the optimum variant was an increase of payments to enterprises up to 500 ha by 15 %, a reduction by 10 % for farms 500 - 1000 ha and a reduction by 15 % for farms over 1000 ha.
- The challenge faced by the Ministry of Agriculture of the Czech Republic, scientific community and by the farmers themselves is to consider the possibility to increase intensity of their activities in mountain and submontane categories. The fact is that in 1930s those categories had been used much more for landscape protection. Such considerations are quite realistic as documented by the economic system in the neighboring countries.
- The controlled interviews with managers of family farms (physical persons) have clearly indicted their requirement that a part of subsidy programs should be directed outside the primary agricultural production (to support multifunctional activities), e.g. to support trades, agrotourism, accommodation and development of human resources. They also made comments about the use of the subsidies, their potential abuse and the need of consequent and objective on-site inspection. It was proposed that subsidies should be directed into administration of their farms and into shared services, similarly as it is the case in the neighboring countries.

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Determinants of Employment and GDP Resilience in the Context of an Economic Crisis: Evidence from EU Countries and Regions

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Abstract

There have been many studies that have analysed the impact of a set of indicators on the economic resilience of countries and regions, but none that focus on the effects of determinants on the resilience of employment and GDP. This paper is a preliminary attempt to fill that gap by providing new cross-country, as well as cross-regional, evidence of the different effects of determinants on resilience measured in terms of GDP and employment. The analytical part of this paper is based on an analysis of the resilience of employment and GDP of EU countries, as well as at the NUTS 2 regional level, within the context of the economic crisis that began in 2008. The main method used in this study is correlation analysis. The results show the existence of specific determinants for a different type of resilience at the country level (e.g. indicators of economic structure). The determinants connected with human capital show a strong positive relationship with regards to resilience both at the country and regional levels (especially in terms of growth of employment and product).

Keywords: resilience, product, employment, recession, economic crisis

Introduction

The main aim of this paper is focused on comparing the effects of the determinants of two different forms of economic resilience (employment resilience and GDP resilience). A comparison of the different effects of determinants can be useful for effective decision making in the field of regional policy within regional management processes. This study used part of the results garnered from previous research that focused on identifying important factors of regional economic resilience measured in terms of employment growth (Svoboda and Klementová 2014). This study differs from the previous study in

that it not only focuses on employment resilience, but also on GDP resilience. New results presented in our study are available thanks to a comparison of national and regional-specific determinants.

The primary sub-objective of this research is to find a possible relationship between five groups of indicators of potential determinants and four resilience indicators. For this purpose, correlation analysis was applied to a set of 25 countries and 256 regions in the EU. It would also have been possible to apply multivariable methods to this analysis. However, the results from this study show that there is a link between all the potential determinants, which is usually indicative of so-called multicollinearity. This fact meant that the use of regression analysis had to be rejected. Another possible approach was to use a method of dimension reduction (e.g. factor analysis), but this raised difficulties in terms of how to interpret the results. It is for these reasons that only correlation analysis was used in this preliminary research.

The analysis was carried out to determine whether the determinants of the resilience of employment and GDP are different or not. The aforementioned analysis was focused on describing the differences between determinants of the resilience of regional and national economies in connection with the economic crisis of 2008. This study follows in a similar vein (e.g. Martin 2012; ESPON 2014).

Regional Economic Resilience

Since the 1970s, the study of the resilience of socio-ecological systems has been the topic of many investigations. From the beginning of the 21st century it has also been actively used in economics (see e.g. Reggiani, De Graaff and Nijkamp 2002). Most of this research has been focused on the dynamics of regional employment and product; they explore why some regions are better at withstanding an economic downturn than others, or are able to recover faster. The term “regional economic resilience” has become widely used in recent years, especially in connection with the assessment of the regional impact of the 2008 economic crisis. Economic resilience is usually defined in terms of a regional economy’s ability to withstand or overcome a recessionary event. The concept takes into account the ability of a region to face adverse events and deal with them without any major problems or difficulties. Some authors argue that resilience helps us to understand how such systems respond to shocks, disturbances and perturbations.

The term resilience has quite a broad meaning and use, which is due to its multidisciplinary origin (it was first used in the field of ecological modelling). The first fundamental definitions were given to us by Holling (1973) and Perrings (1994). Nowadays, the term is also used, for example, in the field of crisis management to evaluate the impact of extraordinary events (disaster resilience), as well as in many other fields (e.g. psychology, etc.). Within this context, we can see regional economic resilience as a closely defined subset of a more generally perceived regional resilience (without the adjective “economic”). Regardless of the various approaches, regional economic resilience is commonly interpreted as the ability to resist and subsequently

adapt to deviations. The deviation of a regional economy can be caused by a wide spectrum of events, including national or global economic downturns, social disorder or natural disasters (these events are interpreted as an external economic shock). Many empirical studies use one of the following indicators for measuring economic resilience (Martin 2012), (ESPON 2014): product, employment, unemployment, number of patents, etc. For this study only the first two indicators (employment resp. product per capita) are used. There are also many other possibilities of how to quantify resilience (e.g. differences in wages and salaries between regions (Kraftová and Kraft 2015)).

Materials and Methods

The first step of cross-country analysis, respectively cross-regional analysis, is the generation of indexes for the quantification of economic resilience. Regional resilience is commonly perceived in terms of the development of regional indicators with regards to the labour market or regional product. The dynamics of regional employment is often selected as a suitable indicator for measuring regional economic resilience. This approach is very apparent in a study conducted by Ron Martin (2012), an economic-geographer, who focused on the impact of recessions on the regions of the UK using long-term data on employment at the NUTS 1 level. The approach applied in this study not only focuses on the regional level, but also on the country level. It is for this reason, that data from regions and countries are combined. In addition, the study focuses on two types of resilience: Resilience measured on the basis of GDP per capita according to the Purchasing Power Standard (PPS); and, employment measured in terms of the number of employed people according to the Labour Force Survey methodology. This approach was adopted in order to find answers to the following research questions: What are the differences between the determinants of the two types of resilience examined? Which determinants increase resilience?

Sample of Countries and Regions

The aforementioned analysis was carried out for 25 countries and 256 regions at the NUTS 2 level and include the following countries of the EU: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, United Kingdom. These countries were selected because they were part of the EU prior to the economic crisis of 2008. This is of particular importance when studying the resilience or the precise reactions of employment and GDP at the national and subnational levels in terms of the EU's regional policy over time. It is for this reason, that our data sample consists of only EU countries and their regions from 2004 onwards (countries and regions at the NUTS 2 level, which joined the EU after its enlargement in 2004, were removed from the sample).

Implemented Indexes and Hypotheses

The following four indexes of resilience were used: gEM as the indicator which describes growth in terms of the number of employed people through the decline of regional (or national) employment (the abbreviation EM is used for the word “employment”); gGDP as the indicator describing GDP growth through the decline of regional (or national) product (GDP in this study means “Gross Domestic Product per capita according to the Purchasing Power Standard (PPS)”); I_{EM} as the index describing changes in employment between 2008 and 2012; I_{GDP} as the index describing changes in product between 2007 and 2011 (the differences between the I_{EM} and I_{GDP} indexes in the mentioned years is due to the delay between GDP and employment development).

The specific objective of this research is to test the following six hypotheses:

H1a: Determinants of GDP resilience and employment resilience differ at the country level.

H1b: Determinants of GDP resilience and employment resilience differ at the regional level.

H2a: The quality of human capital decreases the size of the decline in terms of employment growth at the country level (measured by the gEM index at the country level and calculated on the basis of an analysis of business cycles conducted for the period 2007 - 2014).

H2b: The quality of human capital decreases the size of the decline in terms of employment growth at the regional level (measured by the gEM index at the regional level and calculated on the basis of an analysis of business cycles conducted for the period 2007 - 2014).

H3a: The intensity of R&D and innovation activities increases the change in GDP (measured by the I_{GDP} index for the period 2007 - 2011) at the country level.

H3b: The intensity of R&D and innovation activities increases the change in GDP (measured by the I_{GDP} index for the period 2007 - 2011) at the regional level.

A description of the methodology used in this study now follows. The main aim of this paper is to compare the effects of determinants on two different forms of economic resilience (employment resilience and GDP resilience). The measurement of regional economic resilience was based on a yearly time series of GDP and employment at both the country and subnational (regional – NUTS 2) levels. The main data source was the Eurostat Statistical Office. Due to the examination of the impact of the economic crisis in 2008, a set of examined potential determinant values from the year 2007 were used. These values represent the last year in which the financial crisis did not influence the real economic indicators; this is in line with the conclusions of other authors (e.g. ESPON 2014; Kraft 2011). The datasets consisted of 12 indicators that were used as potential determinants for the two types of resilience examined (the selection of indicators was based on previous research (Svoboda and Klementová 2014)). In addition, four indexes

(gGDP, gEM, I_{GDP}, I_{EM}) were used for the quantification of economic resilience (two in terms of GDP and two in terms of employment). The time series for regional GDP were available in two forms: according to old methodology - ESA95 (available only until 2011); and according to new methodology - ESA2010 (available only from 2010). Due to this change in methodology and because of this study's aim of evaluating the impact of the economic crisis of 2008, regional GDP data were used based on the ESA95 methodology.

According to previous studies (e.g. Martin 2012) the emphasis was put on studying the size of the decline in employment and GDP development. In addition, attention was paid to the change in GDP over the period 2007-2011 and on the change in employment over the period 2008-2012. By focusing on the size of the decline it was necessary to make an analysis of business cycles and identify breakpoints. The process of identifying the breakpoints followed that which has been previously published by, for example, Poměnková (2011), Harding and Pagan (1999), and Bry and Boschan (1971). The peaks and troughs were subsequently identified for each country and region (to identify the period of decline). Simply put, the recession phase begins at that point where the local maximum is reached (peak) and ends at that point where it reaches the local minimum (trough). For the identification of the recession phase we used the definition maintained by the Czech Statistical Office (2015): "Recession is a significant decline in activity across the economy, lasting longer than six months".

The beginning of the recession phase varied from country to country and region to region. For the calculation of the individually constructed gGDP and gEM indexes we worked on the basis of a continuous recession lasting at least one year (4 quarters) that started in the period 2008-2010. By applying this rule, countries and regions were included in the evaluation which already experienced the beginning of the decline in 2008, as well as those countries and regions which experienced a delayed decline over the following two years. In terms of GDP, the earliest signs of the recession phase were already evident in 9 countries in 2008, with the last of the 25 countries (Greece) coming out of the recession phase in 2011. At this point it should be noted that the recession phase for Greece was longer, but in order to generate comparable indexes for countries and regions, we only applied data until 2011. In terms of employment, the earliest evidence of the beginning of the recession phase for countries was identified in 2008. This was the case for 7 out of the 25 EU member states. The latest year for the end of the recession phase in terms of employment was identified in 2014 (Greece and Portugal). At the regional level, and in terms of GDP, the first year of the recession phase was also identified in 2008. This was the case for 116 of the in total 256 regions. The latest year for the end of the recession phase in terms of GDP was identified in 2011 (regions of Spain and Italy). However, this may be due to a lack of availability of more recent data. At the regional level, and in terms of employment, the first year of the recession phase was also identified in 2008, which was the case for 67 of the in total 256 regions. The latest year for the end of the recession phase was identified in 2014, which was the case for some regions in Greece, Spain and Italy.

According to previous research (Martin, 2012; Svoboda, 2013), four resilience indexes (gGDP, gEM, I_{GDP} , I_{EM}) were calculated for two types of resilience (GDP per capita in PPS resp. employment). Firstly, the average growth of GDP per capita in PPS for the recession period of each country and region was calculated on the basis of the identification of the beginning and the end of the recession phase (likewise for employment). These indicators were calculated according to the formulae:

$$gGDP = G(x_1, x_2, \dots, x_n) = \left(\prod_{i=1}^n x_i\right)^{\frac{1}{n}}, \text{ where } x_i = \frac{GDP_t}{GDP_{t-1}} \quad (1)$$

$$gEM = G(x_1, x_2, \dots, x_n) = \left(\prod_{i=1}^n x_i\right)^{\frac{1}{n}}, \text{ where } x_i = \frac{EM_t}{EM_{t-1}} \quad (2)$$

where x_i is the growth rate of GDP per capita in PPS or employment (i.e. inter-year rates of change in output or employment), n is the specific number of years of the recession phase for a country or region, and t is time (year). The gGDP index was subsequently calculated on the basis of the business analysis conducted for the period 2007 – 2011 (because regional data was only available up to 2011; to have comparable indexes it was necessary to use the same period (values up to 2011). This also applied to the calculation of gGDP for countries – although GDP data at country level is available for later years). The gEM index was also calculated on the basis of the same business analysis. The gGDP and gEM indexes were calculated for all EU countries with exception to Poland with regards to the gGDP index and Malta with regards to gEM index; both due to absence of a recession phase. The regional equivalents for gGDP were only calculated for regions with a recession phase in terms of GDP per capita, which was the case in 244 of the 256 regions (95%). The regional gEM indexes were also only calculated for those regions with a recession phase in terms of employment levels, which was the case in 226 of the 256 regions (88%).

I_{GDP} was subsequently calculated as the percentage change in GDP per capita in PPS between 2007 and 2011. Similarly, I_{EM} was calculated as the percentage change in employment measured between 2008 and 2012. The different periods reflect the one year delay in the dynamics of employment compared with that of GDP. In contrast to the first two indexes of resilience, the same period was used for each country and region. This characteristic is symbolised as I_{GDP} and I_{EM} – where “I” expresses “index”. The I_{GDP} and I_{EM} indexes were calculated according to following formulae:

$$I_{GDP} = \frac{GDP_{2011}}{GDP_{2007}} * 100 [\%], \quad (3)$$

$$I_{EM} = \frac{EM_{2012}}{EM_{2008}} * 100 [\%], \quad (4)$$

where GDP_{2007} is the value of GDP per capita in PPS for the year 2007 (likewise for GDP_{2011}) and EM_{2012} is the value of employed people for the year 2008 (likewise for EM_{2012}). These indexes were calculated for each country and region. When taking into consideration the duration of the examined period i.e. 16 quarters (resp. 4 years), Duval and Vogel (2008) suggest that this is the minimal period of time period required for the evaluation of the impact of an economic crisis or recession.

Potential Determinants of Economic Resilience

In accordance with previous research, a set of 12 potential determinants was used which showed a medium or strong correlation with economic resilience (Svoboda and Klementová 2014). The indicators used in this research are given below:

Labour Market (3 indicators): “Job Vacancy Rate” (**JVr**); “Employment rate among people aged 15 to 64 years old” (**EMr**); “Unemployment Rate” (**UNr**).

Human Capital (2 indicators): “Human Resources in Science and Technology – according to occupation” (**HRST**); “Percentage of people aged between 25 to 64 years old with Upper Secondary or Tertiary Education according to ISCED-97 - level from 3 to 6” (**EDU**); the second indicator is according to the International Standard Classification of Education (ISCED-97).

Structure of the Economy (3 indicators): “Percentage of employed people aged between 15 to 64 years old within the primary sector (A, B)” – (**EM_{A, B}**); “Percentage of employed people aged between 15 to 64 years old within the secondary sector (C, D, E, F)” – (**EM_{C-F}**); “Percentage of employed people aged between 15 to 64 years old within the tertiary sector (G - Q)” – (**EM_{G-Q}**). The letters (A-Q) are based on the NACE Rev. 1.1 (The Statistical Classification of Economic Activities).

Innovation Activity and R&D (2 indicators): “Total intramural R&D expenditure in Purchasing Power Standard (PPS) per inhabitant at constant 2005 prices” (**GERD**); “Number of Patent Applications per million inhabitants (European patent application)” – (**PAT**).

Economic Performance (2 indicator): “Labour Productivity (gross value added by the number of people employed)” – (**LP**), “Gross Domestic Product at PPS per capita at current prices” (**GDP**).

All the indicators were acquired from the European Statistical Office (from 2007 onwards). The possible effect of a one year delay between the values of the determinants and the values of the resilience indexes was taken into consideration. In previous research data was also used from 2006, however analysis of the correlation coefficients showed that the effect of the delay of determinant influence on the indexes of resilience was negligible. At this point it should be noted that a Shapiro - Wilk W test failed to show the normality of the used datasets (at the regional level with exception to “Percentage of employed people aged between 15 to 64 years old within the tertiary sector (G-Q)” and “Human Resources in Science and Technology – according to occupation”, and at the country level with exception to “The Unemployment Rate”). As a result, a nonparametric correlation analysis was used (specifically Spearman's correlation coefficient).

Results

The following section contains the results of the correlation analysis. Table 1 shows the results of the correlation analysis for all the determinants at regional level. The calculations are based on Spearman's coefficient for the 256 regions at NUTS2 level; all the values are from 2007. Due to the absence of a normal distribution, the Spearman rank correlation coefficient was used. A statistically significant relationship was found in the majority of correlation pairs. A strong relationship was found especially between GDP and LP, GERD and PAT, EMr and UNr (this is due to the similarity in the construction of the indices and the causal influences between them). The results of the correlation matrix indicate a suitability for dimension reduction. This could be achieved through, for example, factor analysis. However, dimension reduction could prove problematic with regards to the interpretation of the results. It is for this reason, that only correlation analysis was used in this preliminary research.

Table 1: Results of the correlation analysis for determinants of resilience – Spearman's coefficient (the significant values are in the grey cells, values above 0.8 or below -0.8 are in bold) – 256 regions

	EDU	HRS T	EM _A , B	EM _C - F	EM _G - Q	GDP	LP	GER D	PAT	EMr	UNr	Jvr	
EDU	1	0.49	-0.17	0.20	-0.09	0.02	-	0.22	0.25	0.17	0.08	0.61	
HRST	0.49	1	-0.65	-0.15	0.46	0.72	0.56	0.77	0.80	0.61	-0.40	0.23	
EM _A , B	-	0.17	-0.65	1	0.21	-0.68	0.65	0.54	-0.66	0.58	-0.48	0.35	0.10
EM _C -F	0.20	-0.15	0.21	1	-0.78	0.23	0.24	-0.17	0.04	-0.14	0.09	0.00	
EM _G -Q	-	0.09	0.46	-0.68	-0.78	1	0.52	0.50	0.47	0.35	0.36	-0.27	0.16
GDP	0.02	0.72	-0.65	-0.23	0.52	1	0.87	0.77	0.74	0.63	-0.58	0.31	
LP	-	0.13	0.56	-0.54	-0.24	0.50	0.87	1	0.66	0.62	0.28	-0.31	0.29
GER D	0.22	0.77	-0.66	-0.17	0.47	0.77	0.66	1	0.84	0.54	-0.41	0.14	
PAT	0.25	0.80	-0.58	-0.04	0.35	0.74	0.62	0.84	1	0.57	-0.42	0.03	
EMr	0.17	0.61	-0.48	-0.14	0.36	0.63	0.28	0.54	0.57	1	0.80	0.18	
UNr	0.08	-0.40	0.35	0.09	-0.27	0.58	0.31	-0.41	0.42	0.80	1	0.13	
Jvr	0.61	0.23	0.10	0.00	-0.16	0.31	0.29	-0.14	0.03	-0.18	0.13	1	

Source: Authors - based on data from EUROSTAT (2015)

Abbreviations used in Table 1: **EDU** - Percentage of people aged between 25 to 64 years old with Upper Secondary or Tertiary Education according to ISCED-97 - levels 3 to 6 (%); **HRST** - Human Resources in Science and Technology – according to occupation (%); **EM_{A, B}** - Percentage of employed people aged between 15 to 64 years old within the primary sector (A, B - NACE Rev. 1.1); **EM_{C-F}** - Percentage of employed people aged between 15 to 64 years old within the secondary sector (C, D, E, F - NACE Rev. 1.1); **EM_{G-Q}** - Percentage of employed people aged between 15 to 64 years old within the tertiary sector (G – Q - NACE Rev. 1.1); **GDP** - Gross Domestic Product at PPS per capita at current prices; **LP** - Labour Productivity (gross value added by the number of people employed); **GERD** - Total intramural R&D expenditure in Purchasing Power Standard (PPS) per inhabitant at constant 2005 prices; **PAT** - Number of Patent Applications per million inhabitants (European patent application); **EMr** - Employment rate among people aged 15 to 64 years old (%); **JVr** - Job Vacancy Rate (%); **UNr** - Unemployment Rate (%).

The correlation analysis of potential determinants shows that there is a positive correlation between the quality of human capital and the level of economic performance, as well as with innovation and R&D activities in regions (EDU and HRST indicators correlate positively with GDP and PAT indicators). It is also evident that the sectoral structure, as well as innovation and R&D activities in the regions (especially expenditure on R&D) also influence economic performance. To be able to get a fresh perspective on the determinants we were not only interested in the determinants at the NUTS2 regional level, but also in the determinants at the country level. This part of the analysis was motivated by the desire to find country and region-specific determinants. The first step to achieving this was to conduct an analysis of the determinants from the perspective of the 25 countries (see Table 2). The second step was to conduct an analysis of the determinants from the perspective of the 256 regions at the NUTS2 level (see Table 3).

Table 2: Results of the correlation analysis for indexes of resilience – Spearman's coefficient (the significant values are in the grey cells, values above 0.3 or below -0.3 are in bold) – 25 countries

Factor	Index	gEM	gGDP	I _{EM}	I _{GDP}
Human Capital	Percentage of people aged between 25 to 64 years old with upper secondary or tertiary education according to ISCED-97 (level from 3 to 6)	-0.08	-0.49	-0.12	0.45
	Human Resources in Science and Technology – according to occupation	0.49	-0.28	0.40	0.08
Sectoral Structure	Percentage of employed people aged between 15 to 64 years old within the primary sector (A, B)	-0.69	-0.32	-0.61	0.05
	Percentage of employed people aged between 15 to 64 years old within the secondary sector (C, D, E, F)	-0.26	-0.04	-0.36	0.30
	Percentage of employed people aged between 15 to 64 years old within the tertiary sector (G-Q)	0.49	0.13	0.50	-0.22
Economic Performance	Gross domestic product (GDP) at current market prices in Purchasing Power Standard per inhabitant	0.41	-0.07	0.30	-0.50
	Labour productivity (GDP in PPS of employed people)	0.51	0.08	0.40	-0.43
Innovation and R&D	Total intramural R&D expenditure (in PPS)	0.37	-0.17	0.27	-0.26
	Number of patent applications per million inhabitants	0.49	-0.07	0.38	-0.21
Labour Market	Employment rate among people aged between 15 to 64 years old	0.19	0.36	0.02	-0.13
	Unemployment rate	-0.13	0.49	0.05	0.28
	Job vacancy rate	0.37	-0.28	0.22	0.16

Source: Authors - based on data from EUROSTAT (2015)

Table 3: Results of the correlation analysis for indexes of resilience - Spearman's coefficient (the significant values are in the grey cells, values above 0.3 or below -0.3 are in bold) – 256 regions at the NUTS2 level

Factor	Index	gEM	gGDP	I _{EM}	I _{GDP}
Human Capital	Percentage of people aged between 15 to 64 years old with upper secondary or tertiary education according to ISCED-97 (level from 3 to 6)	0.25	-0.18	0.38	0.57
	Human Resources in Science and Technology – according to occupation (% of active pop.)	0.44	-0.20	0.44	0.26
Sectoral Structure	Percentage of employed people aged between 15 to 64 years old within the primary sector (A, B)	-0.33	0.06	-0.29	0.08
	Percentage of employed people aged between 15 to 64 years old within the secondary sector (C, D, E, F)	0.08	-0.08	-0.06	0.36
	Percentage of employed people aged between 15 to 64 years old within the tertiary sector (G-Q)	0.12	-0.05	0.22	-0.29
Economic Performance	Gross domestic product (GDP) at current market prices in Purchasing Power Standard per inhabitant	0.35	-0.21	0.17	-0.11
	Labour productivity (GDP in PPS of employed people)	0.31	-0.07	0.25	-0.07
Innovation and R&D	Total intramural R&D expenditure (in PPS)	0.36	-0.19	0.21	0.34
	Number of patent applications per million inhabitants	0.47	-0.21	0.39	0.14
Labour Market	Employment rate among people aged between 15 to 64 years old	0.24	-0.31	0.00	-0.17
	Unemployment rate	-0.29	0.20	0.02	0.23
	Job vacancy rate	0.28	0.20	0.50	0.45

Source: Authors - based on data from EUROSTAT (2015)

Firstly, determinants protecting employment were identified. These determinants appear to reduce the rate of employment decline (in this case represented by an increase in the gEM index – positive correlation) or increase the change in employment (I_{EM}). The quality of human capital and innovation and R&D activities protect employment resilience both at the national and regional levels. However, the effect of the quality of human capital determinant differs at the national and regional levels in the case of the index “Percentage of people aged between 25 to 64 years old with upper secondary or tertiary education” (it only shows a significant relationship at the regional level). Innovation and R&D activities also has an employment protecting impact (although GERD shows only a significant relationship at the regional level), as does labour productivity (GDP in PPS of employed people). The results also show that some of the sectoral-specific indicators, namely “Percentage of employed people aged between 15 to 64 years old within the primary sector (A, B)”, reduce employment resilience both at the national and regional levels (this indicator seems like it increases employment decline (decreasing gEM) or decreases the change in employment (decreasing I_{EM})).

Secondly, determinants protecting product were identified. These determinants appear to decrease product decline (in our case represented by an increasing gGDP index – positive correlation) or increase the change in product (I_{GDP}). The quality of human capital and innovation and R&D activities protect GDP resilience both at the national and regional levels.

Overall, only a few differences were identified between the national and regional levels. However, there were more significant correlations for the determinants at the regional level. For example, there is a significant relationship between the indicator “Job vacancy rate” and all the resilience indicators (with exception to gGDP). These significant relationships are, however, found only at the regional level.

To summarize, it can be concluded that at the national level a higher level of human capital plays a positive role as a resilience protector (with exception to the negative correlation between gGDP and EDU). More precisely, there is a difference between the effect of EDU (this indicator only acts as a protector for changes in GDP, but not against growth in a decline) and HRST (at the national level, this indicator only acts as a protector for employment resilience and not for GDP resilience). The results at the regional level suggest a similar effect, but not so strict (see Table 3). It can also be concluded that the indicators within the innovation and R&D activities (with exception to the correlation pairs PAT and gEM at national level) were not found to be determinants of both employment resilience and GDP resilience at the national level (contrary to the results at the regional level – see Table 3). This can be explained by the lack of a national dataset in contrast to the regional dataset. In addition, labour productivity and the level of GDP at country level decrease the decline in employment. Countries with higher labour productivity or a higher level of GDP have a higher rate of growth of employment in a decline (this means higher gEM). Labour productivity also significantly increases the change in employment (the higher the LP is, the higher the I_{EM} is). We find the same result at the regional level (see Table 3).

The results show that at the regional level there are more linkages between all the potential determinants and indexes of resilience. The differences are negligible only for the factor Economic Performance and the gEM index (stronger relationships were found at the regional level). The differences were also negligible for the factor Sectoral Structure and the I_{EM} index (however, in contrast to the previous similarities, stronger relationships were found at the country level). This means that when taking into consideration the results at the country level, there is a stronger relationship between employment resilience and the determinants associated with the factor Sectoral Structure (this is not the case for GDP resilience at the country level). In the case of GDP resilience, there is a relatively strong link to the indicator “Percentage of people aged between 25 - 64 years old with upper secondary or tertiary education according to ISCED-97 (levels 3 to 6)” at both the regional and country levels. The factor Economic Performance shows a significant relationship with both GDP and employment resilience. The results at the regional level show that there is a relatively strong positive relationship between employment resilience and the determinants associated with R&D (in particular for the indicator gEM). In the case of employment resilience at the regional level, it appears that there is a strong link to the indicators concerning human capital (the results were similar to those at the country level).

Hypotheses H1a and H1b were not rejected (see the results in Tables 2 and 3). There are differences between the correlation coefficients of the determinants for both types of resilience. Some of the potential determinants share a closer relationship to only one type of resilience (e.g. the indicators of the factor Sectoral Structure share a closer relationship to employment resilience at the country level than to GDP resilience). At the country and regional levels there is at least one specific determinant for employment resilience: “Human Resources in Science and Technology – according to occupation (%)” – this indicator only shows a relatively strong and positive statistically significant relationship at a level higher than 0.3 for gEM and I_{EM} and not for gGDP and I_{GDP}. Hypothesis H2a was not rejected (due to the significant correlation between HRST and gEM at the country level). Hypothesis H2b was not rejected due to both human capital indicators (EDU and HRST showed a positive significant correlation relationship with indicator gEM). Hypothesis H3a was rejected. Hypothesis H3b was not rejected due to both innovation and R&D indicators (GERD and PAT showed a positive significant correlation relationship with indicator I_{GDP} at the regional level).

Discussion

All the results in this study are in accordance with other studies, for example the EPSON ECR2 project (ESPON Final report 2014). The lower degree of post-crisis recovery in employment was recorded in countries and regions where there was a greater concentration of people working in the agriculture, fisheries, forestry and mining sectors. Innovation and research activities, as represented by the “Number of patent applications per million inhabitants”, as well as the size of spending on research and development (GERD), positively affected the response of regions in the event of an

economic shock (especially in terms of both employment and GDP resilience at the regional level, with exception to gGDP). It would appear that the regions which lack a scientific research base suffer the worst; they are usually characterized by minimum innovation activity. The ESPON ECR2 project (2014) came to similar conclusions.

The value of the results of this study are limited by the fact that the data structure was based on the uniqueness of the input data. This uniqueness was based on the number of factors, countries and regions, as well as the event period examined (the economic crisis of 2008). All of these parameters could have affected the results. Future research will focus more on the relationships between determinants and will take into account the results accrued through the application of different methods, including more variables.

Conclusion

The analysis carried out in this paper confirms that regions and countries with human capital of a higher quality tend to have higher levels of both GDP and employment resilience. This finding was confirmed by two indicators: “Percentage of people aged between 25 – 64 years old with upper secondary or tertiary education” and “Human Resources in Science and Technology – according to occupation”. This confirmation is valid with exception to gGDP, for which a negative relationship was found with the two aforementioned indexes. The analysis shows that this conclusion is also valid at the regional level for GERD and the number of patent applications. The important role human capital and innovation and R&D activities has to play was also proven in the research conducted as part of the EPSON ECR2 project (ESPON 2014). It should be stated that the presence of a well-educated and skilled workforce, as well as innovation and R&D activities, can be seen as the main protective factors for economic resilience (in terms of both GDP and employment resilience). The analysis shows that the way to improve the economic resilience of regions stems from regional policy measures which affect the key factors that were found.

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Practical Comparison of Results of Statistic Regression Analysis and Neural Network Regression Analysis

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Abstract

There are many discussions and arguments about accuracy of the results of statistic regression analysis and neural network regression analysis among experts. Of course all of them look for the best method usable in practice. The objective of the contribution is to use a case study to answer the question which of the methods provides better results. As a case study will be used time series of US Gross Domestic Product. It starts in 1966 and ends in 2014. The future development of the variable for the following 20 years will be calculated. Software Statistica 12 developed by Dell corporation will be used for both analyses. The first one will use multiple regression of the software. The second one will use data mining section with its neural networks. Generalized Regression Neural Networks, Multi-layer Perceptron Network, Radial Basis Function Neural Networks, Linear Neural Networks will be calculated. The results are two curves, the first based on statistic regression analysis. The second curve is provided by the best model of neural networks. Both the curves will describe development of the US GDP in 20 next years.

Keywords: regression analysis, neural network, gross domestic product, statistic regression

Introduction

Gross domestic product (GDP) and gross domestic income (GDI) – provide two ways to measure the value of US output. In principle, GDP should equal GDI; however, they differ in practice because each is estimated using different, and largely independent, source data Holdren (2014). The calculation of GDP for any given year rests on a host of difficult methodological decisions; resolving those methodological issues in other, equally plausible ways would result in very different final figures Lindsey (2016).

The planning process often starts with a set of assumptions about economic growth that includes forecasts for growth in real gross domestic product (GDP) in the countries or regions in which a company operates. A company might assume, as a first approximation, that demand for its products (and sales volume if market share is stable) grows with real GDP. Fry (2015) the following comparison directly does not concern US GDP, but other economic areas, where prediction was performed as the statistical regression analysis and artificial neural networks.

GDP is defined by the following formula:

$$GDP = Consumption + Investment + GovernmentSpending + NetExports \text{ or}$$

More succinctly as:

$$GDP = C + I + G + NX$$

where consumption (C) represents private-consumption expenditures by households and non-profits, investment (I) refers to business expenditures by businesses and home purchases by households, government spending (G) denotes expenditures on goods and services by the government, and net exports (NX) represents a nation's exports minus its imports (Bondarenko 2016).

García-Plaza et al. (2013) applied both of the proposed techniques for calculating surface finish (Ra) i. e., multivariable polynomial regression, and artificial neuronal networks were good at predicting the Ra parameter, and similar results were obtained with either data validation algorithm.

During a research of a comparison of construction cost estimation using multiple regression analysis and neural network in elementary school project was concluded the artificial neural network model was found to be superior in terms of average error rate and standard distribution. Cho et al. (2013).

Shtub and Versano (1999) solved estimating the cost of steel pipe bending by using a model base of neural networks and regression analysis. Their result showed that the neural network provides a practical solution to the problem of estimating cost in a fast, inexpensive yet accurate and objective way.

Author, Cuauhtemoc (2015), looked into a predictive accuracy comparison between neural networks and statistical regression for development effort of software projects, the result clearly proved that neural network was better than for a simple linear regression at the 99% confidence level.

Using Neural networks versus Regression in task for cost Estimating model for utility rehabilitation projects averaged that the neural network model produced much more accurate results compared to the regression one. The neural network model was tested on a set of 10 projects and was able to predict the project costs by up to – 18% for 80% of projects Shehab et al. (2010).

To recognize costs estimation and sensitivity analysis on Cost Factors, according to Liu (2010), who analysed the capabilities of Taylor Kriging (regression analysis), and artificial neural networks, his conclusion is in an empirical case of cost estimation, regression analysis is shown to provide accurate results that are better than those of regression but worse than those of an ANN (artificial neural network).

Opposite view proved a study of Heiat (2002) "Comparison of artificial neural network and regression models for estimating software development effort." The article has compared the neural network estimation method to regression approach for software effort estimation. The results of this preliminary research indicate that neural network approach was competitive with regression.

The paper "Estimating the cost of vertical high-speed machining centers, a comparison between multiple regression analysis and the neural networks approach" of the authors Ciurana, Quintana and Garcia-Romeu (2008), was aimed to set a cost model for vertical high-speed machining centers based on machine characteristics. Result was based on the correlation; the best artificial neural network gave more accurate estimation results than the MRA (multiple regression analysis) model.

Wang and Gibson (2010) were dealing with problem how to solve a pre-project planning and project success using artificial neural network and regression models. This paper studies the pre-project planning of industrial and building construction projects and investigates its relationship with project success (measured by cost and schedule growth). Data collected from a total of 62 industrial and 78 building projects are used for the model development. Both models show positive relationship between PDRI (project definition rating index) score and cost/schedule growth for this particular sample of projects. The results indicate that projects with better pre-project planning are more likely to have a better project performance at completion. Modelling Blanking Process using multiple regression analysis and artificial neural networks, a paper presents the development and comparison of two models to predict the quality of the blanked edge.

According to Al-Momani et al. (2012) artificial neural network methodology consumes lesser time and gives higher accuracy. Modelling the blanking process using ANN is more effective compared with multiple regression analysis.

The aim of this paper is to compare the prediction of the future development of the GDP at current prices in the US in 2024 performed by neural networks and standard statistical time series.

Materials and Methods

The World Bank (The World Bank 2016) data on the US Gross Domestic Product in common prices will be used for calculations. The World Bank itself defines GDP in common prices as the following: (The World Bank 2016): „GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated

without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current U.S. dollars. Dollar figures for GDP are converted from domestic currencies using single year official exchange rates. For a few countries where the official exchange rate does not reflect the rate effectively applied to actual foreign exchange transactions, an alternative conversion factor is used." Data is available for the years of 1966 to 2014. As the goal of this contribution mentions, the purpose is to create at least two models that will predict the GDP development until 2024.

The first model will work with artificial neural structures. The second model will use standard statistical models of time series (thus a model created through regression, while time will be the independent variable).

In both cases the DELL Statistica software in version 12 will be used.

To determine the statistical model, a statistical tool of multiple regression will be used. First, it is necessary to determine the dependent and the independent variable. In the first case it will be the GDP. In the second case the year will be determined. Consequently, descriptive statistics will be carried out (the average and standard deviation) and the correlational matrix. The result will be a model through which we will calculate the GDP values of 2015 to 2024.

To determine neural models, the Data Mining part of Neural Networks Tool will be used. The setting of the calculation will be as follows:

1. Choice of new analysis: Time series (regression).
2. Choice of variables:
 - a. Goal continuous variable: GDP,
 - b. Independent continuous variable: year.
3. Automated neural networks will be used.
4. Random sampling of networks will have the following structure:
 - a. Training set of data: 70 %,
 - b. Training set of data: 15 %,
 - c. Testing set of data: 15 %.
5. The down-sampling method will be random. Two down-samples will be created.
6. Delay of time series at the input will be 1 maximum.
7. Delay of time series will be 1 minimum.
8. The following networks will be used for the calculation:
 - a. MLP (multiple perceptron network with one hidden layer),
 - b. RBF (neural network of the basic radial function) with 9 to 12 neurons in the hidden layer.
9. Hidden layers and output neurons (identical ones) will be used for the neurons as activating functions:
 - a. identity,
 - b. logistical function,
 - c. tanh (hyperbolic tangent),

- d. exponential,
 - e. sinus.
10. Weight decomposition will be performed on the 0.001 level for the hidden as well as the output layer.
 11. Initialization will not be used.
 12. 1000 random networks will be trained.
 13. 5 best networks will be kept (determined by the method of smallest squares).

The result will thus be five models which will predict the US GDP development until 2024. It will be possible to compare predictions of individual years with the obtained regression time series.

Results

As it is assumed by the methodics, we will gain models through statistical regression and through neural networks.

Time series created through Regression

It is possible to see the basic statistics of the collection from Table No. 1.

Tab. 1: Average and standard deviation of the Data Collection

Variable/ Characteristics	Average	Standard Deviation	N
Year	1,990000E+03	1,428869E+01	49
GDP	7,054454E+12	5,206925E+12	49

Source: Author

We can characterize the data more closely looking at this table. Especially we can reach the GDP information about general prices in the US during the last 49 years. For the calculation the GDP statistics are especially interesting. The correlational matrix was generated in the next step (Table No. 2).

Tab. 2: Correlational Matrix

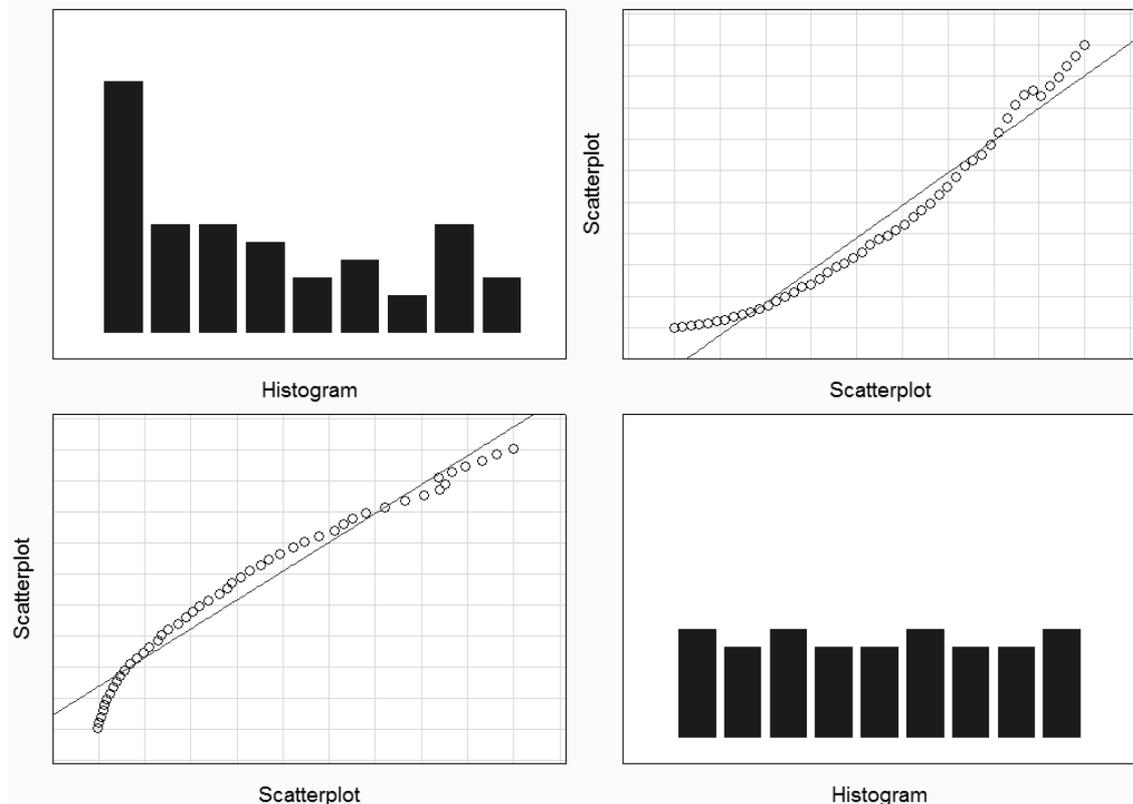
	Year	GDP in USD
Year	1,000000	0,979566
GDP in USD	0,979566	1,000000

Source: Author

It is clear from the result, that correlational coefficient between the year of observation and US GDP is very high, almost 0.98. That points to a very strong dependence between the two variables.

Data about the collection of variables has been used to create a scatter chart and histogram to create a better visualization. The result is a clear correlation of the dependent and independent variable.

Pic. 1: Variable Correlation



Source: Author

Already the histogram process suggests a huge correlation. That is, however, disproportionately clearer from scatter charts, where individual observations (GDP values) are intercut with a regression curve. Optically it is obvious that there will not be a huge data dispersion.

Consequently, a calculation of regression curve parameters calculation has been performed. A statistical sum-up of the calculation is the subject of Table No. 3.

Tab. 3: Statistical Sum-up of a Time Series Calculation

	Value
Multiple R	9,795664E-01
Multiple R2	9,595504E-01
Adapted R2	9,586898E-01
F(1,47)	1,114940E+03
P	2,160993E-34
Standard mistake of an estimate	1,058303E+12

Source: Author

Results of regression with a dependent variable are the subject of Table No. 4.

Tab. 4: Results of Regression with a dependent Variable

	b*	Standard Mistake from b*	b	Standard Mistake z b	t(47)	p-value.
Abs. Member			-7,033013E+14	2,127458E+13	-33,0583	0,000000
Year	0,979566	0,029336	3,569627E+11	1,069047E+10	33,3907	0,000000

Source: Author

In the Column marked b there are the final parameters of a regression curve which may, for a simplification, be written as follows:

$$y = 356962700000 * x - 7,033013000000000$$

Where y represents the GDP value in the year observed and x the year observed. To find out the result validity an analysis of dispersion has been carried out. Its results are stated in Table No. 5.

Tab. 5: Analysis of Variance

	Square Add-up	Sv	Square Average	F	p-value
Regress.	1,248739E+27	1	1,248739E+27	1114,940	0,000000
Resid.	5,264024E+25	47	1,120005E+24		
Total	1,301379E+27				

Source: Author

With regard to the number of observations and value volume in which the USA GDP is moving, we may state that the square add-up is not in any way huge and the result is thus acceptable.

Neural networks

Having generated 1000 random neural structures, these structures have been tested through the method of the smallest squares to keep five of the best networks. The outline of the obtained and at the same time preserved neural networks is presented in Table No. 6 and Table No. 7.

Tab. 6: Outline of Preserved Neural Networks

No	Network name	Training performance	Test performance	Valid. performance	Training error	Test error	Valid. error
1	MLP 1-20-1	0,999895	0,999695	0,999837	2,678466 E+21	3,180630 E+22	2,882701 E+21
2	RBF 1-10-1	0,999821	0,998997	0,999808	4,526701 E+21	6,038251 E+22	2,088118 E+21
3	RBF 1-11-1	0,997960	0,995470	0,999845	5,150231 E+22	4,046948 E+23	1,805968 E+21
4	MLP 1-19-1	0,999916	0,999689	0,999818	2,140256 E+21	3,216547 E+22	2,319496 E+21
5	RBF 1-11-1	0,998170	0,992277	0,999841	4,619809 E+22	6,262512 E+23	3,541035 E+21

Source: Author

Tab. 7: Outline of Preserved Neural Networks – part 2

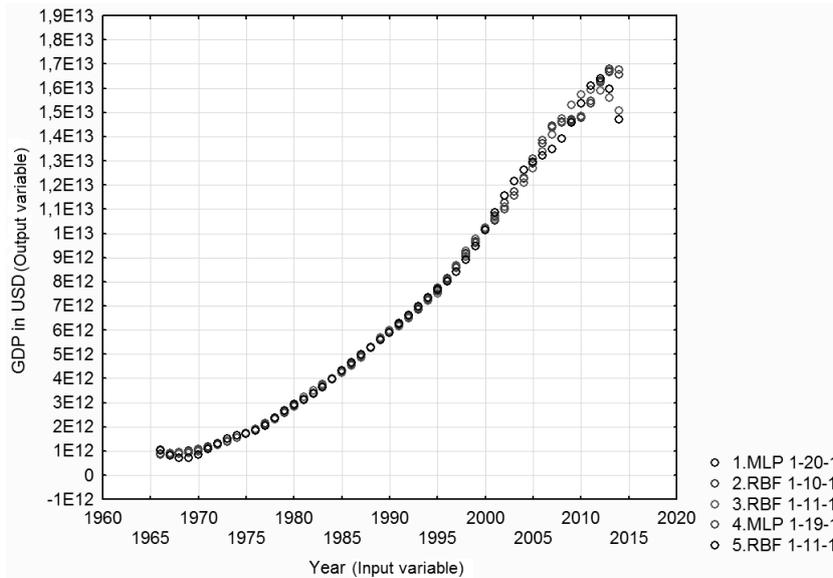
No	Network name	Training algorithm	Error function	Activation of hidden layers	Output activation function
1	MLP 1-20-1	BFGS (Quasi-Newton) 405	Sum of squares	Logistic	Logistic
2	RBF 1-10-1	RBFT	Sum of squares	Gauss	Identity
3	RBF 1-11-1	RBFT	Sum of squares	Gauss	Identity
4	MLP 1-19-1	BFGS (Quasi-Newton) 371	Sum of squares	Logistic	Logistic
5	RBF 1-11-1	RBFT	Sum of squares	Gauss	Identity

Source: Author

Especially the first two networks and the fourth network (MLP 1-20-1, RBF 1-10-1 and MLP 1-19-1) prove excellent results, i.e. maximal reliability and minimal error.

Picture No. 2 offers GDP development from 1966 to 2014 according to models of preserved neural networks.

Pic. 2: GDP Development from 1966 to 2014 according to preserved neural structures

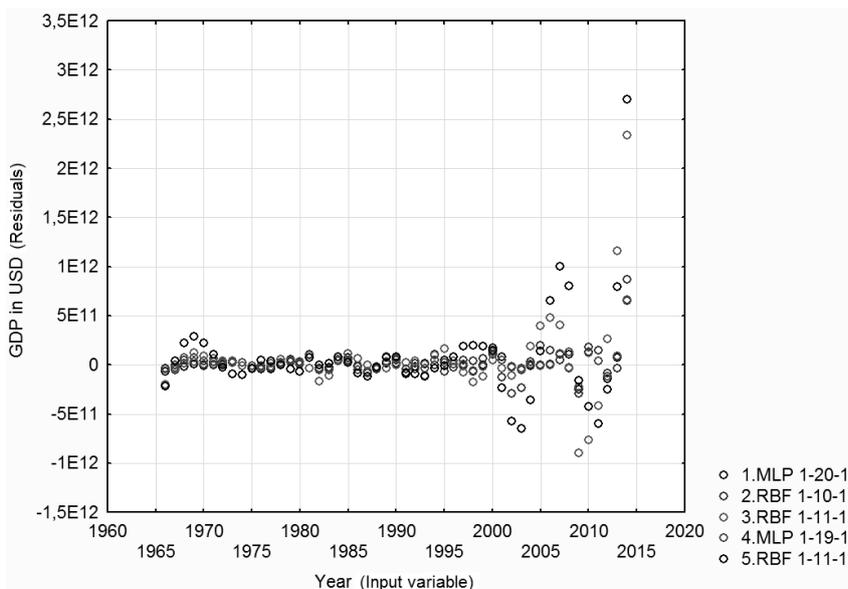


Source: Author

All networks comparatively well (meant in relation towards reality) cover the first 40 observations. Consequently, they begin to vary distinctly from each other.

Naturally, we are interested especially in the difference between individual models and reality. Picture No. 3 offers the development of residuals, i.e. the difference of GDP development according to individual preserved neural structures and the real GDP development.

Pic. 3: Development of GDP residuals in 1966 to 2014 according to preserved neural structures

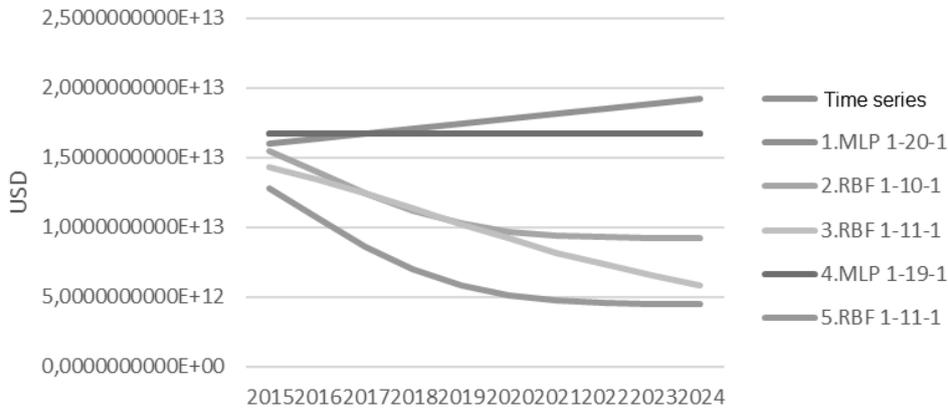


Source: Author

The best model resulting from the residual chart is the first three-layer perceptron network (MLP 1-20-1), the fourth network consequently.

The most important result in the relation towards the determined goal is given in Picture No. 4.

Pic. 4: Comparison of GDP prediction according to individual models



Source: Author

It is the US GDP development prediction in common prices (in USD) from 2015 to 2024. Optically it looks as if the picture contained only five curves instead of six. However, the MLP 1-20-1 waveform is almost equal to the MLP 1-19-1 waveform.

Discussion

From the chart and numerical results, it is clear that three models predict the GDP growth – particularly the time series and MLP 1-20-1, although in the case of neural networks the growth is only minimal, and that is for the years of 2015 and 2016. The rest of neural networks predict a GDP decline. In all three cases it is a relatively significant GDP decline, which, in the case of the second network stabilizes under the level of USD 10 trillion, and in the case of the fifth neural network it will be kept under the level of USD 5 trillion. The third neural network predicts a relatively steep fall which will not stop until 2024.

To be able to predict which prediction is the correct one we need to recourse from specific calculations to intuition and the economist’s knowledge. The amplitude of reality and models during the last years of observation is probably given by the unexpected GDP development during the world economic crisis. Thanks to that the results of individual models have been subject to amplitude too. If we have a look at the results through the eyes of the finished economic crisis, we will reach the fact that the US GDP should be growing. That means that time series and MLP 1-20-1 and MLP 1-19-1 come into consideration.

Time series assumes GDP growth of USD 16 trillion up to almost USD 20 trillion in the observed period of 2015 to 2024. Both neural networks predict a growth disproportionately smaller, specifically USD 30 trillion, respectively 40 trillion. In case of time series such a development would suppose an annual constant growth of GDP in an order slightly bigger than 2% per year. In case of the neural networks MLP 1-20-1 and MLP 1-19-1 the growth would mean the order of about 2% in the years of 2015 – 2016, and stagnation subsequently.

Conclusion

It is thus clear that a classical statistical regression, respectively a time series set with its assistance has proven better results than all preserved neural structures.

The goal of this contribution has been to compare the prediction of the GDP development in common prices within the US until 2024 performed through neural networks and standard time series. Calculations have been conducted. Results have been mutually compared. The goal of this contribution has thus been fulfilled. The conclusion can be formulated as follows: **Statistical regression has proven significantly better results of the future USA GDP development in common prices than neural networks have.**

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The Influence of Selected Factors on Overall Job Satisfaction

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Abstract

Having satisfied employees is one of the key pillars of a successful organisation. Satisfied employees results in greater productivity and less staff turnover. There are several factors that influence overall employee satisfaction, these include the level of communication, the relationships with co-workers and the nature of the work. The aim of this study was to determine the degree to which certain factors influence overall employee satisfaction. The study was first carried out in 2013 and subsequently repeated in 2015. Both studies are mutually comparable. In total, 1,776 and 1,470 respondents were interviewed in 2013 and 2015 respectively (excluding incomplete questionnaires). There were some limitations to the study in 2015: the low proportion of respondents with lower levels of education and the large proportion of Czech-owned organisations. The surveys show that from 2013 to 2015 there was no significant change in the partial and total satisfaction of employees.

Keywords: job satisfaction, communication, co-workers, nature of work

Introduction

Employee satisfaction is very important to business owners. Satisfied employees tend to work with greater effort, are usually more productive and are more likely to stay with the organisation (Edwards et al. 2008; Baruch et al. 2016). Job satisfaction can serve to boost project success too (Rezvani et al. 2016). Conversely, if employees are not satisfied, their rate of absenteeism grows as does the staff turnover (Lotich 2015).

A survey conducted in 2014 by the Boston Consulting Group identified the TOP 26 factors that affect job satisfaction (The Boston Consulting Group 2014). These factors have only changed slightly over time, as is evident from earlier surveys, such as that conducted in 2012 by the Society for Human Resources Management (2012). Table 1 compares the results of both studies.

Table 1: Comparison of the TOP10 factors influencing job satisfaction (2012 and 2014)

	2012	2014
1	Opportunity to use their skills and abilities	Recognition for their work
2	Job security	Good relationships with colleagues
3	Wages and remuneration	Good work-life balance
4	Communication between employees and managers	Good relations with superiors
5	Relationship with their direct superior	Financial stability of the company
6	Employee benefits	Education and professional development
7	Financial stability of the organisation	Job security
8	Nature of the work	Attractive steady wage
9	Recognition by company management	Interesting job description
10	Independence	Corporate values

Source: Authors on the basis of SHRM (2012) and The Boston Consulting Group (2014)

In a study conducted in 2013 in Beijing, China, the relations between co-workers were statistically significant in the used model, which was developed on the basis of three categories of factors: job characteristics; organisational-environmental factors; personal attributes (Yang 2013). The importance of relationships was also proven in a study conducted in Slovenia (Tomažević 2013).

Employees often spend a lot of time at work, which is why the relationships between them are very important. According to a survey from 2006, 30% of employees consider their best friend to be at work. Of these employees, 75% planned to stay in the company they worked for at least another year, of which 51% subsequently stated that they worked with passion and felt a connection to the company because of the presence of their best friend (Rath and Harter 2010). Friendships among employees helps to reduce stress, improve communication and collaboration, reduce feelings of insecurity, etc. (Jung Hoon and Chihyung 2011). Relationships between co-workers are also important for good teamwork. As Allegre, Mas-Machuta and Berbegal-Mirabent (2016) state, teamwork plays a significant role in job satisfaction. In other words, co-worker satisfaction has a positive effect on job satisfaction (Simon 2010).

It is well documented in sub-studies that friendship between workers, and its impact on overall employee job satisfaction, is closely related to the development and the level of communication in the workplace (Carrière and Bourque 2009).

According to Jehn and Shah (1997), a friendly exchange of words between employees can serve to encourage, build confidence, and provide critical feedback, which can increase enthusiasm and instil a positive attitude to work.

Effective communication can also help to reduce problems with morale. Understanding how the quality of communications affects workers and their supervisors helps to generate greater job satisfaction (Ashe-Edmunds 2015).

Job satisfaction is also related to working conditions and the nature of the work to be performed. It was discovered that the importance of working conditions is higher for those people working in administration than for those working in difficult conditions. For those working in difficult conditions, operating conditions were considered more important for their overall job satisfaction (Bakotić and Babić 2013).

Materials and Methods

A questionnaire survey into the degree of job satisfaction was conducted in January and February of 2013 and 2015. In 2013, a total of 1,950 respondents participated in the survey, of which 174 questionnaires were excluded due to missing values or errors. In 2015, a total of 1,547 respondents participated in the survey, of which 77 questionnaires were excluded from the sample. The distribution of respondents by gender and age is given in the chapter "Results and Discussion". The respondents were from the Hradec Králové, Pardubice and Vysočina regions, however this was not specified in the questionnaire. The questionnaires for both surveys were distributed among the respondents with the help of students attending distance bachelor programmes at the Faculty of Informatics and Management at the University of Hradec Králové. Students were asked to each get 15 work colleagues to complete the questionnaire survey. Due to the different types of organisations the students worked for, the sample therefore included responses from both the profit and non-profit sectors, as well as a wide range of disciplines. The final data therefore represented a cross-section of all economic sectors (e.g. healthcare, tourism, education, automotive, management, engineering and advertising).

The questionnaire was divided into several parts. The first part was devoted to demographic issues relating to gender, age and education level. The second part included questions on the character of the organisation which employed the respondent. These questions mainly focused on the ownership of the organisation, its size, line of business, and the position the respondent held within the organisation. The third part of the questionnaire consisted of a Czech translation of the Wallach questionnaire (1983) survey on organisational culture, which describes organisational culture in three dimensions: bureaucratic, innovative and supportive. The fourth part of the questionnaire was the job satisfaction survey. This part consisted of 36 items by which to determine the level of job satisfaction (Spector 1985). This part of the questionnaire focused on nine categories of factors: pay, promotion, supervision, fringe benefits, recognition, operating conditions, co-workers, nature of the work and communication.

The respondents determined the extent of their agreement with a statement on a six-point scale, ranging from strongly disagree (1) to completely agree (6). Based on the ranking of the most common factors influencing job satisfaction, three factors were selected for further evaluation (co-workers, nature of the work, communication). These factors have not yet been studied in-depth within the context of job satisfaction. For an accurate assessment of overall satisfaction this value was calculated for all the nine factors examined. (SHRM 2012), (The Boston Consulting Group 2014)

The statistical analysis of the data obtained through the questionnaire survey was performed using Statistica 8 software and Microsoft Excel 2013. To identify the differences between the research conducted in 2013 and 2015, the unpaired two-sample t-test was used.

The aim of this study is to evaluate the time horizon of the development of overall job satisfaction and the state of partial indicators of job satisfaction, which includes co-workers, the nature of the work and communication in the workplace.

Results and discussion

In 2013, 1,776 respondents participated in the survey, of which 762 were men and 1,014 were women). In 2015, 1,470 respondents participated in the survey, of which 619 were men and 851 were women. The respondents were aged 17-74 years (average age 36.3 years, SD = 10.80) and 16-77 years (average age 36.19 years, SD = 10.70) respectively. Both surveys are comparable.

There were some limitations to the 2015 study, such as the small number of respondents with a lower level of education and the predominance of Czech owned companies.

Job satisfaction may also be influenced by the average salary in a region. The study is therefore also limited by the fact that respondents were not divided and compared accordingly on that basis.

Table 2: Average scores for factors affecting job satisfaction – personal factors (2013, 2015).

Item	2013				2015			
	Co-workers	Nature of the work	Communication	Overall satisfaction	Co-workers	Nature of the work	Communication	Overall satisfaction
Gender								
Male	4.42	4.33	4.14	3.79	4.36	4.29	4.07	3.78
Female	4.48	4.31	4.25	3.69	4.34	4.24	4.07	3.70
Age								
Less than 30 years	4.49	4.24	4.24	3.77	4.39	4.18	4.10	3.77
30-40 years	4.44	4.33	4.18	3.74	4.28	4.26	4.02	3.71
41 years and above	4.43	4.38	4.19	3.68	4.38	4.34	4.08	3.71
Education								
Elementary education	4.11	4.26	4.14	3.75	4.02	4.02	3.41	3.51
Skilled worker	4.32	4.14	4.09	3.64	4.07	4.20	3.89	3.59
Secondary school	4.40	4.29	4.16	3.70	4.33	4.25	4.04	3.69
Higher professional school	4.47	4.48	4.18	3.78	4.30	4.28	4.06	3.74
Undergraduate (distance learning)	4.50	4.21	4.30	3.70	4.36	4.29	4.13	3.79
University degree education	4.56	4.40	4.28	3.80	4.45	4.29	4.16	3.81

Source: Authors

From the results, it is evident that a low level of overall job satisfaction prevails. This directly corresponds to the results in other published studies (Franěk et al. 2014). In terms of gender, age, size of the company or work experience, no significant differences in overall satisfaction were recorded.

In 2015, the monitored characteristics (co-workers, communication and the nature of the work) experienced a slight deterioration in most cases compared to 2013. However, when comparing the various determinants according to the given criteria (size of the organisation, type of organisation, length of work experience, education, etc.) the results in both years are, in the majority of cases, very similar.

In order to detect statistically significant differences in the research results for 2013 and 2015, the t-test method was applied. As a result, statistically significant differences in satisfaction ($p < 0.05$) were identified for co-workers and communication in relation to the ownership of an organisation. A statistically significant difference in satisfaction, with a significance level of $p < 0.1$, was also observed in co-workers in relation to years of experience and job level.

Communication and co-operation were practically the same for men and women. According to the age range, both determinants were better among employees younger than 30 years old than for older employees. This can be explained by the need of younger employees to communicate and cooperate with their older colleagues in order to gain valuable experience. The degree of communication between younger workers can also be explained by the increased use of information technologies by them compared to that of their older colleagues. Both determinants also improved in relation to the educational attainment of the employees.

Table 3: Average scores for factors affecting job satisfaction – company factors (2013, 2015).

Item	2013				2015			
	Co-workers	Nature of the work	Communication	Overall satisfaction	Co-workers	Nature of the work	Communication	Overall satisfaction
Years of experience (tenure)								
Less than 5 years	4.51	4.28	4.26	3.79	4.42	4.22	4.13	3.80
5-10 years	4.41	4.28	4.19	3.71	4.27	4.26	4.01	3.68
11-15 years	4.35	4.34	4.07	3.61	4.28	4.24	3.95	3.64
More than 15 years	4.48	4.48	4.17	3.70	4.36	4.40	4.13	3.73
Organisation ownership								
Czech owner	4.45	4.35	4.18	3.74	4.40	4.34	4.14	3.79
Foreign owner	4.44	4.21	4.24	3.82	4.30	4.22	4.10	3.80
International corporation	4.41	4.27	4.15	3.87	4.38	4.22	3.95	3.77
Public/governmental organisation	4.49	4.37	4.25	3.56	4.28	4.15	3.96	3.49
Organisation size								
up to 50 employees	4.55	4.47	4.34	3.79	4.48	4.40	4.29	3.87
up to 250 employees	4.42	4.28	4.16	3.68	4.24	4.21	3.94	3.63
up to 500 employees	4.39	4.21	4.22	3.73	4.24	4.23	3.96	3.68
more than 500 employees	4.39	4.18	4.05	3.70	4.33	4.17	3.97	3.69
Job level								
Manager/supervisor	4.47	4.57	4.35	3.91	4.37	4.17	4.02	3.68
Non-supervisory employee	4.45	4.23	4.15	3.68	4.29	4.48	4.17	3.85

Source: Authors

On the basis of descriptive analysis and a comparison of the average values, the following can be concluded. Cooperation was the best between those people with less than 5 years' work experience, and also in 2015 in smaller organisations (less than 50 employees) and businesses with a Czech owner. The degree of cooperation can be

explained by the need to gain work experience, whilst in smaller companies the quality of cooperation can be explained by the small number of employees who know each other better.

In 2015, communication was better between those people with less than 5 years' work experience, as well between those with more than 15 years' work experience. There was also a significant change with regards to communication and the size of an organisation. In 2013, this relationship was the strongest in public or government organisations, whereas in 2015 it was found to be the strongest in businesses with a Czech owner and in smaller organisations (less than 50 employees).

With regards to the nature of the work, there was, with a few minor exceptions, a slight deterioration between the two surveys.

When comparing managers and ordinary workers, there was a slight deterioration in all the monitored factors between the two surveys.

There were some limitations to this study. The first was the selection of the respondents. The data was only collected in three regions of the Czech Republic, namely Hradec Králové, Pardubice and Vysočina. However, the Czech Republic has a relatively homogenous socio-economic composition, so this restriction was not deemed to be too significant.

The second potential limitation was the source of the data. The part-time students who distributed the questionnaires worked in different parts of the private and public sectors. This limitation was not considered to have any significant influence either.

The last identified potential limitation may be the high level of respondents with higher education. However, there could be additional factors that have an influence on job satisfaction that were not taken into consideration in the analysis conducted for this study (incomes, etc.). The questionnaire used is included as an Appendix to this paper.

Conclusion

Promoting those factors that improve job satisfaction, as well as the achievement of the overall job satisfaction of employees would enable companies to improve their performance and profits. According to surveys conducted in the Czech Republic in 2013 and 2015, there were imperceptible changes in the assessment of overall job satisfaction. Statistically significant differences ($p < 0.05$) in job satisfaction were found for co-workers and communication in relation to organisation ownership. The evaluation of the level of partial determinants (communication, co-workers and the nature of the work) was valued with a higher average score (for 2013 - 4.32 and for 2015 - 4.23) than overall job satisfaction (3.73 in both studies). However, when evaluating the overall job satisfaction score, it is also necessary to take into account other factors, like those mentioned in the introduction to this paper, that affect job satisfaction.

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Appendices

Table 4: Characteristics of the research sample

<i>Item</i>	2013		2015	
	<i>Percentage</i>	<i>Frequency</i>	<i>Percentage</i>	<i>Frequency</i>
<i>Gender</i>				
Male	42.9	762	42.1	619
Female	57.1	1014	57.9	851
<i>Age</i>				
Less than 30 years	32.4	576	32.4	476
30-40 years	35.2	625	34.7	510
41 years and above	32.4	575	32.9	484
<i>Education</i>				
Elementary education	1.2	22	0.7	11
Skilled worker	9.7	172	6.4	94
Secondary school	42.3	752	48.8	717
Higher professional school	6.4	113	6.5	96
Undergraduate (distance learning)	8.2	145	8.9	131
University degree education	32.2	572	28.6	421
<i>Years of experience (tenure)</i>				
Less than 5 years	44.0	781	42.2	621
5-10 years	29.5	524	29.9	440
11-15 years	11.9	211	12.9	190
More than 15 years	14.6	260	14.9	219
<i>Organisation ownership</i>				
Czech owner	42.0	746	44.5	654
Foreign owner	21.1	375	21.5	316
International corporation	13.4	238	14.3	210
Public/governmental organisation	23.5	417	19.7	290
<i>Organisation size</i>				
up to 50 employees	35.9	637	33.3	490
up to 250 employees	30.1	535	27.9	410
up to 500 employees	9.1	161	8.2	120
more than 500 employees	24.9	443	30.6	450
<i>Job level</i>				
Manager/supervisor	24.4	434	29.2	429
Non-supervisory employee	75.6	1342	70.8	1041

Source: Authors

Appendix: The Czech language questionnaire used for the study "Research into job satisfaction".

Facts about you and your organisation:

1.1. Gender:

- Male female

1.2. Age:

1.3. Education:

- Elementary educational
 Skilled worker
 Secondary school
 Higher professional school
 Undergraduate (distance learning)
 University degree education

1.4. Organisation size:

- up to 50 employees
 up to 250 employees
 up to 500 employees
 more than 500 employees

1.5. Organisation ownership:

- Czech owner
 Foreign owner
 International corporation
 Public/governmental organisation

1.6. Years of experience (tenure):

1.7. Job level:

- Non-supervisory employee
 Manager/supervisory

1.8. In which field does your organisation operate?

.....

Appendix: The Czech language questionnaire used for the study "Research into job satisfaction".

Job Satisfaction Survey Please select the option that best describes your opinion.		Disagree completely	Disagree moderately	Disagree slightly	Agree slightly	Agree moderately	Agree completely
4.1.	I feel I am being paid a fair amount for the work I do.	<input type="checkbox"/>					
4.2.	There is really too little chance for promotion on my job.	<input type="checkbox"/>					
4.3.	My supervisor is quite competent in doing his/her job.	<input type="checkbox"/>					
4.4.	I am not satisfied with the benefits I receive.	<input type="checkbox"/>					
4.5.	When I do a good job, I receive the recognition I should.	<input type="checkbox"/>					
4.6.	Many of our rules and procedures make doing a good job difficult.	<input type="checkbox"/>					
4.7.	I like the people I work with.	<input type="checkbox"/>					
4.8.	I sometimes feel my job is meaningless.	<input type="checkbox"/>					
4.9.	Communication within this organisation seem good.	<input type="checkbox"/>					
4.10.	Raises are too few and far between.	<input type="checkbox"/>					
4.11.	Those who do well in their job stand a fair chance of being promoted.	<input type="checkbox"/>					
4.12.	My supervisor is unfair to me.	<input type="checkbox"/>					
4.13.	The benefits we receive are as good as most other organisations offer.	<input type="checkbox"/>					
4.14.	I do not feel that the work I do is appreciated.	<input type="checkbox"/>					
4.15.	My efforts to do a good job are seldom blocked by red tape.	<input type="checkbox"/>					

4.16 .	I find I have to work harder at my job because of the incompetence of the people I work with.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
4.17 .	I like doing the things I do at work.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
4.18 .	The goals of this organisation are not clear to me.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Appendix: The Czech language questionnaire used for the study "Research into job satisfaction".

Please select the option that best describes your opinion.		Disagree completely	Disagree moderately	Disagree slightly	Agree slightly	Agree moderately	Agree completely
4.19 .	I feel unappreciated by the organisation when I think about what they pay me.	<input type="checkbox"/>					
4.20 .	People get ahead as fast here as they do in other places.	<input type="checkbox"/>					
4.21 .	My supervisor shows too little interest in the feelings of subordinates.	<input type="checkbox"/>					
4.22 .	The benefit package we have is equitable.	<input type="checkbox"/>					
4.23 .	There are few rewards for those who work here.	<input type="checkbox"/>					
4.24 .	I have too much to do at work.	<input type="checkbox"/>					
4.25 .	I enjoy my co-workers.	<input type="checkbox"/>					
4.26 .	I often feel that I do not know what is going on with the organisation.	<input type="checkbox"/>					
4.27 .	I feel a sense of pride in doing my job.	<input type="checkbox"/>					
4.28 .	I feel satisfied with my chances for salary increases.	<input type="checkbox"/>					
4.29 .	There are benefits we do not have which we should have.	<input type="checkbox"/>					
4.30 .	I like my supervisor.	<input type="checkbox"/>					

4.31 .	I have too much paperwork.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
4.32 .	I don't feel my efforts are rewarded the way they should be.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
4.33 .	I am satisfied with my chances for promotion.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
4.34 .	There is too much bickering and fighting at work.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
4.35 .	My job is enjoyable.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
4.36 .	Work assignments are not fully explained.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

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