Influence of Science and Research on Regional Competitiveness-Czech Republic Case Study

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***Abstract*—Concept of the knowledge economy and innovation development is an important aspect of regional competitiveness. Rating competitiveness of regions and identifying disparities between them is an important tool that can be used both for exploring the extent of the effects of individual determinants of the competitiveness of the region, but also for the government in case of a decision on granting aid for the purpose of promoting economic development and increased competitiveness. This paper presents the application of the Index of regional competitiveness in the NUTS3 regions in the Czech Republic. The aim of the present paper is the analysis of selected determinants of the knowledge economy and their impact on regional competitiveness. This is done with the help of elasticity calculations. It is a new concept in measuring the level of competitiveness and measuring the impact of individual determinants.**

***Index Terms*—region, regional competitiveness, development, innovation**

I. Introduction

Economic development is influenced by uneven distribution of manufacturing resources, economic and extra-economic factors which influence the total effectiveness of economic development. In consequence of this fact, there is space differentiation and therefore regional disparities origin. This is the source of regional policy which tries to reduce negative economic as well as social impacts of uneven development and at the same time to support regional potential and its utilization for the increase of inhabitants´well-being [1].

Regional policy increases its importance also by the fact that regions are considered in the current globalized economy as driving engines of their economic development and growth and therefore also as driving engines of the development and growth of national economies. There is utilization of available manufacturing resources and other components of potential (mainly knowledge and ability to learn). It is possible to realize the concept of industrial clusters and other forms based on triple-helix principles and cooperation better at the regional level than at the national one [2]. The regional policy supporting creation of innovations or creation of innovative systems contributes significantly to consolidation of regional importance in the economic development.

II. Regional Competitiveness

Competitiveness is considered as a basic determiner of long-term success not only of regions but also states, as regards economic development. Generally, competitiveness expresses country's ability to penetrate into the foreign market and so being able to compete with other states [3]. The assessment of competitiveness in a region has its specifics. In reference [4] is defined the regional competitiveness as the ability of local economy to attract companies with stable or growing shares in the market and also the ability of this regional economy to ensure stable or growing living standard of the participating parties [4]. According to [5], the regional competitiveness isn't defined only by the sum of success of individual companies but it also reflects the impact of non-profit organizations and companies´cooperation. A suitable tool for meeting this target seems to be innovations as results of knowledge use in the production process. References to [6] they perceive the ability of creating innovations as a determiner of business competition and considers the space level of regions as an ideal for innovations´enforcement. He states also that innovations are driving force for companies and their influence sets ambitious targets for companies. These targets lead to the renewal of industrial structures and contribute also to the origin of new branches in economic activities. According to [7], investments in creation, propagation and utilization of new knowledge started being applied more and more in contrast to traditional factors (material, working, capital ones). This knowledge becomes so one of the main sources of wealth of people, companies, regions and countries. In reference [8] suppose that the economic growth depends on the accumulation of knowledge and its spread via business activities. This collective developed the concept of knowledge filtration system which would work as a barrier limiting the total change of knowledge into new products, procedures and organizations. They argue that the change of knowledge in regional economies proceeds only via common actions (=cooperation) between corporate subjects and creators or carriers of knowledge (=scientific research organizations and universities). The carrier of costs for this cooperation can be the public sector. [9] This meets triple-helix principles. Innovations

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incurred from this cooperation represent transformed, so-called relevant economic and uneconomic knowledge. The economic knowledge represents results of an applied research which supports companies in creating new economic opportunities and introducing new ideas in the market. On the other hand, uneconomic knowledge is the result of a basic research. During its transformation, this knowledge doesn't have any economic value commercialized in the market. However, in the long term this knowledge is necessary for the applied research and gaining of important competitive advantage of involved regional economic subjects.

When searching for the sources of regional competitiveness, more and more economists (often called as so-called Marshall's followers) call attention to the importance of basic determiners influencing the economic growth of a region and also its competitiveness. These determiners are relative geographical proximity (sometimes also agglomeration) and spillover effects incurred from cooperation ([10]-[12]). Thanks to the geographical proximity of cooperating subjects and via natural contacts, there are interactions causing positive effects, often synergistic ones. If there is utilization and development of knowledge based on science and research within this cooperation, spillover effects of knowledge are concerned. Corporate subjects involved in such cooperation gain benefits which reflect in their economic results ([1], [13]). They have an opportunity to gain a competitive advantage in the market as compared to isolated companies. However, natural increase of knowledge and skill potential of employees is typical for them without spending any additional costs for this increase. Another effect is consolidation of cooperative linkages and development of science and research as the platform for creation of innovations [14]. The above mentioned text implies to the fact that the basic production factor which has the creation potential of global competitive advantage is knowledge. Knowledge is the main driving force of technological progress as well as economic growth [15]. Other researches show however that the excess of geographical proximity, respectively too dense cooperative linkages among subjects in a small region, can work also negatively. Too large agglomeration and too dense knowledge transactions disperse subsequently the advantages of knowledge spillover effects because losses, caused by the decrease of appropriability, incur [16]. Appropriability is company's ability to keep the added value which the company creates for its own benefit. Nevertheless, who has benefit from this added value depends on company's decision, structure of the market where it works and sources of the added value [17].

Many authors (e.g. [10], [18]-[20] etc.) investigated the nature of processes which proceed in regions when realizing cooperation based on knowledge (and of course processes where knowledge spillover effects incur). Two main processes were described. The first one describes only so-called Marshallian externalities which origin mainly within one certain branch within the agglomerated territory with a dense internal structure of cooperative linkages. The second type of processes was originally designed by [18] and it focuses on various externalities which support creativity and origin of new ideas across branches. Diversity of local activities plays an important role in the innovative process because a completely natural request for the increase of production capacity results from this diversity. This request leads to production of more and various goods and services. Interesting expansion is provided also by [19]. They argue that specialization and diversity of externalities can appear also within additional (service) industrial branches which use the results of science and research.

The importance of knowledge spillover effects, as the determiner of new knowledge creation, is supported by most authors of theoretical models of endogenous growth, e.g. [21]-[23].

They agree that cooperative linkages in a certain relatively small territory (region) and between creators (science and research or universities) and recipients of knowledge (companies) are necessary for the origin of spillover effects. Thus, knowledge transformation into a commercialized innovation proceeds faster, is cheaper and contributes to the effective allocation of private as well as public means. However, the mentioned statements about the influence of "university determiner of economic growth and development" don't apply in all cases, for sure. There are many researches of the influence of science and research on the economic development of regions ([5]-[6]). However, all of them wrestle with heterogeneous methodology or methods of competitiveness evaluation or hard measurable conception of science and research or with their results [24].

Therefore the ambition of this article is to consider the influence of science and research on regional competitiveness in the Czech Republic and evaluate its development in the period 2004-2012. The indicator of regional economic efficiency and its sensitivity reaction to selected determiners will be used for the analysis. The indicator will help us find out if there isn't so-called innovative paradox or if the support of science and research in Czech regions abets to increase the competitiveness.

III. Competitiveness and Its Evaluation

To define the concept of competitiveness it is possible to view from a microeconomic or macroeconomic perspective. Competitiveness is generally defined by OECD: Competitiveness is the rate of ability with which a country is able to produce goods and services in open market conditions. This goods and services have to compete in the international competition test and also keep and increase the real domestic income [25].

In reference [24] considers competitiveness as a combination of positive business efficiency and extras. References to [26] they consider a subject, which can best adapt itself to the changing environment or will create this environment with its activity, as the most competitive subject.

It is quite an abstract concept which is however one of the most quoted characteristics of economic subjects (mainly companies) as well as regions and states in globalized economies. All the mentioned entities deal with the maximization of their prosperity which however builds always on economic or social development, as regards regional viewpoint. Even the ability of regional development to contribute to the increase of economic subjects ´prosperity in the given region is often expressed even by regional competitiveness.

There are several sources of regional competitiveness. It is mainly export specialization which concentrates on location factors influencing production costs. It is mainly utilization of present production factors, savings thanks to the market proximity, various advantages or savings and also the influence of localized direct foreign investments. The second source of regional competitive advantage is the region itself as a source of growing revenues. Therefore subjects focus on cultivation of direct human potential of manpower, utilization of available technologies, results of science and research, huge structural investments and concentrate on the origin of innovations. The last source of competitive advantage can be knowledge, ability to learn and its concentration in a region. To gain this advantage, suitable innovative environment have to be created in regions, there have to be industrial clusters, business networks, eventually regional innovative systems. All the sources of competitive advantage can mingle in a region. This causes synergistic effects.

There are many factors which influence competitiveness and this implies to the difficulty of its measurement. Nowadays, there isn't any unified procedure of measuring but many authors have already published their own procedures, e.g. [4], [16], [27]-[29], etc.

Other national approaches of member states of the EU evaluate the competitiveness according to various types of efficiency-economic and innovative one-and a part of the evaluation is also the quality of life. Another approach to the measurement of competitiveness was provided by [27] who constructed the index of competitiveness in Great Britain. It was the first attempt to affect competitiveness with one number. Till then, competitiveness was reviewed only by means of individual indicators. In reference [27] tried to include indicators evaluating inputs, outputs and results of economy into the index. The index of regional competitiveness was elaborated further by the European Union. The Regional competitiveness index (RCI), which compares regions of the European Union at the NUTS2 level from the viewpoint of their competitiveness, was created. Many other similar indicators of regional competitiveness were created later.

In the sixth periodic report of social and economic situation and development of regions in the European Union, the European Commission considers productivity and employment and close interconnection of these factors with other indicators as the main indicators of competitiveness. Productivity is the result of other factors´ influence. The number of investments in a country, expansion of research and development, direct foreign investments and capital level in the country contribute to the productivity growth. A high productivity level causes consequently higher wages, then higher living standard and employment. A close linkage of competitiveness and regional productivity is confirmed also by [3].

IV. Evaluation of Competitiveness-Czech Republic Case Study

A. Methodology of Evaluation

Based on the above proven relation between productivity and employment, such an indicator was chosen which affects this relation and is also able to analyze the regional competitiveness or efficiency of the utilization of individual production factors.

For the evaluation of regional competitiveness-in the Czech Republic case study-the CER coefficient was chosen. This index can be used for various levels of regions and most often for analyses at the levels of NUTS2 and NUTS3 regions. The results of CER coefficient analysis record development of competitiveness of individual regions during monitored periods from the viewpoint of the relation between productivity and employment.

Based on Hanclova´s work [30], it is possible to write the form of CER coefficient as follows:

$$CER = \frac{C_P}{KC_Z}, \text{ where} \quad (1)$$

$$C_P = \frac{\frac{GDP_{region}}{GDP}}{\frac{S_{region}}{S}}, \text{ where} \quad (2)$$

GDP_{region}-gross domestic product in the given region,

GDP-gross domestic product in the Czech Republic and

$$C_Z = \frac{\frac{Z_{region}}{Z}}{\frac{S_{region}}{S}}, \text{ where} \quad (3)$$

Z_{region}-the number of employed people in the NUTS3 region,

Z-the number of employed people in economy,

S_{region}-the number of inhabitants in the NUTS3 region,

S-the total number of inhabitants.

After some mathematical adjustments, the pattern (1) can be written in the following form:

$$CER = \frac{\frac{HDP_{kraj}}{HDP}}{\frac{Z_{kraj}}{Z}}. \quad (4)$$

The CER values indicate the competitiveness rate which was reached in the given region with certain employment. Efficiency expresses the ratio between inputs and outputs. The CER coefficient has such values which amount indicates the following facts:

- If CER = 1, it means that pace of regional development (in the case study of NUTS3) and

competitiveness are equal to the pace of entire economy development;

- If CER < 1, the region reaches lower development pace of the competitiveness rate than in case of the national pace;
- If CER > 1, the region reaches higher pace of the competitiveness rate, it is also more competitive than the entire country.

B. Results of the Analysis and Discussion

Based on the data of the Czech Statistical Office for the period 2004-2012, the CER coefficient was calculated for individual Czech regions (NUTS3 size). The results are mentioned in Table I.

TABLE I. VALUES OF THE COEFFICIENT CER IN THE NUTS3 REGIONS CZECH IN 2004-2012

Region	2004	2005	2006	2007	2008	2009	2010	2011	2012
Prague	1.80348*	1.86099*	1.86879*	1.87046*	1.96190*	1.95185*	1.91617*	1.91020*	1.86302*
Central Bohemia	.89777	.90349	.87679	.91771	.89471	.88974	.87212	.85863	.85353
South Bohemia	.86557	.86475	.88016	.84755	.84070	.84040	.84423	.82993	.85340
Plzen	.89070	.91063*	.90530	.92197	.87035	.84822	.82925	.85911	.85502
Karlovy Vary	.78355	.76312	.76400	.70030	.71828	.68033	.71568	.70011	.71718
Usti	.89296	.86766	.86019	.87798	.86532	.85767	.89493	.84440	.87673
Liberec	.78618	.79112	.86098	.84569	.77480	.72574	.75773	.78373	.81634
Hradec Kralove	.90627	.88672	.85527	.84372	.83246	.86275	.87320	.88399	.87109
Pardubice	.86238	.82503	.81924	.85895	.83904	.84319	.80716	.81771	.80252
Vysocina	.86719	.84498	.84436	.82840	.83265	.78767	.81863	.83509	.86086
South Moravia	.95483*	.94351*	.93727*	.94862*	.94312*	.97539*	.94236*	.95515*	.95439*
Olomouc	.85181	.83718	.78496	.78647	.80957	.79701	.82224	.82763	.82265
Zlin	.83842	.83867	.81866	.82520	.80932	.85606	.87235	.86754	.89684
Moravia-Silesia	.91162*	.88931	.94032*	.90212	.88820	.85889	.88064	.91668	.91841
Average	.93662	.93051	.92973	.92680	.92003	.91249	.91762	.92071	.92586
Deviation +5 %	.98346	.97704	.97622	.97314	.96603	.95812	.96350	.96674	.97215
Deviation -5 %	.88979	.88398	.88325	.88046	.87403	.86687	.87174	.87467	.87956

Source: own processing

Note: * The value of the CER in the region is higher than average rate of modified competitiveness of the country for the year

Table I shows that only the capital city, Prague, reaches higher regional competitiveness rate than 1. The CER values in other regions are below 1. This result can lead to distorted conclusions because it is necessary to modify the data by means of creating an average CER value for the entire republic, then set deviations from the average and based on these values, we can better consider the real competitiveness and economic situation of the given NUTS3 regions. The deviation rate was set for +/- 5 %. According to [31], the average of values with the same initial base provides the following results:

- CER values above + 5 % deviation from the average indicate regions with a high competitiveness rate;
- CER values oscillating around ± 5 % average from the average indicate regions with an average competitiveness rate;
- CER values below-5 % deviation from the average indicate regions with a low competitiveness rate.

Next research should investigate belonging of the given regions to categories which were defined for a new EU programming period 2014-2020 (depending on GDP-less advanced regions, intermediate regions and more advanced regions). This way can increase the predicative ability of the CER coefficient.

The CER coefficient enables interregional comparison and on its base it is possible to monitor the economic development in a time line. The capital city, Prague, and the South Moravian Region record above-average values for the whole monitored period 2004-2012 (the highest CER value was noted in 2008 in Prague-1.96190). Therefore we can say that these regions are the most advanced ones with stable economic development and the highest competitiveness rate. Except for 2006, the second most advanced competitive region is the South Moravian Region. The South Moravian Innovation Centre is situated there. It was founded in 2003 and its main target is support of origin and development of innovations for enterprisers as well as students and private persons. The annual report of the South Moravian Innovation Centre for the year 2013 states that companies of the South Moravian Region are disposed to invest more financial means in research and development each year and that the share of investments in innovations is higher than in other regions. Innovative companies are more stable, can better gain the foreign capital and invest in the utilization of new technologies and creation of innovations. This contributes significantly to the increase of own competitiveness. We can consider the Moravian-Silesian Region as the next most advanced region which exceeded the average values in 2004, 2006, 2011 and 2012. The survey of development of regional CER results helps find out if and how the rate of regional competitiveness changes in individual regions (none of the best evaluated regions has constantly growing pace in 2012).

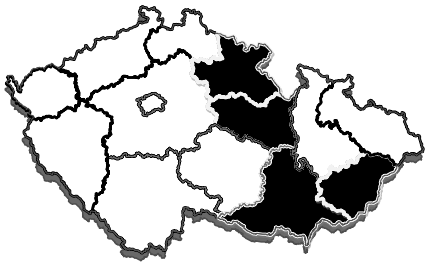
On the other hand, the last position is occupied by the Karlovy Vary Region which showed the lowest CER values (maximal value 0.8) for the whole monitored period. Foundation of low CER values can be the absence of universities and consecutive absence of highly-skilled manpower and experts who are necessary for research and creation of innovations. Further, there is a missing infrastructure which would enable easier transport connections with other regions. The Liberec Region

showed significantly below-average values too. In 2006, 2007 and 2009 the Olomouc Region dropped below the limit of 0.8 CER and the Vysocina Region dropped also below this limit in 2009. The lowest value was measured in 2009 in the Karlovy Vary Region (.68033).

The CER coefficient offers the possibility of investigating competitiveness also during a time period. In 2008 there was an economic crisis which had an influence on deterioration of macroeconomic indicators in the following years. The mentioned CER values imply also to the fact that CER values were growing in most regions until 2008. Regions were developed and economically growing.

The development in 2009 is interesting. Only three regions were above-average or oscillating around the average (within the range of +/- 5 % deviation from the average). In 2010 the situation was much better and seven regions were included in the above-averagely or averagely competitive regions. In 2011 and 2012 there was a drop of CER values and only four regions out of fourteen belonged to the group with a high or average competitiveness rate.

In spite of the economic crisis, there was an increase of the CER value in four regions in 2009: Hradec Kralove, Pardubice, South Moravia and Zlin Region. We can sustain the situation by the geographical proximity of the Hradec Kralove and Pardubice Region. The same situation is in the South Moravian Region which neighbours on the Zlin Region. Another reason can be mutual cooperation between the neighbouring regions or spillover of knowledge, innovations and other competitive tools. This conclusion is supported also by the study of Srholec, Žížalová [32].



Source: own processing

Figure 1. The regions in which there was an increased rate of CER IN 2009

C. Analysis of CER Determiners

To have a higher predicative ability of regional competitiveness rate, which is measured by the CER coefficient, it is necessary to analyse in more detail the influence of determiners influencing the competitiveness, e.g. by the sensitivity analysis. It enables to monitor how individual determiners (variables) influence the competitiveness rate of each region. The principle of sensitivity analysis is the calculation of elasticity between determiners and the CER coefficient-E_{det}.

Regarding the fact that determiners of the knowledge economy have the highest proven influence on competitiveness of regions, the following determiners were selected in compliance with study results ([4], [16], [27]-[29]):

- Share of university students, studying in a region, in regional inhabitants aged 16-64 years (STU);
- Number of scientific and research employees (EMP);
- Expenses for science and research in a region (FIN);
- Scientific and research outputs in a region (sum of issued patents and utility designs; OUT);
- Number of subjects dealing with science and research in a region (ENT).

Considering the range of calculations, analyses will be executed only in selected NUTS3 regions of the Czech Republic. The regions which CER coefficient indicated a low or high competitiveness rate were chosen for the presentation of differences between the influences of individual competitiveness determiners:

- South Moravian Region and Moravian-Silesian Region ($CER_{2012} > .91841$),
- Karlovy Vary Region and Liberec Region ($CER_{2012} < .81634$).

We can find out the sensitivity or reaction when calculating according to the following pattern:

$$E_{det} = \frac{\frac{determinant_{t1} - determinant_{t0}}{determinant_{t0}}}{\frac{CER_{t1} - CER_{t0}}{CER_{t0}}} \quad (5)$$

where t_1-value of a determiner during the monitored year; t_0-value of a determiner during the previous year.

The most negative reaction was noted in the Karlovy Vary Region in 2006. The sensitivity reaction (with the value-476.68572) to the change of CER coefficient was noted when changing the output of science and research. The most positive reaction with the value of 186.08430 was noted in the South Moravian Region in 2013.

According to the selected determiners, the following biggest sensitivity reactions to the change of CER coefficient were noted:

- Share of students in inhabitants aged 15-64 years: the smallest reaction was in the Moravian-Silesian Region in 2012 (-35.78440); the biggest one was in the South Moravian Region in 2012 (84.79613);
- Number of scientific and research employees; the smallest reaction was in the Liberec Region in 2009 (-8.61085); the biggest one was in the South Moravian Region in 2012 (128.27158);
- Expenses for science and research; the smallest reaction was in the Karlovy Vary Region in 2006 (-125.88256); the biggest one was in the South Moravian Region in 2012 (186.08430);
- Scientific and research outputs; the smallest reaction was in the Karlovy Vary Region in 2006 (-476.68572); the biggest one was in the Moravian-Silesian Region in 2012 (107.93727);
- Subjects working in science and research; the smallest reaction was in the Karlovy Vary Region in 2006 (-78.83554); the biggest one was in the South Moravian Region in 2008 (10.87047).

TABLE II. ELASTICITY OF DETERMINANTS ON THE DEVELOPMENT INDICATORS CER IN SELECTED REGIONS IN 2004-2012

Year	Region	CER_y	STU	E_{STU}	EMP	E_{EMP}	FIN	E_{FIN}	OUT	E_{OUT}	ENT	E_{ENT}
2004	Moravia-Silasia	.91162	.04267	n/a	6 575	n/a	4 578	n/a	177	n/a	265	n/a
	South Moravia	.95483	.08657	n/a	16 347	n/a	14 654	n/a	145	n/a	466	n/a
	Karlovy Vary	.78356	.00639	n/a	200	n/a	204	n/a	12	n/a	22	n/a
	Liberec	.78618	.02775	n/a	2 286	n/a	2 850	n/a	55	n/a	90	n/a
2005	Moravia-Silasia	.88931	.04413	-1.39872	6 313	1.63032	4 941	-3.23976	155	5.20330	259	.92510
	South Moravia	.94352	.08880	-2.17499	14 456	9.75587	11 170	20.05731	141	1.84878	445	3.80175
	Karlovy Vary	.76313	.00733	.17016	159	.14556	124	15.03894	32	-67.49477	22	n/a
	Liberec	.79112	.02899	.14081	2 147	- .10315	1 861	-55.22295	60	14.59962	93	5.30453
2006	Moravia-Silasia	.94033	.04503	.35456	5 716	-1.64950	3 114	-6.44573	151	-0.38488	228	-2.08646
	South Moravia	.93728	.08962	-1.39945	14 017	4.60168	8 411	37.36686	126	16.05590	420	8.49901
	Karlovy Vary	.76401	.00829	.22980	154	.19272	106	-125.88256	15	-476.68572	20	-78.83554
	Liberec	.86099	.03062	1.57218	1 872	- .69112	1 449	-2.50674	68	1.55413	91	- .24350
2007	Moravia-Silasia	.90213	.04499	.02147	5 356	1.54862	3 030	.66401	142	1.45310	201	2.91505
	South Moravia	.94863	.08852	-1.01726	13 529	-2.87367	8 127	-2.78867	149	14.76373	365	-10.81532
	Karlovy Vary	.70030	.00888	.27877	183	.23164	92	1.58398	9	4.89370	23	-1.79895
	Liberec	.84569	.03090	-1.94068	1 702	.19482	1 329	4.66151	68	- .41592	87	2.47419
2008	Moravia-Silasia	.88821	.04194	4.39581	5 395	- .46707	2 661	7.89068	131	5.41462	192	2.90120
	South Moravia	.94313	.08535	6.17362	12 277	15.95788	6 047	44.15159	145	4.92333	342	10.87047
	Karlovy Vary	.71829	.00881	.24214	160	.19715	98	2.53913	10	7.55987	21	-3.38551
	Liberec	.77481	.02906	1.41250	1 727	-5.65336	1 517	-1.68769	45	4.01962	81	.82279
2009	Moravia-Silasia	.85890	.03893	2.17416	5 336	.33103	2 765	-1.18436	143	-2.94134	189	.47349
	South Moravia	.97539	.08154	-1.30504	11 442	-1.98959	5 726	-1.55165	164	3.95683	321	-1.79483
	Karlovy Vary	.68034	.00859	0.26677	217	0.21669	78	3.86266	8	3.53920	22	- .90129
	Liberec	.72574	.02623	.65043	1 740	-8.61085	1 312	2.13399	74	-10.03276	74	1.36470
2010	Moravia-Silasia	.88065	.03629	-2.67581	4 496	-6.21359	5 535	39.55403	135	-2.21850	181	-1.67122
	South Moravia	.94237	.07647	1.83578	10 963	1.23631	5 057	3.45074	191	-4.79213	315	.55206
	Karlovy Vary	.71569	.00778	.23845	330	.20216	71	-1.72730	8	n/a	19	-2.62460
	Liberec	.75774	.02345	- .41567	1 892	.50308	1 483	2.95636	48	-8.01097	74	n/a
2011	Moravia-Silasia	.91668	.03339	-1.95494	3 886	-3.31455	2 182	-14.80495	183	8.65961	176	- .67512
	South Moravia	.95516	.07117	-5.11349	11 391	2.88072	4 654	-5.87180	242	19.78095	292	-5.37993
	Karlovy Vary	.70012	.00749	.30463	151	.24577	76	-3.23753	12	-21.60727	16	7.25888
	Liberec	.78373	.02165	- .44614	1 604	- .22567	1 110	-7.33203	105	34.90963	73	- .39394
2012	Moravia-Silasia	.91841	.03113	-35.78440	3 831	-7.56048	2 212	7.29059	220	107.93727	160	-48.20627
	South Moravia	.95440	.06636	84.79613	10 227	128.27158	3 964	186.08430	246	-18.57333	292	n/a
	Karlovy Vary	.71718	.00638	.27561	268	.23560	96	10.79625	11	-5.86082	20	10.25644
	Liberec	.81634	.02058	- .83920	1 656	1.29355	868	-5.23971	114	1.94814	74	.32922

Source: own processing

The above mentioned statement implies to the fact that the highest reaction values were found out in four out of five determiners in 2012 when changing them to the CER values. A more detailed situation in 2012 is described in diagram no. 1. The lowest reaction values of determiners´ change to the CER coefficient were noted in the Karlovy Vary Region which was already sooner marked as the least advanced region of the Czech Republic.

The highest sensitivity reactions were noted in the South Moravian Region which was mentioned already above as the most competitive region in the Czech Republic following the capital city, Prague.

The biggest reactions to determiners´ changes were noted in the South Moravian Region in 2012. The region reacted very positively when changing the development of number of university students, scientific and research employees and expenses for science and research. In case of the reaction to scientific and research outputs, negative relation was noted. Because there was no change in the number of subjects which are active in science and research, the value of reaction is zero. The Moravian-Silesian Region shows a very positive reaction when changing OUT where the value of reaction reaches 107.93727. This region reacts positively also to the change of FIN but the value is much higher (7.29059). For other determiners, the elasticity rates are negative.

The Karlovy Vary Region doesn't react to changes of STU and EMP indicators. We noted positive reactions to changes of FIN and ENT, negative ones were noted for OUT.

The Liberec Region reacts only little to changes of individual determiners; sensitivity reactions are negative or oscillating around 0.

V. CONCLUSION

The presented way of evaluating regional competitiveness represents an easily applicable tool which doesn't require much various data which gaining is often problematic in practice. The CER coefficient provides basic orientation information which can serve to policy markers when creating public policies and

strategies supporting the competitiveness increase of the given region. The elasticity analysis of individual indicators has the potential to provide sufficiently accurate data about the influence of individual determiners on economic productivity and employment or the competitiveness rate. The disadvantage of this approach is incapability to consider time delay or spillover effects or cross-border effects and sensitivity to extreme fluctuations of values. These fluctuations can't be removed by the method. The advantage is simplicity of the method, availability of necessary data, performance speed. Other advantages can be also variability of individual determiners which we can group and analyse the influence of entire determiner groups on the competitiveness rate.

Results of the primary analysis can be used also in other ways. They are useful for the regression model which enables to quantify the influence rate of individual determiners on the CER coefficient. However, the choice of determiners for the regression analysis can be complicated by multicollinearity because of the small number of surveys or small changes of individual determiners. Another complication can be mutual correlativeness of individual determiners. Suitable variables can be chosen by means of the factor analysis which can provide rates of individual variables whereas the data isn't encumbered with multicollinearity. Therefore it is possible to apply the method of regression analysis to resultant groups of indicators. Such results could provide more accurate results for interregional comparison.

The analysis revealed that there are significant disparities in the monitored sample of regions, as regards the regional competitiveness rate. These disparities influence the economic development of regions and their future development. The executed analysis helped divide individual Czech regions in weakly, averagely and strongly competitive ones, according to the competitiveness rate. In addition to that, important positive effects of knowledge determiners on regional competitiveness were found out. Even the partial analyses of individual determiners enable to improve the approach of public policies to creation of positive corporate environment or the environment which will positively influence the competitiveness of economic subjects which are located in the given region.

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