MEASUREMENT OF REGIONAL DISPARITIES AND ECONOMIC COMPETITIVENESS OF A REGIONS

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Abstract:This article is devoted to the principles of measurement of regional disparities and a regional economic competitiveness and discuss the most frequently used indicators in this measurement. Inasmuch as the regional economic competitiveness is conditional on a large number of sub-factors, it is useful to focus on the ways of measurement of these factors. Their measurement allows to analyze in which competitiveness areas the region has weaknesses and on what the regional development strategy should be focused.

Keywords: Region, competitiveness, disparities, comparison, indicators of competitiveness.

1. Introduction

Currently the member states of the European Union are facing to increasing disparities in all regions and countries across the EU. The disparities can influence a level of worldwide production and competitiveness of the EU as a worldwide player in world economy.

"Europe has to renew the basis of its competitiveness, increase its growth potential and its productivity and strengthen social cohesion, placing the main emphasis on knowledge, innovation and the optimization of human capital. To achieve these objectives, the Union has to mobilize all appropriate national and Community resources – including the cohesion policy – in the Strategy's three dimensions (economic, social and environmental) so as better to tap into their synergies in a general context of sustainable development"[8].

During the last five years the history of the European integration tried and henceforth tries to meet two different objectives, namely to support the economic competitiveness and reduce regional disparities. The query is if is possible to follow the both of these targets at the same time. Competitiveness is important for economy of the Union and its enterprises. Herewith the Union has to take into consideration also other political targets – especially its cohesion policy intended on reducing of disparities.

2. Competitiveness

The notion „competitiveness" is usually used in relation to individual enterprises or persons and most often we can understand it the ability of a subject to assert its offer on a relevant market. Recently the notion „competitiveness" begins to be used in relation to particular regions as well.

The efficient analysis of competitiveness means to come out of the defined concept of competitiveness. In the case of the Czech Republic we can refer the problem of basic determination of competitiveness by reason of absence of unified approach to its definition. The competitiveness has become a „currently" used term in many specialized and nonfiction publications. The competitiveness of a state is hereat the basic measure of its efficiency, reflection of adaptability in globalization world and at the same time the mirror of national fruitfulness in international comparison.

We can find certain potentialities in approaches to its term basis, no however generally considered base, in the course of definition of regional competitiveness. It is possible to use

the definition of the European Commission or many foreign and also native institutions that deal with measurement of competitiveness.

The competitiveness is, therefore, defined here as „the ability to produce goods and services which meet the test of international markets, while at the same time maintaining high and sustainable levels of income." [2]. More generally competitiveness is defined as „the ability of companies, industries, regions, nations and supra-nations regions to generate, while being exposed to international competition, relatively high income and employment level." [2]

Kadeřábková [4] gives regional competitiveness to context especially of economic efficiency. Innovative efficiency and quality of life are the other components of competitiveness. Comprehensive approaches to the evaluation of competitiveness include the first group of structural indicators developed in response to the implementation of the Lisbon objectives. The second concept is based on the methodology of the World Bank with an emphasis on the pillars of knowledge economy in a healthy institutional framework. The evaluation is concluded by the results published in the Competitiveness Yearbook from World Economic Forum and International Institute for Management Development.

The well-known measurement of competitiveness represents World Competitiveness Yearbook. The competitiveness is evaluated according to this yearbook on the basis of 300 criteria. The economic efficiency of a state, the efficiency of administration and the infrastructure make up the group of factors. Further Porter [6] says that quality of corporate environment is influenced by factors of inputs that can be used by firms, next given rules, level of domestic demand, possibility of cooperation and its clustering. Further Skokan [9] includes in the main components of competitiveness as follows:
- industrial structure (specialization in activities with high added value, new products and services, clusters of related activities etc.),
- human resources (unemployment rate, education level, furnishings for training and education, adaptability of labour, entrepreneurial talent etc.),
- innovation (furnishings of research and development, firms based on knowledge),
- quality of living environment (attraction for activities of high level, quality of life, devastation of environment).

We can also use practices and analysis which are used in Global Competitiveness Yearbook from IMD Lausanne and Global Competitiveness Report from World Economic Forum. IMD analysis is based on four basic groups of factors described by extensive group of criteria (economic efficiency, government efficiency, business efficiency and infrastructure). World Economic Forum uses two basic areas of evaluation, the first of which refers to the evaluation of institutions and economic policies (three sub-indices of growth competitiveness for level of technology, the quality of public institutions and macroeconomic conditions) and the second refers to the microeconomic competitiveness index (sub-indices of the actual efficiency and the quality of companies and the quality of the business environment). World Economic Forum [7] defines competitiveness as the set of institutions, policies, and factors that determine the level of productivity of a country.

All the authors consider to be good that regions that show out good results (productivity, employment e. g. in the teeth of innovation etc.). Recently we can meet widening of these definitions by quality of life and to accentuation of total sustainable development.

The regional competitiveness can be measured or expressed by two basic ways. The first one consists in quantitative and qualitative description of individual components and their evaluation (technical infrastructure, accessability of acceptable areas or buildings,

qualification and wage heftiness, functioning of public sector, safeness, quality of living environment, civil facilities).

The second one is measurement of consequences, then economic level of region by complex of indicators (level of GDP, tax yield, unemployment rate, average incomes). We can usually obtain different results by using only one of these basic indicators. Practically, for example is not asserted following relation – the higher GDP, the lower unemployment.

The indicator GDP can be divided into partial factors, especially: productivity of labour, unemployment rate and proportion of population of working age to total population.

With the view of competitiveness of a region, it should reach both high level of productivity of labour, and employment. The both of these matters are dependent on offer of job opportunities. There is a very complicated relation between productivity of labour and employment. This relation can be interpreted as relation indirectly proportional in the simplest representation, so the higher productivity, the lower employment. We can meet this relation at level of firms, notwithstanding it is not so unique at the regional level.

We can generally claim that longtime reducing of competitiveness of states or their regions leads „only" to adequate reducing of living standard of their inhabitants.

3. Regional disparities

The disparity represents general marking for inequalities or variances. Generally we can speak about inequalities or variances caused by basic tendencies of society evolution. These tendencies are characterized by significant level of variability. The unstable development is then the effect.

Hučka [3] define disparity as variance, respectively inequality of characters, phenomena of processes, whose identification and comparison has some rational sense (identification, psychological, social, economic and political).

The notion „regional disparity" can be defined in the strict sense of the word as (according to [3]) as variance or inequality of characters, phenomena or processes that have definite territorial placement (is possible to allocate them in a determinate territorial structure) and that occur in two entities of this territorial structure. The authors themselves of this definition call attention to high level of universality and neutrality when is not fully evident if it is possible regional disparities to perceive in positive, or negative sense and if regional policy tries to reduce them.

The definition of regional disparities according to the OECD [5] connects regional disparities especially with economical phenomena when the notion „regional disparity" indicates a measure, by which intensity of a certain economical phenomenon distinguishes among regions within existing state.

We can differ several types of regional disparities by closer research:
- economical disparities,
- social disparities,
- territorial disparities.

Economical disparities represent variances in quality and quantity of a state and development of economical potential, demonstrative especially in regional output.

Social disparities are disparities in quality and quantity of state and development of human capital, demonstrative especially in incomes and living standard of population.

Territorial disparities are usually connected with geographical and natural conditions, demonstrative especially accessability of markets, education, services etc.

4. Indicators and measurement of regional disparities and economic competitiveness of regions

We particularly deal with competitiveness at the level of single regions because it is convenient to actively influence the size of regional disparities. Primarily, it is necessary to attend to the measurement of regional disparities. A quality of measurement and often also achieved results are subjects to selection and construction of indicators. In advanced economies regional disparities are most frequently measured by unemployment rate and the level of economic output (GDP) per capita. Slightly less often regional variability is measured through the level of entrepreneurial activity. The applicability of the particular characteristics depends among others on the availability of quality data by the regional classification.

As competitiveness is measured in this article by indicators of the European Union (see above), there will be examination of disparities in the term of these indicators as well.

The size of regional disparities is usually measured using the standard statistical indicators of variability rate. The most frequently used indicators are standard deviation and variation coefficient. Standard deviation is the radical of a variance. Variance is the average of square deviations of the particular character value from their arithmetic averages.

Variance:

$$Sd^2 = \frac{\sum (x_i - \bar{x})^2}{n} \text{ , where}$$

Sd^2 variance
Sd standard deviation,
x_i value of a character in the unit i,
$\bar{x}$ arithmetic average of character value,
n the number of monitored units.

Standard deviation:

$$Sd = \sqrt{Sd^2}$$

The variation coefficient (Vx) is expressed as a ratio of standard deviation and arithmetic average:

$$Vx = \frac{Sd}{\bar{x}}$$

For adequate illustration of regional variability rate, respectively, the importance of regional differences, it is appropriate to use both variability rates, ie. both the standard deviation and variation coefficient. Standard deviation is not a dimensionless number. It depends on the total level of the phenomenon in the country. The value of standard deviation does not express only variability rate but it can rise with the growth of the phenomenon in the country. By contrast, the variation coefficient is a dimensionless number and it shows only the value of variability (in our case of regional disparities). For that reason it is necessary to combine the two rates, especially by comparing the size of regional disparities between different regions. By comparing national differences according to different characteristics use of standard deviation does not have practical meaning and it is appropriate to use the variation coefficient.

5. Disparities and competitiveness in the regions of the Czech Republic

For the searching of the regional competitiveness and disparities among the regions of the Czech Republic administratively determination of regions was used. The regions are formed by 14 districts. The European Union approach was used to measuring of competitiveness of the single regions. This approach measures competitiveness through the indicator GDP per capita and further by decomposition of that indicator to productivity rate, employment rate and the portion of economically active population in the total population. Data were searched in the period 5 years. Values of particular indicators are presented in the following tables 1 to 4. The average values of each examined indicators were determined in terms of a weighted average. That average was achieved through the following relationship, where:

GDP_i gross domestic product of region i,
P_i total population of region i,
E_i of unemployed in region i,
EAP_i number of economically active people in region i,
i   = 1, 2, … n
values marked **.** represent the sum of examined variables.

$$\frac{\sum_i GDP_i}{\sum_i P_i} = \sum_i \frac{P_i}{P_{\bullet}} \cdot \frac{GDP_i}{P_i} = \frac{\sum_i P_i \cdot \frac{GDP_i}{P_i}}{P_{\bullet}}$$

and because $\dfrac{\sum_i P_i}{P_{\bullet}} = 1 = wP_i$,

it is possible to write down the previous relation as $\sum_i wP_i \cdot \dfrac{GDP_i}{P_i}$.

Analogous approach can be used in other ratio indicators:

$$\frac{\sum_i GDP_i}{\sum_i E_i} = \sum_i wE_i \cdot \frac{GDP_i}{E_i},$$

$$\frac{\sum_i E_i}{\sum_i EAP_i} = \sum_i wEAP_i \cdot \frac{E_i}{EAP_i},$$

$$\frac{\sum_i EAP_i}{\sum_i P_i} = \sum_i wP_i \cdot \frac{EAP_i}{P_i}.$$

Tab. 1: GDP per capita in years 2002 to 2006 (in thousands CZK)

	2002	2003	2004	2005	2006
Prague	514 789	532 496	567 322	612 369	661 696
Central Bohemia Region	184 047	192 454	261 927	269 273	285 239
South-Bohemian Region	214 440	224 819	246 474	261 321	283 831
Plzen Region	216 630	233 803	265 447	273 342	294 927
Karlovy Vary Region	192 822	201 892	214 022	220 077	240 147
Usti Region	192 487	208 310	226 869	236 627	253 563
Liberec Region	204 696	205 704	221 504	245 717	266 741
Hradec Kralove Region	214 936	230 060	247 421	255 889	273 779
Pardubice Region	199 735	214 239	231 243	240 244	257 429
Vysocina Region	206 153	216 239	232 063	243 793	265 328
South-Moravian Region	219 754	234 879	253 309	266 585	286 051
Olomouc Region	182 749	195 166	217 441	221 964	233 841
Zlin Region	189 510	207 349	219 599	235 576	254 412
Moravan-Silesian Region	184 349	197 123	225 308	248 241	270 316
Weighted average	234 861	248 120	275 642	292 075	314 824

Source: Czech Statistical Office, own calculation

Tab. 2: GDP per employee in years 2002 to 2006 (in thousands CZK)

	2002	2003	2004	2005	2006
Prague	982 525	1 019 537	1 100 961	1 167 702	1 250 840
Central Bohemia Region	378 181	398 507	545 154	561 727	586 865
South-Bohemian Region	448 593	473 605	519 764	544 080	589 119
Plzen Region	444 503	488 207	554 182	557 018	605 989
Karlovy Vary Region	402 044	418 489	455 620	464 932	511 373
Usti Region	440 922	484 109	520 171	544 346	575 756
Liberec Region	425 727	436 521	463 499	521 282	576 284
Hradec Kralove Region	447 218	490 101	539 592	544 940	572 462
Pardubice Region	433 376	465 150	507 973	515 761	548 345
Vysocina Region	445 317	470 761	504 540	530 965	565 163
South-Moravian Region	484 833	517 879	558 713	583 955	627 405
Olomouc Region	406 280	434 498	502 585	499 149	511 350
Zlin Region	427 080	457 525	485 528	529 547	547 956
Moravan-Silesian Region	434 431	474 469	542 496	582 009	629 392
Weighted average	502 993	535 279	598 035	627 133	669 340

Source: Czech Statistical Office, own calculation

Tab. 3: The portion of employed in economically active population

|	2002	2003	2004	2005	2006
Prague	0,9637	0,9581	0,9612	0,9650	0,9720
Central Bohemia Region	0,9509	0,9484	0,9461	0,9478	0,9546
South-Bohemian Region	0,9501	0,9483	0,9429	0,9498	0,9490
Plzen Region	0,9534	0,9468	0,9417	0,9493	0,9539
Karlovy Vary Region	0,9251	0,9363	0,9061	0,8907	0,8983
Usti Region	0,8725	0,8699	0,8555	0,8546	0,8629
Liberec Region	0,9527	0,9390	0,9363	0,9355	0,9234
Hradec Kralove Region	0,9582	0,9415	0,9341	0,9523	0,9461
Pardubice Region	0,9284	0,9240	0,9301	0,9436	0,9454
Vysocina Region	0,9490	0,9467	0,9315	0,9323	0,9468
South-Moravian Region	0,9239	0,9196	0,9166	0,9192	0,9204
Olomouc Region	0,9039	0,9045	0,8798	0,9001	0,9183
Zlin Region	0,9210	0,9246	0,9258	0,9056	0,9295
Moravan-Silesian Region	0,8669	0,8525	0,8545	0,8611	0,8802
Weighted average	0,9272	0,9222	0,9170	0,9208	0,9286

Source: Czech Statistical Office, own calculation

Tab. 4: The portion of economically active population in the total population

|	2002	2003	2004	2005	2006
Prague	0,5437	0,5451	0,5361	0,5434	0,5442
Central Bohemia Region	0,5118	0,5092	0,5079	0,5057	0,5092
South-Bohemian Region	0,5031	0,5006	0,5029	0,5057	0,5077
Plzen Region	0,5112	0,5058	0,5086	0,5169	0,5102
Karlovy Vary Region	0,5184	0,5153	0,5184	0,5314	0,5228
Usti Region	0,5004	0,4946	0,5098	0,5087	0,5104
Liberec Region	0,5047	0,5019	0,5104	0,5039	0,5013
Hradec Kralove Region	0,5016	0,4986	0,4909	0,4931	0,5055
Pardubice Region	0,4964	0,4985	0,4895	0,4937	0,4966
Vysocina Region	0,4878	0,4852	0,4938	0,4925	0,4959
South-Moravian Region	0,4906	0,4932	0,4946	0,4967	0,4954
Olomouc Region	0,4976	0,4966	0,4918	0,4941	0,4980
Zlin Region	0,4818	0,4901	0,4885	0,4912	0,4995
Moravan-Silesian Region	0,4895	0,4873	0,4860	0,4953	0,4880
Weighted average	0,5036	0,5026	0,5026	0,5058	0,5065

Source: Czech Statistical Office, own calculation

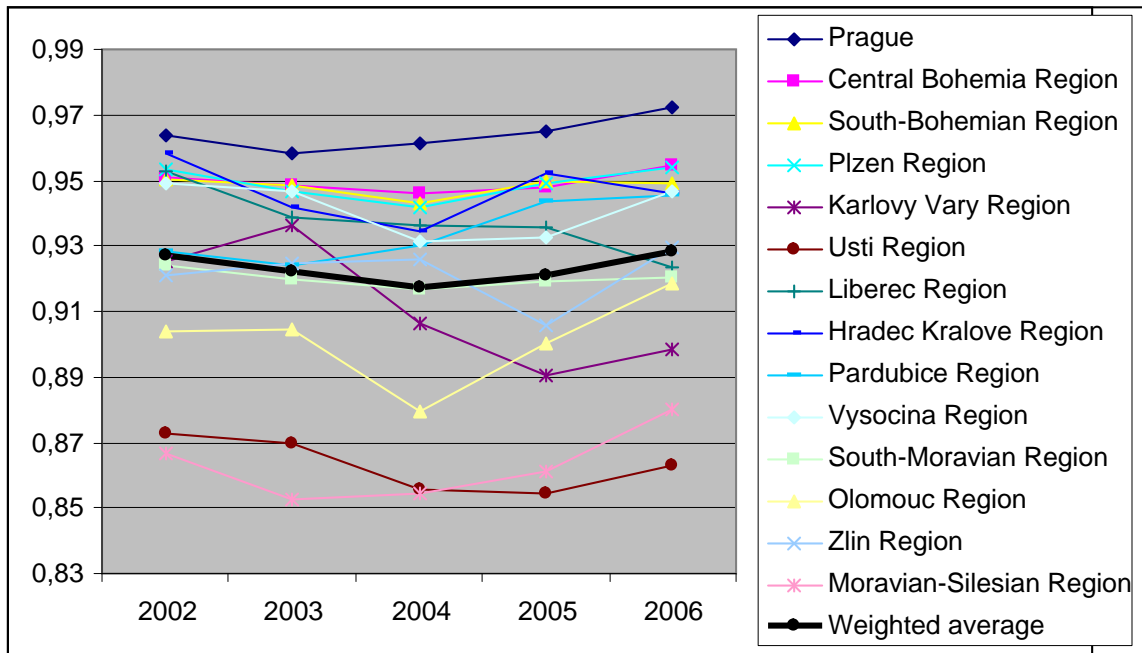For greater clarity it is possible to illustrate data from tables 1 to 4 in a graphic form on pictures 1 to 4.
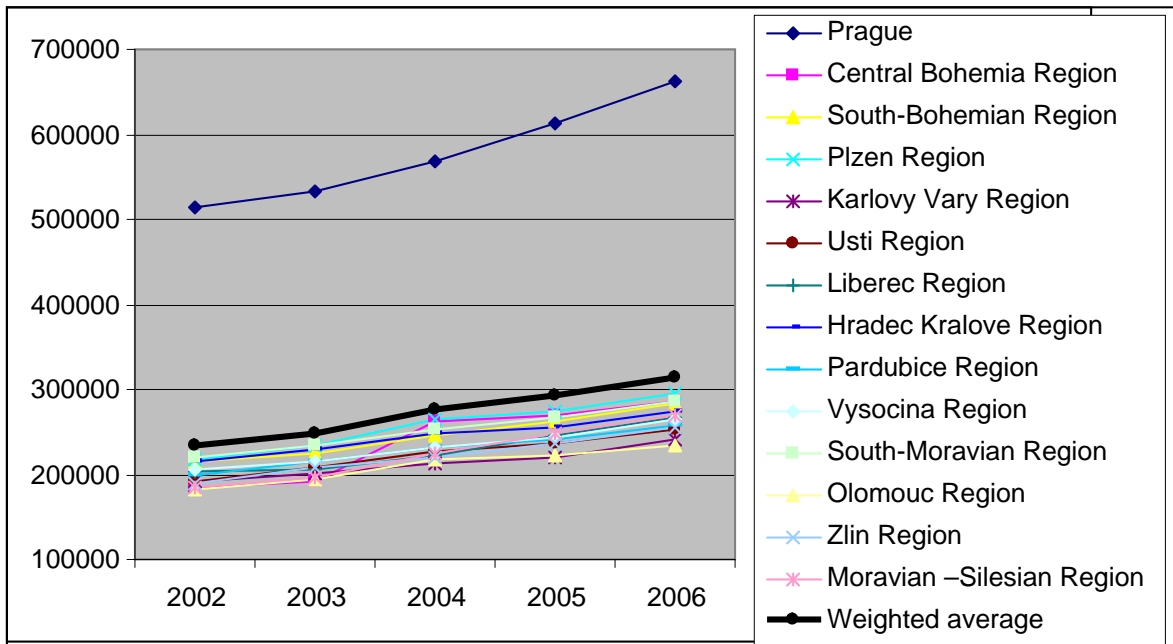
Source: own

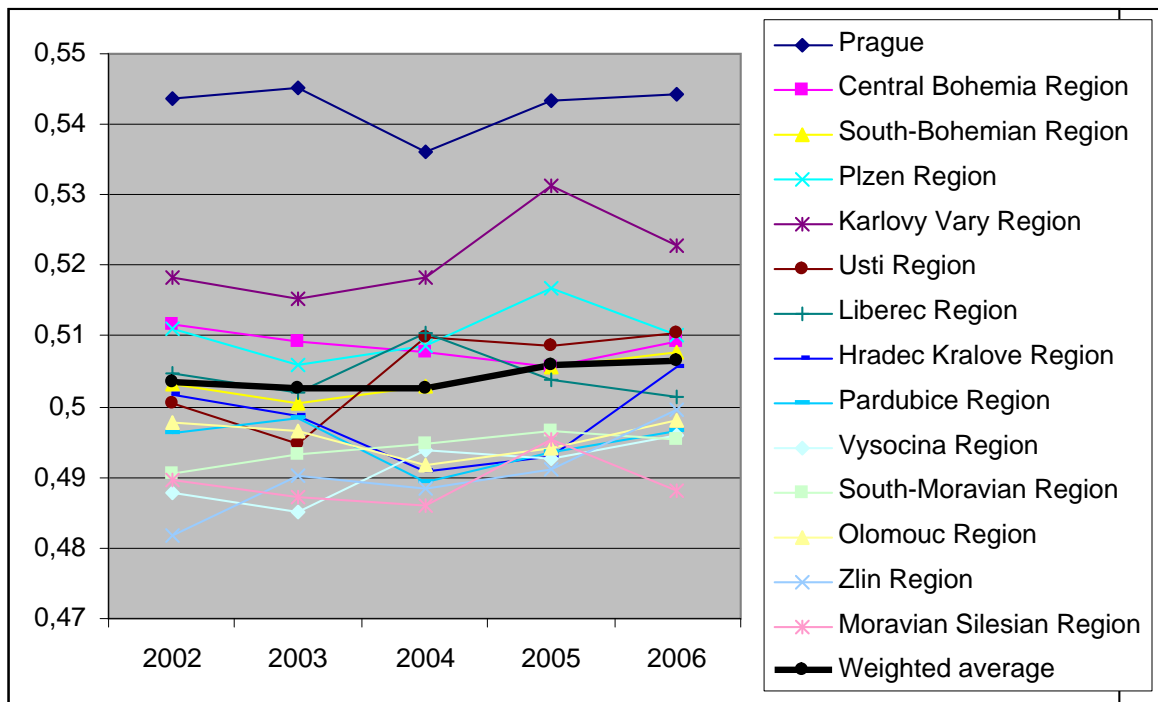**Picture 1: Development of GDP per capita for single region**
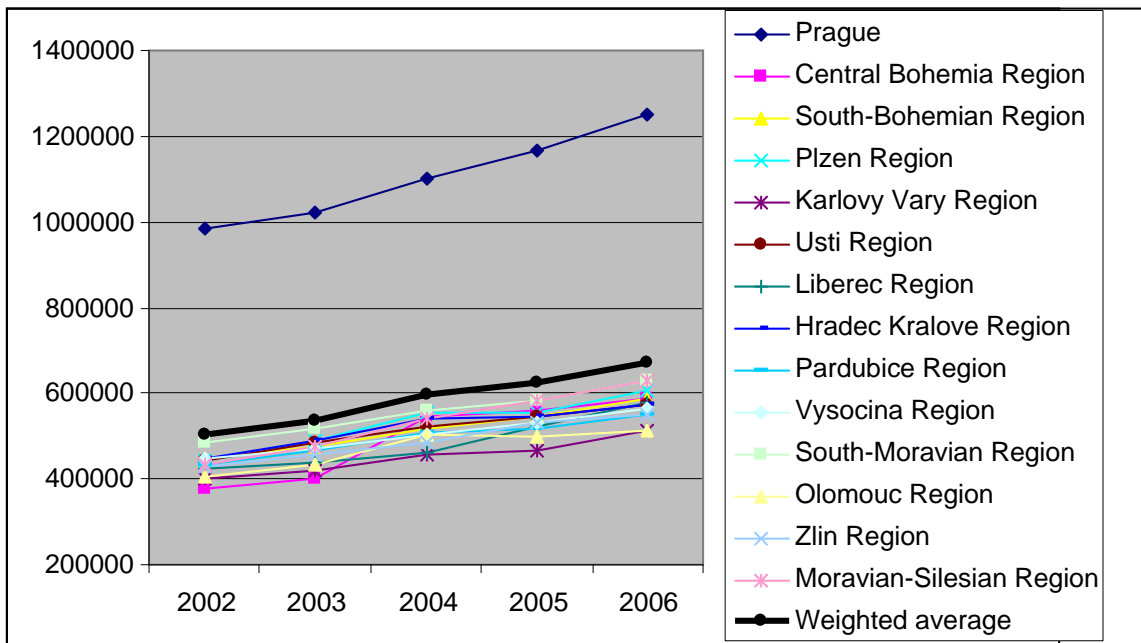
Source: own

Picture 2: Development of produced GDP in number of employed

Picture 3: The portion of employed in economically active population

Picture 4: Development of the portion of economically active population in the total population

From the above pictures can be concluded that in the past five years the competitiveness of Czech regions increased. The labor productivity had the largest contribution. The employment rate and the proportion of economically active population in the total population showed during the 5 years fluctuating trend.

By assessing of the competitiveness it is also necessary to take into account the fact that the amount of produced GDP per capita is influenced by the degree of interregional commuting to work. The centres of commuting achieve higher values of examined indicators.

For the evaluation of disparities among regions we are going to examine the statistical characteristics that were described in the previous chapter. Disparity will be examined in the context of absolute values (not relative values as in the case of competitiveness).

Tab. 5: GDP produced by single regions (in billion CZK)

	2002	**2003**	**2004**	**2005**	**2006**
Prague	597,670	619,8788	662,008	718,370	784,492
Central Bohemia Region	207,296	217,9985	298,308	309,287	331,990
South-Bohemian Region	133,991	140,623	154,181	163,629	178,400
Plzen Region	119,038	128,545	145,916	150,283	162,829
Karlovy Vary Region	58,618	61,476	65,063	67,090	73,122
Usti Region	157,762	170,939	186,273	194,821	209,041
Liberec Region	87,487	87,959	94,693	105,142	114,565
Hradec Kralove Region	117,976	126,152	135,420	140,036	150,207
Pardubice Region	101,238	108,524	116,838	121,365	130,295
Vysocina Region	106,787	111,947	120,038	125,677	135,618
South-Moravian Region	246,806	263,652	284,441	300,094	323,553
Olomouc Region	116,521	124,223	138,214	141,149	149,436
Zlin Region	112,493	122,937	129,796	139,067	150,102
Moravan-Silesian Region	233,072	248,746	283,574	311,712	337,926
Variance	16 786,10	18 032,45	21 282,29	25 256,89	30 135,24
Standard deviation	129,56	134,28	145,88	158,92	173,60
Arithmetic average	171,20	180,97	201,05	213,41	230,83
Variation coefficient	0,7568	0,7420	0,7256	0,7447	0,7521

Source: Czech Statistical Office, own calculation

Tab. 6: Employment in single regions (in thousands persons)

	2002	2003	2004	2005	2006
Prague	608,3	608,0	601,3	615,2	627,2
Central Bohemia Region	548,1	547,0	547,2	550,6	565,7
South-Bohemian Region	298,7	296,9	296,6	300,7	302,8
Plzen Region	267,8	263,3	263,3	269,8	268,7
Karlovy Vary Region	145,8	146,9	142,8	144,3	143,0
Usti Region	357,8	353,1	358,1	357,9	363,1
Liberec Region	205,5	201,5	204,3	201,7	198,8
Hradec Kralove Region	263,8	257,4	251,0	257,0	262,4
Pardubice Region	233,6	233,3	230,0	235,3	237,6
Vysocina Region	239,8	237,8	237,9	236,7	240,0
South-Moravian Region	509,1	509,1	509,1	513,9	515,7
Olomouc Region	286,8	285,9	275,0	282,8	292,2
Zlin Region	263,4	268,7	267,3	262,6	273,9
Moravan-Silesian Region	536,5	524,3	522,7	535,6	536,9
Variance	20 100,07	19 873,29	19 880,93	20 755,76	21 544,91
Standard deviation	141,77	140,97	141,00	144,07	146,78
Arithmetic average	340,36	338,09	336,19	340,29	344,86
Variation coefficient	0,4165	0,4170	0,4194	0,4234	0,4256

Source: Czech Statistical Office, own calculation

Table 7: Number of economically active population (in thousands persons)

	2002	2003	2004	2005	2006
Prague	631,2	634,6	625,6	637,5	645,2
Central Bohemia Region	576,4	576,8	578,4	580,9	592,6
South-Bohemian Region	314,4	313,1	314,6	316,6	319,1
Plzen Region	280,9	278,1	279,6	284,2	281,7
Karlovy Vary Region	157,6	156,9	157,6	162,0	159,2
Usti Region	410,1	405,9	418,6	418,8	420,8
Liberec Region	215,7	214,6	218,2	215,6	215,3
Hradec Kralove Region	275,3	273,4	268,7	269,8	277,3
Pardubice Region	251,6	252,5	247,3	249,4	251,3
Vysocina Region	252,7	251,2	255,4	253,9	253,5
South-Moravian Region	551,0	553,6	555,4	559,1	560,3
Olomouc Region	317,3	316,1	312,6	314,2	318,3
Zlin Region	286,0	290,6	288,8	290,0	294,7
Moravan-Silesian Region	618,9	615,0	611,7	622,0	610,0
Variance	23 826,61	23 950,75	23 679,18	24 468,71	24 645,95
Standard deviation	154,36	154,76	153,88	156,42	156,99
Arithmetic average	367,08	366,60	366,60	369,57	371,38
Variation coefficient	0,4205	0,4222	0,4197	0,4233	0,4227

Source: Czech Statistical Office, own calculation

Tables 5 - 7 show the measurement of regional disparities through various statistical indicators. The variation coefficient is used for further analysis to measure regional disparities. The development of regional disparities in time is shown in Figure number 5.

In the field of social disparities and their relation to competitiveness we can meet the various results. Social disparities are possible to be searched by means of human capital. This capital belongs namely among the key factors for regional development. Human capital includes in itself aspects, as are education, health, wealth and utility potential of individual persons. This capital comprehends both physical and mental health, education, motivation and working ability. These elements administer to economical development thanks to productive labour.

We can focus on one component of human capital in the following part of this article. The education indicator will be used as this component. The education is measured here by number of persons with university education. The concrete values for regions of the Czech Republic are displayed in table 8. The level of disparities is expressed here through the medium of variation coefficient as well.

Tab. 8: Number of persons with university education (in thousands persons)

	2002	**2003**	**2004**	**2005**	**2006**
Pratur	216,9	219	225,8	229,8	239,9
Central Bohemia Region	63,6	69,9	76,7	79,4	83,7
South-Bohemian Region	44,4	45,3	46,3	46,1	53,3
Plzen Region	39,3	37,5	42	39,8	41,4
Karlovy Vary Region	14,2	16,3	16,9	17,9	17,4
Usti Region	41,5	33,7	35,3	41,1	44,9
Liberec Region	25	26,2	23	28	28
Hradec Králové Region	36,7	38,5	38,3	40,2	49
Pardubice Region	31,36	33,67	33,47	39,2	39,25
Vysocina Region	29,8	31,9	32,1	35,4	37,5
South-Moravian Region	111,5	112,4	120	120,7	122,1
Olomouc Region	39	42,3	45,4	53,6	55,4
Zlin Region	81,3	84,2	84,3	89,7	96,6
Moravian-Silesian Region	39,1	40,7	42,5	46,2	46,2
Variance	2 349,08	2 391,68	2 588,01	2 600,41	2 805,29
Standard deviation	50,13	50,57	52,61	52,69	54,71
Arithmetic average	57,59	58,81	60,98	63,99	67,29
Variation coefficient	0,8417	0,8316	0,8343	0,7970	0,7871

Source: Czech Statistical Office, own calculation
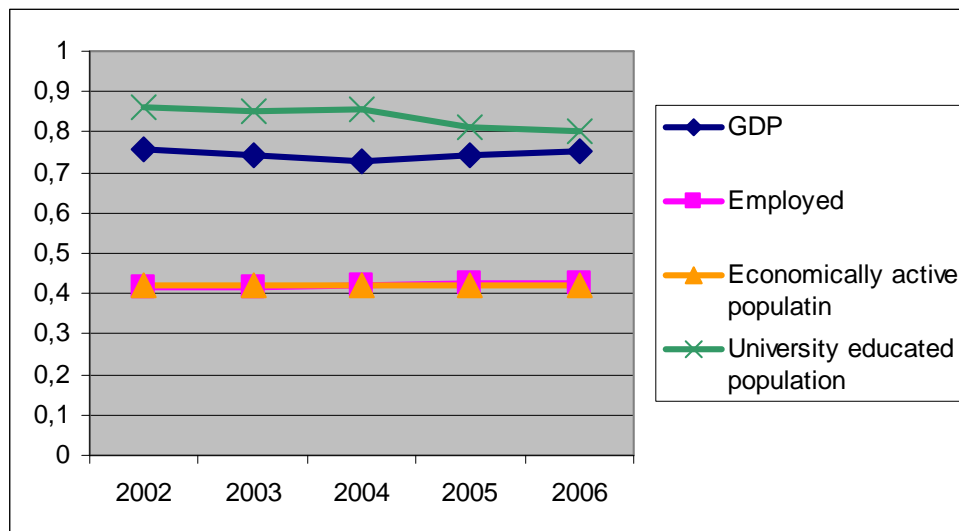
Picture 5: The trend of disparities in Czech regions

We can claim according to the performed analysis of relations between competitiveness and disparities that the raising of competitiveness entails also deepening especially of economical disparities among regions. The effort concerning their reducing so can threaten competitiveness of regions. Reducing of disparities is so evincible only with regard to cohesion of particular regions in terms of higher organization. Regional disparities can be on the other side also impulsive force of competitiveness.

6. Conclusion

The removing of disparities among regions and keeping of competitiveness are the main effort of the Czech Republic and the European Union. The query is the same if is possible to perform the both of these policies successfully at the same time. The analysis of relation between competitiveness demonstrated that growth of competitiveness is succeeded by deepening of economical disparities among regions. The reducing of disparities can lead to reducing desirable competitiveness. The policy of reduction of regional disparities relates to effort to ensure sufficient cohesion among regions within higher entity. In case of social disparities is not already surveyed relation so much transparent. The incidence of regional disparities on the other side can become a factor of competitiveness when these disparities take effect inventively.

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