



THE EVOLUTION OF REGIONAL DISPARITIES IN THE SLOVAK REPUBLIC

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Annotation

For the evaluation of regional development are commonly used the social, economic, ecological and demographic indicators. The aim of this paper is to assess the development of regional disparities between Slovak regions in the context of selected socio-economic indicators: the unemployment rate (%), regional GDP in PPS (at current prices, EUR), average nominal monthly wage (EUR), the number of trading partnerships per 1000 economically active population, density of highways and motorways and the expenditures on research and development (EUR). For assessing the regional disparities in the contribution we use the calculation of Coefficient of Variation and Gini coefficient. Observed period are years 2001 – 2013, depending on the data availability in regional databasis of Statistical office of the Slovak republic. For some indicators the observed period is until 2011 or 2012. The part of the analysis is the creation of correlation matrix between observed indicators and statistical significance of correlations is confirmed through the values of p-value. Based on the three types of regional typology, the output of the analysis is the ordering of the Slovak regions into the various categories.

KEYWORDS: region, regional disparities, indicators.

Introduction

The attention of economists on the issue of differences in socio-economic development of regions increasingly began to catch up in the context of the global economic crisis (30th years), especially after 2nd World War. As reported Pike, Rodríguez – Pose and Tomaney (2006), local and regional development has become an increasingly important activity for national as well as local and regional governments across the world since 1960s and 1970s. In the former socialistic economies the regional development has become a part of interest in the context of economic transformation conducted after 1990. In the Slovak Republic, the process of transformation was associated with the building of market economy on the principle of private property predominance. The system measures of economic reform in Slovakia have also influenced the overall level of regional development. In this context we can follow the deepening of regional disparities. The other factors that influenced the evolution of regional disparities were processes of globalization, the process of integration into the EU, changes associated with decentralization of public administration, strengthen of local self-government competencies, fiscal decentralization and many others.

According Habánik, Koišová (2011) regional disparities in the Slovak Republic are affected also by geography and potential of the region. Under these conditions the regions acquire the status of marginal or developing regions. Marginal regions are characterized by a low level of transport equipment, technical and social infrastructure; rapid aging of the population, but on the other hand, this region has a natural wealth.

The knowing the extent of regional disparities is important for the professional public, for plants operating

and people living in these regions. The level of development of the region affects their quality of life and long-term prospects and objectives. According Rajčáková (2009) the specific feature of the regional structure of Slovakia are spatially distinct and ever-widening regional disparities, which are the immediate expression of spatially differentiated economic and social level of regions. Dawkins (2003) defines region as a spatially contiguous population (of human beings) that is bound either by historical necessity or by choice to a particular geographic location. The dependence on location may arise from a shared attraction to local culture, local employment centers, local natural resources, or other location-specific amenities.

The object of this particular study is: the level of regional disparities in the Slovak regions.

The aim of the study is: to evaluate the regional disparities using selected measurement concepts.

The objectives of the study are:

- 1) to characterize regional disparities and the typology of regions through the theoretical point of view,
- 2) to explain using the measurement concepts of Variaton coefficient and Gini index.
- 3) to evaluate the correlation between the analyzed indicators of socio-economic development of regions.
- 4) to classify the regions of the Slovak republic into the three categories based on the results of analysis.

The methods of the study are:

- The paper builds on a literature review of main theoretical and methodological concepts,
- using of mathematical and statistical methods for calculations.

The novelty of the study: the paper has scientific contribution in the way that classifies regions of Slovakia into three categories. Basis for this classification consists

of results obtained by calculation of frequently used methods for measuring of regional disparities in the conditions of the Slovak republic.

Theoretical concepts

Before characteristic of regional disparities it is necessary to mention the concept of regional policy and regional development. Regional policy can be defined as a set of measures, developing and support activities, programs and trends undertaken by the government, local government and association of various interests from different sectors at local and regional level with aim to achieve economic development. According OECD (2013) the regional development is a broad term but can be seen as a general effort to reduce regional disparities by supporting (employment and wealth-generating) economic activities in regions. Grmanová (2012) pointed out, that all three terms are in close relationship and are linked to each other.

The attributes of regional policy are: to reduce disparities between the levels of development in different parts of the region, to promote economic and social development, ensuring a better quality of life and ensuring the sustainable development of the region. The reasons for implementation of regional policy are mainly the growing regional disparities.

In various national and foreign scientific and professional works in the case of regional development, the regional disparities are interpreted as different degrees of social and economic development, that create the inequalities between the compared units. Regional disparities represent the measurable differences in the development of bounded regions (units) characterized by a set of indicators. Disparities can have social and economic nature, or they can be understood more widely, such as spatial inequality, geographical, political, social, ecological, and many more. The character depends on the research area. The disparities can be negative as well as positive.

Habánik and Koišová (2011) identify three types of regional disparities: 1. social (average wage, unemployment, education level and life expectancy), 2. economic (GDP, GDP per capita, labour productivity, average wage, unemployment, education level, life expectancy, transport infrastructures), 3. ecological (drainage, water, air pollution). Rehák, Černěňko, Buček, Tvrdoň (2013) use the classification structured into three dimensions: 1. economic (business, employment, productivity, creativity, high-tec), 2. social (education, crime, long-term unemployment, participation, poverty), 3. the infrastructure and public services (education, health, social services, transportation, internet).

The reached level of regional development in these areas is evaluated through statistical indicators. Based on the results, the regions could be divided into the several groups. According Novotná (2007), the structural indicators approved by European Commission in 2003 are divided into the following areas: overall economic environment, employment, innovation and research, economic reform, social cohesion, environment.

In the professional and economic literature we can find several classification of region. Selection of

universal criteria for the level of regions assessment in this paper is based on a comparison of the two key approaches to the classification of regions with the results of methodology of Rehák, Černěňko, Buček, Tvrdoň (2013). First is the classification of regions based on regional competitiveness according Martin (2003) who differentiates three types of regions: production sites, knowledge hubs, sources of increasing returns, based on two criteria – the density of population, gross domestic product per capita. Second is the classification of regions according Tödtling and Tripple (2004) who on the basis of innovation performance distinguish between metropolitan regions, economic regions core and peripheral regions. The compared classification is the classification of Rehák, Černěňko, Buček, Tvrdoň (2013) based on development index. For assessing the level of development of regions is selected 15 indicators, divided into the 3 dimensions - economic, social and infrastructure dimension. Consequently, the regions are ranked by level of development – above average, average and below average.

Methodological base

As stated Ivanová 2013, the primary condition for solutions (eliminating) of regional disparities is to quantify their level. To address the problem, it is necessary to know the methodologies that allow us to obtain relevant information on the extent of regional disparities. For measuring of regional disparities a lot of methods exist that present interesting properties. As stated Michálek (2012) methods used for the measurement of regional disparities can be divided into several groups:

- simple indirect methods (point method, scaling technique - semaphore),
- simple comparative methods (method of static and dynamic regional comparison),
- spatial degree of polarization (range (ratio) data file, the relative size of a data file, standard deviation, coefficient of variation),
- tools of spatial arrangement and concentration (coefficient of concentration, Herfindahl index of geographic concentration, The coefficient of localization, Gini coefficient, Lorenz curve, elementary rate of entropy, Theil index, Hoover index),
- the methods of convergence (sigma convergence, beta convergence),
- comprehensive methods and tools of regional disparities (regression, multiple models, factor analysis, cluster analysis, time series analysis, etc..)

Most of these methods used OECD, World Bank, EU and other institutions. For measuring of regional disparities, we used the method of the Coefficient of variation (CV) and Gini index (Gini).

Coefficient of variation (CV) is used for measuring of regional disparities in works of Monfort (2008), Huang and Leung (2009), Matlovič, Matlovičová (2005). CV is adopted to measure the degree of regional inequality. As stated Habanik, Hostak, Kutik (2013) the formula of CV is

$$CV = \frac{\sqrt{\frac{\sum_{i=1}^N (y_i - \bar{y})^2}{N}}}{\bar{y}} \quad (1)$$

Where: CV – the coefficient of variation, y_i – the indicator for region i , N – the number of regions, $\bar{y}$ – the mean of indicator.

Gini index (Gini) is one of the widely used measures of regional disparities. Consistent with OECD (2011) methodology unweighted Gini index is defined as:

$$GINI = \frac{2}{N-1} \sum_{i=1}^{N-1} |Fi - Qi| \quad (2)$$

Where: $Fi = i/N$ and $Q_i = \left(\sum_{j=1}^i y_j / \sum_{i=1}^n y_i \right) \Bigg| \quad (3)$

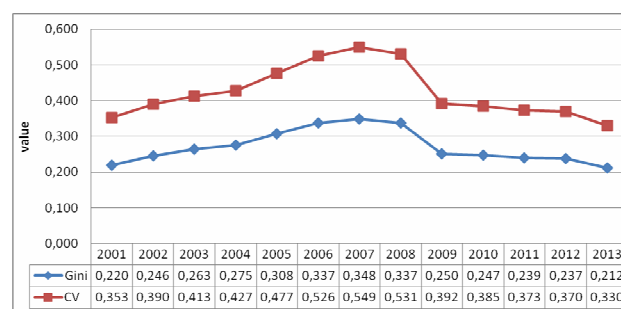
N – the number of regions, y_i is the value of variable y in region j . The index ranges between 0 (perfect equality: y is the same in all regions) and 1 (perfect inequality: y is nil in all region except one).

Data, results and discussion

The Slovak republic consists of 8 self-governing regions (Bratislava - BA, Trnava - TT, Trenčín - TN, Žilina- ZA, Banská Bystrica - BB, Nitra- NR, Prešov - PO, Košice - KE) and comprises the area of 49035.56 km². The population in 2012 was 5410836 inhabitants and a population density was 110.3 inhabitants per km². In Slovakia there are several industries with long traditions, such as engineering, chemical, electrotechnical engineering, wood processing and food industry. There are 164771 enterprises, of which around 99% are small and medium sized enterprises. According to data of Statistical office of the Slovak republic in 2013, the GDP growth rate (constant prices, year on year change) was 1.5% (72134 mil. Euro) and unemployment was 14.2 % (386 thousands persons).

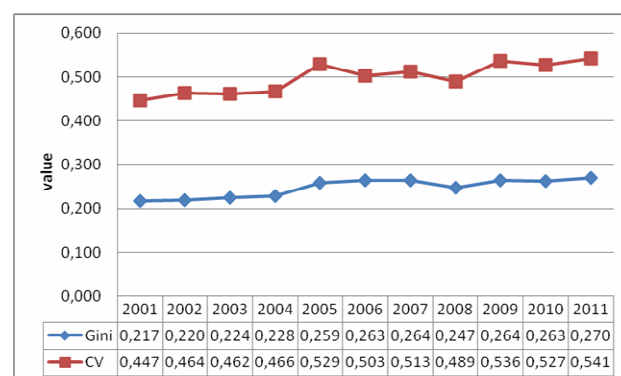
The evolution of the **unemployment rate (UR, %)** within the observed period in Slovakia had a variable character with a declining trend. The unemployment rate dropped from 18,5% in 2001 to a level of 13.5% in 2013. The highest unemployment rate in 2013 was registered in regions of Prešov (23,96%), Banská Bystrica (23,59%) and Košice (25,55%), the lowest in the Bratislava region (5,79%). The CV and the Gini (1 Figure) indicate regionally differentiated development of unemployment. The CV increased from a level of 0.3532 in 2001 to level 0.5488 in 2007. Gini increased from 0.2198 to 0.3483. Since 2008 there has been a decline in regional disparities. In 2013, the CV shows the value of 0,3295 and 0,2120 on the Gini index. Median of CV is 0,3924 and Gini 0,2589. The decline in the unemployment rate between 2001 and 2007 was affected by: the continuing process of restructuring in some sectors, FDI inflows, reforms in the field: of pensions, tax, social benefits, labor market, health care, public finance and fiscal decentralization, change in the system of active policy labor market, the new social law, privatization and many more. The growth of unemployment in the next period

was mainly influenced by the global crisis and a decline in foreign demand.



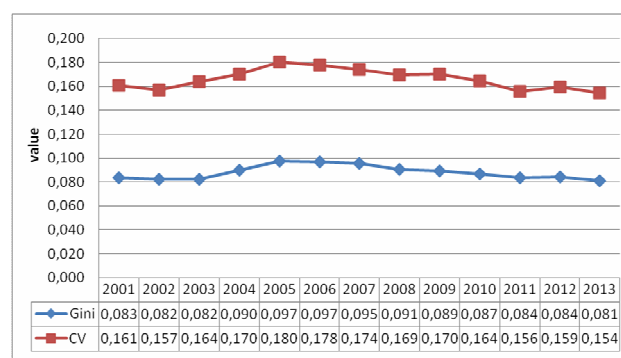
1 Figure. The unemployment rate (%)

The overall trend of **regional GDP in PPS (RGDP, EUR)** evolution had until 2008 the upward trend, when regional GDP in PPS reached 18090,70 mil. EUR what represents an increase in comparison with year 2001 (74.48%). A slight decrease occurred between 2008, 2009. During the next period the development of the indicator has the upward trend (10.77%). Regional GDP in Bratislava and Trnava region during observed period was above the Slovak national average. The CV and the Gini (2 Figure) indicate an increase in disparities between regions. The deepening of regional disparities occurred in 2009 mainly due to the financial crisis. The median of CV is 0,5029 (in 2006) and Gini 0,2589 (in 2005).



2 Figure. Regional GDP in PPS

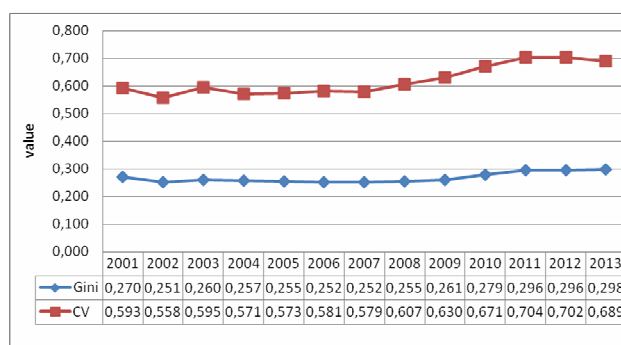
Indicator of the **average nominal monthly wage (NMW, EUR)** had increasing trend throughout observed period, both at national level and in individual regions. In 2013, the average wage in Bratislava region (1049 EUR) compared with the average in Slovakia (824 EUR) was higher by 27.31% and in comparison with the Prešov region (the lowest average of 636 Eur) up to 64.94%.



3 Figure. The average nominal monthly wage (EUR)

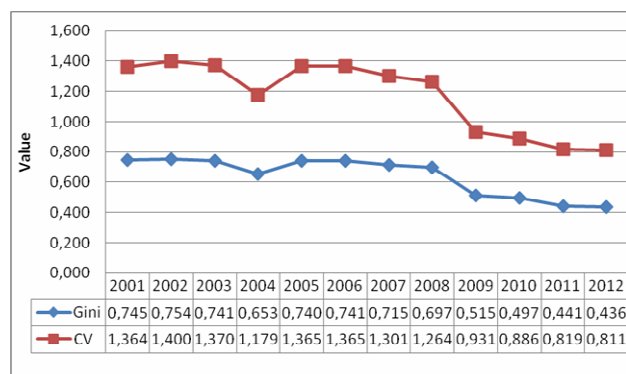
CV and Gini index (3 Figure) point to the variable character of regional disparities development. The most substantial regional differentiation was recorded in 2005. The median of CV is 0,1643 and Gini 0,0869.

When evaluating the proportion of the number of trading partnerships per 1000 economically active population (TP/1000 EAP, number), we can observe a growing trend at the level of the SR within the observed period. In some regions (Bratislava, Košice, Trenčín, Prešov) we can watch the decline of this indicator between 2001, 2002. In 2013 in Slovakia was accounted for 1,000 economically active population 89109.86 trading partnership, representing an increase of 153.96% (2001). Bratislava region exceeded the national average by 101.13% and Presov Region by 624.17%. CV and Gini (4 Figure) point to increasing regional disparities after year 2007. The median of CV is 0,5950 and Gini 0,2602.



4 Figure. The variable proportion of trading partnerships per 1000 economically active population

One of the basic conditions for localization of large manufacturing firms, mobility of people, goods and services, according Rehák, Černěňko, Buček, Tvrdoň (2013) is quality of infrastructure represents by **density of the highways and motorways (DHM, km/1000 km²)**. They calculated this indicator as a share of the highways and motorways length and region area. As follows from the calculation of CV and Gini (5 Figure), observed density of highways and motorways is dynamically developing.

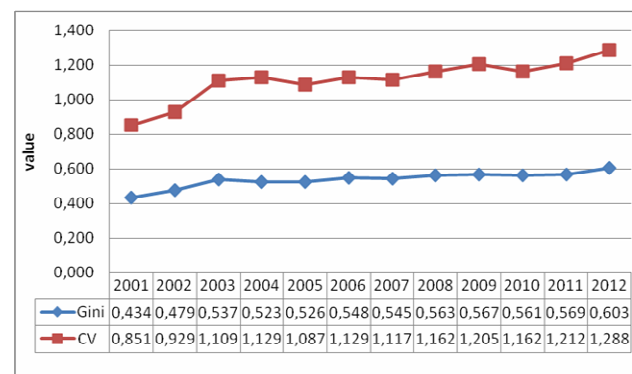


5 Figure. Density of highways and motorways (km/1000 km²)

According Masárová and Šedivá (2013) for the period 2000 – 2012, the length of motorways increased by 136.8 km (46.3%). The largest increase was recorded in the category of highways, whose length increased more than 8-times, which represents an increase of 221.3

kilometers. The median of CV is 1,2825 and Gini is 0,7062

The last evaluated indicator was **expenditure on research and development (R&D, EUR)**. In Slovakia, the expenditure on research and development in the observed period grew by 172.63%. The highest increase was in Košice Region (383, 02%) and in Bratislava region (274,44%), the lowest was recorded in the Trenčín Region (4,43%). Long-term economic growth is associated with the ability to bring innovative products and services to the market. A necessary condition for the formation of innovation is currently promoting of R&D. Kordoš (2013) draws attention to the fact that most fundamental research is done at universities and in national research institutes. Krajňáková and Vojtovič (2012) argue, that firms play a primary role in applied R&D – that is research, that can be directly applied in new goods and services, together with process and product development actually to bring these new goods and services into market. In the evaluation of regional innovation performance, as partly confirmed from analysis, most of the Slovak regions are still behind the national average. CV and Gini pointed to increasing regional disparities (6. Figure). The median of CV is 1,128763 and Gini 0,5469.



6 Figure. The expenditure on research and development (EUR)

The correlation matrix of selected socio-economic indicators

Among the indicators of socio-economic development, we surveyed a statistically significant dependence using the correlation matrix, based on methodology of Šipikal, Rehák, Labudová (2010). The table contains in addition to the pairwise correlation coefficients (1st row) and values of p-value (2nd row), based on which we can decide on the statistical significance of the correlation coefficient. Many authors indicate $P < 0.05$ as statistically significant and $P < 0.01$ as statistically highly significant relationship. P value pointed to statistically highly significant relationship between unemployment rate and average nominally monthly wages ($P=0,001$), and between regional GDP and expenditures on R&D ($P=0,003$), where coefficients of correlation represent positive correlation dependence. The statistically highly significant relationship is between density of highways and motorways and the number of trading partnerships per 1000 EAP, but it is the indirect dependency.

The correlation between trading partnerships/1000 economically active population and unemployment rate is

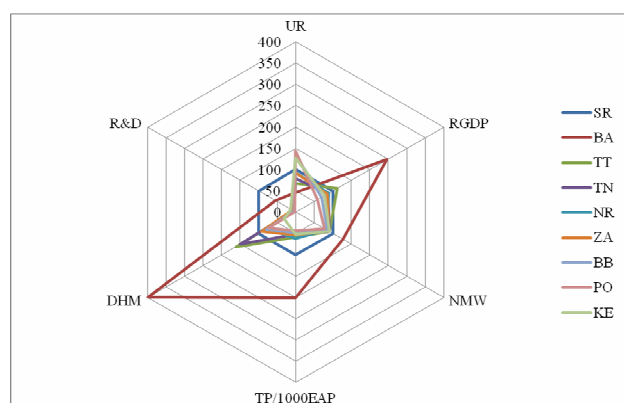
statistically significant ($P = 0,048$), but the correlation represents negative, indirect dependency.

1 Table. Correlation matrix of selected socio-economic indicators (2001 – 2011)

	UR	RGDP	NMW	TP/1000 EAP	DHM	R&D
UR	1	0,394 0,225	0,835 0,001	-0,595 0,048	0,409 0,205	0,405 0,211
RGDP	0,394 0,225	1	0,560 0,067	0,279 0,402	-0,566 0,064	0,783 0,003
NMW	0,835 0,001	0,560 0,067	1	-0,502 0,110	0,238 0,447	0,349 0,288
TP/ 1000 EAP	-0,595 0,048	0,279 0,402	-0,502 0,110	1	-0,786 0,003	0,190 0,572
DHM	0,409 0,205	-0,566 0,064	0,238 0,447	-0,786 0,003	1	-0,575 0,059
R&D	0,405 0,211	0,783 0,003	0,349 0,288	0,190 0,572	-0,575 0,059	1

Conclusions

The results of analysis show, that most developed region is Bratislava region. Evaluated indicators in this region are above the national average. The results are also documented by the following graph. In the Bratislava region is the highest concentration of production with high added value. Region is located close to the other significant prosperous cities such as Vienna or Győr. It is characterized by high mobility of the workforce that comes from another region and other related agglomeration factors. Trnava region dominates as social as well as economic area. Trenčín region has a relatively high density of highways and motorways, relatively low rate of unemployment. Žilina region is better fitted with transport infrastructure and there is registered a higher average wage. Prešov and Banská Bystrica regions show a high unemployment rate and low rate of regional GDP. In the rest of indicators in the Nitra, Žilina, Banská Bystrica show similar values. The position of regions presents following Figure (6 Figure).



6 Figure. The position of Slovak region in individual indicators (2011)

Based on the results of the Slovak regions analysis we can divide these regions into 3 groups. 1. dynamically developing regions (Trnava, Trenčín), 2. moderately fast growing regions (Žilina, Nitra) and least developed regions (Banská Bystrica, Prešov, Košice).

The 2 Table presents comparison of three typologies of regions and it is complemented by the results of this analysis.

2 Table. Comparison of regional typologies

Authors	Classification		
Martin (2003)	Production sites KE, PO, BB, NR	Knowledge hubs BA	Sources of increasing returns TT, TN, ZA
Tödtling and Tripple (2004)	Metropolitan regions BA, TT	Economic regions core TN, ZA, BB, NR, KE	Peripheral regions PO, BB,
Rehák, Černěňko, Buček, Tvrdoň (2013)	Above average BA, TT, TN	Average ZA, KE	Below average NR, BB, PO
Own classification	Dynamically developing regions TT, TN,	Moderately fast growing regions ZA, NR	Least developed regions BB, PO, KE

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