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ANALYSIS OF REGIONAL DEVELOPMENT IN THE SLOVAK REPUBLIC USING SELECTED METHODS OF MEASURING REGIONAL DISPARITIES

The aim of the paper is to assess regional disparities within the Slovak Republic with focus on the market concentration that is used to determine the competitiveness of the market. Following the main research aim the regional structure of Slovakia in the light of the selected socio-economic indicators was examined. The most relevant indicator in terms of research carried out is the GDP/capita, the appropriate indicator of socio-economic development in the region. Following step presents the Herfindahl-Hirschman Index (HHI), a measure of market concentration, examining the GDP of regions. The paper focuses on the application of 3 methods used for measuring regional disparities such as variance, standard deviation and coefficient of variation. In accordance with the gained results based on the analysis of RGDP in Slovakia, it can be concluded that the regional disparities between the regions of Slovakia and Bratislava region are gradually disappearing. The obtained data shows that disparities among regions are decreasing, while the decrease was faster during certain years. In 2016 a divergence of disparities can be observed. This year shows a significant divergence, e.g. Trnava region (-0,7217), Nitra region (-0,6243), Banská Bystrica region (-0,2565), Prešov region (-0,4498), which reflects deepening regional disparities compared to Bratislava region. However 2018 recorded values ex-

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pressing the relationship $m > 1$ (gradual elimination of regional disparities) between the regions - region of Trnava, region of Trenčín, region of Prešov.

Keywords: *Herfindahl-Hirschman Index, regional GDP, regional development, Slovak Republic*

1. INTRODUCTION

The main aim of the paper is to focus on new issues in order to reflect on the correlation of topics contributing to evaluation of regional disparities within the Slovak Republic and the market concentration that is used to determine the competitiveness of the market. As a first step, we examine the regional structure of Slovakia in the light of the selected economic indicator. The most relevant indicator in terms of research is the GDP/capita adjusted by inflation, the appropriate indicator of socio-economic development in the region. We suppose convergence of regional disparities region of Bratislava and the other regions of Slovakia in terms of GDP/capita. This step is followed by the presentation of the Herfindahl-Hirschman Index (HHI)- of market concentration. The most frequently used methods for measuring regional disparities include standard deviation, coefficient of variation, Lorenz curve, Theil Index, Gini Index, Atkinson Indexes and cluster analysis. This paper introduces of the selected methods descriptive statistic such as variance, standard deviation, coefficient of variation. The processed analysis is presented to the reader in the survey results.

The structural economic problems today are those that are not merely due to the normal business cycle, but are the result of more fundamental changes, some of which may be economic, social, political, etc. Structural problems are typically caused by a combination of the following: long-term effects of technological change, unfavourable demographic changes, resource depletion, unwise government action and market saturation. Saturated markets initiate the operation of recently discovered yet for a long time operating problematic economic paradoxes: the paradox of growing returnability and the paradoxes of debt and leverage trap. These paradoxes occur exclusively in the saturated markets and cause the majority of economic problems including overproduction, economic bubbles and cyclic economic development (Girdzijauskas, Streimikiene & Mialik et al., 2012).

The imbalanced development of standard of living in different regions of Slovakia is a reason to ask why the gap is widening between the above-mentioned regions¹,

¹ The analysis has been elaborated on regional level NUTS3, and thus the concept of region refers to county in Slovakia

especially between the eastern and western part of Slovakia (Oláh, Hajduová, Lacko & Andrejovský, 2020). We can observe significant regional disparities in GDP (Rafaj, Strazovska & Sulikova, 2017). The lowest GDP in long-term was detected in the regions of Prešov and Banská Bystrica. The highest unemployment rate in the Slovak Republic was also recorded in the above mentioned regions. Therefore, it is important to know, what generates GDP growth in different regions of Slovakia (Ostrihoň & Ivaničová, 2015; Nosková & Peráček, 2019). The regional disparities have long been one of the most important issues addressed by different scientific disciplines including the regional geography (Korec, Ondoš & Rusnák, 2016). According to the work of Michálek (2014), regional disparities as a special group of disparities focus on the research of inequalities between the determined territorial units and regions. The concept of disparity, in contrast to more general term of difference, refers to those characteristic features of regions that have a precisely determined social value content, most often economic and social. It is clear that the long-term, enormous regional disparities have destabilizing effect, and most of the developed states introduce regional, sectorial and other policies to reduce this disparity. However, it is appropriate to comment on the interpretation of the existing regional disparities. Politicians as well as experts from different fields of science tend to overexpose the issue of existing regional disparities. Typical example of such an incorrect interpretation is to emphasize and criticize the large disparities between region of Bratislava and other regions of Slovakia (NUTSIII regions) as well as on the level of four areas (NUTSII), (Korec & Rusnák, 2016).

Some authors recommend the use of the concept regional disparity whenever the disparities of the evaluated social phenomena are significant, already pose a threat of social unrest and at the same time it is not possible to eliminate these disparities autonomously in the 258 regions (Hučka, Kutscherauer & Tománek, 2008; Kotulič & Marchevská, 2017; Korec et al., 2016; Jašková, 2019; Hajduová (2020); Štefko, Bačík & Gburová et al. 2015).

2. LITERATURE REVIEW

Regional disparity is a relatively frequently used term however the scientific literature associates different meaning with the term. Disparity is generally understood as inequality, difference, heterogeneity or difference (Víturka, 2010). The analysis of regional development and regional disparities as well as the phenomenon of spatial polarization has become very popular in Slovakia in the recent years. Many authors have already addressed the issue (Lietava & Fáziková 2018;

Jašková & Havierníková, 2020). Several works have been published, emphasizing the interdisciplinary approach to the issue (Mazák, 2018).

The empirical studies were followed by several theoretical and methodological work (Kováčik & Mariš 2014, Fazekašová, Angelovičová, Semancová & Torma, 2014; Huttmanová, Adamišin, Hronec & Chovancová, 2015; Adamišin & Vavrek, 2015; Lazíková, Lazíková, Takáč, Rumanovská & Bandlerová, 2019 or Hasan, Popp, & Oláh, 2020). In addition to domestic scientific work, the foreign scientific contribution is also widely used regarding the issue (Filipishyna, Bessonova & Venckeviciute, 2018; Mishenin, Koblianska, Medvid & Maistrenko, 2018; Kendiukhov & Tvaronaviciene; 2017, Pavlova & Šenfelde, 2017; Atkociuniene & Kiausiene 2017; Milovic & Jocovic, 2017).

According to Matlovič & Matlovičová (2011), the issue is significantly relevant in Slovakia as well. This is because deepening regional disparities in Slovakia have not stopped. It may potentially lead to an increase in sensitivity the issue is perceived by the residents of regions lagging behind. The cumulative effect of financial and human capital flight can lead to deepening problems of the regions lagging behind as well as might result in decreasing endogenous potential. This may negatively affect their absorption capacity in case of potential future development impulses. These regions are at a risk of weakening resilience, they might gradually lack behind with weakening confidence of residents. Restarting regional development might be more expensive than early prevention of the problems.

Individual authors assessing the business environment at a lower regional level explore different aspects of regional competitiveness (Kotiková, 2018). One of the methods of effective management is the use of strategic planning that represents a very important tool for development of regions. An integral part of strategic planning is to create individual projects through which strategic objectives are subsequently carried out. While the lifespan of the process of change depends on a plethora of factors such as social and political ones, the factorial core of the change always depends on identity, institutions and traditions determined by the historical evolution of a certain region. The current rise in economic polarization maintains an increased interest in the social and ethical dimensions of the economy (Antošová, Šilhánková & Wokoun, 2017; Barna & Maniu, 2016; Albescu & Maniu, 2017).

Disparities between the regions are determined by their different conditions. The effective allocation of resources is ensured by market mechanisms, but the forced state intervention into this mechanism is undesirable (exemption is formed by ensuring the legal framework of market functioning, maintaining the law enforcement, free access to information and the suppression of cartels). There is a second group of divergent theories based on Keynesianism and Neomarxism. These expect a long-term imbalanced economic development and state intervention is required to decrease the regional disparities (Koraus et al., 2017). The pro-

cesses of economic convergence observed in many developing countries are characterized by reduction of economic disparities on cross-country level, which are accompanied by growing internal economic inequalities. This may stem from the fact that in catching-up countries a more dynamic growth pattern is observed in the economically strong regions, which is initially reflected in spatial polarization and increasing regional inequalities. However, just as the countries reach higher levels of development, the diffusion of growth-inducing impulses to less developed areas should lead to spatial equalizing of the development levels and reduction of regional inequalities (Blažek & Uhlíř, 2002). According to Ferreira & Dionisio (2016), the main conditions affecting convergence are the government consumption ratio (lower levels will increase convergence) and the education level and life expectancy (both with positive influence on convergence). The first two conditions show quite interesting results: reduction of government expenditure and budget constraints are an open debate; the European Union's aim to become a more competitive economy can only be maintained with higher levels of education.

According to Zajkowski & Domanska (2019), there is a difference in perception of regional pro-entrepreneurial institutions and businesses that obtained or did not obtain support. The role of entrepreneurs and support institutions as one of the main actors of regional entrepreneurship ecosystem was underscored. Regional development is a crosscutting theme that is addressed on various levels, e.g. public administration, service facilities and bottom-up processes. Its effectiveness lies on multiple levels of scale ranging from goals determined by the EU to local projects (Heintel, Wanner & Weixlbaumer, 2018; Tóth & Mura 2016).

Spatial divergence on global level as well as the increasing regional disparities in individual countries present a significant problem. Addressing this issue requires theoretical knowledge, the knowledge of methodology and concepts. Successful solution to achieve decrease of regional disparities lies in access to relevant knowledge. The appropriate knowledge and orientation among the methods that might result in different results is necessary to quantify the level of disparity and have an access to exact results. Determining the level of regional disparities and the spectrum of applied methods measuring spatial and regional disparities, especially the socio-economic disparities of the regions is numerous (Michálek, 2012; Mura, Gontkovičova, Dulová, Spišáková & Hajduová, 2019; Poór, J., Engle, A.D., Ádám Kovács, Á., Albrychiewicz-Slocinska, A., Caha, Z., Kumpikaite-Valiuniene, V. & Horbulák, Z., 2020; Rumanovská, Lazíková, Takáč, Bandlerová & Lazíková, 2018).

The existing theoretical and practical processes dealing with RD analysis show that there is not unanimous opinion among the professionals, which criteria to use in order to define regional disparity and which indicators resp. methods to use to describe and evaluate them. Each author chooses an approach based on scientific focus and the pre-determined objectives (Hamada, 2013).

One of the basic indicators of evaluation of the R&D level in country is an indicator reflecting the share of gross domestic expenditure on R&D in the country's GDP. Delic & Dumancic (2016) confirmed that financial development has a significant impact on the economic growth. The size of monetary aggregates divided by GDP and the share of allocated loans in the total banking assets, displayed a positive impact on stimulating the economic growth. Androniceanu, Gherghina & Ciobănașu. (2019) observes the issue of the role of fiscal public policies.

Authors investigated commuting of people to work as an indicator which can also show economic strength of regions. Economic factors and job opportunities in connection with the regional structure contribute to establishment of commuting patterns of employees which are relatively higher in western and north-western Slovakia. The results also showed that despite the economic hardship people are not willing to commute or migrate for work to more developed regions which further makes the situation worse in these regions (Mariš, Kováčik & Fáziková, 2019).

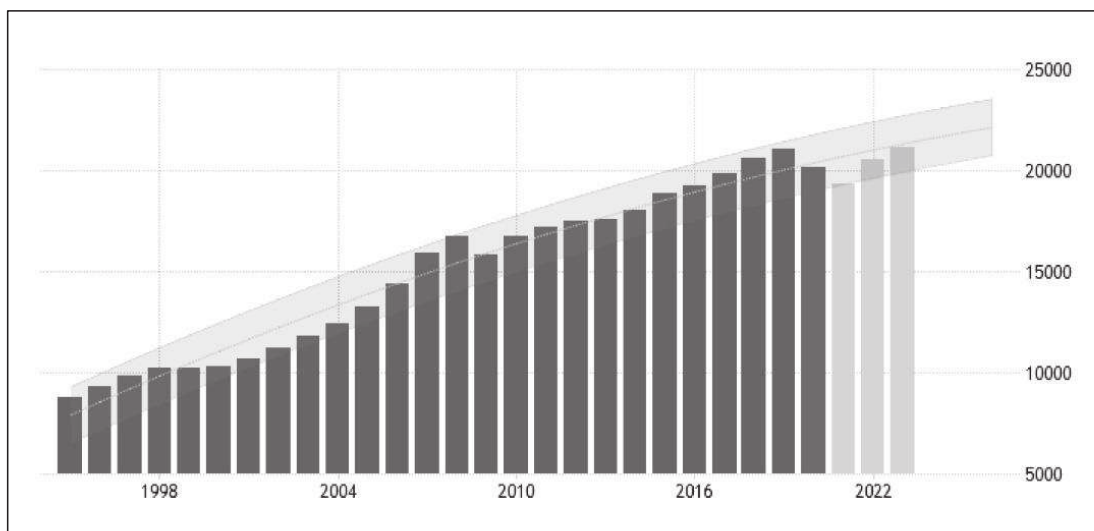
The regional development is based on competitive advantages, which has been a subject of fundamental research by Michal Porter and serves as a basis for the current scientific methodology to assess competitiveness of regions and countries (Zeibote, Volkova & Todorov 2019). National and regional competitiveness are emphasized as the main goals of the economic policy, but considering the fact that the discussions about defining and measuring the competitiveness are numerous, it is the question how to determine these terms and how to measure (regional) competitiveness (Tijanic, 2010; Bashynska, 2020). The access to foreign markets, sources of foreign investments and global knowledge networks are essential ingredients to the growth and development prospects of low and middle-income countries (Tvaronaviciene & Razminiene 2017).

Sustainable development is the agenda for many countries, which adopted it at national level and promoted through their regions (Raszkowski & Bartniczak, 2018; Kendiukhov & Tvaronaviciene, 2017). Innovation is a key to economic growth (Mura & Sleziak, 2015; Prokopenko, Omelyanenko, & Klisinski, 2018). Stimulation of innovation processes has been a core strategy for regional development policies for a long time (Schmidt, Mueller, Ibert & Brinks, 2018). Economic and social development in the regions and the growing disparities in social welfare are listed among the main threats to sustainable development in the EU Sustainable Development Strategy (Streimikiene, Barauskaite & Jakubauskiene, 2012; Šanda & Křupka, 2018; Smékalova, 2018; Moumen, Idrissi & Tvaronavičienė, 2019; Korauš et al., 2020). Globalization determines the economic environment and contributes to identification of new development models that harmoniously integrate the modern digital economy with corporate social responsibility for sustainable development (Androniceanu, 2019).

Figure 1 shows the forecast of GDP per capita development 1998-2022 for the Slovak Republic. The GDP per capita is obtained by dividing the country's gross domestic product, adjusted by inflation, by the total population. GDP per capita in Slovakia is expected to reach 19300.00 USD by the end of 2020, according to Trading Economics global macro models and analysts' expectations. In the long-term, the Slovakia GDP per capita is projected to trend around 20500.00 USD in 2021 and 21100.00 USD in 2022, according to our econometric models (Trading Economics, 2020).

Figure 1:

FORECAST GDP PER CAPITA 1998-2022.



Source: <https://tradingeconomics.com/slovakia/gdp-per-capita>

In terms of economic development of the region (including the regional disparities), the restrictions are represented by different endogenous factors e.g. geographical location, transport accessibility, economic underestimation, absence of large companies, low rate of business density, low level of GDP, low added-value of company production as well as the neighbourhood of less developed regions e.g. Poland, Hungary, Ukraine or characteristics of demographic structure (Gregorová & Korec, 2017). The main objective of regional policy is to support the regions with diverging development (Prokopenko et al., 2015). The openness of the Slovak economy and the effort of politicians, divergence of regional disparities between the developed and less developed regions can be detected.

3. METHODS AND METHODOLOGY

The methods of measuring regional development are direct and indirect. Direct methods are used to measure the effectiveness of individual regions. One of the direct methods is the method of comparison (Hurbánková, 2007). Statistical Office of the Slovak Republic offers an application programming interface (API) providing access to the data available in the DATAcube statistical database² representing the individual indicators entering the analysis. Graphic processing is presented using a statistical program Statistics 13.4 and Statgraphics XVIII. The aim of the paper is to analyze regional disparities in the Slovak Republic on the basis of a selected indicator by pointing out the tendency (leveling or increasing) of regional disparities in a particular period. The partial goal is to evaluate indicators using descriptive statistics as well as the concentration index, which expresses how the aggregate pension or capital is evenly distributed between the individual parts of the whole. In relation to the research objective, a hypothesis was formulated, which is confirmed or rejected based on an analysis.

H₀: A convergence of regional disparitiesdisparities can be detected in terms of GDP/capita between the regions of Slovakia and the Bratislava region.

The method of comparison

The method of comparison is used to analyse the regional disparity. The purpose of this method is to determine the growth dynamics of regions lagging behind (A) in comparison to more developed regions (B). In terms of our research (A) refers to other regions of Slovakia, while (B) refers to Bratislava region with the values of Gross Domestic Product GDP_A and GDP_B per capita (Klamár et al., 2010):

We expect two regions A and B that produce pensions HDP_A, HDP_B which is applicable:

$$\frac{HDP^A}{S^A} \text{ a } \frac{HDP^B}{S^B} ,$$

² ŠUSR, https://slovak.statistics.sk/wps/portal/ext/Databases!/ut/p/z1/jcxBDoIwEIXhs3iCvIqwdTkYKTUNsdUIdGNYmSaKLoznF4lbibN7yfcPi6xlcehf6dI_033or-Pu4upMzrmDbRroZlnCCK5RhwCUkp0m-4KRRRcEJqvZbmCPtt9IHFnO4j_9DPj0-HGEsY8T2WiqMmkBZXUOQ1XwaycESHZbZl_HLbRItHgDLV-4J0A!!/dz/d5/L2dBISEvZ0FBIS9nQSEh/

then the assumption is given as a following: $\frac{HDP^A}{S^A} < \frac{HDP^B}{S^B}$

where S^A and S^B refer to the number of population in regions A and B. The calculation is the following:

$$d_A = \frac{HDP_t^A}{S_t^A} - \frac{HDP_{t-1}^A}{S_{t-1}^A}, d_B = \frac{HDP_t^B}{S_t^B} - \frac{HDP_{t-1}^B}{S_{t-1}^B} \quad (1),$$

$$m = \frac{d_A}{d_B} \quad (2),$$

if:

- $m < 1$ there is no elimination of disparities between regions detected in the surveyed period,
- $m = 1$ the level of disparities is unchanged,
- $m > 1$ gradual elimination of regional disparities is detected.

The Herfindahl-Hirschman Index

The use of index was originally proposed in the work of Hirschmann „*National Power and the Structure of Foreign Trade*“, which was published in 1945. Independently from Hirschmann, the index was preformulated in the work of Herfindhal „*Concentration in the U. S. Steel Industry*“ Brezina & Pekár (2013). The Herfindahl-Hirschman Index is a commonly accepted measure of market concentration. It is calculated by squaring the market share of each form competing on a market, followed by summing the resulting numbers (Brezina, Oršulová & Pekár, 2009):

$$HHI = \sum_{i=1}^n (s_i)^2$$

where

S_i – market share of the enterprise i ,

N – number of enterprises in the sector.

The HHI thus can reach a maximum value of 1, which occurs when the supply in the sector is concentrated by one company and the minimum value of $1/n$ in case all firms have the same market share. However, the HHI index does not substantially affect the impact of small companies on the concentration in the sector

whose share on output is less than 1%. Brezina (1994) introduces a classification of the concentration degree in the industry based on the calculated index value reported by the FTC USA:

- *unconcentrated*; if the value of HHI is lower than 0,1;
- *moderately concentrated* ;0,1;0,18 ;
- *concentrated*; if the value of HHI is higher than 0,18.

Extending the use of Herfindahl-Hirschman Index

The Herfindahl-Hirschman Index theoretically acquires values from zero (in case of zero concentration, i.e. perfect competition) to 10,000 (in case of a maximum concentration, i.e. monopoly ($0 < \text{HHI} \leq \text{HHI } 10,000$)). Growth of the HHI value indicates a decrease in competition and an increase in market power; low HHI values represent increased competition and a decrease in market power. Significant features that HHI possesses may be summarized as follows:

- the index is rising as the number of businesses in the sector is increasing,
- the index is the sum of the percentage shares of the individual enterprises in the sector squared, giving greater weight to large enterprises,
- as larger enterprises affect more the resulting index value, the index will show a valid result even in case of incomplete information about the size of small enterprises in the sector (Hečková, Chapčáková & Marková, 2017).

$$HHI = \frac{(HHI - \frac{1}{n})}{1 - 1/n}, \quad (1)$$

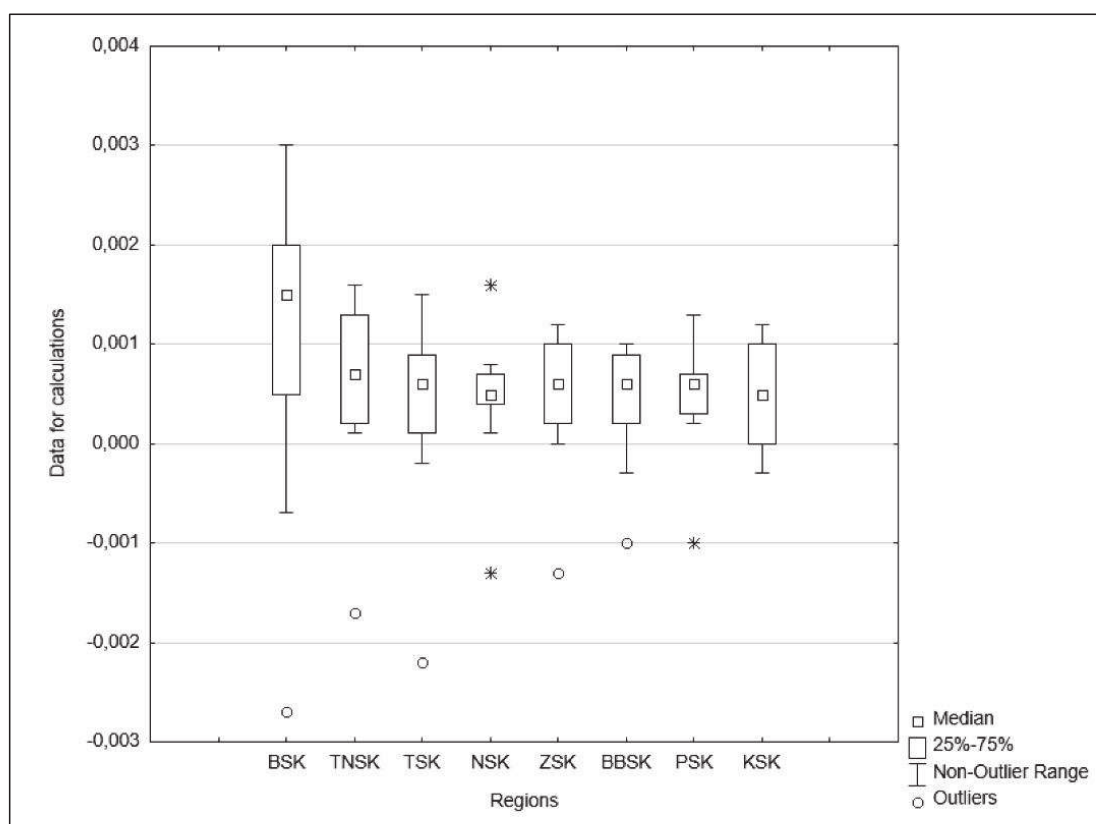
The limitations of the study: disparities are presented by selected indicators where the main focus is reflected by the GDP per capita and the Herfindahl-Hirschman Index. To have a more complex view on the surveyed field via further indicators such as economic or social ones it would be required to extend the range of the survey however this was not possible within the scope of the paper. Thus, further scientific plans will deal with the more complex analysis of remaining indicators in order to analyse and interpret wider view on the measurement of regional disparities.

4. SURVEY RESULTS

Graph 1. shows Δ regions that serve as a basis for comparison according to the methodology (1).

Graph 1.

THE STRUCTURE OF DATA USED FOR COMPARISON AND
 CALCULATION $m D_A a d_B$



Source: own editing, Statistica 13.4 and Statgraphics XVIII

Table 1. presents the calculation of the speed of development during the researched period and the compared regions, based on the methodology (1).

Table 1.

CALCULATION OF $m D_A a d_B$

Regions /years	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Region of Bratislava	x	0,0028	0,0018	0,0005	0,0020	0,0015	0,0030	-0,0007	-0,0027	0,0013
Region of Trnava	x	0,0013	0,0007	0,0008	0,0002	0,0016	0,0001	0,0005	-0,0017	0,0014
Region of Trenčín	x	0,0012	0,0001	0,0006	0,0001	0,0009	0,0009	-0,0002	-0,0022	0,0015
Region of Nitra	x	0,0007	0,0016	0,0007	0,0001	0,0008	0,0004	0,0004	-0,0013	0,0005
Region of Žilina	x	0,0012	0,0002	0,0006	0,0002	0,0012	0,0010	0,0000	-0,0013	0,0009
Region of Banská Bystrica	x	0,0009	-0,0003	0,0006	0,0006	0,0005	0,0010	0,0002	-0,0010	0,0009
Region of Prešov	x	0,0007	0,0004	0,0006	0,0002	0,0008	0,0007	0,0003	-0,0010	0,0013
Region of Košice	x	0,0012	0,0000	0,0006	0,0003	0,0010	0,0012	-0,0003	-0,0001	0,0005

Source: own calculations

Based on calculations presented in Table 1. the indicators of development according to method (2) are listed in Table 2.

In the monitored period 2009-2018, a divergence of regional disparities can be detected between Bratislava region and the other regions of Slovakia. The other regions (7) are compared to Bratislava region, the region with the strongest level of economic activity. However, 2012 recorded values expressing the relationship $m > 1$ (gradual elimination of regional disparities). It means an increasing economic development of the Slovak regions compared to Bratislava region. The values show gradual elimination of the economic disparities in the regions of Slovakia. The speed of development in 2016 expresses a significant divergence between the regions e.g. Trnava region (-0,7217), Nitra region (-0,6243), Banská Bystrica region (-0,2565), Prešov region (-0,4498), which reflects deepening disparities compared to Bratislava region. However 2018 recorded values expressing the relationship $m > 1$ (gradual elimination of regional disparities) between the regions - region of Trnava, region of Trenčín, region of Prešov.

Table 2.

CALCULATIONS OF SPEED OF THE DEVELOPMENT (2)

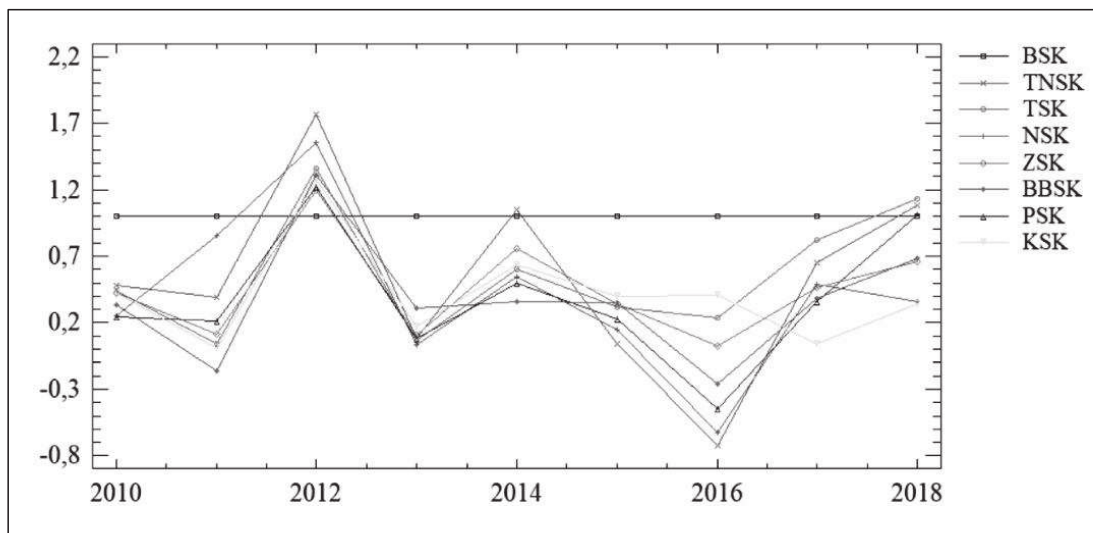
Regions/ years	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Region of Bratislava	x	1,0000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Region of Trnava	x	0,4811	0,3912	1,7680	0,0796	1,0533	0,0434	-0,7217	0,6483	1,0783
Region of Trenčín	x	0,4438	0,0429	1,3604	0,0682	0,6045	0,3138	0,2341	0,8204	1,1350
Region of Nitra	x	0,2498	0,8563	1,5565	0,0310	0,5463	0,1443	-0,6243	0,4920	0,3601
Region of Žilina	x	0,4238	0,1152	1,2001	0,1054	0,7531	0,3408	0,0226	0,4662	0,6588
Region of Banská Bystrica	x	0,3378	-0,1592	1,3069	0,3095	0,3579	0,3478	-0,2565	0,3844	0,6851
Region of Prešov	x	0,2411	0,2125	1,2179	0,0782	0,4970	0,2296	-0,4498	0,3548	1,0077
Region of Košice	x	0,4195	0,0121	1,2812	0,1722	0,6354	0,4013	0,4062	0,0386	0,3428

Source: own calculations

The convergence of economic performance in different regions of Slovakia was imbalanced. Graph 2 presents which regions of Slovakia detected an increase in their economic performance compared to Bratislava region and which regions showed decrease in their economic performance.

Graph 2.

ECONOMIC PERFORMANCE OF REGIONS IN SLOVAKIA



Source: own editing, Statistics 13.4 and Statgraphics XVIII

The following can be summarized:

Hypothesis H_0 was not confirmed however in several years we can observe the convergence among surveyed regions and Bratislava region. In the majority of years of the surveyed period the divergence of disparities is observed. The Herfindahl Index is the equivalent to Gini coefficient on aggregate data. H takes on values from $1/N$ to infinity, where N equals to number of parts – in our case the number of regions. We used standardized index to compare the value of H with the values of different countries. It takes values from 0 to 1. The regional GDP index shows low concentration, except of Bratislava region.

- An H value below 0,01 indicates a very low concentration.
- An H value of 0,01 - 0,15 indicates a low concentration.
- An H 0,15 - 0,25 means mean concentration.
- An H value above 0,25 indicates a high concentration, Cracau & Lima, (2016).

Table 3

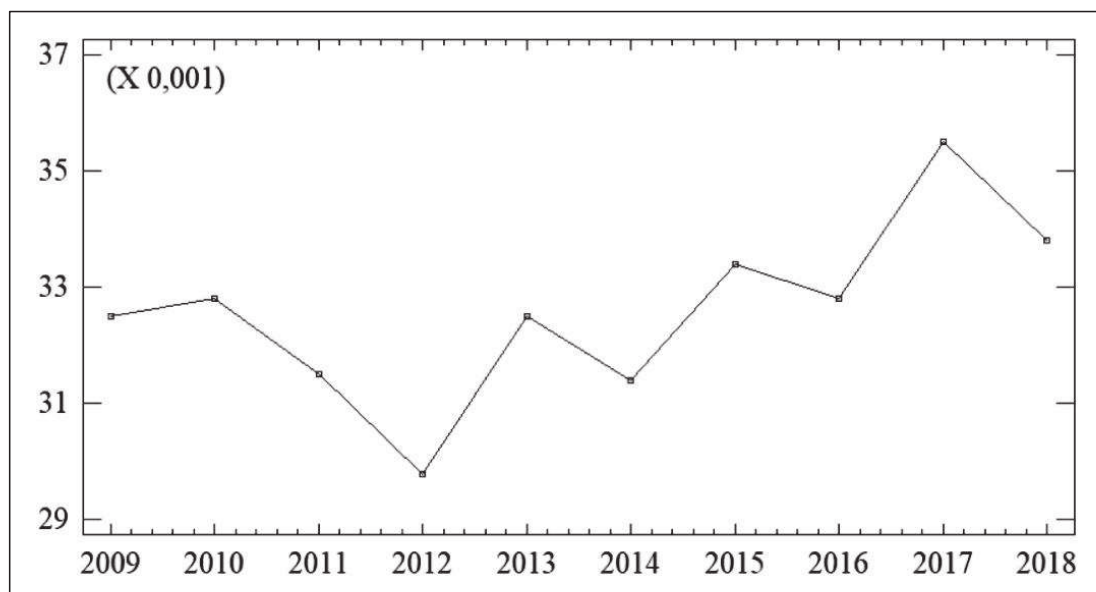
CALCULATION OF HHI BASED ON REGIONAL GDP%

Regional Gross Domestic Product (% region)										
Regions/years	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Region of Bratislava	28,0%	28,1%	27,7%	27,3%	28,1%	27,7%	28,3%	28,1%	28,7%	28,4%
Region of Trnava	11,4%	11,4%	11,4%	11,5%	11,3%	11,5%	11,0%	11,3%	11,1%	11,2%
Region of Trenčín	9,8%	9,9%	9,7%	9,7%	9,5%	9,5%	9,4%	9,3%	8,7%	9,0%
Region of Nitra	11,0%	10,7%	11,3%	11,4%	11,1%	11,0%	10,7%	10,9%	10,7%	10,4%
Region of Žilina	11,1%	11,2%	11,0%	11,0%	10,9%	11,0%	11,0%	11,0%	10,9%	10,8%
Region of Banská Bystrica	8,8%	8,8%	8,6%	8,7%	8,8%	8,6%	8,7%	8,8%	8,7%	8,7%
Region of Prešov	8,6%	8,6%	8,8%	9,0%	8,9%	9,0%	9,0%	9,2%	9,1%	9,5%
Region of Košice	11,2%	11,4%	11,4%	11,5%	11,5%	11,6%	11,8%	11,5%	12,2%	11,9%
HHI 0-1	0,0325	0,0328	0,0315	0,0298	0,0325	0,0314	0,0334	0,0328	0,0355	0,0338

Source: own calculations

Graph 3:

NORMALIZED HERFINDAHL INDEX (2009 – 2018)



Source: own editing, Statistics 13.4 and Statgraphics XVIII

The following table provided a primary outline of methods and approaches used to assess the issue of regional disparities. The frequently used indices of RD measurement include tools and rates of deviation resp. dispersive in nature. The most commonly used tools include standard deviation and standard relative deviation (coefficient of variation). In general, variance Q^2 based on the value X_i is designated as a mean of squares of the deviation of the character values and their arithmetic mean. Standard deviation is a method to measure the interregional variability and disparities used by Eurostat. In our case, it is a variance, expressed in units of average. The variation coefficient is expressed by the ratio of deviation per unit of average. It allows to compare the variability of the variables. Based on the coefficient values, it is possible to point to a deepening trend of the existing disparities between the regions of Slovakia and thus strengthen the imbalanced development and disparity. V table 4. we can observe (2018) 18.4%, ie the rHDP in the country fluctuates around + - 18% of the average. Based on the coefficient of variation, we obtained a more accurate idea of variability. Almost 18% of the variability can be observed as moderately low.

Table 4.

DESCRIPTIVE STATISTICS

	Regional Gross Domestic Product per capita									
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Mean	17 367	18 601	19 019	19 677	20 155	21 215	22 317	22 399	21 105	22 176
Variance	11 193 231	12 685 830	13 690 318	13 673 506	15 152 274	16 003 075	18 028 701	17 604 045	16 202 871	16 683 200
Standars deviation	3 346	3 562	3 700	3 698	3 893	4 000	4 246	4 196	4 025	4 085
Variation coefficient	0,193	0,191	0,195	0,188	0,193	0,189	0,190	0,187	0,191	0,184

Source: own calculation

5. CONCLUSION

In accordance with the gained results based we concluded that the regional disparities between the regions of Slovakia and Bratislava region are gradually equalized. The obtained data shows that disparities between the regions equali-

ze, and vice versa, in others regions are regional disparities more pronounced. In 2012 regional disparities equalized in all regions of Slovakia. On the contrary in 2016 shows a significant divergence, e.g. region of Trnava (-0,7217), region of Nitra (-0,6243), region of Banská Bystrica (-0,2565), region of Prešov (-0,4498), which reflects deepening regional disparities compared to Bratislava region. In 2018 regional disparities equalized in particular in the regions: region of Trnava (1,078), region of Trenčín (1,135), region of Prešov (1,007). This year shows a significant divergence in the region of Nitra (0,360), region of Žilina (0,658), region of Banská Bystrica (0,685) and region of Košice (0,342), which reflects deepening regional disparities compared to region of Bratislava. The increase in the meaning of this term in the recent period related to the deepening of socio-economic disparities between regions in Slovakia. The most significant settlement of regional disparities took place in 2016. The Herfindahl-Hirschman Index is the commonly accepted index of market concentration. Results show a very low concentration of the Slovak economy in terms of regions.

Presented results of the paper are in accordance with a survey carried out in Slovakia between 2005 and 2016 where diagnostics of the current situation and development of regional disparities in Slovakia are demonstrated. Based on the economic indicator of regional GDP per capita, which reflects the performance of the region, the fact was confirmed that the most efficient region of the country is the Bratislava region. On the contrary, the Prešov Region is one of the least efficient, with the value of the indicator regional gross domestic product per capita in 2016 only at the level of 25.49% of the value of the most efficient region, resp. 57.04% of the average value of the indicator for the country. To analyze the current status and development of convergence trends, researchers used the measures of dispersive character of the coefficient of variation and the standard deviation. Based on the achieved results, it can be stated that disparities in the development of the basic indicator of regional GDP per capita persist, mainly due to disproportions in the performance of regions caused mainly by intensive absolute growth of the indicator in the Bratislava region. In the case of the indicators of the average monthly nominal wage and the registered unemployment rate, a declining trend in the disparities between the regions of Slovakia can be observed, while the amplitudes in the development of statistics of these indicators are to some extent influenced by the economic cycle phase. At the time of economic growth, the disparities in the above mentioned indicators in the regions of Slovakia decreased and, conversely, deepened during the period of decline. However, despite efforts by governments to reduce them, they remain a significant problem in the national economy (Levický, Urbaníková, Hudáková, Maroš & Štubňová, 2019).

Specific historical conditions can lead to imbalanced development of the regions, resulting in a wide range of disparities (economic, social, cultural, infra-

structural, living standard disparities etc.) and a regional polarisation (Matlovičová & Matlovič, 2005). The issue of regional development, especially in terms of regional disparities is an issue discussed in various spheres of the society. It is one of the most important issues not only in Slovakia, but also in European context. There are several indicators used for evaluation of regional disparities. We can divide them according to their characteristics into economic, socio-economic, demographic and infrastructure indicators.

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ANALIZA REGIONALNOG RAZVOJA U SLOVAČKOJ PRIMJENOM ODABRANIH METODA MJERENJA REGIONALNIH RAZLIKA

Sažetak

Cilj rada je procijeniti regionalne razlike unutar Slovačke Republike s fokusom na koncentraciju tržišta koja se koristi za određivanje konkurentnosti tržišta. U skladu s glavnim ciljem istraživanja ispitana je regionalna struktura Slovačke u svjetlu odabranih socioekonomskih pokazatelja. Najrelevantniji pokazatelj u smislu istraživanja koja se provode je BDP po stanovniku, odgovarajući pokazatelj socio-ekonomskog razvoja regije. Sljedeći korak predstavlja Herfindahl-Hirschmanov indeks (HHI), mjeru koncentracije tržišta, koja ispituje BDP regija. Rad se fokusira na primjenu 3 metode koje se koriste za mjerenje regionalnih dispariteta kao što su varijanca, standardna devijacija i koeficijent varijacije. Sukladno dobivenim rezultatima na temelju analize RGDP-a u Slovačkoj, može se zaključiti da regionalne razlike između regija Slovačke i Bratislavske regije postupno nestaju. Dobiveni podaci pokazuju da se razlike među regijama smanjuju, dok je smanjenje u pojedinim godinama bilo brže. U 2016. godini može se uočiti divergencija dispariteta. Ova godina pokazuje značajno odstupanje, npr. regija Trnava (-0,7217), regija Nitra (-0,6243), regija Banská Bystrica (-0,2565), regija Prešov (-0,4498), što odražava produbljivanje regionalnih razlika u usporedbi s regijom Bratislava. Međutim, 2018. zabilježene su vrijednosti koje izražavaju odnos $m > 1$ (postupno uklanjanje regionalnih razlika) između regija - regija Trnava, regija Trenčín, regija Prešov.

Ključne riječi: Herfindahl-Hirschmanov indeks, regionalni BDP, regionalni razvoj, Slovačka Republika