Politická ekonomie
2024, Volume 72, Issue 5
https://doi.org/10.18267/j.polek.1433
Open Access

VŠE / PRAGUE UNIVERSITY OF ECONOMICS AND BUSINESS

Are Slovak Regions Ready for Crises? Analysis of Their Socio-economic Resilience

Pavol Korec, Martin Plešivčák

Pavol Korec (e-mail: pavol.korec@uniba.sk) Comenius University in Bratislava, Faculty of Natural Sciences, Slovak Republic

Martin Plešivčák (*corresponding author*, e-mail: martin.plesivcak@uniba.sk) Comenius University in Bratislava, Faculty of Natural Sciences, Slovak Republic

Abstract

Socio-economic and political systems are becoming increasingly unstable under the influence of various recent global events. The resilience of territorial units and their ability to respond to new challenges is significantly different in both the international and national context. In the presented work, we try to quantify the level of socio-economic resilience of Slovak regions and districts, while evaluating its state in time sections (2010 and 2020) capturing two crisis periods: the global economic and financial crisis and the onset of the crisis associated with the SARS-CoV-2 pandemic. We use a set of indicators that reflect the demographic, economic, knowledge society, social and public-administrative context of this resilience, which define the degree of preparedness for (ability to react to) real or potential socio-economic crises. For this purpose, a multi-criteria evaluation method is used, quantifying the level of socio-economic resilience of the analysed territorial units. They are divided into five groups using the clustering method (with very high, high, medium, low and very low levels of resistance). It turns out that during the study decade there were no major changes in the socio-economic resilience of individual regions and districts and that territorial units concentrated in the western half of Slovakia and in the hinterland of large cities are much better prepared for socio-economic crises, in contrast to the limited ability to react in peripheral areas located at the south of central Slovakia and the east of the country.

Keywords: Socio-economic resilience, multi-criteria evaluation method, clustering, regions, Slovakia

JEL Classification: O20, P25, R58

Citation: Korec, P., Plešivčák, M.: Are Slovak Regions Ready for Crises? Analysis of Their Socio-economic Resilience. Politická ekonomie, 2024(5), 780–811, https://doi.org/10.18267/j.polek.1433

1. Introduction

Regional resilience has become a very frequent term during the past 15–20 years of major economic (financial) crises, significant changes in the global economy and major political turbulence. This term expresses the evolutionary process where the regional socio-economic system must adapt to changing external conditions (Masik and Grabowska, 2020). In the scientific literature, the discussion on the concept of regional resilience began to appear very intensively after the global financial and economic crisis that broke out in 2009 because of the mortgage crisis in the United States in 2007–2008. It is obvious that the debate on regional resilience was conducted even before 2007–2009, but a more massive interest in the concept of regional resilience arose only after the outbreak of the crisis. From the first reactions to the consequences of the turbulent development of the economy and social problems after the COVID-19 pandemic, the war in Ukraine and the clearly manifested negative effects of climate change, it is obvious that interest in regional resilience will soon increase.

Despite the fact that more than 30 years have passed since the fall of communism in Central and Eastern Europe, the countries in this part of the continent and their regions still have some special features of the economy and social systems that encourage caution when evaluating works that have dealt with the regional resilience concept and analysed the resilience of countries or regions in Western European or North American countries.

In all works that have analysed the socio-economic regional structure of Slovakia and evaluated the differences between its regions (at the level of regions and districts) in the past 25 years, the authors have come to the same conclusion, in fact (Korec *et al*., 2005; Rajčáková and Švecová, 2009; Matlovičová *et al.*, 2014; Michálek and Podolák, 2014). The Bratislava Region is significantly the most developed, and the three regions of Banská Bystrica, Košice and Prešov, clearly lag. Similarly, at the district level, the five Bratislava districts and the three other districts that belong to the Bratislava Region (Malacky, Pezinok and Senec) have the best ratings, while the districts of the abovementioned three regions are the most underdeveloped. Regional disparities have long been a major problem in Slovakia, while we know that these disparities are the result of the action of general transnational phenomena (transformation, integration, globalization and postmodernization) and regional endogenous factors (political, locational, economic, social, cultural, demographic and environmental). These phenomena and factors have affected the regional development of Slovakia since the establishment of the Slovak Republic in 1993. We consider the analysis of regional resilience to be a suitable tool for showing the possibilities and limits of the development regarding individual regions of Slovakia.

The present contribution has three basic objectives. Firstly, to clarify the basic theoretical issues associated with the concept of regional resilience, focusing on its use in the analysis of the regions of post-communist Central and Eastern Europe. Secondly, to analyse the socio-economic resilience of Slovakia's regions at the level of higher territorial units (self-governing regions) and districts, using basic mathematical and statistical models. Thirdly, to show the generalizations of the analysis concerning the resilience of Slovakia's regions, which have wider validity at the level of the post-communist countries of Central and Eastern Europe.

The originality and contribution of this article lies in the fact that we try to assess regional resilience in a comprehensive way, while most earlier authors have emphasized only selected attributes of regions (and within them, most often, only economic factors). The article brings an accurate assessment and expression of the degree related to the resilience of regions – comprehensive on the one hand and according to individual attributes/components on the other (demography, economy, knowledge society, social and public administration). We point out the differences in the resilience of individual regions, which are self-governing units and have independent investment policies in the context of regional development.

2. Theoretical Background

Discussions about regional resilience were first dominated by the economic dimension of regional resilience (Martin, 2012; Martin and Sunley, 2015). Several authors, in the context of the broad negative societal impacts of crises, emphasized both the social dimension (Obrist *et al*., 2010; Quinlan *et al*., 2016) and the institutional dimension (Brislow and Healy, 2014; Masik, 2018). In the latest studies, adequate attention has been paid to all three mentioned basic dimensions in the discussion of the concept of regional resilience (Gong and Hassink, 2017; Masik and Grabkowska, 2020).

It is obvious that due to the different interpretations of the concept of regional resilience, there is an effort to define an accepted interpretation of this concept. Masik and Grabkowska (2020) state that there is a consensus to interpret regional resilience as the ability of the regional socio-economic system to withstand external shocks, to adapt and to overcome well the economic, social and institutional problems of the post-crisis situation. The authors also presented a second accepted definition, according to which regional resilience is defined as an "ability of a region to anticipate, prepare for, respond to, and recover from a disturbance". This definition draws attention to the actions taken by institutions in response to an external shock.

As Swanstrom (2008) stated, regional resilience is more than a metaphor but less than a theory. Regional resilience can be used as a conceptual framework for the study of a region. Importantly, it helps explore regions in a holistic, dynamic and systematic way. In research focused

on the resilience of regions, the impact of an external factor (economic crisis) and its destructive effects on the region are particularly emphasized. However, as some authors point out, the crisis and its destructive effects can be seen as an opportunity to restore and transform inefficient socio-economic systems (Gong and Hassink, 2017).

Several researchers have identified regional resilience with a shift to "path dependency", as regions can escape from their historical heritage and should develop new growth paths (Neffke and Henning, 2013; Henning *et al*., 2013). Boschma (2015) stated that path dependence does not only cause problems in the region when responding to new challenges and does not limit the resilience of the region. Path dependence also provides more options for creating new economic development strategies and more alternatives to switching to new roads. As Bristow and Healy (2015) pointed out, when conceptualizing resilience in terms of a region's ability to develop new paths of economic growth, it is necessary to distinguish between adaptation and adaptability. Adaptation refers to changes within existing development pathways, while adaptability refers to the ability of a region to adapt and the ability to develop new pathways.

Briguglio *et al*. (2009), Simme and Martin (2009), Masik (2018) and others have pointed out in their work that there are general features of the economy that help countries and their regionsbuild resilient socio-economic systems. These features have a basis in political decisions, while the results of these decisions are observable in the medium and long term. Macroeconomic factors such as political stability, fiscal deficit, inflation, unemployment rate, size of foreign debt and others have been emphasized. Briguglio *et al*. (2009) also defined the economic vulnerability of the state and its regions, citing the threat to the economy from exogenous shocks, such as the crisis in 2009. In the past five years, two extremely large exogenous shocks appeared in the context of regional resilience – the global crisis of 2020–2022 caused by the COVID-19 pandemic and the global crisis of 2022+ caused by the war in Ukraine. The authors claimed that the resilience of regions under globalization is conditioned by the openness of the economies of countries and their regions, which depends mainly on the supply of raw materials and semi-finished products, the direction of exports, dependence on imports and other phenomena. We could verify this fact easily in 2020–2022.

The concept of regional resilience offers three basic interpretations: engineering, ecological and adaptive (Boschma, 2015). Martin and Sunley (2017) presented expanded interpretations of regional resilience as follows: resilience as "bounce back" from shocks, resilience as "ability to absorb" shocks and resilience as "positive adaptability" in anticipation of, or in response to shocks. According to the first interpretation, the ability of regions to resist disruption and maintain their status quo in the face of external crises and upheavals is an important feature of regions. The second interpretation of resilience assumes that regions reach different (new)

equilibrium levels in several dimensions after crises and shocks. The third interpretation refers to evolutionary economic geography, assuming a continuous process, *i.e.*, adaptation to new post-crisis circumstances and constant transformation of the region. The basic attributes of an adaptive socio-economic system (economy, institutional base, social area, demography, environmental situation, infrastructure and others) are formulated within this third interpretation. For this reason, the adaptive interpretation of resilience is of key importance for building resilience strategies in regions (Masik and Grabkowska, 2020).

From the point of view of assessing the resilience regarding the regions of Central and Eastern European countries, we consider the comment of Martin and Sunley (2015) to be important, according to which the main task of geographical research concerning resilience of regions is the examination of their economic resilience. Geographers should identify the causes and explain how regions respond to shocks and crises. They should also show the institutions' role in anticipating and subsequently preventing or mitigating the effects of crises on regions. The quality of regional policy and its instruments at individual hierarchical levels – especially at the level of the state and NUTS3 regions in the case of Slovakia – is thus one of the key tasks of geographic research in the study of regional resilience.

In the context of this paper, the term "crisis" must be understood in its more complex meaning, *i.e.*, not only in connection with its economic dimension (decline in economic performance), but in a broader connotation. Namely, the fact is that an economic crisis is a consequence of a decline related to several phenomena, especially a crisis of political, educational, demographic, social, public administration and other development. If we use the term "crisis", we mean a general societal crisis manifested in several areas, an important part (or outcome) of which is the economic one.

3. Data and Methods

At the beginning of the empirical part of the work, we looked at the European comparison of Slovakia and its NUTS2 regions, primarily in the context of the development based on the economic level of the Visegrad Four countries after 2010 (2010–2020). For this purpose, we used the indicator of gross domestic product per inhabitant compared to the EU average (assessed by the purchasing power parity of the population). Subsequently, to quantify the degree of socio-economic resilience concerning regions and districts of Slovakia, we worked with 23 and 16 indicators at the level of regions and districts, respectively.

We identified a set of indicators and classified them into four groups based on the findings of several authors covering the issue of resilience from the social and economic perspective (Norris *et al.*, 2008; Simme and Martin, 2009; Obrist *et al.*, 2010; Martin, 2012; Bristow and Healy, 2014; Martin and Sunley, 2015; Quinlan *et al.*, 2016; Masik, 2018; Plummer *et al.*, 2018;

Masik and Grabkowska, 2020). Our research was also based on the real availability of indicators at the regional and district levels. The resulting four groups of indicators represent the components of the socio-economic resilience concept at the regional and district level of Slovakia. These are the demographic, economic, knowledge society, and social and public administration components.

The goal was to identify the current state and change in the degree of socio-economic resilience of individual regions and districts of Slovakia. We chose the beginning and the end of the last decade as the reference years, *i.e.*, 2010 and 2020 (similarly to the comparison of Slovakia's development on a European scale). These years are also suitable for analysis because they capture the state of the study territorial units during the global financial crisis of 2008–2013 as well as the beginning of the global crisis associated with the SARS-CoV-2 (COVID-19) pandemic. Moreover, the study period also captures the era of the economic boom (2013–2019), which different EU countries (especially the Visegrad Four ones) used in diverse ways.

The TOPSIS method can quantify the effects of input variables considering their character (whether high or low values are positive). The preferred orientation of the input variable in the sense of achieving a higher level of socio-economic resilience is indicated – the variables can thus be of a positive orientation (*e.g.*, average wage), or a negative orientation (unemployment rate) contributing to the *final socio-economic resilience*.

The variables entering the *socio-economic resilience index* were as illustrated in Table 1.

The abovementioned data for the national and European level were obtained from the Eurostat (Eurostat, 2010–2020), and regional and district levels use datasets of the Statistical Office of the Slovak Republic (Statistical Office of the Slovak Republic, 2010–2020).

The technique for order preference by similarity to ideal solution, also known as the TOPSIS method (Hwang and Yoon, 1981; Opricovic and Tyeng, 2004; Shih *et al.*, 2007; Manokaran *et al*., 2011) was applied to assess the positions of the given territorial units (regions and districts) considering the values of indicators entering the model. As a result, the final values of the socio-economic resilience index were generated. The purpose of this method is to find the option that is as close as possible to the positive ideal solution and as far as possible from the negative ideal solution.

Accelerators increasing the value of the index (score from 0 to 1) were the high values of the positively oriented indicators (the higher the better) and the low values of the negatively oriented indicators (the lower the better). When calculating the index, each indicator was equally weighted, with the exception of the indicators of the average life expectancy for women and men – they had half the weight due to their character.

Table 1: Variables entering socio-economic resilience index

Socio-economic resilience – component			
Demographic			
Indicator	**Orientation**	**Territorial level**	**Justification**
Life expectancy – male	positive	region/ district	to a certain extent, it expresses the standard of living regarding the population of the given territorial unit, the level of social and health care, in the statistics it is only reported separately for both categories
Life expectancy – female	positive	region/ district	to a certain extent, it expresses the standard of living regarding the population of the given territorial unit, the level of social and health care, in the statistics it is only reported separately for both categories
Aging index	negative	region/ district	expresses the demographic perspectives of the given territorial unit in terms of the representation of the post-productive and pre-productive components of the population (age structure)
Born persons, *per thousand inhabitants*	positive	region/ district	expresses the intensity of the birth rate, the strengthening of the young component of the population regarding the given territorial unit, the indicator of natural population growth could not be used, since in certain cases it also generates the negative values limiting the operation of the applied statistical model
Immigrated persons, *per thousand inhabitants*	positive	region/ district	expresses the attractiveness of the given territorial unit from the point of view of migration, the indicator of migration population growth could not be used, since in certain cases it also generates the negative values limiting the operation of the applied statistical model
Economic			
Indicator	**Orientation**	**Territorial level**	**Justification**
Gross domestic income, *per capita, in EUR*	positive	region	expresses the economic performance of the given territorial unit
Unemployment rate, *in %*	negative	region/ district	expresses the state of the economy in terms of (un)employment
Average wage, *in EUR*	positive	region/ district	expresses the attractiveness of the given territorial unit in terms of wages
Foreign direct investments, *in EUR per capita*	positive	region	expresses the attractiveness of the given territorial unit from the point of view concerning localization of the amount of foreign investments
Enterprises – foreign and international, *in % of enterprises*	positive	region/ district	expresses the degree of representation of foreign companies in the corporate structure of the given territorial unit
Labour productivity, in EUR *per employed person*	positive	region	expresses the employee productivity of work in the companies of the given territorial unit
Knowledge society			

Table 1: continuation

Indicator	Orientation	Territorial level	Justification
University-educated population, *in %*	positive	region/ district	expresses the structure of the population regarding the given territorial unit in terms of higher education
Enterprises – professional, scientific and technical activities, *in % of enterprises*	positive	region/ district	expresses the degree of representation concerning highly specialized companies within the economic structure of the given territorial unit
Enterprises – information and communication, *in % of enterprises*	positive	region/ district	expresses the degree of representation regarding companies in the field of information and communication technologies within the economic structure of the given territorial unit
Employees – research and development, *% of economically active population*	positive	region	expresses the representation of research and development employees from the economically active population of the given territorial unit
Expenditures – research and development, *in EUR per capita*	positive	region	expresses research and development expenditures per inhabitant of the given territorial unit
Gross added value, *in EUR per capita*	positive	region	expresses the volume of gross added value of companies in a given territorial unit
Social and public administration			
Indicator	**Orientation**	**Territorial level**	**Justification**
Expenditure on pensions, *in EUR per capita*	positive	region/ district	to a certain extent, it expresses the standard of living regarding persons of post-productive age in the given territorial unit
Youth unemployment, *% of job seekers aged 15–24 from the population 15–24*	negative	region/ district	expresses the problem of youth unemployment in the given territorial unit
Persons in the poverty, *in %*	negative		expresses the extent of poverty in a given territorial unit
Crimes, *per thousand inhabitants*	negative	region/ district	expresses the problem of criminality in the given territorial unit
Public administration employees, *% of employees*	negative	region/ district	expresses the level of employment in the public sector in a given territorial unit, many lagging regions are characterized by high employment in the public sector as a result of the underdevelopment of the private economic sector, at the same time it can also mean a problem with "too much enployees" in the public sector
Wages in public administration, *% of the average wage in the given territorial unit*	positive	region/ district	expresses the degree of financial attractiveness of work in the public sector and its competitiveness towards the private sector in terms of the quality of the workforce

Source: Authors' own processing

The calculation procedure incorporated the next steps.

1. To calculate the normalized multi-criteria decision matrix $\mathbf{R} = (r_{ij})$ using the formula:

$$r_{ij} = \frac{y_{ij}}{\left(\sum_{i=1}^{p} (y_{ij})^2\right)^{\frac{1}{2}}}, \qquad I = 1, 2, \ldots, p, \qquad j = 1, 2, \ldots, k.$$

After this transformation, the columns in the matrix are vectors of unit size by Euclidean metrics.

2. To calculate the weighted multi-criteria decision matrix $\mathbf{W} = (w_{ij})$, how the j-th column is multiplied by the appropriate weight, as follows:

$$w_{ij} = (v_j r_{ij}) .$$

3. To determine the positive ideal solution:

$$H_j = (\max_i w_{ij}) , \qquad j = 1, 2, \ldots, k,$$

and the negative ideal solution:

$$D_j = (\min_j w_{ij}) , \qquad j = 1, 2, \ldots, k.$$

4. To calculate the distance from the positive ideal solution using the formula:

$$d_i^+ = \left((\sum_{j=1}^{k} (w_{ij} - H_j)^2 \right)^{\frac{1}{2}}, \qquad i = 1, 2, \ldots, p,$$

and from the negative ideal solution using the formula:

$$d_i^- = \left((\sum_{j=1}^{k} (w_{ij} - D_j)^2 \right)^{\frac{1}{2}}, \qquad i = 1, 2, \ldots, p.$$

The Euclidean distance measure was used to calculate the distance.

5. To calculate the relative distance from the negative ideal solution using the formula:

$$c_i = \frac{d_i^-}{d_i^+ + d_i^-}, \qquad i = 1, 2, \ldots, p,$$

Variants were then arranged in descending order according to the c_i values.

Then, we applied the cluster method to identify groups of districts based on the *socio-economic resilience index* (Hastie *et al*., 2016). As a result, several clusters were generated, having similar properties within, but different properties in comparison with others.

The content of the cluster analysis is covered by N objects marked by the indices $1 < i < N$, which have d features labelled as $1 < j < d$. These data are applied to fill the $\mathbf{N} \times \mathbf{d}$ matrix:

$$\mathbf{X} = \begin{pmatrix} x_{11} & x_{12} & \cdots & x_{1d} \\ x_{21} & x_{22} & \cdots & x_{2d} \\ \vdots & \vdots & \ddots & \vdots \\ x_{N1} & x_{N2} & \cdots & x_{Nd} \end{pmatrix} \tag{1}$$

The The d-dimensional vector $\boldsymbol{x}_i$ is a vector of the i-th object, while the element x_{ij} denotes the value of the j-th feature of the i-th object.

The cluster analysis comprised four general steps: (1) selecting and extracting the features, (2) selecting the algorithm, (3) verifying accuracy, and (4) evaluating the results. We applied K-means as the clustering method for our analysis.

The IBM SPSS Statistics 22 programme was used to conduct the clustering. As a result of the clustering, based on the values of the socio-economic resilience index, five groups of regions as well as districts with internal similarity of *very high, high, medium, low and very low socio-economic resilience* were generated.

4. Results

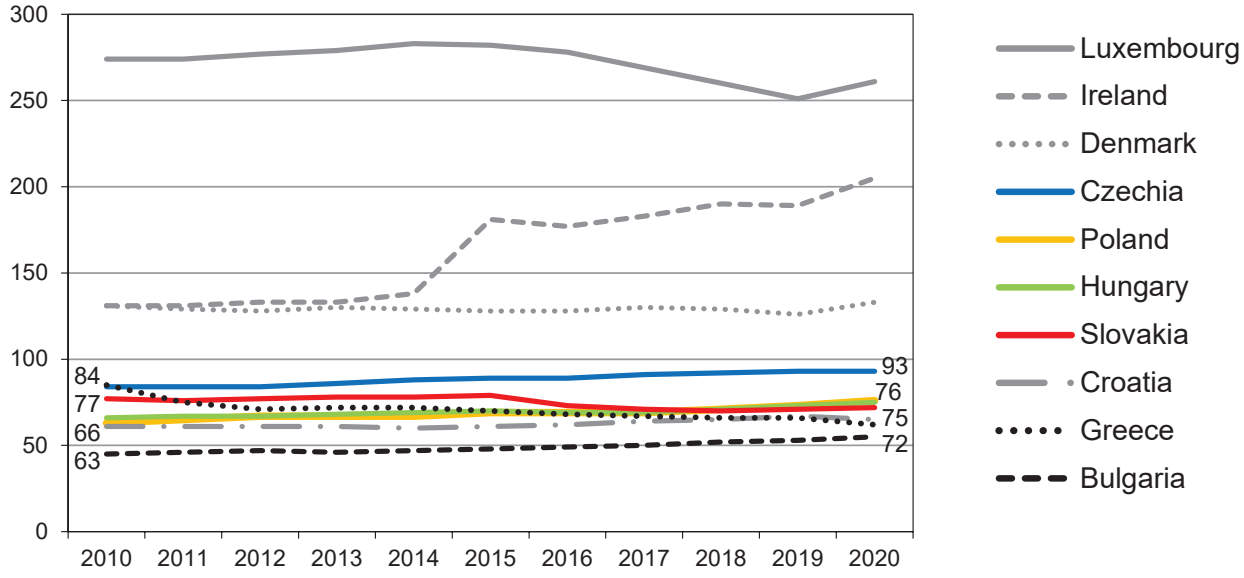
4.1 Slovakia and its NUTS2 regions in a European comparison

In the empirical part of the work, we will focus on assessing the level of socio-economic resilience of Slovak regions and districts in the decade 2010–2020. This is a period characterized by the global economic and financial crisis (2008–2013), followed by a relatively successful economic period until 2020, which already marked the beginning of the global crisis related to the COVID-19 disease. At the beginning of this period, Slovakia achieved an economic performance of 77% of the EU average GDP (in purchasing power parity; Figure 1). It was slightly behind Czechia, while the two remaining countries of the Visegrad Four (V4), Hungary and Poland, were behind Slovakia by more than ten percentage points. However, the situation had changed significantly ten years later. While Czechia continued to approach the EU average and had it within sight (93%), Slovakia began to move away from it. Whereas the three V4 countries recorded an increase of approximately ten percentage points during this period, Slovakia decreased by five points (to 72%). In the study period, both Hungary and Poland were ahead of Slovakia in terms of economic performance. The year 2016 seems to be the turning point, when after all the four countries had previously moved closer to the EU average, Slovakia began to move away. In 2020, Slovakia was losing more than 20 percentage points to Czechia, while in 2010 this difference was only seven percentage points.

In practice, regional development is evaluated by one indicator – GDP per capita. Despite the numerous advantages (universality, relative ease of interpretation as well as comparability in time and space), this measure does not comprehensively reflect the complex nature of regional structure, referring only to its economic dimension. However, the economic dimension of regional resilience is important, because only a well-functioning economy can provide financial means to solve social, environmental and other problems.

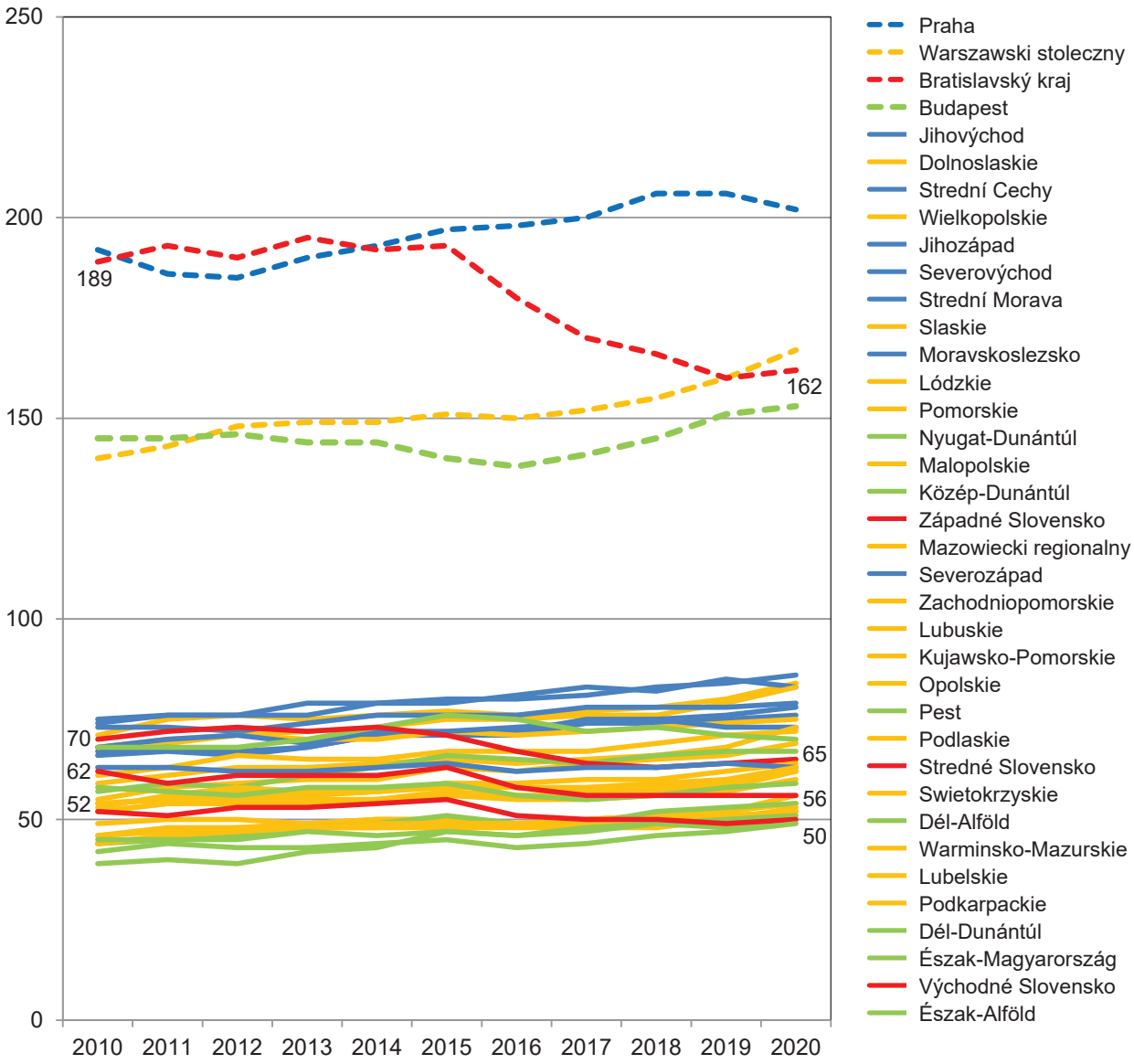
We can state similar conclusions for the regional level (Figure 2). The capital city regions are still at a completely different level to the remaining NUTS2 regions of the V4 countries. However, it is interesting to note that while the Prague region continued to hold its lead among the V4 regions (it had even reached 200% of the EU average GDP in purchasing power parity by 2020), Bratislava had declined by 27 percentage points since 2016. Budapest recorded moderate growth (eight percentage points), Warsaw was much more dynamic (24 percentage points), and it overtook Bratislava in 2020. Among the other 33 NUTS2 regions of the V4 countries, which are significantly behind the four mentioned ones, only three Slovak NUTS2 regions (Western, Central and Eastern Slovakia) moved away from the EU average– Western and Central Slovakia by up to five and six percentage points respectively compared to the position in 2010.

Figure 1: Gross domestic income (in purchasing power parity) of Visegrad Four countries, top 3 EU countries and bottom 3 EU countries compared to EU average between 2010 and 2020



Source: Eurostat (2010–2020)

Figure 2: Gross domestic income (in purchasing power parity) of NUTS 2 regions of Visegrad Four countries compared to EU average between 2010 and 2020



Source: Eurostat (2010–2020)

What caused this development? How are Slovak regions and districts prepared for crisis periods, of which there have already been several after 2010 (financial, economic, COVID-19, migration, energy and currently Ukrainian)? What are the prospects for Slovakia and its regions entering times characterized by increasing levels of instability, volatility and political uncertainty, when the paradigm of the economy based on manual labour and fossil fuels is changing? Are Slovak regions and districts ready for new challenges? Are they durable enough? Which ones are

and which ones are not? What is the structure of this resistance? We try to find answers to these and other questions in this work.

4.2 Socio-economic resilience at regional level

The global economic crisis of 2008–2013 affected primarily developed regions with a well--functioning economy in Slovakia (Bratislava, Trnava, Žilina), while lagging regions were significantly less affected due to their weak economy. Also, for that reason, we observe regional convergence after 2009, which is clearly visible, *e.g.*, in the reduction of differences in the unemployment rates at the district level – however, we call this trend "convergence in misery". The reduction of differences after approximately 2016 came as a consequence of Slovakia being stuck in the so-called middle-income trap. From a low level, its economy began to grow dynamically after 1998 (when the Dzurinda governments began to implement neoliberal reforms, *e.g.*, a flat tax), which culminated in 2007 with a single double-digit year-on-year GDP growth (10.4%). However, this dynamic growth was primarily based on foreign investments, cheap labour and exports. That development path has exhausted itself: Slovakia's economy has shifted significantly and today the country lacks quite a lot in order to continue to grow economically (and socially), *e.g.*, an economy based on knowledge and innovation, growth in added value of production and others (*e.g.*, quality of university education, support of science and research, transport and information infrastructure, correct political decisions).

For the reasons mentioned above, it makes sense to look at the disparities existing at the regional and district level within Slovakia. Due to the limited possibilities of this study (especially in terms of extent), we decided to focus on the more narrowly defined socio-economic resilience of the regions of Slovakia, without considering their environmental and transport (infrastructural) predispositions. We will only focus on the potential defining their socio-economic resilience in the dimensions of demographic conditions, economic performance, predispositions towards a knowledge-based society and social and public administration.

As can be seen from the figures, the situation at the regional level changed only slightly in 2020 compared to 2010 (Figures 3, 4 and 5). The highest value of socio-economic resilience is expected to be shown in 2020 by the Bratislava Region (0.886) in Figure 4. Other regions are already significantly behind. The second Trnava Region (0.334) benefits from its position in the neighbourhood of Bratislava, representing the outer part of Bratislava's functional catchment area. Similarly, in the case of the Trenčín Region (0.315), we can talk about a high degree of socio-economic resilience. The other regions located in the western part of Slovakia, namely Žilina (0.299) and Nitra Regions (0.275) also have balanced positions. They show a medium level of socio-economic resilience. The regions in the east of Slovakia, *i.e.*, Košice (0.178) and Prešov

Regions (0.145), lag significantly, and here we can talk about a low ability to face socio-economic crises. However, the Banská Bystrica Region is the least resistant (0.104), and the only one falling into the category of very low resistance. If we look at the development after 2010, we can see that Bratislava and Žilina Regions improved their position more significantly in terms of the TOPSIS score value. On the contrary, Košice, Prešov and Banská Bystrica Regions, which had the worst rating in 2010, weakened even more (Figure 5). There were no changes in the order of the regions regarding the overall socio-economic resilience during the decade under review.

If we look at the structure of socio-economic resilience of individual regions in 2020 (Figure 4), we will conclude the following findings. The *Bratislava Region* is especially strong in the economic component (maximum score, *i.e.*, 1.000) and the knowledge society component (1.000). It also has a highly favourable value in the demographic field. In all the fields under study, it shows the highest potential among all the regions. From the point of view of the social and public administration area, it reaches the fifth highest value, but it is not far behind the first four regions. The neighbouring *Trnava Region*, except the last-mentioned area, lags significantly behind the capital region (similar to all other regions of Slovakia). What is important is that it is the second most successful in three evaluated areas – demographic, economic and social and public administration. It is the third in the field of knowledge society. The *Trenčín Region* achieves just the third highest value of socio-economic resilience. Among all the regions, it gained the highest score in the assessment of social and public administration. It lags in the demographic field, but it is favourable in the economic level and knowledge society indicators. The *Žilina Region* has a lower score in the social and public administration area than the Trenčín Region, but it is more favourable from the point of view of the demographic component. In terms of socio-economic resilience, the *Nitra Region* is slightly ahead. However, this region lags mildly behind in its economic performance. The value of the demographic component is very similar to that of the Trenčín Region. From the point of view of social and public-administration resilience, it is doing well. The Nitra Region is the fifth in terms of socio-economic resilience. It is interesting that there is a relatively large difference between the values of the economic dimension and the knowledge society component. The low value of the demographic potential can perhaps be explained by the reproductive behaviour of the large population of Calvinist faith. The *Košice Region* is, not surprisingly, in sixth place in the assessment of socio-economic resilience. The region of Slovakia's second largest city is favourably evaluated from a demographic point of view; however, the economic component and social and public administration area send it to a low overall position. The *Prešov Region* has the second lowest socio-economic potential. The situation there is favourable only in the demographic area. On the contrary, from the point of view of the economic and knowledge society components, it is the most problematic of all the regions of Slovakia. However, the lowest socio-economic resilience is attributed to the *Banská*

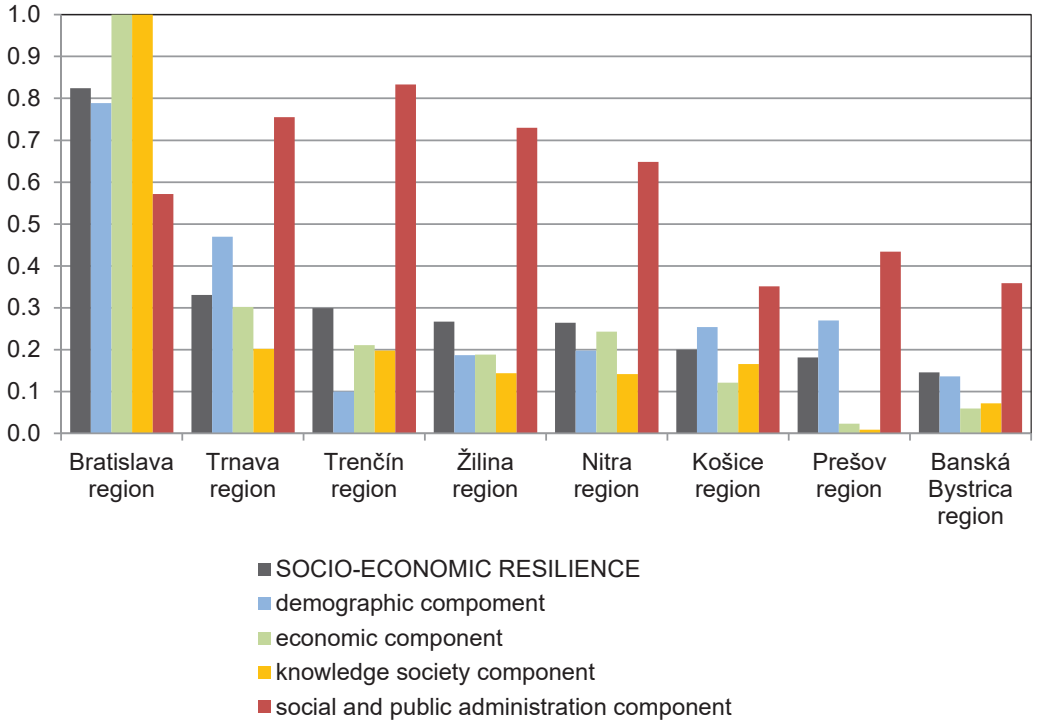
Bystrica Region. It has the worst value of the demographic component, but it has also very unfavourable values in the other three dimensions. In the field of economy and knowledge-based society, only the Prešov Region is worse off. The weak resistance of the Banská Bystrica Region is primarily due to the state of the evaluated indicators in its five southern districts (Veľký Krtíš, Lučenec, Poltár, Rimavská Sobota and Revúca).

During the observed decade, the situation in the demographic field improved the most in the Bratislava Region; on the contrary, the Nitra, Trnava and Banská Bystrica Regions worsened in this area (Figure 5). Besides this component, only changes in the social and public administration area will be of interest. While the regions in the western part of Slovakia (Bratislava, Nitra, Žilina, Trenčín and Trnava Regions) improved, the problem regions of the south-central Slovakia (Banská Bystrica) and the east (Košice and Prešov) lost again. Socio-economic resilience as such improved slightly only in the Bratislava and Žilina Regions. On the contrary, the three least successful regions slightly increased their backwardness, while in this case it is true that the less developed the region, the greater decrease in the value of overall socio-economic resilience (which shows the trend of increasing differences at the regional level). However, these changes did not affect the ranking of the regions in the interdecadal comparison, as the growth or drop in values were not significant. The only shift within the categories was recorded by the Trenčín Region, which moved from the group of moderately resistant regions to highly resistant ones.

We consider it necessary to pay special attention to the economic dimension when evaluating the socio-economic resilience of Slovak regions. The three regions with low socio-economic resilience score markedly the worst in the economic field in both study years. As mentioned above, most authors consider the economic dimension to be crucial in the resilience of regions. The economic lagging of the Banská Bystrica, Košice and Prešov Regions started in the Austro-Hungarian Compromise of 1867, when modern industry began to be built on the territory of Slovakia as well (Haloun, 1995; Korec, 2014). After the convergence of regional differences in the economy during the 40 years of communist regime (1948–1989), a strong regional divergence began in Slovakia practically immediately after 1990. The backwardness of the economy of the three mentioned regions after 1990 is a consequence of the negative influence concerning practically all of the regional endogenous factors mentioned in the introduction: political (bad regional policy), locational (long distance from the capital, absence of highways, less developed regions of neighbouring countries), economic (poorly diversified economy, few headquarters of large companies, lack of investment), social (little active local society, low level of employee qualification, high long-term unemployment, high proportion of beneficiaries in material need, poor housing stock), cultural (absence of large cities, high proportion of residents with only basic education), demographic (complicated ethnic structure with a high proportion of Roma people in poor living conditions) and environmental (absence of basic infrastructure). General transnational

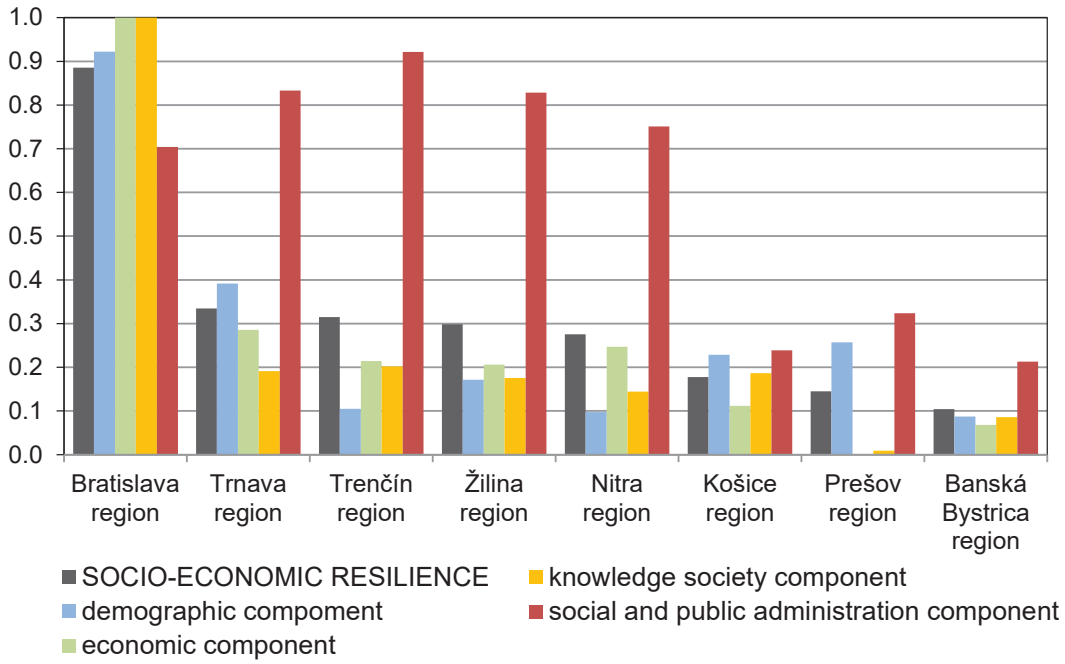
phenomena also have a negative impact on the economy of these three regions: transformation (the collapse of industry and agriculture after 1989), integration (the regions are not integrated into the national and European economy), globalization (due to the poor geographical location and the absence of large cities, there is a lack of direct foreign investments, the regions have not become part of global production networks) and postmodernization (educational, infrastructural, economic and institutional unpreparedness of the regions). Several authors have drawn attention to the negatives of the three mentioned regions with a low economic resilience (Rajčáková and Švecová, 2002; Korec *et al*., 2005; Ira and Lehotský, 2008; Matlovičová *et al*., 2014).

Figure 3: Socio-economic resilience at regional level in Slovakia in 2010 (including its partial components)



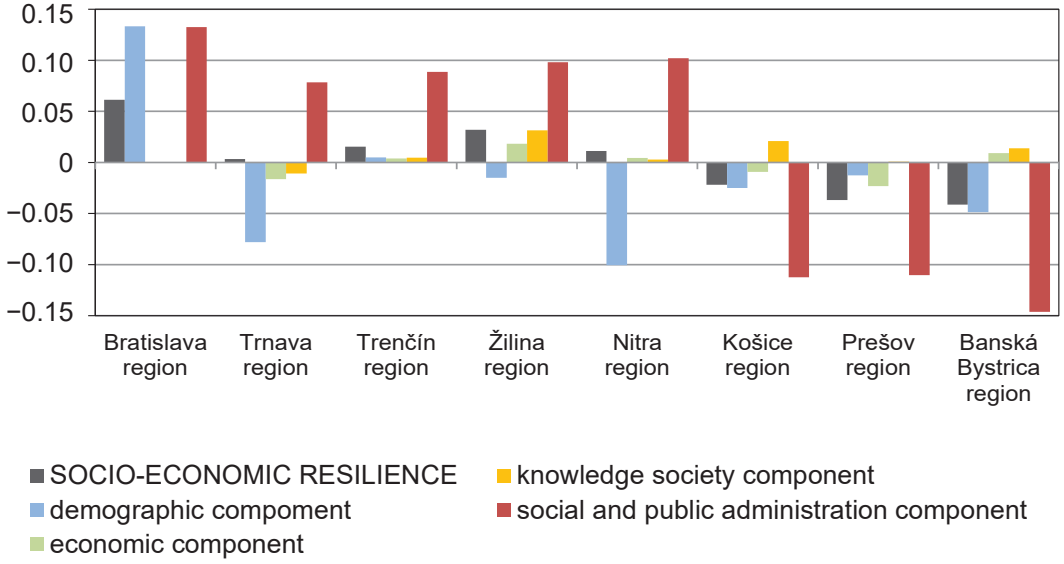
Source: Authors' own processing based on Statistical Office of the Slovak Republic (2010)

Figure 4: Socio-economic resilience at regional level in Slovakia in 2020 (including its partial components)



Source: Authors' own processing based on Statistical Office of the Slovak Republic (2020)

Figure 5: Change in socio-economic resilience at regional level in Slovakia between 2010 and 2020 (including its partial components)



Source: Authors' processing based on Statistical Office of the Slovak Republic (2010, 2020)

4.3 Socio-economic resilience at the district level

Figures 6, 7 and 8 illustrate the situation at the district level (Table 2, as a list of the districts of Slovakia). We calculated the classification of districts into five types with regard to the attained degree of socio-economic resilience (very high, high, medium, low, very low) using the clustering method via the IBM SPSS Statistics 22 software, separately for the years 2010 and 2020. At the end of the study period (Figure 7), six districts located in the far southwest of Slovakia (all five city districts of Bratislava and the neighbouring district of Senec) showed the highest level of socio-economic resilience (very high resilience). The absolutely highest values were achieved by the districts of Bratislava 3 (0.799), Bratislava 1 (0.740) and Bratislava 5 (0.699). Another category of territorial units consists of districts with a high level of socio-economic resilience. It is represented by 22 districts located in the western half of Slovakia and the districts of the large cities of Košice, Žilina, Banská Bystrica and Zvolen. The highest values within this category of districts were achieved by Košice 1 (0.592), Pezinok (0.573) and Malacky (0.565), while this category is closed by the districts of Ilava (0.502), Banská Bystrica (0.500) and Zvolen (0.479). The third, most numerous group is characterized by a medium level of socio-economic resilience and consists of 26 districts. They are mostly located in the western and northwestern part of Slovakia; however, this group also includes the districts of the large cities of the Prešov region – Prešov and Poprad. The highest values in this category are achieved by the districts of Považská Bystrica (0.490), Hlohovec (0.486) and Liptovský Mikuláš (0.485). The districts of Prešov (0.446), Levice (0.445) and Banská Štiavnica (0.444) close this group of territorial units. The next, fourth group of districts (15 districts) is characterized by a low level of socio-economic resilience. Districts of this category are mainly located in the Banská Bystrica Region and the two regions in the east of Slovakia (Košice and Prešov Regions). Among these districts, Humenné (0.434), Krupina (0.425) and Veľký Krtíš (0.412) achieve the highest values. The situation in terms of socio-economic resilience is already considerably unfavourable at the bottom of this group, especially in the districts of Levoča (0.361), Lučenec (0.346) and Svidník (0.343). However, the most problematic are the prospects of the ten districts with the lowest achieved values, in which a very low ability to react to potential socio-economic crises, with serious social consequences, can be assumed. Again, this group consists of districts in the Banská Bystrica, Prešov and Košice Regions. This class is represented by the districts of Sobrance (0.323), Trebišov (0.301), Kežmarok (0.298), Poltár (0.294), Sabinov (0.287), Gelnica (0.281), Vranov nad Topľou (0.261), Rožňava (0.219), Revúca (0.201) and Rimavská Sobota (0.198).

The situation in the classification of districts into individual groups of socio-economic resilience changed in only twelve cases during the decade (Figures 6 and 7). The district of Myjava moved from the third to the second category, the districts of Bytča, Čadca and Banská Štiavnica

from the fourth to the third category, and the districts of Levoča and Svidník also improved by one category, while they are currently part of the fourth group of districts. Conversely, during the decade, the districts of Hlohovec, Senica, Martin, Šaľa (all moved from the second to the third category), Humenné (from the third to the fourth) and Kežmarok (from the fourth to the fifth) registered a negative shift. The only category in which the number and composition of districts did not change between the decades was the group of six districts with a very high level of socio-economic resilience (city districts of Bratislava and Senec district).

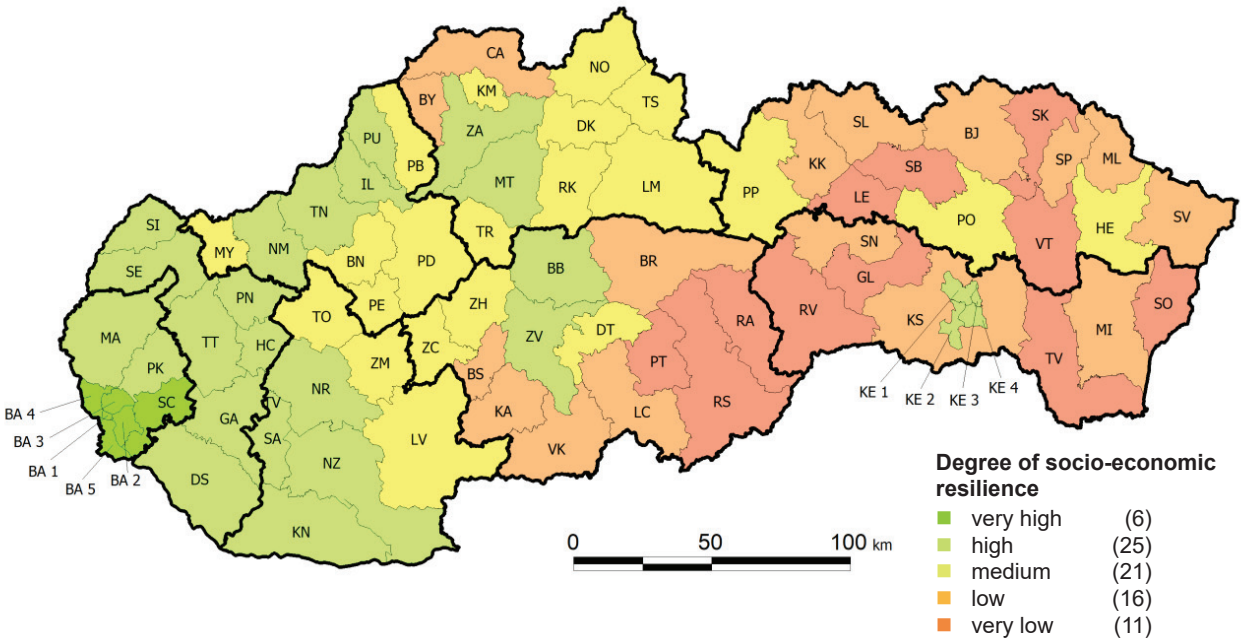
Table 2: List of Slovak districts and their abbreviations

Bratislava region		**Trnava region**		**Trenčín region**		**Nitra region**	
District	**Abbr.**	**District**	**Abbr.**	**District**	**Abbr.**	**District**	**Abbr.**
Bratislava 1	BA 1	Dunajská Streda	DS	Bánovce nad Bebravou	BN	Komárno	KN
Bratislava 2	BA 2	Galanta	GA	Ilava	IL	Levice	LV
Bratislava 3	BA 3	Hlohovec	HC	Myjava	MY	Nitra	NR
Bratislava 4	BA 4	Piešťany	PE	Nové Mesto nad Váhom	NM	Nové Zámky	NZ
Bratislava 5	BA 5	Senica	SE	Partizánske	PE	Šaľa	SA
Malacky	MA	Skalica	SI	Považská Bystrica	PB	Topoľčany	TO
Pezinok	PK	Trnava	TT	Prievidza	PD	Zlaté Moravce	ZM
Senec	SC			Púchov	PU		
				Trenčín	TN		
Žilina region		**Banská Bystrica region**		**Prešov region**		**Košice region**	
District	**Abbr.**	**District**	**Abbr.**	**District**	**Abbr.**	**District**	**Abbr.**
Bytča	BY	Banská Bystrica	BB	Bardejov	BJ	Gelnica	GL
Čadca	CA	Banská Štiavnica	BS	Humenné	HE	Košice 1	KE 1
Dolný Kubín	DK	Brezno	BR	Kežmarok	KK	Košice 2	KE 2
Kysucké Nové Mesto	KM	Detva	DT	Levoča	LE	Košice 3	KE 3
Liptovský Mikuláš	LM	Krupina	KA	Medzilaborce	ML	Košice 4	KE 4
Martin	MT	Lučenec	LC	Poprad	PP	Košice - okolie	KS
Námestovo	NO	Poltár	PT	Prešov	PO	Michalovce	MI
Ružomberok	RK	Revúca	RA	Sabinov	SB	Rožňava	RV
Turčianske Teplice	TR	Rimavská Sobota	RS	Snina	SV	Sobrance	SO
Tvrdošín	TS	Veľký Krtíš	VK	Stará Ľubovňa	SL	Spišská Nová Ves	SN
Žilina	ZA	Zvolen	ZV	Stropkov	SP	Trebišov	TV
		Žarnovica	ZC	Svidník	SK		
		Žiar nad Hronom	ZH	Vranov nad Topľou	VT		

Source: Authors' own processing

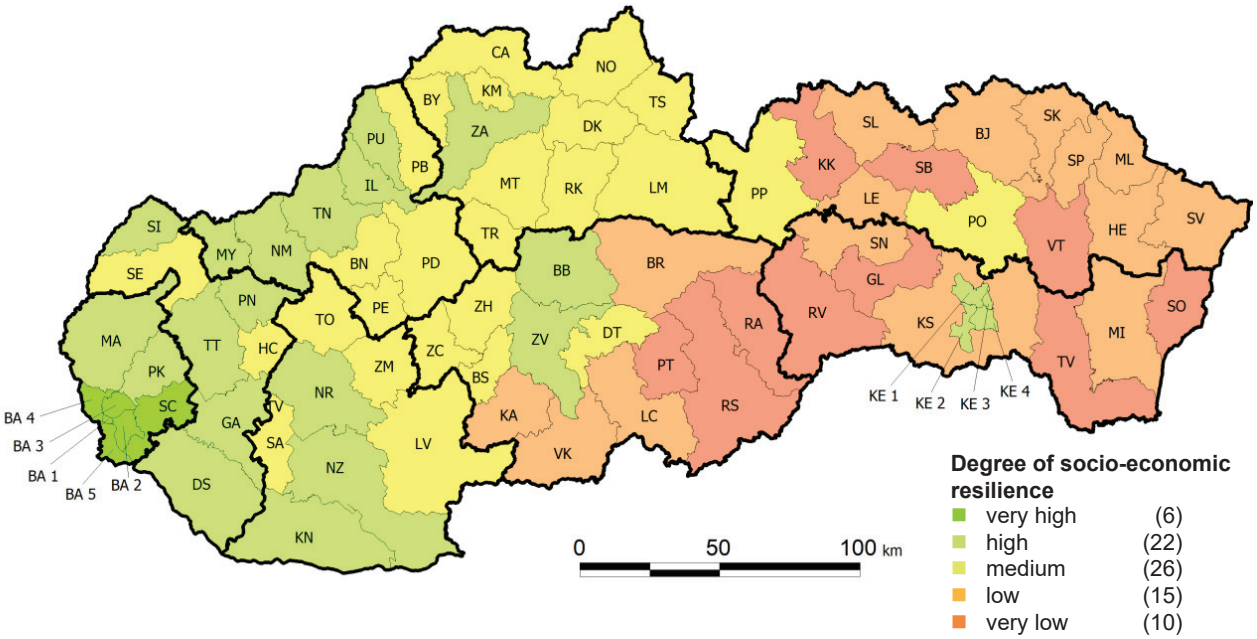
In terms of increase or decrease in the value of socio-economic resilience itself (Figure 8), we can state several interesting facts. The changes in the resilience score were not large. However, the biggest losses were recorded by districts that were and still are part of the category with a very low level of socio-economic resilience. It comprises a compact belt of the districts of Rimavská Sobota, Revúca, Rožňava and Gelnica in the south, complemented by the districts of Vranov nad Topľou and Kežmarok. Most of the districts in which the situation has worsened slightly are located in the Banská Bystrica, Košice a Prešov Regions. It is true that even the districts of Senec and Bratislava 2 dropped slightly, but they still achieve very high values in the socio-economic resilience assessment, and this decrease does not mean anything fundamental in their case. On the other hand, the districts that have improved slightly are mainly concentrated in the western half of Slovakia, but even some districts of the Prešov Region have recorded some improvement. When considering shifts in the order of districts, the most significant progress was recorded by the districts of Bytča (by 16 places), Považská Bystrica, Myjava, Čadca, Námestovo and Veľký Krtíš. On the contrary, from the point of view of the position in the socio-economic resilience ranking, Poprad district deteriorated the most over the course of the decade (by 14 places), followed by the districts of Šaľa, Michalovce, Prievidza, Ružomberok, Detva, Levice and Bardejov.

Figure 6: Socio-economic resilience at district level in Slovakia in 2010 (including its partial components)



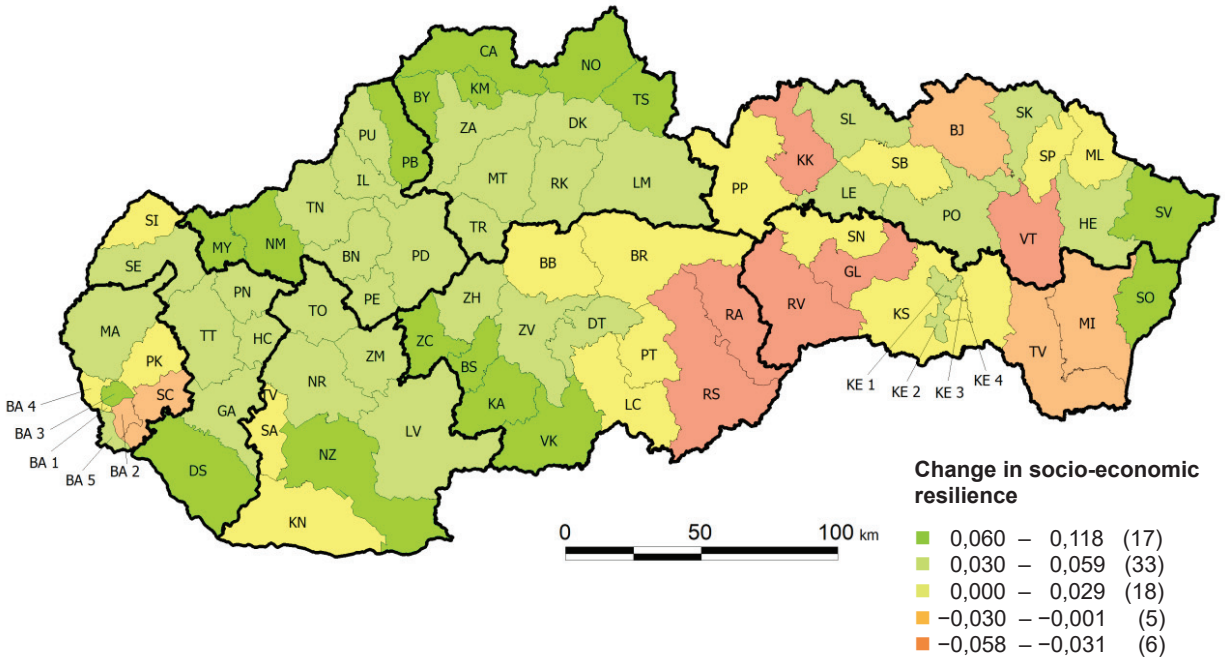
Source: Authors' own processing based on Statistical Office of the Slovak Republic (2010)

Figure 7: Socio-economic resilience at district level in Slovakia in 2020 (including its partial components)



Source: Authors' own processing based on Statistical Office of the Slovak Republic (2020)

Figure 8: Change in socio-economic resilience at district level in Slovakia between 2010 and 2020 (including its partial components)



Source: Authors' own processing based on Statistical Office of the Slovak Republic (2010, 2020)

Table 3: Regions of Slovakia and types of districts according to degree of overall socio-economic resilience

Territorial unit	Degree of Resilience	Overall Socio-economic Resilience	*Component*			
			Demographic	*Economic*	*Knowledge Society*	*Social and public Administration*
		Difference from median value				
Bratislava region	very high	**0.599**	*0.722*	*0.790*	*0.819*	*–0.023*
Trnava region	high	**0.047**	*0.191*	*0.075*	*0.010*	*0.106*
Trenčín region	high	**0.028**	*–0.095*	*0.004*	*0.021*	*0.194*
Žilina region	medium	**0.012**	*–0.029*	*–0.004*	*–0.006*	*0.101*
Nitra region	medium	**–0.012**	*–0.103*	*0.037*	*–0.037*	*0.023*
Košice region	low	**–0.109**	*0.029*	*–0.098*	*0.006*	*–0.489*
Prešov region	low	**–0.142**	*0.057*	*–0.210*	*–0.172*	*–0.403*
Banská Bystrica region	very low	**–0.183**	*–0.113*	*–0.142*	*–0.095*	*–0.515*
TOP Districts 1–6	very high	**0.233**	*0.486*	*0.229*	*0.499*	*0.055*
Districts 7–28	high	**0.055**	*0.034*	*0.098*	*0.118*	*0.029*
Districts 29–54	medium	**–0.003**	*–0.029*	*–0.007*	*0.003*	*–0.001*
Districts 55–69	low	**–0.089**	*0.001*	*–0.090*	*–0.055*	*–0.142*
BOTTOM Districts 70–79	very low	**–0.205**	*0.047*	*–0.239*	*–0.094*	*–0.342*

Source: Authors' processing based on Statistical Office of the Slovak Republic (2020)

Table 3 reports on the classification of individual regions and types of districts according to their overall socio-economic resilience. Their position is evaluated with respect to the median value of the TOPSIS score separately for the regional and district level. Subsequently, we can say in which fields and how significantly the territorial units lag behind (with respect to the median value). We looked more closely at the regional issue in the previous part, by analysing the data from Figure 4. We can see that at the district level, the six most resistant districts have an edge over the others, especially in the demographic and knowledge society components, but significantly also in the economic area. The districts in the second category, characterized by high socio-economic

resilience, are more successful than the median district, especially in the economic and knowledge society dimensions. From the demographic, social and public administration point of view, they do not differ from the median in principle. The moderately resistant districts (the most numerous in terms of representation) are very close to the median value in each of the partial areas. However, they are slightly behind in the demographic area. The districts characterized by low socio-economic resilience are slightly below the median in the area of knowledge society, but their prospects are much less favourable in the economic component and especially in the social and public administration dimension. The ten most problematic districts have favourable demographic potential, lag behind in the area of knowledge-based society, but especially in the case of economic resilience and social and public administration.

5. Discussion

According to Martin and Sunley (2015), the main task of geographical research in the field of regional economic resilience is to identify and explain how regions respond to external shocks and crises. They draw attention to the important role of the "government, institutions and responsible people" to make responsible decisions and thus prevent or mitigate the impact of shocks and crises on the region or use the situation to improve the region's economy. In the case of Slovakia (especially at the level of the state and self-governing territorial units, *i.e.*, NUTS3 regions), the quality of regional policy and its instruments at individual hierarchical levels is one of the key tasks of geographical research not only in the assessment of regional resilience, but also in the study of regional development in general.

Masik (2018) came to interesting findings when studying the determinants of resilience at the regional level using the example of the less developed Pomeranian Region of Poland during and after the economic crisis of 2008–2009. We consider some of the conclusions from his research interesting in the context of the possibilities and limits of the less developed regions located in the south central and eastern Slovakia. The author's findings are inspiring when considering the resilience of the economy of Slovakia and its regions in the context of the crisis associated with the COVID-19 pandemic and the war in Ukraine. Regarding the economic determinants of resilience at the regional level, Masik (2018) emphasized the importance of the following: (i) diversified economy of the regions, (ii) diversified exports, by both products and destinations, (iii) price competitiveness of products, (iv) technological improvement of companies, (v) headquarters of companies in the region, and (vi) flexible small and medium-sized companies in the region. In the present work, we showed directly and indirectly that the quality of the aforesaid determinants in the less resistant regions of Slovakia lags behind significantly. Similarly, in the five social determinants mentioned by Masik (2018) at the regional level, the less resistant

regions of Slovakia have a lot of space for improvement. It covers (i) local society, (ii) an adequate level of entrepreneurship, (iii) the required level of employee qualification, (iv) a flexible labour market, and (v) active leaders (personalities, companies and institutions).

Immediately after the fall of communism and the transition to a market economy, all the post-communist countries of Central and Eastern Europe experienced rapid economic growth in the regions of capital cities and economic lagging of peripheral rural regions. In the literature, such regional development has been evaluated as a "centre-periphery polarization" model (Lang, 2015; Korec *et al*., 2016; Pociūtė-Sereikienė, 2019; Pénzes and Demeter, 2021). While in some of the mentioned countries, such regional development was less obvious (Czechia), it was very pronounced in others (Poland and Slovakia) on the contrary. Some authors say that growing polarization is a complex phenomenon affecting not only economic, but also political, social, demographic, cultural, environmental and other phenomena (Vaishar, 2006; Pociūtė-Sereikienė, 2019; Korec and Przybyla; 2019). As pointed out by Lang (2015), increasing regional polarization leads to the "peripheralization" of marginal territories. Kebza (2018) showed very well the factors conditioning the peripheralization of regions. According to several authors, peripheralization has very negative socio-economic impacts on the affected regions, which can be shown by several statistical values of basic socio-economic indicators, or a complex socio-economic one (Blowers and Leroy, 1994; Eriksson, 2008; Daugirdas and Burneika, 2008; Máliková *et al*., 2015). We also consider the development in Slovakia very serious, and assessment of the regions' resilience can help eliminate their problems. Currently, the consequences of peripheralization in Slovakia are manifested significantly, besides the socio-economic area also in the political context, which we can see in the regional preferences for political parties.

Atkinson (2016) took a position on the classic opinion of economists that reduction in regional inequalities can only be achieved at the expense of a reduction in the country's overall economic output or a slowdown in economic growth. The author noted that even if the economic output decreases as a result of a policy aimed at reducing regional inequalities, we cannot strictly reject this policy. Preference for a "smaller pie" has its reasons, the most common of which are two: reduction of social tension in society and better use of individual regions' potential. Atkinson (2016) presented 15 proposals and five ideas that can help reduce regional differences in the country. We agree with the author, but he indirectly states that the policy of reducing regional disparities is appropriate to conduct at a time when three facts are favourable: (i) consolidated public finances, including the state debt and the state budget deficit, (ii) a favourable global economic and political situation supporting the development of the economy, and (iii) a broad-minded government that does not see the positives of its decisions in four years, but works for the country in the medium and long term. Unfortunately, such a situation has not yet occurred in Slovakia in the past 30 years.

Several authors have dealt with the development of disparities in Slovakia at the regional level (Matlovičová *et al*., 2014; Madajová *et al*., 2014), while Fitalová (2022) dealt with the development at the district level. Matlovičová *et al*. (2014) evaluated the development of regional disparities in the period 2000–2012. They used 18 basic economic and social indicators for statistical models that allowed them to track the development of the disparities. The conclusion of their study was that there was no easing of regional polarization during the observed period, while the west-east gradient of "developed west – lagging east" became even stronger. Fitalová (2022) typified the districts of Slovakia in the years 2001 and 2019 on the basis of their socio-economic development, while in the mathematical model she used four indicators: two economic and two social. The result of her analysis was the division of the 79 districts of Slovakia into four types. The author found that the districts of the two worst types withdrew from central Slovakia during the study period and were concentrated in the east in the Prešov and Košice Regions, while these two types also included five districts in the south of the Banská Bystrica Region (Veľký Krtíš, Lučenec, Poltár, Rimavská Sobota and Revúca). On the other hand, the districts of the second most successful type expanded significantly in western Slovakia, while only the Trnava district joined the five Bratislava city districts of the best first type. We see that the results obtained in this work correspond to the results of previous works. The socio-economic lagging of eastern Slovakia behind the western part is still slightly increasing.

6. Conclusions and Policy Implications

The present contribution aimed to discuss the concept of regional resilience in the context of the Central and Eastern European countries, using the example of one of them – Slovakia. Recent turbulent times, bringing many challenges, whether planned or unexpected, require the readiness of actors at all hierarchical and territorial levels. It is obvious that the potential for an adequate response to crises or more fundamental societal changes varies from place to place, even in such a small country as Slovakia. We took a closer look at the level of socio-economic resilience of the regions and districts of Slovakia in two time points: 2010 (the global economic and financial crisis 2008–2013) and 2020 (the beginning of the global crisis caused by the COVID-19 pandemic). The results of the research showed that the territorial units located in the west of Slovakia, with the highest level of socio-economic resilience, are the best prepared for crises. In this respect, the region of the capital, Bratislava Region (especially the city districts of Bratislava and the neighbouring district of Senec) has a prominent position. Its ability to respond to challenges or to adapt to fundamental changes in socio-economic development is at a many times higher level than even in the case of regions that are still quite resilient (*e.g.*, Trnava and Trenčín Regions). However, they still have a comparative advantage in terms of location (even within the territory

of Central Europe), economic maturity (economic structure, job opportunities, wage levels, *etc*.), connection to main transport routes or migration attractiveness. On the contrary, the south central Slovakia and the east of the country have the lowest potential for stable socio-economic environment in the event of the need to react to negative circumstances of societal development. This especially concerns the ten districts of Sobrance, Trebišov, Kežmarok, Poltár, Sabinov, Gelnica, Vranov nad Topľou, Rožňava, Revúca and Rimavská Sobota. When we talk about the structure of socio-economic resilience, they lag behind very significantly especially in the economic area and in the field of the knowledge society (especially the Prešov and Banská Bystrica Regions). However, from a demographic point of view, they are not the worst off (especially the Prešov and Košice Regions). However, it is necessary to invest in the education of young people, without whom these regions have no future. The positive thing is that despite the noticeable economic lag or significant shortcomings in terms of the development concerning a knowledge-based society, they do not lose so much to the best ones in the social and public administration field. However, it is a question how long social programmes or the attractiveness of work in the public sector will be available and will thus remedy the deficiencies in the real economic basis of these territorial units. In addition, the research showed that their position does not improve over time (comparing 2010 and 2020).

It is a sad conclusion for Slovakia that in the ranking of EU countries after 2016, the indicator of GDP per capita in purchasing power parity fell sharply. While in 2010 it was the third strongest economy in the Central and Eastern European region (after Slovenia and Czechia, with a value of 77% of the average of EU countries), in 2021 it was already the second weakest in this territory after Bulgaria with a value of 68%. In addition to Czechia and Slovenia, Slovakia had already been overtaken by Lithuania, Estonia, Poland, Hungary, Romania, Latvia and Croatia by 2021. Among all the EU countries (except Bulgaria with 55% of the EU average), only Greece (67%) has a lower value than Slovakia. What caused the braking of Slovakia's economy after 2015 and the reduction of its socio-economic resilience? In our opinion, three reasons are most important. Firstly, complacency reigned in Slovakia, and it stopped reforming and continuously improving. The overall tax burden on companies was increasing and we lost the charm for investors. Secondly, there is a crisis of university education in Slovakia. Top universities are missing here. Neighbouring countries, Czechia, Poland and Hungary, made the necessary reforms of university education earlier, shortly after 1989. It is accepted that the return on investment in university education is from 15 to 20 years. The economies of the neighbouring countries are already benefiting significantly from long-term investment in universities, not only in the form of a higher share of the knowledge economy, innovations and numbers of startups, but also through better education of university graduates. The third reason is the inefficient use of funds from the EU and state budget. The causes of inefficient use of funds are slow use, lengthy public procurement,

the problem of co-financing, excessive bureaucratization concerning related processes and others. The readiness of Slovakia and its regions with regard to the vision of the transformation concerning economic sectors towards carbon neutrality (by 2050) is becoming an important topic today. Meeting this challenge will require additional investments in all sectors of the economy, especially in industry, energy, transport, construction and agriculture. However, not all the regions are equally prepared for this. Those with higher socio-economic resilience have a comparative advantage, as they are better prepared not only for crises, but also for planned minor or major (paradigmatic) changes in societal development.

Due to their structural weaknesses, we can assume that at a time of a new crisis, lagging regions will suffer from an acceleration of outflow, especially regarding the young part of the population, due to deepening unemployment, a weak offer of better-paid job opportunities, a higher number of people dependent on state social benefits, stagnation of housing and commercial construction, the increasing risk of poverty and the growth of socio-pathological phenomena (crime, shadow economy), decreasing quality of public services provided by local governments (as a result of shortfalls in income from share taxes in the context of the growth of unemployment and emigration of the economically active population), *etc*. Due to the loss of human capital (brain drain, but also the manual labour component of the population), it will be much more complicated for local governments to use the financial opportunities resulting from, *e.g.*, European Structural and Investment Funds intended for infrastructural and social projects (reconstruction and construction of schools, medical facilities, roads, public spaces (squares), sewers, water pipes, waste management, tourism development, support of cross-border cooperation, various social programmes oriented towards education, labour market, work with marginalized communities, *etc*.).

Lagging regions have to overcome the negative effects of several important endogenous determinants: historical marginality, location, absence of large agglomerations, transport exclusion, special ethnic structure and others. The very poor state of public finances and the poor territorial-administrative division at the level of districts and self-governing regions must be added to that.

Our recommendations for reducing regional disparities, which would help the lagging southeastern regions, can be formulated in five points as follows:

(i) Adjust the territorial-administrative division at least at the district level; out of the 70 districts (79 minus 9 urban districts of Bratislava and Košice), 20 districts should not have been established in 1997; in the lagging east, they are either only areas separated from the core (*e.g.*, Poltár, Sabinov, Kežmarok, Gelnica, Košice-surroundings and others) or districts with a small population (in the east Medzilaborce, Sobrance and others).

(ii) Try to mitigate the adverse effect of the ethnic structure in the three lagging regions (Banská Bystrica, Košice and Prešov Regions), where the proportion of Roma ethnic residents (the most affected by social and economic exclusion) and the associated socio-economic problems is alarming.

(iii) It is necessary to complete the construction of the D1 motorway and the R2 expressway, connecting Bratislava and the west of Slovakia with Košice and the east of Slovakia; although the highway is not a guarantee of regional development in the east of the country, it is certainly a condition for it.

(iv) Investments should preferably be allocated to larger centres in the east and south (Košice, Prešov, Poprad, Michalovce, Humenné, Rimavská Sobota and Lučenec), not in small volumes to individual districts, as has been the case after 2015 in the 20 least developed districts in the south and east of Slovakia (state aid scheme currently in force).

(v) Support the model of decentralization (transfer) of finances from the European Structural and Investment Funds from centrally managed sector programmes and projects of managing bodies (individual ministries) to territorial self-governments (self-governing regions and municipalities) based on the instrument of integrated territorial investments and strategies, from demand-oriented projects to joint projects based on the cooperation of several municipalities and actors in the territory (programming period 2021–2027).

The research limitations of this contribution lie in both the quantity and quality of the dataset used, especially concerning the number of available indicators at the disaggregated level of the studied territorial units. In general, the lower down the spatial hierarchy the researcher investigates, the fewer indicators suitable for analysing the given issue are available. In the same way, the valid legal delimitation of self-governing regions and districts was not implemented in Slovakia exclusively according to professional, but rather political criteria. Thus, some natural, historically existing regions were artificially divided into several self-governing units (*e.g.*, Spiš historical region between the self-governing regions of Prešov and Košice, Zemplín historical region as well, *etc*.). Therefore, it would be more appropriate to work with existing natural regional units (functional urban regions) in similar analyses in the future (if the scope and structure of the available data allow). It is also worth to think about defining the different weights of the input indicators (considering their relevance and contribution to the overall socio-economic resilience), but with regard to the correct arguments that accompany the process of defining the weights of the individual input variables.

Acknowledgement

Funding: This paper was prepared with support from research grant VEGA No. 1/0252/23 – "Spatial systems resilience – its factors, differentiation and consequences".

Conflicts of interest: The authors hereby declare that this article was not submitted nor published elsewhere.

References:

Atkinson, A. B. (2016). *Ekonomika nerovnosti*. Brno: BizBooks. ISBN 9788026505082.

Blowers, A., Leroy, P. (1994), Power, politics and environmental inequality: A theoretical and empirical analysis of the process of "peripheralization". *Environmental Politics*, 3(2), 197–228. https://doi.org/10.1080/09644019408414139

Boschma, R. (2015). Towards an evolutionary perspective on regional resilience. *Regional Studies*, 49(5), 733–751. https://doi.org/10.1080/00343404.2014.959481

Briguglio, L., Cordina, G., Farrugia, N., et al. (2009). Economic Vulnerability and Resilience: Concepts and Measurements. *Oxford Development Studies*, 37(3), 229–247. https://doi.org/10.1080/13600810903089893

Bristow, G., Healy, A. (2014). Regional resilience: An agency perspective. *Regional Studies*, 48(5), 923–935. https://doi.org/10.1080/00343404.2013.854879

Bristow, G., Healy, A. (2015). Crisis response, choice and resilience: Insights from complexity thinking. *Cambridge Journal of Regions, Economy and Society,* 8(2), 241–256. https://doi.org/10.1093/cjres/rsv002

Daugirdas, V., Burneika, D. (2008). Peripherality and peripheral regions in Lithuania –borderland of EU. In: Baubanis, J. *Problem regions in Lithuania (sociogeographical aspect)*, 6–12. Vilnius: Geologijos ir geografijos institutas.

Eriksson, M. (2008). (Re)Producing a "peripheral" region – Northern Sweden in the news. *Geografiska Annaler: Series B, Human Geography*, 90(4), 369–388. https://doi.org/10.1111/j.1468-0467.2008.00299.x

Eurostat (2010–2020). *Database*. [Retrieved 2022-11-10] Available at: https://ec.europa.eu/eurostat/web/main/data/database

Fitalová, A. (2022). *Vplyv globalizácie na rozvoj regiónov Slovenska*. Rigorózna práca. Bratislava: Univerzita Komenského.

Gong, H., Hassink, R. (2017). Regional resilience: The critique revisited. In: Williams, N. *Creating resilient economies: Entrepreneurship, growth and development in uncertain times*, 206–216.

Haloun, Ľ. (1995). *Industrializácia Slovenska 1918–1938*. Bratislava: VEDA.

Henning, M., Stam, E., Wenting, R. (2013). Path dependence research in regional economic development: Cacophony or knowledge accumulation? *Regional Studies*, 47(8), 1348–1362. https://doi.org/10.1080/00343404.2012.750422

Hwang, C. L., Yoon, K. (1981). *Multiple Attribute Decision Making: Methods and Applications*. New York: Springer Verlag. ISBN 978-3-642-48318-9.

Ira, V., Lehotský, M. (2008). Developmental possibilities and limits in models of selected regional systems. *Folia Geographica*, 12, 122–130.

Kebza, M. (2018). The development of peripheral areas: The case of West Pomeranian Voivodeship, Poland. *Moravian Geographical Reports*, 26(1), 69–81. https://doi.org/10.2478/mgr-2018-0006

Korec, P. (2014). Lagging regions of Slovakia in the context of their competitiveness. *Rozwój regionalny i politika regionalna*, 25, 113–133. https://doi.org/10.14746/rrpr.2014.25.07

Korec, P., Ondoš, S., Matu, P., et al. (2005). *Regionálny rozvoj Slovenska v rokoch 1989–2004*. Bratislava: Geografika. ISBN 9788096933808.

Korec, P., Ondoš, S., Rusnák, J. (2016). Regionálne disparity na Slovensku; Niekoľko poznámok k ich bádaniu. *Acta Geographica Universitatis Comenianae*, 60(2), 257–293.

Korec, P., Przybyla, V. (2019). Kríza kapitalizmu, globalizácia a post-industriálny vývoj spoločnosti a ich vplyv na politický vývoj na Slovensku. *Acta Geographica Universitatis Comenianae*, 63(1), 69–102.

Lang, T. (2015). Socio-economic and political responses to regional polarisation and socio-spatial peripheralisation in Central and Eastern Europe. A research agenda. *Hungarian Geographical Bulletin*, 64(3), 171–185. https://doi.org/10.15201/hungeobull.64.3.2

Madajová, M., Michálek, A., Podolák, P. (2014). Úroveň regionálnych disparít na Slovensku a jej zmena v období rokov 2001–2011. *Geographia Slovaca*, 28, 127–152.

Manokaran, E., Subhashini, S., Senthilvel, S., et al. (2011). Application of multi criteria decision making tools and validation with optimization technique case study using TOPSIS, ANN & SAW. *International Journal of Management & Business Studies*, 1(3), 112–115.

Martin, R. (2012). Regional economic resilience, hysteresis and recessionary shocks. *Journal of Economic Geography*, 12(1), 1–32. https://doi.org/10.1093/jeg/lbr019

Martin, R., Sunley, P. J. (2015). On the notion of regional economic resilience: Conceptualisation and Explanation. *Journal of Economic Geography*, 15(1), 1–42. https://doi.org/10.1093/jeg/lbu015

Martin, R., Sunley, P. (2017). Competitiveness and regional economic resilience. In: Huggins, R., Thompson, R. *Handbook of Regions and Competitiveness*, 287–307. London: Edward Elgar Publishing. ISBN 978-1-78347-500-1.

Masik, G. (2018). An agency perspective of resilience: The case of Pomorskie region. *European Planning Studies*, 26(5), 1060–1077. https://doi.org/10.1080/09654313.2018.1436700

Masik, G., Grabkowska, M. (2020). Practical dimension of urban and regional resilience concepts: a proposal of resilience strategy model. *Miscellanea Geographica – Regional Studies on Development*, 24(1), 30–34. https://doi.org/10.2478/mgrsd-2019-0028

Matlovičová, K., Židová, A., Kolesárová, J. (2014). Dynamika regionálnych disparít na Slovensku v predkrízovom období a ich riešenie vybranými nástrojmi regionálnej politiky. *Geographia Slovaca*, 28, 63–99.

Máliková, L., Klobučník, M., Bačík, V., et al. (2015). Socio-economic changes in the borderlands of the Visegrad Group (V4) countries. *Moravian Geographical Reports*, 23(2), 26–37. https://doi.org/10.1515/mgr-2015-0008

Michálek, A., Podolák, P. (2014). Regionálne a priestorové disparity na Slovensku, ich vývoj v ostatnom desaťročí, súčasný stav a konzekvencie. *Geographia Slovaca*, 28, 5–21.

Neffke, F., Henning, M. S. (2013). Skill relatedness and firm diversification. *Strategic Management Journal*, 34(3), 297–316, https://doi.org/10.1002/smj.2014

Norris, F. H., Stevens, S. P., Pfefferbaum, B., et al. (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *American Journal of Community Psychology*, 41(1–2), 127–150. https://doi.org/10.1007/s10464-007-9156-6

Obrist, B., Pfeiffer, C., Hanley, R. (2010). Multi-layered social resilience: a new approach in mitigation research. *Progress in Development Studies*, 10(4), 283–293. https://doi.org/10.1177/146499340901000402

Opricovic, S., Tzeng, G. H. (2004). Compromise solution by MCDM methods: A comparative analysis of VIKOR and TOPSIS. *European Journal of Operational Research*, 156(2), 445–455. https://doi.org/10.1016/S0377-2217(03)00020-1

Pénzes, J., Demeter, G. (2021). Peripheral areas and their distinctive characteristics: The case of Hungary. *Moravian Geographical Reports*, 29(3), 217–230, https://doi.org/10.2478/mgr-2021-0016

Plummer, P., Tonts, M., Argent, N. (2018). Sustainable rural economies, evolutionary dynamics and regional policy. *Applied Geography*, 90, 308–320, https://doi.org/10.1016/j.apgeog.2017.01.005

Pociūtė-Sereikienė, G. (2019). Peripheral regions in Lithuania: the results uneven development. *Regional Studies, Regional Science*, 6(1), 70–77, https://doi.org/10.1080/21681376.2019.1571437

Quinlan, A. E., Berbés-Blázquez, M., Haider, L. J., et al. (2016). Measuring, and assessing resilience: broadening understanding through multiple disciplinary perspectives. *Journal of Applied Ecology*, 53(3), 677–687. https://doi.org/10.1111/1365-2664.12550

Rajčáková, E., Švecová, A. (2002). Postavenie okresov a krajov Slovenska z hľadiska hodnotenia vybraných sociálnych a ekonomických znakov. *Geographia Slovaca*, 18, 167–175.

Rajčáková, E., Švecová, A. (2009). Regionálne disparity na Slovensku. *Geographia Cassoviensis*, 3(2), 142–149.

Shih, H. S., Shyurb, H. J., Lee, E. S. (2007). An extension of TOPSIS for group decision making. *Mathematical and Computer Modelling*, 45(7–8), 801–813. https://doi.org/10.1016/j.mcm.2006.03.023

Simmie J., Martin R. (2009). The Economic Resilience of Regions: Towards an Evolutionary Approach. *Cambridge Journal of Regions, Economy and Society*, 3(1), 27–43, https://doi.org/10.1093/cjres/rsp029

Statistical Office of the Slovak Republic (2010–2020). *DATAcube*. [Retrieved 2022-11-10] Available at: https://datacube.statistics.sk/

Swanstrom, T. (2008). *Regional resilience: A critical examination of the ecological framework*. Berkeley: University of California.

Vaishar, A. (2006). Regional periphery: What does it mean. *Europa XXI*, 15, 7–12.