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DIFFERENTIATION OF THE SOCIO-ECONOMIC DEVELOPMENT OF THE NUTS-3 SUBREGIONS IN CENTRAL AND EASTERN EUROPEAN COUNTRIES

Marcin Spychała

Poznań University of Economics and Business, Poznań, Poland

Abstract: The article focuses on the analysis of the level of the socio-economic development of 239 NUTS-3 level subregions of Central-Eastern Europe based on 31 indicators categorised within the three subcomponents (factors) of the regional development: the natural environment, the human capital, as well as entrepreneurship and innovativeness. The purpose of the article is to specify the variation in the level of socio-economic development of the subregions within the arrangement of the NUTS-3 units. The level of socio-economic development, as well as the level of the development of its factors, shall be presented based on a synthetic gauge exhibiting the taxonomic distance of a particular subregion from the established pattern of development. In the study, a hypothesis shall be verified according to which the socio-economic development of Central-Eastern European subregions is highly varied, and its highest level is registered in the subregions located around the capitals of the researched states.

Keywords:

regional development;
NUTS-3 units;
Hellwig's reduction method;
distance from the role model

Email: marcin.spychala@ue.poznan.pl

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Introduction

Specifying the level of socio-economic development as well as its changes is an incredibly important research problem both in economic theory and in economic practice. For example, the allocation of the European funds to specific subregions, as well as the intensity of state aid for communities depends on the level of development (Albulescu and Goyeau 2013, Nistor and Glodeanu 2014, Matsuura 2015). Researching the significance of the process of socio-economic development, together with its causes and consequences, is the subject of a lot of scientific reports (Dreyer et al. 2006, Đukičin Vučković et al. 2018, Orlova et al. 2018, Shikverdiev et al. 2019, Jašková and Havierniková 2020, Mukhametzhan et al. 2020).

A characteristic feature of regional development is its spatial differentiation. The growing discrepancies in regional development in turn constitute one of the main problems of the contemporary economy, and the fundamental goal of the European cohesion policy is convergence, i.e. activities directed towards decreasing the differences in the level of development of EU regions (Martin and Sunley 1998, Charron et al. 2014, Beugelsdijk et al. 2018).

Based on 31 indicators categorised within the three subcomponents (factors) of the regional development, we present the level of the socio-economic development of NUTS-3 subregions of eleven countries of Central and Eastern Europe (CEE)according to human capital, natural environment, as well as entrepreneurship and innovativeness. The basis applied to calculate the indicators was the statistical data of Eurostat (2021) database, enriched by the data from the Statistical Offices of the surveyed countries. The main assumption of the article is to present the variation of the level of the socio-economic development of CEE countries that are members of the European Union (Bulgaria, Croatia, the Czech Republic, Estonia, Lithuania, Latvia, Poland, Romania, Slovakia, Slovenia and Hungary) within the arrangement of specific 239 subregions, i.e. the third level of classifying territorial units for statistical purposes applied by Eurostat (the so-called NUTS-3). The level of the socio-economic development are presented based on a synthetic gauge representing a taxonomic distance of a given subregion from the established pattern of development.

This study verifies a hypothesis according to which the socio-economic development of the NUTS-3 subregions in CEE is highly varied, and its highest level is registered in the subregions located around the capitals of the researched countries, and the lowest – in the subregions located the farthest from the indicated large cities, constituting the centres of growth. The research encompasses all NUTS-3 subregions in the EU Member States of CEE – 239 units in total.

Regional development theories

Accepting the definition of a region as a territory-based social system, Hauke and Kossowski (2011) defined the regional development as a combination of socio-economic changes which take place within the region-system. Regional development may be considered in terms of quantity and quality dimensions. Striving towards the increase in work efficiency in all branches of the economy may be considered in the form of quantitative activities, and stimulating the growth of certain layers of activity with a simultaneous lack of encouragement for other branches may pass as qualitative activities (Đukičin Vučković et al. 2018). It is well worth noting that the quantitative dimension of growth is economic development. The development is thus a notion wider than growth, as, apart from quantitative changes, it is accompanied by qualitative structural changes (Bystrova et al. 2015).

The subject matter literature includes a lot of reviews of theories and outlooks on regional development. Part of them is an attempt to systematise them, taking advantage of different takes at that (Illeris 1993, Martin 2015). In this article, a review of the takes on regional development shall be done in terms of the factors of the said development based on the two main trends of the economic thought: (1) the neoclassical one, assuming, in line with the liberal doctrine, minimising the state interventionism and treating the free market economy as a measure of regulating the above mentioned; (2) the neo-Keynesian one, acknowledging state interventionism as necessary and the most important regulating mechanism of regional development.

A concept of regional development relating to the representatives of the classical school of Economics – Adam Smith and David Ricardo – is the theory of comparative cost (Sinha 2019). Within the framework of the concept, Ricardo has proven not only the mistaken nature of the beliefs of Mercantilists concerning international trade, then assuming that only one side of the transaction obtains benefits, but he also supported Smith's argument concerning the loans from the free foreign trade (Sinha 2019). Smith saw the benefits of both exchanging partners, if each of them, thanks to specialising, is in possession of a cheaper product, created with a relatively lower labour input than their partner (Friedmann 1983). Therefore, the main assumption of the theory is a conclusion that a comparison of efficiency and labour costs between two regions shapes the development factor which is cooperation and international trade (Sinha 2019).

Another theory of the neoclassical trend is a concept of convergence formulated by the Nobel Prize laureate Jan Tinbergen (Dekker 2021). The concept is directly related to the theory of comparative cost, and its supporters claim that the trade exchange between the developed and undeveloped (backward) countries may, with time, lead to a decrease in the level of their development, and even to the levelling out the level of income in both those groups (Dekker 2021). Apart from the international exchange, the

factor of development of the concept is also the capital and technological development (Henrekson and Jakobsson 2003).

As opposed to the neoclassical concepts, in the first part of the twentieth century, theories emerged which related to John Maynard Keynes' doctrine (Dimand and Hagemann 2019). The previous concepts were focused on the supply aspect, and Keynes and his followers concentrated on the demand analysis (Dimand and Hagemann 2019). The demand theories postulate different administrative activities, striving towards the creation and the strengthening of the factors of development, such as: increasing the qualifications of the workforce, promoting export, investment in infrastructure, supporting the development of entrepreneurship or creating innovativeness (Florida 2002, Zemtsov and Smelov 2018, Diebolt and Hippe 2019, Li et al. 2019).

The importance of innovating the process of regional development has been emphasised by Joseph Schumpeter, a representative of the Austrian school (De Castro et al. 2018, Emami Langroodi 2021). The development resembles the process of creative destruction (De Castro et al. 2018, Emami Langroodi 2021). Innovation assures, on one hand, a structural change as well as the development, and, on the other – it destroys the previous economic and social structures (De Castro et al. 2018, Emami Langroodi 2021). Not all entities are prepared for such changes. Sometimes they are forced to self-destruct and to introduce new technological solutions (De Castro et al. 2018, Emami Langroodi 2021). Otherwise, they stop being economically viable.

A new theory of growth, initiated by Paul Romer, assumes the possibility of accumulating the factors of development, which is a possibility of achieving a state of durable development, as well as maintaining or even extending the economic differences between regions (Chandra 2022). A stable and long-lasting development is termed within this framework as endogenous development. The basic factors generating growth are: human and physical capital, as well as technological innovativeness (Chandra 2022). The poor regions may not make up for the developmental differences in a different manner than increasing its technological level and investing in human qualifications (Benner 2003, Rodionov et al. 2018, Arranz et al. 2019, Baklanov 2020).

Within the framework of the neoclassical trend, the contemporary model of the so-called new economic geography combines three elements within itself: transport costs, the benefits of an agglomeration, and the costs of the flows of the production input (Krugman 1998). The model takes account of the possibility of the occurring of, or even deepening, of the interregional differences, which, according to Grosse (2010), is a result of the tendencies to accumulate growth factors in the most developed metropolitan regions. A new theory of development as well as a new economic geography have found wide use in the concept of endogenous regional development (Kadyrbechevna Shugova 2018). According to the theory, the economic development

of a particular region depends on factors such as: the endogenous material, its human and social capital, as well as an intra-regional development policy (Kadyrbechevna Shugova 2018). Regional development should constitute an internal effect and it should as well as be managed by a region "from the bottom" (Gallego et al. 2010). The conditions for sustainable regional development should be created by an efficiently managed regional policy. Therefore, the concept rejects the neoclassical assumption of "the invisible hand of the market", to the benefit of neo-Keynesian state interventionism (Gallego et al. 2010).

Regional development might occur in a spontaneous manner, or it might be supervised. The second option relates to shaping development through stimulating the factors of regional development within the conducted regional policy. The subject matter of regional policy is the subject of lively debates among the representatives of different fields of knowledge: Economics, Geography, Law, or Political Science. A rich literature has been created in the subject of regional policy, and the number of definitions is hard to grasp. Defining regional policy is somewhat difficult, especially in the context of activities taken within the structural policy and the cohesion policy of the European Union (Milenković et al. 2021). The notions are often interchangeable, as both the regional policy and the cohesion policy as well as the structural policy have the same purpose, which is decreasing the economic and social differences among the EU regions (Moroshkina 2019).

The mutual relationship and the intertwining of the abovementioned community policies has been specified by Grosse (2010"326), concluding that "regional policy is also termed as a structural policy or the socio-economic cohesion policy. The first term refers to a deliberate activity of public authority agencies striving towards the recreation of the economic structure and a stimulation of the economic growth of a particular area. In the case of the cohesion policy, the aim of the authority is to decrease the developmental differences of the respective territories."

Downes (1996), however, pointing towards the relationship between the structural policy and other community policies, emphasises that the subject matter of the cohesion policy, the structural policy and the regional policy is the same reality, with a reservation that the emphasis of a particular policy is placed differently. Due to their close relationship, Downes (1996) suggests using the "regional structural policy" term.

The European Commission concludes that the regional policy is a conscious and deliberate activity of the central public authority agencies striving towards regulating the interregional proportions of development (Smętkowski and Dąbrowski 2019). The structural policy is, however, a notion used in the European Union almost automatically linked with the Cohesion Policy (Czaplewski and Klóska 2020).

According to Smętkowski (2015), the regional policy in the economic dimension

comprises all forms of state intervention which are directed towards the change in the spatial location of the economic activity. Within such a framework, it aims to correct the effects of free market trends in the direction of ensuring economic growth and the change in income redistribution (Pfirrmann 1995). Within the general framework, the regional policy may be defined as activities aiming to maximise the usability function, i.e. aiming to improve the economic situation of one or more regions (Démurger 2001).

The regional policy is related to the occurrence of differences in the level of the development of the respective regions. The uneven regional development resulting from the investors' decisions, the important aspects of the free-market economy mechanism, or the geographical factors, lead to the varying levels of income, as well as the life quality of the population. The main task of the regional policy is the necessity to limit the scale of those differences (Liu et al. 2018).

The need to strengthen the economic and social cohesion of Europe through decreasing the differences in the development of the respective regions was discussed already at the level of creating the European Community. In the preamble to the Treaty of Rome, it has thus been indicated that one of the assumptions of the Communities is "a strengthening of the unity of its economies and ensuring their harmonious growth, through decreasing the differences existing between the respective regions as well as the lagging behind of the regions less privileged" (Madanipour et al. 2022: 818). Introducing this principle to the Treaty of 1957 is widely accepted as the symbolic beginning of the European cohesion policy (Lu et al. 2020).

The sources of the funding of the cohesion policy related activity of the European Union are currently the structural funds and the Cohesion Fund. The European Social Fund (ESF), being the oldest structural fund of the European Communities, is a basic instrument of European social policy (Avgerou 2008). The activity of the fund centres above all around the development of the job market through stimulating the employment of people, counteracting the unemployment, creating and maintaining workplaces, or taking care of a high level of employment (Fongwa and Marais 2016). The activity of the European Social Fund was directed towards the creation of mechanisms conducive to the development of the job market. The fund is thus to contribute to the increase in the level of employment, at the same time stimulating professional and geographical mobility of workforce resources (Benz and Fürst 2002).

The most important financial instrument of the cohesion policy is, however, the European Fund of Regional Development (EFRD). It was launched in 1975. EFRD is directed towards supporting the activity with the aim of levelling out the differences in the level of the respective Community regions (Gburová and Matušíková 2014). The fund aims to contribute towards correcting the basic regional discrepancies in the Community through participation in the development as well as structural adjustment of the regions lagging behind in the development, as well as in transforming the

industrial regions experiencing downfall as well as supporting the transborder, transnational and interregional cooperation (Gburová and Matušíková 2014). Complementing the above mentioned two structural funds is the Cohesion Fund (CF) created based on the Treaty of Maastricht (Palvia et al. 2018). The fund is not a structural fund, as it is not regionally directed, and the aid it offers is aimed at the least developed countries. Its direction is focused on supporting the realisation of national-level projects, and the paying out of aid is dependent on the level of the development of a member state (below 90% of GDP per capita at the national level), as well as maintaining by the state a budget deficit at the level not compromising the possibility of fulfilling one of the basic convergence criteria (Goryachikh and Kravchenko 2020). Support from this fund is granted towards the activities concerning the environment and the TEN-T trans-European transport networks (Ibinceanu Onica et al. 2021).

Among the most frequently mentioned in the literature factors of regional development, there are: aspects related to human capital and economic aspects. As a result of the literature studies, however, a research gap was identified in relation to including environmental aspects among regional development factors. This may be caused by the difficulty in identifying and the insufficient indexing of environmental elements. Therefore, the author of this study decided to address the research gap and to include environmental aspects in his considerations as one of the most important regional development factors. However, due to the low availability of empirical data directly referring to the natural environment, the author is aware of certain imperfections related to the construction of a synthetic indicator.

Methodology

In order to research the level of socio-economic development of NUTS-3 level subregions in the eleven countries of CEE (being EU Member States), a synthetic gauge of the distance from the recommended pattern has been used. The research procedure has been conducted parallelly – in the static dimension (based on the values of the indicators in 2019), as well as in the dynamic dimension (based on the change of the value of the indicators in the years of 2010-2019). The research procedure was composed of five respective stages:

1. specifying the subcomponents – i.e. the factors of regional development;
2. the selection of variables – the creation of a matrix of geographical information;
3. the reduction of the multi featured space;
4. indicating the level of socio-economic development of the units subject to research;
5. the classification of the subregions against the scale of socio-economic development.

A review of the regional development concept allows for specifying the most

important constituents, i.e. factors of regional development. A development factor is a constituent, regional property or an occurrence which impacts the socio-economic development (Feldman 1999, Yun et al. 2017, Naydenov 2019, Khasanova et al. 2020). The socio-economic development has been characterised based on its three subconstituents, termed for the purpose as follows: "the human capital", "the natural environment", and "the entrepreneurship and innovativeness".

Table 1. Indicators taken into account in the analysis specifying the subcomponents of regional development

The subcomponent of development	Indicators
Human capital (11 variables)	The natural growth per 1000 inhabitants; the migration balance per 1000 inhabitants; the feminisation coefficient in total; the share of people at the production age in the total number of people; the share of people at the post-production age in the total number of people; the share of people at the pre-production age in the total number of people; the number of people at the non-production age per 100 people at the production age; the number of people at the post-production age per 100 people at the pre-production age; the median age of the population; the total birth-rate; the average age of women at birth.
Natural environment (10 variables)	The municipal waste per 1 inhabitant; disposed of municipal waste per 1 inhabitant; the share of farmland as well as natural green areas in the total area; the share of farms below 5 hectares in the total number of farms; the share of farmers-farm owners under the age of 35 in the total number of farm owners; registering misdemeanour and a crime concerning the natural environment per 1000 inhabitants; road transport of goods measured in tonnes per 1000 inhabitants; the use of electrical energy for freezing the living quarters (as EU average); the use of the electrical energy for heating the living quarters (as EU average); the quantity of accommodation per 1000 inhabitants.
Entrepreneurship and innovativeness (10 variables)	The share of microenterprises in the total number of economic entities; the creation of enterprise coefficient; the share of the employed in farming in the total number of the employed; the share of the employed in the financial sector in the total number of the employed; the share of the employed in the sector of information and communication in the total number of the employed; the share of the employed in the sector of professional services in the total number of the employed; the share of the employed in services in the total number of the employed; the number of consumables per 1 mln inhabitants; the number of trademarks per 1 mln inhabitants; GDP per 1 inhabitant (as EU average).

The "human capital" subconstituent has been specified through indicators displaying the population potential of a particular subregion, referring to the balance of migration and the birth-rate, the fertility, the level of education, as well as the age structure. Within "the natural environment", indicators concerning the use of land have been considered, the structures of farms, the waste, the burden connected with the road transport of goods and the use of energy for heating and the freezing flats have been analysed. Within the "entrepreneurship and innovativeness" factor, however, the indicators connected with entrepreneurship, the structure of employment, the GDP, as well as the scale of innovativeness measured by the number of trademarks and consumables obtained were considered. All the factors mentioned above that are

connected with the regional development were interrelated. In the striving towards a competitive development of a particular region, the factors ought to be included in the long-term strategy. As Churski (2008) claims, one may thus assume that regional development comprises both the dynamic processes occurring under the influence of specific factors, which determine the character, the direction, as well as the speed of the socio-economic changes, as well as the changes deliberately directed, which through the pro-development factors are aimed at realising the tasks within the regional policy.

At the second stage of the conducted research procedure, a matrix of geographical information was built based on 31 indicators (Table 1), which specified the level of development of the NUTS-3 units in 2019, as well as the changes thereof in the years between 2010-2019, in relation to three subcomponents of growth: the human capital, the natural environment, and the entrepreneurship and innovativeness. Subsequently, Pearson's linear correlation coefficients were calculated between all the researched departure indicators separately for 2019, as well as separately for its change in the years of 2010-2019. It is extremely important, however, for the indicators selected for a synthetic gauge of distance from the recommended pattern to be loosely correlated between each other. As a result, the information capacity of those indicators differs.

The matrices of Pearson's correlation coefficients were the basis of conducting a reduction of the departure variables by using Z. Hellwig's reduction method – i.e. to separate the diagnostic features, i.e. those indicators which shall be taken into account in further research procedure (Balcerzak 2016). The Z. Hellwig's reduction method is used for calculation of the correlation coefficients between the variables. In Z. Hellwig's reduction method, the diagnostic feature is the indicator whose sum total of the absolute correlation coefficients with other features is the highest (it is then called the central feature). Next, those variables are eliminated for which the value of the correlation coefficient with the diagnostic feature is higher than the critical value specified based on the hereinbelow mentioned pattern (Nowak 2018):

$$r^* = \sqrt{\frac{(t^*)^2}{n - 2 + (t^*)^2}} \tag{1}$$

where:

r^* – critical value of Pearson's linear correlation coefficient
t^* – the t-Student statistics value (at the significance level p=0.05)
n – the number of departure indicators (variables)

As a result of the applied method, those variables are eliminated which are significantly statistically correlated with the diagnostic feature (called satellite features). At every next step, there is a reduction of the correlation matrix by the central

feature and the satellite features. The Z. Hellwig's method is repeated, obtaining new reduced correlation matrices, up to the point of exhausting a collection of features or the separation of isolated features (Hauke and Kossowski 2011). The procedure of the reduction of variables has been eightfold: separately for the level of the socio-economic development in total, as well as separately for the level of the development for each subcomponent both in the static dimension (for the data for 2019), as well as the dynamic one (for the data for 2010-2019).

At the next step of the research procedure, a pattern, and an anti-pattern of the level of socio-economic development have been devised. A pattern has been defined as the maximum standardised values of the respective diagnostic features, and the anti-pattern – their minimum values (Spychała 2020). At the next stage, the taxonomic value of each researched subregion of the NUTS-3 level from the pattern of development was devised based on the hereinbelow mentioned pattern (Reiff et al. 2016):

$$d_{i0} = \sqrt{\sum_{j=1}^{m} \left(z_{ij} - z_{0j}\right)^2} \tag{2}$$

where:

d_{i0} – the taxonomic distance of the *i*-subregion from the assumed pattern of development

z_{ij} – the standardised value of the *j*-indicator (feature) for the *i*-subregion

z_{0j} – the standardised value of the *j*-indicator (feature) for the pattern of development

At the last stage of the research procedure, a synthetic gauge for each NUTS-3 subregion was devised, being an indicator of the level of development in a particular subregion. The value of the synthetic gauge was calculated for the general level of the socio-economic level of development, as well as separately for each of the three subcomponents of the development. The synthetic gauge was calculated based on the following pattern:

$$v_i = 1 - \frac{d_{i0}}{d_0} \tag{3}$$

where:

v_i – a synthetic gauge of the level of development of the i-subregion

d_{i0} – the taxonomic distance of the i-subregion from the assumed pattern of development

d_0 – the taxonomic distance of the pattern from the antipattern of development

A synthetic gauge of the level of development assumes values from 0 to 1, with a proviso that the higher the value, the higher the level of the development of a particular phenomenon. Based on the calculated synthetic gauges, a ranking of 239 subregions of the NUTS-3 level in the EU Member States of CEE was established, and its subcomponents were subsequently subdivided into five groups: at a very high (20% of the subregions at the highest value of the synthetic gauge – the 1. group – places 1-48 in the ranking); high (the following 20% of the subregions – the 2. group – places 49-96 in the ranking); average (subregions located on positions 97-143, taking account of their decreasing placement based on a given synthetic gauge – the 3. group); low (subregions on positions 144-191 – the 4. group); and a very low (20% of the subregions at the lowest value of the synthetic gauge – the 5. group – positions 192-239) level of development. Taking account of the research conducted in the dynamic dimension, the subregions for which the indicator took the highest values (20% of the researched units) were classified into the group comprising units of a very high variability of the intensity of the phenomenon, and the units for which the indicator assumed the lowest values (20% of the researched subregions), classified into the group exhibiting the relatively low variability of the level of development of a particular phenomenon.

Results

Table 2 presents the NUTS-3 units exhibiting the highest and the lowest values of the synthetic gauge within the respective subcomponents of the socio-economic development calculated separately for 2019. In Table 3, the NUTS-3 subregions of the extreme values of the synthetic gauge were compiled and calculated for the changes in the years of 2010-2019. Figure 1 contains the choropleth maps representing the spatial variation of the socio-economic level of the NUTS-3 subregions in the EU Member States of CEE in 2019, as well as the changes in the development for the period 2010-2019.

As a result of the conducted research procedure, the spatial differentiation of 239 NUTS-3 level subregions in eleven countries of CEE was presented with respect to the level of socio-economic development, as well as three subcomponents being factors of that growth. In the researched group of units, the value of the synthetic gauge representing the level of the socio-economic development in 2019 ranged from 0.165 to 0.471. The value of the gauge representing the change in the level of the socio-economic development of the subregions in the years of 2010-2019 ranged from 0.392 to 0.581. A similar differentiation was observed in the case of the human capital (0.142–0.623 for 2019, as well as 0.293–0.571 for the change in the years of 2010-2019), the natural environment (0.270–0.479, as well as 0.275–0.659, respectively), as well as the entrepreneurship and innovativeness (0.078–0.830, respectively, as well as 0.233–0.657). One should thus note that the biggest differentiation of the subregions was registered in terms of entrepreneurship and innovativeness, and the biggest similarity of the researched units was observed in the case of the natural environment.

Table 2. Extreme values of the synthetic gauge within the respective subcomponents of the socio-economic development in 2019

The highest values of the synthetic gauge (2019)			**The lowest values of the synthetic gauge (2019)**		
Item	The NUTS-3 subregion	Value	Item	The NUTS-3 subregion	Value
		Human capital			
1	Poznanski (PL)	0.623	239	Vidin (BG)	0.142
2	Ilfov (RO)	0.618	238	Gabrovo (BG)	0.185
3	Gdanski (PL)	0.618	237	Kyustendil (BG)	0.237
4	Warszawski wschodni (PL)	0.599	236	Teleorman (RO)	0.253
5	Kosický kraj (SK)	0.594	235	Montana (BG)	0.267
		Natural environment			
1	Koszalinski (PL)	0.479	239	Vilniaus apskritis (LT)	0.270
2	Liberecký kraj (CZ)	0.471	238	Gliwicki (PL)	0.284
3	Slupski (PL)	0.468	237	Miasto Wroclaw (PL)	0.298
4	Jihocecký kraj (CZ)	0.417	236	Katowicki (PL)	0.300
5	Gdanski (PL)	0.408	235	Kauno apskritis (LT)	0.301
		Entrepreneurship and innovativeness			
1	Miasto Warszawa (PL)	0.830	239	Vaslui (RO)	0.078
2	Osrednjeslovenska (SL)	0.613	238	Kardzhali (BG)	0.086
3	Miasto Kraków (PL)	0.610	237	Razgrad (BG)	0.099
4	Põhja-Eesti (EE)	0.597	236	Neamt (RO)	0.104
5	Hlavní mesto Praha (CZ)	0.596	235	Silistra (BG)	0.112
		Level of general socio-economic development			
1	Miasto Warszawa (PL)	0.471	239	Vidin (BG)	0.165
2	Põhja-Eesti (EE)	0.465	238	Montana (BG)	0.211
3	Miasto Kraków (PL)	0.460	237	Teleorman (RO)	0.213
4	Osrednjeslovenska (SL)	0.452	236	Kyustendil (BG)	0.215
5	Bratislavský kraj (SK)	0.448	235	Gabrovo (BG)	0.217
6	Obalno-kraska (SL)	0.440	234	Pleven (BG)	0.223
7	Hlavní mesto Praha (CZ)	0.425	233	Lovech (BG)	0.230
8	Warszawski zachodni (PL)	0.423	232	Utenos apskritis (LT)	0.233
9	Miasto Poznan (PL)	0.418	231	Pernik (BG)	0.240
10	Trojmiejski (PL)	0.414	230	Silistra (BG)	0.240

Table 3. The highest and the lowest values of the synthetic gauge within the respective subcomponents of the socio-economic development in the period 2010-2019

The highest values of the synthetic gauge (the period of 2010-2019)			The lowest values of the synthetic gauge (the period of 2010-2019)		
Item	The NUTS-3 subregion	Value	Item	The NUTS-3 subregion	Value
			Human capital		
1	Miasto Warszawa (PL)	0.571	239	Marijampoles apskritis (LT)	0.293
2	Bucharest (RO)	0.542	238	Smolyan (BG)	0.298
3	Timiș (RO)	0.540	237	Taurages apskritis (LT)	0.300
4	Cluj (RO)	0.530	236	Utenos apskritis (LT)	0.317
5	Iași (RO)	0.526	235	Vukovarsko-srijemska zupanija (HR)	0.324
			Natural environment		
1	Telsiu apskritis (LT)	0.659	239	Sibensko-kninska zupanija (HR)	0.275
2	Obalno-kraska (SL)	0.658	238	Primorsko-notranjska (SL)	0.384
3	Goriska (SL)	0.645	237	Zadarska zupanija (HR)	0.400
4	Kesk-Eesti (EE)	0.622	236	Yambol (BG)	0.433
5	Alytaus apskritis (LT)	0.605	235	Dubrovacko-neretvanska zupanija (HR)	0.463
			Entrepreneurship and innovativeness		
1	Põhja-Eesti (EE)	0.657	239	Pieriga (LV)	0.233
2	Vilniaus apskritis (LT)	0.648	238	Koroska (SL)	0.340
3	Cluj (RO)	0.635	237	Zasavska (SL)	0.363
4	Bucharest (RO)	0.633	236	Zemgale (LV)	0.386
5	Miasto Warszawa (PL)	0.622	235	Utenos apskritis (LT)	0.388
			Level of general socio-economic development		
1	Miasto Warszawa (PL)	0.581	239	Sibensko-kninska zupanija (HR)	0.392
2	Bucharest (RO)	0.578	238	Utenos apskritis (LT)	0.409
3	Cluj (RO)	0.571	237	Pieriga (LV)	0.414
4	Põhja-Eesti (EE)	0.566	236	Smolyan (BG)	0.427
5	Vilniaus apskritis (LT)	0.563	235	Primorsko-notranjska (SL)	0.427
6	Lääne-Eesti (EE)	0.558	234	Koroska (SL)	0.438
7	Riga (LV)	0.556	233	Zadarska zupanija (HR)	0.445
8	Kesk-Eesti (EE)	0.555	232	Razgrad (BG)	0.446
9	Vas (HU)	0.549	231	Zasavska (SL)	0.450
10	Iași (RO)	0.549	230	Legnicko-Glogowski (PL)	0.452

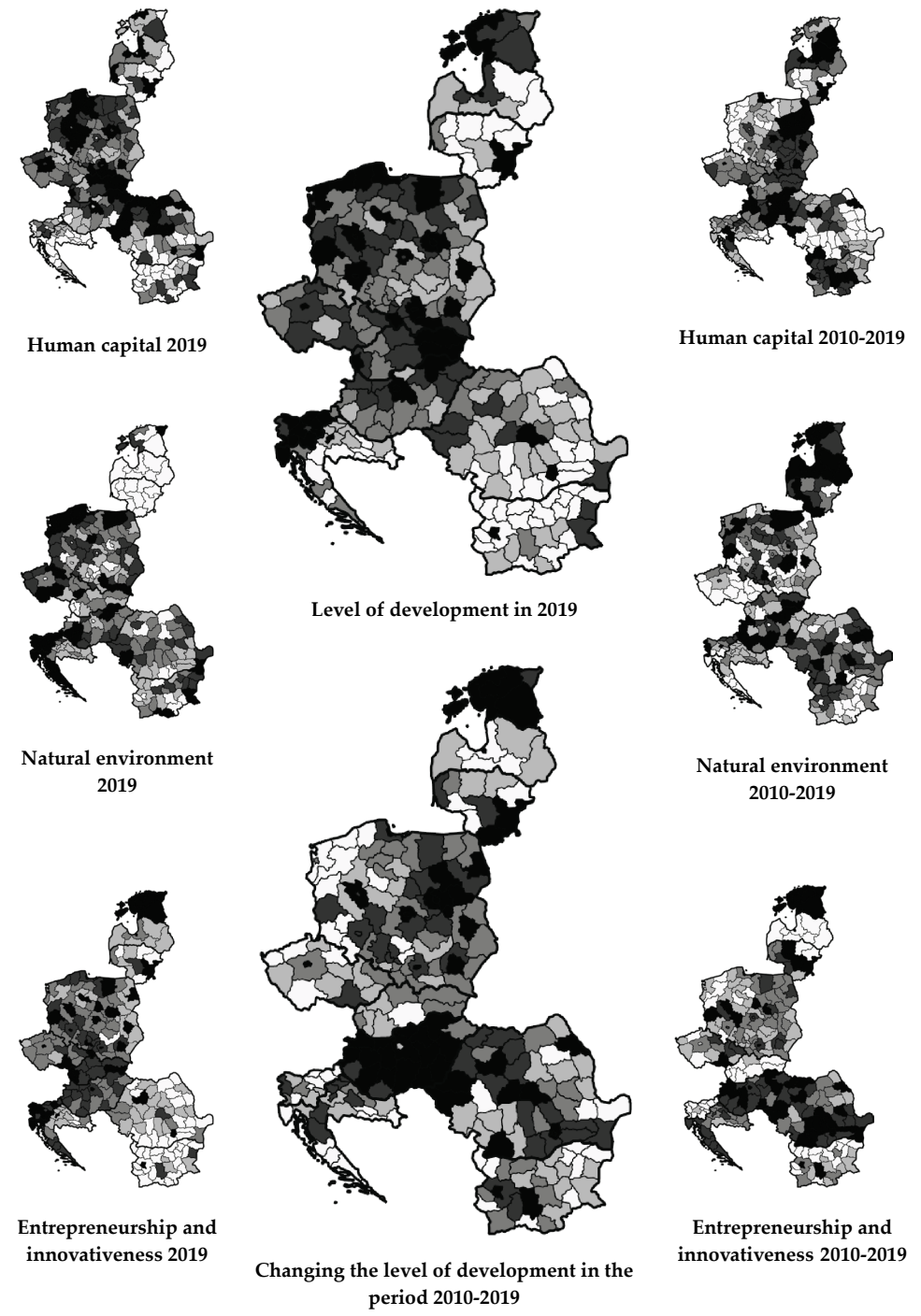

Figure 1. The differentiation of the socio-economic level of the subregions in eleven countries of CEE

Taking account of the level of development for the "human capital" subcomponent, the highest value of the synthetic gauge in 2019 was registered in the Poznański (PL), Ilfov (RO) and Gdański (PL) subregions, and the lowest in the subregions: Vidin (BG), Gabrovo (BG) and Kyustendil (BG). The high position of the indicated districts was decided on by: the beneficial age structure of the population, a high migration balance, as well as a high indicator of fertility. A low position of the respective units was decided on by: the negative birth-rate, as well as a very high share of people at the post-production age in the total number of people.

In regard to the dynamic dimension, the biggest change in the level of development of the "human capital" subcomponent in the years of 2010-2019 was observed in Warsaw (PL), Bucharest (RO) and Timiș (RO) subregions, and the lowest – in the following units: Marijampoles apskritis (LT), Smolyan (BG), and Taurages apskritis (LT) subregions. The weaker position of the NUTS-3 units indicated in the research on the change in the level of development for the human capital was decided on by: the decrease in the birth-rate indicator, as well as an increase in the indicator of the demographic burden. A high position of the respective subregions in the ranking was decided on by: a very high increase in the migration balance, an increase in the share of the people at the production age in the total number of people, as well as a relatively high decrease of the average age of women at the moment of giving birth.

Based on the state of the natural environment, the highest value of the synthetic gauge in 2019 was registered in the following subregions: Koszaliński (PL), Liberecky kraj (CZ), and in the Słupski (PL) subregion; and the lowest – in the subregions: Vilniaus apskritis (LT), Gliwicki (PL), and in Wrocław (PL). The high position of the NUTS-3 units in the research was impacted mainly by: the number of accommodation units per 1000 inhabitants, as well as the lowest use of electrical energy for the purpose of cooling the living quarters, and the high level of the disposed municipal waste per 1 inhabitant. The low position in the ranking of the subregions mentioned hereinabove was decided on by: the problematic road transport of goods measured in tonnes per 1000 inhabitants, as well as a significant amount of municipal waste per 1 inhabitant.

Taking account of the analysis conducted in the dynamic dimension, the biggest improvement of the state of the natural environment in the years of 2010-2019 was observed in the Telsiu apskritis subregion (LT), Obalno-kraska subregion (SL), and the Goriska subregion (SL); and the lowest – in the following subregions: Sibensko-kninska zupanija (HR), Primorsko-notranjska (SL), and Zadarska zupanija (HR). The lower position of the units in the research was decided on by: the increase in demand for cooling the living quarters per capita, as well as an increase in the quantity of municipal waste per 1 inhabitant. A high position in the ranking of the respective units was decided on by: a relatively high share of natural green areas in the area in total, as well as the highest increase, in the researched period, in the percentage of waste disposed of.

In the case of the level of development for entrepreneurship and innovativeness, the highest value of the synthetic gauge in 2019 was registered in Warsaw (PL), Osrednjeslovenska subregion (SL), and Cracow (PL) – in those subregions the most microenterprises per 1000 inhabitants were registered, as well as the biggest share of the employed in the finance sector in the total number of the employed was observed; and the lowest – in the subregions: Vaslui (RO), Kardzhali (BG), and Razgrad (BG) (of the lowest number of microenterprises per 1000 inhabitants, as well as the lowest coefficient of the creation of enterprises). From another standpoint, taking account of the analysis conducted in the dynamic dimension, the biggest progress in the level of development of the "entrepreneurship and innovativeness" subcomponent in the years of 2010-2019 was observed in following units: Põhja-Eesti (EE), Vilniaus apskritis (LT), and Cluj (RO); and the lowest – in the following subregions: Pieriga (LV), Koroska (SL), and Zasavska (SL). The NUTS-3 units position in the conducted research in the dynamic dimension was influenced mainly by: the percentage of the employed in the financial sector, the share of the employed in the sector of professional services, as well as the GDP per capita (in all three indicators, the highest growth was registered in Warsaw), as well as the number of trademarks per 1 million inhabitants (the highest growth in Cracow), as well as the changes in the structure of the enterprises size.

Discussion

Summarising the results of the research conducted on the level of socio-economic development of all 239 NUTS-3 subregions in the EU countries from CEE, one may indicate the following conclusions. The level of the general development of the regions in 2019 was specified based on 31 indicators subcategorized within the three subcomponents of the development: the human capital, the natural environment, and entrepreneurship and innovativeness. The highest value of the synthetic gauge was registered in the big cities that are supra-regional growth centres: Warsaw (PL), Põhja-Eesti (EE) with the capital Tallinn, Cracow (PL), as well as Osrednjeslovenska subregion (SL) with the capital Ljubljana, and Bratislava (SK). The hypothesis stated at the beginning of the article has therefore been positively verified.

Moreover, all eleven state capitals were qualified into the group of units at a very high level of socio-economic development, among which the first ten of the best developed subregions, five capitals were found (Warsaw – the first position, Tallinn – the second position, Ljubljana – the fourth position, Bratislava – the fifth position, Prague – the seventh position), the following two capitals in the second ten (Bucharest – the sixteenth position, Sofia – the seventeenth position), and the three capitals were classified in the third ten of the best developed NUTS-3 units (Budapest – the twenty-first position, Vilnius – the twenty-fifth position, Zaghreb – the thirtieth position). Riga was placed in the thirty-fourth position of the best developed NUTS-3 subregions.

Taking account of the analysis conducted in the dynamic dimension, the biggest change in the level of socio-economic development in the years of 2010-2019 was observed in Warsaw (PL), Bucharest (RO), Cluj (RO), and the Põhja-Eesti subregion (EE), while Vilnius (LT) and Riga (LV) (the 5th and 7th position respectively) were also high in the ranking. The group of units with the greatest change in the level of socio-economic development in 2010-2019 also included for example: Sofia (31st place) and Prague (44th place). On the other hand, Zagreb (HR) was classified only on the 64th place, while the lowest among the capitals were: Bratislava (SK), Ljubljana (SL), and Budapest (HU) (on the 130th, 133rd and 144th place, respectively).

It is well worth noting that the subregions at a very high level of socio-economic development are usually those units in which the biggest change in the development was registered in the years of 2010-2019 (and the reverse). Apart from the capitals of the indicated countries, the group also includes the subregions surrounding the provincial capitals such as those including: Warszawski zachodni (PL), Trójmiejski (PL), Ilfov (RO), and Pest (HU). On the other hand, the subregions at the weakest level of socio-economic development include the NUTS-3 units located at the periphery, as well as far from the strongest regions, e.g. Sibensko-kninska zupanija (HR), Smolyan (BG), Koroska (SL), and Legnicko-Głogowski (PL). One may thus conclude that – on one hand – the current level of development of the respective subregions of CEEan countries is to a large extent shaped by the activities taken in the last decade, i.e. in the period of complete participation in the policy of cohesion of the European Union; and – on the other hand – bigger and bigger disproportions are observed at the level of NUTS-3 units, as to the largest extent, the level of socio-economic development has increased in the economically strongest subregions (in Warsaw, Bucharest and Tallinn), and to the least extent in the relatively weakest developed subregions (e.g. in those located at the north-eastern border of Poland, the southern of Croatia, eastern Bulgaria, and eastern Slovenia). Large developmental disproportions may also be observed in individual countries. Within the area of almost each of them, subregions both at a very high level of socio-economic development, as well as units classified as the 20% of the least developed NUTS-3 units in the researched countries, are located.

Conclusions

Summarising the conducted research, it is well worth looking into the results relating to the respective countries. The level of socio-economic development is highly varied also in the respective states (Table A1 in Appendix). The biggest developmental discrepancies measured both by the value of the synthetic gauge and by the position within the ranking of the best developed subregions were registered in Bulgaria. The countries with a strong variation in the level of socio-economic development are also Poland and Romania, whose capitals are mostly counted as 10% of the best developed subregions, and a lot of NUTS-3 units were found on the last positions of the

compilation. Taking account of the value of the synthetic gauge, Hungary is the country with the lowest development disparities. However, based on the positions of individual NUTS-3 subregions in the ranking, the most balanced level of socio-economic development can be observed in Slovenia.

In the results discussed to date, the most mentioned were the Polish, the Romanian, and the Bulgarian subregions, therefore one may get an illusory feeling that those features are the best (the least) developed. However, a higher frequency of the occurrence of the subregions from those countries in the test results is a result of the fact that in Poland as many as 73 NUTS-3 units (31% among all those being the subject of the research) were established, in Romania – 42 subregions (18% of the researched group), and in Bulgaria – 28 units (12%), while in Estonia only 5 NUTS-3 subregions were established, in Latvia 6 such units, and in Slovakia – 8 NUTS-3. It is related to the assumption that a NUTS-3 subregion must count – apart from certain extraordinary situations – at least 150 000 inhabitants, and 800 000 inhabitants at most, thus the most such units were created in the most heavily populated countries and the reverse.

Table A2 (Appendix) contains a different attitude to the specification of the level of development within the perspective of respective states. The level of socio-economic development was presented there as well as the changes thereof in the NUTS-3-unit subregions of CEE, taking account of the average values of the synthetic gauge of all subregions of a particular state. The highest average value of the synthetic gauge of the general level of socio-economic development, as well as the "natural environment" subcomponent, was registered in the Slovenian subregions. In turn, the highest level of development of the "human capital" subcomponent was registered in Slovakia. The highest average value of the synthetic gauge within the "entrepreneurship and innovativeness" subcomponent, both in the static and dynamic dimension, was observed in Estonia. In addition, Estonia's subregions also saw the highest average value of the measure in terms of changes in the general level of socio-economic development, as well as the greatest improvement in the condition of the natural environment in the 2010-2019 period. On the other hand, the greatest improvement in the "human capital" factor was observed in the Hungarian subregions. In summary, one may thus conclude that, in the analysis comprising the respective NUTS-3 subregions, the Polish, Romanian and Bulgarian units dominate due to their biggest number of subregions. Taking account of the average value of the respective synthetic gauges, the best results were registered in the case of Estonian and Slovenian subregions. The abovementioned considerations, the research conducted, as well as the results obtained may therefore constitute an inspiration for making deeper analyses including the ones of direction.

References

ALBULESCU C. T., GOYEAU D. (2013) EU Funds Absorption Rate and the Economic Growth, Timisoara Journal of Economics and Business 6 (20), 153-170.

ARRANZ N., ARROYABE C. F., FERNANDEZ DE ARROYABE J. C. (2019) The effect of regional factors in the development of eco-innovations in the firm, Business Strategy and the Environment 28 (7), 1406-1415, https://doi.org/10.1002/bse.2322.

AVGEROU C. (2008) Information systems in developing countries: A critical research review, Journal of Information Technology 23 (3), 133-146, https://doi.org/10.1057/palgrave.jit.2000136.

BAKLANOV P. Y. (2020) Geopolitical Factors in Regional Development, Customs Policy of Russia in the Far East 93 (4), 75-83, https://doi.org/10.24866/1815-0683/2020-4/75-83.

BALCERZAK A. P. (2016) Multiple-criteria evaluation of quality of human capital in the European Union countries, Economics and Sociology 9 (2), 11-26, https://doi.org/10.14254/2071-789X.2016/9-2/1.

BENNER C. (2003) Labour flexibility and regional development: The role of labour market intermediaries, Regional Studies 37 (6-7), 621-633, https://doi.org/10.1080/0034340032000108723.

BENZ A., FÜRST D. (2002) Policy learning in regional networks, European Urban and Regional Studies 9 (1), 21-35, https://doi.org/10.1177/096977640200900102.

BEUGELSDIJK S., KLASING M. J., MILIONIS P. (2018) Regional economic development in Europe: the role of total factor productivity, Regional Studies 52 (4), 461-476, https://doi.org/10.1080/00343404.2017.1334118.

BYSTROVA T. Y., LARIONOVA V. A., OSBORNE M., PLATONOV A. M. (2015) Introduction of open e-learning system as a factor of regional development, R-Economy 1 (4), 587-596, https://doi.org/10.15826/recon.2015.4.021.

CHANDRA R. (2022) Endogenous Growth in Historical Perspective: From Adam Smith to Paul Romer, Palgrave Macmillan, Cham, https://doi.org/10.1007/978-3-030-83761-7.

CHARRON N., DIJKSTRA L., LAPUENTE V. (2014) Regional Governance Matters: Quality of Government within European Union Member States, Regional Studies 48 (1), 68-90, https://doi.org/10.1080/00343404.2013.770141.

CHURSKI P. (2008) Czynniki rozwoju regionalnego i polityka regionalna w Polsce w okresie integracji z Unią Europejską (Factors of regional development and regional policy in Poland during integration with the European Union), Wydawnictwo Naukowe UAM, Poznań.

CZAPLEWSKI M., KLÓSKA R. (2020) Regional Policy as a Factor in Shaping Regional Development in Poland, South East European Journal of Economics and Business 15 (1), 93-104, https://doi.org/10.2478/jeb-2020-0008.

DE CASTRO E. A., MARQUES J., VIEGAS M. (2018) The Schumpeter creative destruction hypothesis: a spatial assessment on Portuguese regions, Global Business & Economics Review 20 (2), 198-212, https://doi.org/10.1504/GBER.2018.090069.

DEKKER E. (2021) Jan Tinbergen (1903-1994) and the Rise of Economic Expertise, Cambridge University Press, Cambridge, https://doi.org/10.1017/9781108856546.

DÉMURGER S. (2001) Infrastructure Development and Economic Growth: An Explanation for Regional Disparities in China?, Journal of Comparative Economics 29 (1), 95-117, https://doi.org/10.1006/jcec.2000.1693.

DIEBOLT C., HIPPE R. (2019) The long-run impact of human capital on innovation and economic development in the regions of Europe, Applied Economics 51 (5), 542-563, https://doi.org/10.1080/00036846.2018.1495820.

DIMAND R. W., HAGEMANN H. (eds.) (2019) The Elgar Companion to John Maynard Keynes, Edward Elgar, Cheltenham.

DOWNES R. (1996) Economic transformation in CEE: The role of regional development, European Planning Studies 4 (2), 217-224, https://doi.org/10.1080/09654319608720341.

DREYER L. C., HAUSCHILD M. Z., SCHIERBECK J. (2006) A framework for social life cycle impact assessment, International Journal of Life Cycle Assessment 11 (2), 88-97, https://doi.org/10.1065/lca2005.08.223.

ĐUKIČIN VUČKOVIĆ S., ĐORĐEVIĆ J., MILANKOVIĆ JOVANOV J., IVANOVIĆ BIBIĆ L., ĐORĐEVIĆ T. (2018) Socio-economic characteristics as limiting factors of regional development. The case of Kolubara District, Republic of Serbia, Romanian Journal of Geography 62 (2), 217-231.

EMAMI LANGROODI F. (2021) Schumpeter's Theory of Economic Development: A Study of the Creative Destruction and Entrepreneurship Effects on the Economic Growth, Journal of Insurance and Financial Management 4 (3), 65-81, https://doi.org/10.2139/ssrn.3153744.

EUROSTAT (2021) Regional statistics by NUTS classifications, Retrieved from: ec.europa.eu/eurostat.

FELDMAN M. P. (1999) The new economics of innovation, spillovers and agglomeration: A review of empirical studies, Economics of Innovation and New Technology 8 (1-2), 5-25, https://doi.org/10.1080/10438599900000002.

FLORIDA R. (2002) The economic geography of talent, Annals of the Association of American Geographers 92 (4), 743-755, https://doi.org/10.1111/1467-8306.00314.

FONGWA N. S., MARAIS L. (2016) University, Knowledge and Regional Development: Factors Affecting Knowledge Transfer in a Developing Region, Africa Education Review 13 (3-4), 191-210, https://doi.org/10.1080/18146627.2016.1224587.

FRIEDMANN J. (1983) Life space and economic space: contradictions in regional development, in: Seers D., Öström K. (eds.), The Crises of the European Regions,

Palgrave Macmillan, London, 148-162, https://doi.org/10.1007/978-1-349-06588-2_9.

GALLEGO A., RODRÍGUEZ L., HOSPIDO A., MOREIRA M. T., FEIJOO G. (2010) Development of regional characterization factors for aquatic eutrophication, International Journal of Life Cycle Assessment 15, 32-43, https://doi.org/10.1007/s11367-009-0122-4.

GBUROVÁ J., MATUŠÍKOVÁ D. (2014) Tourism as important regional development factor (on the example of the chosen region in Slovak Republic), Economic Annals-XXI 9-10 (1), 102-105.

GORYACHIKH M. V., KRAVCHENKO L. A. (2020) Free economic zone as a factor of regional economic development, Scientific Bulletin: Finance, Banking, Investment 51 (2), 213-222, https://doi.org/10.37279/2312-5330-2020-2-213-222.

GROSSE T. G. (2010) EU Cohesion policy and the peripheries of the new Member States, in: Gorzelak G., Bachtler J., Smętkowski M. (eds.), Regional Development in CEE: Development processes and policy challenges, Routledge, London, pp. 313-328, https://doi.org/10.4324/9780203855386-17.

HAUKE J., KOSSOWSKI T. (2011) Comparison of values of Pearson's and Spearman's correlation coefficients on the same sets of data, Quaestiones Geographicae 30 (2), 87-93, https://doi.org/10.2478/v10117-011-0021-1.

HENREKSON M., JAKOBSSON U. (2003) The transformation of ownership policy and structure in Sweden: Convergence towards the Anglo-Saxon model?, New Political Economy 8 (1), 73-102, https://doi.org/10.1080/1356346032000078732.

IBINCEANU ONICA M. C., CRISTACHE N., DOBREA R. C., FLORESCU M. (2021) Regional Development in Romania: Empirical Evidence Regarding the Factors for Measuring a Prosperous and Sustainable Economy, Sustainability 13 (7), 3942, https://doi.org/10.3390/su13073942.

ILLERIS S. (1993) An inductive theory of regional development, Papers in Regional Science 72, 113-134, https://doi.org/10.1007/BF01557454.

JAŠKOVÁ D., HAVIERNIKOVÁ K. (2020) The human resources as an important factor of regional development, International Journal of Business and Society 21 (3), 1464-1478, https://doi.org/10.33736/ijbs.3364.2020.

KADYRBECHEVNA SHUGOVA S. (2018) A factor analysis of models for regional development, International Journal of Engineering & Technology 7 (3.15), 340-343, https://doi.org/10.14419/ijet.v7i3.15.18702.

KHASANOVA A., AMIROVA N., SARGINA L. (2020) Natural resource potential as a factor of regional development, CITISE 2 (24), 234-245, https://doi.org/10.15350/2409-7616.2020.2.22.

KRUGMAN P. (1998) What's new about the new economic geography?, Oxford Review of Economic Policy 14 (2), 7-17, https://doi.org/10.1093/oxrep/14.2.7.

LI W., WANG J., CHEN R., XI Y., LIU S. Q., WU F., MASOUD M., WU X. (2019) Innovation-driven industrial green development: The moderating role of

regional factors, Journal of Cleaner Production 222, 344-354, https://doi.org/10.1016/j.jclepro.2019.03.027.

LIU G., LIU Y., ZHANG C. (2018) Factor allocation, economic growth and unbalanced regional development in China, The World Economy 41 (9), 2439-2463, https://doi.org/10.1111/twec.12572.

LU Y., CAO B., HUA Y., DING L. (2020) Efficiency measurement of green regional development and its influencing factors: An improved data envelopment analysis framework, Sustainability 12 (11), 4361, https://doi.org/10.3390/su12114361.

MADANIPOUR A., SHUCKSMITH M., BROOKS E. (2022) The concept of spatial justice and the European Union's territorial cohesion, European Planning Studies 30 (5), 807-824, https://doi.org/10.1080/09654313.2021.1928040.

MARTIN R. (2015) Rebalancing the spatial economy: The challenge for regional theory, Territory, Politics, Governance 3 (3), 235-272, https://doi.org/10.1080/21622671.2015.1064825.

MARTIN R., SUNLEY P. (1998) Slow convergence? The new endogenous growth theory and regional development, Economic Geography 74 (3), 201-227, https://doi.org/10.1111/j.1944-8287.1998.tb00113.x.

MATSUURA M. (2015) Contribution of EU Funds to Economic Growth in Poland, Russian and East European Studies 44, 87-98, https://doi.org/10.5823/jarees.2015.87.

MILENKOVIĆ M., VASEASHTA A., VASOVIĆ D. (2021) Strategic planning of regional sustainable development using factor analysis method, Polish Journal of Environmental Studies 30 (2), 1317-1323, https://doi.org/10.15244/pjoes/124752.

MOROSHKINA M. V. (2019) Geographical Factor in Regional Development, Journal of Volgograd State University. Economics 21 (4), 90-98, https://doi.org/10.15688/ek.jvolsu.2019.4.9.

MUKHAMETZHAN S. O., JUNUSBEKOVA G. A., DAUESHOV M. Y. (2020) An econometric model for assessing the asymmetry of urban development as a factor of regional economic growth: The case of Kazakhstan, Industrial Engineering & Management Systems 19 (2), 460-475, https://doi.org/10.7232/iems.2020.19.2.460.

NAYDENOV K. (2019) Human resources development as a factor for regional development, SGEM Conference Proceedings 19 (5.4), https://doi.org/10.5593/sgem2019/5.4/S23.063.

NISTOR R. L., GLODEANU A.-C. (2014) Regional economic development influenced by the EU funds absorption rate, Managerial Challenges of the Contemporary Society 7 (1), 115-118.

NOWAK P. (2018) Regional variety in quality of life in Poland, Oeconomia Copernicana 9 (3), 381-401, https://doi.org/10.24136/oc.2018.019.

ORLOVA L., GAGARINSKAYA G., GORBUNOVA Y., KALMYKOVA O. (2018) Start-ups in the field of social and economic development of the region: a cognitive model, Entrepreneurship and Sustainability Issues 5 (4), 795-811, https://doi.org/10.9770/jesi.2018.5.4(7).

PALVIA P., BAQIR N., NEMATI H. (2018) ICT for socio-economic development: A citizens' perspective, Information & Management 55 (2), 160-176, https://doi.org/10.1016/j.im.2017.05.003.

PFIRRMANN O. (1995) Path Analysis and Regional Development: Factors Affecting R&D in West German Small and Medium Sized Firms, Regional Studies 29 (7), 605-618, https://doi.org/10.1080/00343409512331349223.

REIFF M., SURMANOVÁ K., BALCERZAK A. P., PIETRZAK M. B. (2016) Multiple criteria analysis of European union agriculture, Journal of International Studies 9 (3), 62-74, https://doi.org/10.14254/2071-8330.2016/9-3/5.

RODIONOV D. G., KUDRYAVTSEVA T. J., SKHVEDIANI A. E. (2018) Human development and income inequality as factors of regional economic growth, European Research Studies Journal 21 (2), 323-337.

SHIKVERDIEV A. P., OGANEZOVA N. A., MAZUR V. V., OBREZKOV N. I., ICHETKINA M. A. (2019) Development of regional competitiveness as a factor in creating a favorable business environment, Espacios 40 (28), 6.

SINHA A. (2019) Theories of Value from Adam Smith to Piero Sraffa, Routledge, London, https://doi.org/10.4324/9780429441998.

SMĘTKOWSKI M. (2015) Spatial patterns of regional economic development in CEEan countries, Geographia Polonica 88 (4), 539-555, https://doi.org/10.7163/GPol.0033.

SMĘTKOWSKI M., DĄBROWSKI M. (2019) Economic crisis, Cohesion Policy and the eroding image of the European Union at the regional level, Regional Science Policy & Practice 11 (4), 713-732, https://doi.org/10.1111/rsp3.12238.

SPYCHAŁA M. (2020) The absorption of EU funds and the socio-economic development in the subregional dimension in Poland, Research Papers of Wroclaw University of Economics and Business 64 (3), https://doi.org/10.15611/pn.2020.3.07.

YUN J. J., WON D., PARK K., YANG J., ZHAO X. (2017) Growth of a platform business model as an entrepreneurial ecosystem and its effects on regional development, European Planning Studies 25 (5), 805-826, https://doi.org/10.1080/09654313.2017.1282082.

ZEMTSOV S. P., SMELOV Y. A. (2018) Factors of regional development in Russia: Geography, human capital and regional policies, Journal of the New Economic Association 4 (40), 84-108, https://doi.org/10.31737/2221-2264-2018-40-4-4.

APPENDIX

Table A1. The NUTS-3 subregions of the highest and the lowest level of the socio-economic development in the EU Member States from CEE in 2019

Country	The most developed region NUTS-3			The least developed region NUTS-3		
	The name of the region	Value	Place	The name of the region	Value	Place
Bulgaria	Sofia	0.397	17	Vidin	0.165	239
Czech Rep.	Hlavní mesto Praha	0.425	7	Kraj Vysocina	0.319	152
Estonia	Põhja-Eesti	0.465	2	Kirde-Eesti	0.329	133
Croatia	Grad Zagreb	0.379	30	Vukovarsko-srijemska zupanija	0.259	219
Latvia	Riga	0.375	34	Latgale	0.274	206
Lithuania	Vilniaus apskritis	0.386	25	Utenos apskritis	0.233	232
Hungary	Budapest	0.390	21	Békés	0.303	170
Poland	Warszawa	0.471	1	Sandomiersko-jedrzejowski	0.286	188
Romania	Bucharest	0.399	16	Teleorman	0.213	237
Slovenia	Bratislavský kraj	0.448	5	Trenciansky kraj	0.333	115
Slovakia	Osrednjeslovenska	0.452	4	Pomurska	0.333	117

Table A2. Average values of the synthetic gauge in the subregions of researched countries

Item	Bulgaria	Czech Rep.	Estonia	Croatia	Latvia	Lithuania	Hungary	Poland	Romania	Slovenia	Slovakia	CEE
Number of NUTS-3 subregions	28	14	5	21	6	10	20	73	42	12	8	239
Level of development in 2019												
General: the average value of the synthetic measure	0.267	0.346	0.373	0.304	0.314	0.286	0.342	0.352	0.310	**0.386**	0.366	0.328
Human capital: the average value of the synthetic measure	0.377	0.480	0.464	0.392	0.470	0.441	0.473	0.502	0.486	0.434	**0.529**	0.465
Natural environment: the average value of the measure	0.254	0.277	0.255	0.277	0.218	0.197	0.269	0.261	0.254	**0.372**	0.247	0.263
Entrepreneurship and innovativeness: the average value of the synthetic measure	0.171	0.280	**0.405**	0.240	0.256	0.223	0.281	0.300	0.195	0.353	0.328	0.260
Changing the level of development in the period 2010-2019												
General: the average value of the synthetic measure	0.487	0.490	**0.546**	0.487	0.484	0.493	0.526	0.503	0.507	0.475	0.492	0.500
Human capital: the average value of the synthetic measure	0.456	0.443	0.444	0.429	0.476	0.383	**0.482**	0.450	0.426	0.436	0.463	0.444
Natural environment: the average value of the measure	0.522	0.512	**0.578**	0.505	0.574	0.563	0.551	0.539	0.545	0.545	0.540	0.538
Entrepreneurship and innovativeness: the average value of the synthetic measure	0.476	0.504	**0.599**	0.514	0.414	0.515	0.534	0.507	0.535	0.439	0.465	0.506