

DISCREPANCIES IN THE REGIONAL DEVELOPMENT OF THE EU MEMBER STATES

Marcin SPYCHAŁA^{1*}, Joanna SPYCHAŁA²

¹ Poznań University of Economics and Business; marcin.spychala@ue.poznan.pl,
ORCID: 0000-0002-3860-303X

² Poznań University of Economics and Business; joanna.spychala@ue.poznan.pl, ORCID: 0000-0002-0706-4205

* Correspondence author

Purpose: The purpose of the article is to present the variation in the level of the socio-economic development of the regions of 28 EU member states within the arrangement of 281 NUTS-2 units (including the United Kingdom). The level of the development shall be established in a multi-criterion manner, separating three factors of the regional development: the human capital, the natural environment as well as entrepreneurship and innovativeness.

Design/methodology/approach: The article presents the level of the socio-economic development of the NUTS-2 regions based on 42 indicators based on public statistical data of the Eurostat database. The level of the development has been presented based on the synthetic gauge exhibiting the taxonomic distance of each region from the established pattern of development. The research procedure was composed of five stages and comprised: identifying the factors of regional development, a selection of variables, a reduction of multi-attribute space, specifying the level of the socio-economic development of the researched units as well as a classification of regions against the scale of the level of the socio-economic development based on the ranking created according to a decreasing value of the synthetic gauge.

Findings: As a result of the research procedure conducted, spatial differentiation of 281 regions of the NUTS-2 level in 28 EU member states (that is before Brexit) with respect to the level of the socio-economic development as well as three components constituting the factors of the said growth is presented. The highest value of the synthetic gauge has been registered in regions comprising the capitals of the respective states. Moreover, large developmental discrepancies within the respective member states have been identified.

Originality/value: The results obtained as a result of having conducted the research may constitute a source of inspiration for the EU institutions within the scope of specifying the richest and the poorest EU regions with the purpose of an efficient management of the cohesion policy in the subsequent programming periods.

Keywords: The regional development; the NUTS-2 units; developmental discrepancies; distance from the role model; Hellwig's reduction method.

Category of the paper: Research paper.

1. Introduction

Specifying the level of the socio-economic development as well as its changes is an extremely important research problem both in the theory of the economic science as well as in the economic practice. The amount of the EU fund allocation in regions as well as the intensity of state aid granted in the respective regions depends on the level of the development (Nistor, Glodeanu, 2014; Matsuura, 2015; Albulescu, Goyeau, 2014). Within the cohesion policy of the European Union, richer and poorer regions are classified, and based on that, the NUTS-2 units are subcategorised, falling under the EU aid fund support. The abovementioned classification is conducted solely based on GDP per capita of a particular region and by means of comparing its value against the background of the EU average. The purpose of the compilation shall be to specify the EU region level of development, however taking account of a larger number of indicators than GDP per capita.

Researching the significance of the socio-economic development, its core, causes and consequences is a subject of many research works (Vučković et al., 2018; Dreyer et al., 2006; Mukhametzhan et al., 2020; Orlova et al., 2018; Jašková, Havierníková, 2020; Shikverdiev et al., 2019). A characteristic feature of the regional development is its spatial variation. The growing discrepancies in the regional development in turn are one of the crucial problems of the modern economy, and the main purpose of the EU cohesion policy is convergence, i.e. activities directed towards decreasing the differences in the level of the development of the EU regions (Beugelsdijk et al., 2018; Martin, Sunley, 1998; Charron et al., 2014; Azis, 2020).

The paper presents the level of the socio-economic development of all 281 NUTS-2 regions of the European Union (according to the state of affairs as of 2019 – the last full year of the presence of the United Kingdom in the European Community) based on 42 indicators comprised within 3 subcomponents (factors) of the regional development: the human capital, the natural environment, as well as entrepreneurship and innovativeness. The basis used for calculating the indicators were statistical data from a publicly available Eurostat database. The main goal of the article is to present the varying of the level of the socio-economic development of the regions of 28 EU member states within the arrangement of 281 NUTS-2 units, i.e. the second level of classifying the territorial units for statistical purposes used by Eurostat. The level of the socio-economic development shall be presented based on a synthetic gauge representing a taxonomic distance of a particular region from the established pattern of development.

In the article, a review of literature shall be conducted in the first place from the scope of the factors of the regional development. Next, a methodology of the research shall be presented together with a description of the respective stages of the research procedure. Consequently, the received results of the research shall be presented. In the final part of the publication, however, the conclusions and recommendations shall be specified within the scope of the establishment of the level of the regional development.

2. Regional development in subject literature

In the subject literature, a lot of reviews of theories and concepts of the regional development have been compiled. Part of them undertake to systematize them, using different perspectives on that (Martin, 2015; Illeris, 1993). In the article, a review of concepts of the regional development shall be done within the angle of factors of the said development based on two main trends of economic thoughts: the neoclassical and neo-Keynesian one.

A concept of the regional development of the neoclassical trend is a concept of convergence which was formulated by a laureate of the Nobel Prize, Jan Tinbergen. The concept is directly related to the theory of comparative cost, and its proponents claim trade exchange between developed and backward countries may with time lead to a decrease in the differences in the level of their development, and even to the balancing out of the level of income of both those groups. Apart from the international exchange, a factor of development in that concept is also the capital as well as technological advancement (Henrekson, Jakobsson, 2003; Friedmann, 1983; Bystrova et al., 2015).

As opposed to neoclassical concepts, in the first part of the twentieth century, theories have emerged relating to John Maynard Keynes' doctrine. The prior concepts focused on the supply aspect, and Keynes and his followers focused on the demand analysis. The demand theories postulate different administrative activities, striving towards the creation and/or 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 (Zemtsov, Smelov, 2018; Diebolt, Hippe, 2019; Li et al., 2019; Florida, 2002).

The importance of innovativeness in the process of the regional development was emphasized by, among others, Joseph Schumpeter, a representative of the Austrian school. The development resembles, in his opinion, a process of creative destruction (Emami-Langroodi, 2018; De Castro et al., 2018). Innovation ensures on one hand structural change and development, and on the other – they destroy the former economic and social structures. Not all entities are prepared for such changes. Sometimes they are forced to self-destruct and introduce new technological solutions. Otherwise they stop being economically viable.

A new theory of growth, initiated by Paul Romer, assumes the possibility of accumulating the factors of growth, which assumes the possibility of obtaining sustainable development, as well as maintaining or even increasing the economic differences between the regions. A stable and longlasting development is specified within the concept as an endogenous concept. The basic factors generating growth are: the human and physical capital, as well as technological innovativeness. Poor regions may not make up for the developmental differences in a different manner than by increasing their technological level as well as by investing in human qualifications (Baklanov, 2020; Arranz et al., 2019; Rodionov et al., 2018; Benner, 2003).

Against the background of the neoclassical trend, a contemporary model of the so-called new economic geography emerges, which combines three elements: the agglomeration benefits, transport costs and the cost of production mean flows (Krugman, 1998). The model assumes the possibility of the occurrence of, and even the deepening of, interregional differences, which, according to Grosse (2018), is a result of the tendency to accumulate the factors of the development in the most developed metropolitan areas.

The regional development may take place in a spontaneous manner or in a preordained manner. The second option is related to the shaping of the development through stimulating the factors of the regional development within the regional policy managed. The problem of the regional policy is a subject of lively debates among the representatives of different fields of knowledge: Economics, Law, Geography or political science (Moroshkina, 2020; Milenković et al., 2021).

According to Smętkowski (2015), the regional policy within the economic dimension comprises all forms of state intervention which are directed towards the change in the spatial distribution of the economic activity. Within such an arrangement, its goal is to correct the effects of the impact of the free market forces aimed at ensuring the economic development as well as a change in income redistribution (Pfirrmann, 1995). Within the general framework, the regional policy may be defined as activities aimed at maximizing the usability function, i.e. whose goal is to improve the economic situation of one or several regions (Démurger, 2001).

The regional policy is related to the occurrence of variations in the level of the development of the respective regions. An uneven regional development resulting from the decisions of the investors, the specificity of the free market mechanism, or the geographical factors leads to the variation in the level of income, as well as the conditions of life of the population. The basic task of the regional policy is thus the necessity to limit the scale of those variations (Liu et al., 2018; Fongwa, Marais, 2016; Avgerou, 2008).

3. Stages of the research procedure – research methodology

The study aims to verify a hypothesis according to which the socio-economic development of the EU regions is highly varied, and its highest level is registered in the NUTS-2 units comprising the capitals of the researched states, and the lowest – in the regions the farthest away from the capital units indicated. All NUTS-2 units subcategorized within the 28 EU member states are comprised within the research – 281 units in total. 2019 is the last year of the survey, due to the full availability of Eurostat data resulting from two factors: a wide range of 42 indicators concerning various areas of life and Brexit, which took place in 2020. The authors of the research wanted to present the development disproportions of the area, which also includes the United Kingdom, therefore, in this article, it is treated as the 28th member of the EU.

In order to research the level of the socio-economic development of the NUTS-2 level regions in the EU member states, a synthetic gauge of the distance from the established pattern of development has been used. The research procedure has been conducted parallel – in the static dimension (based on the value of indicators in 2019) as well as in the dynamic dimension (based on the change in the value of indicators in the years of 2010-2019). The research procedure consisted of five subsequent stages:

1. specifying the subcomponents – i.e. the factors of the regional development,
2. a selection of variables – a creation of the matrix of geographical information,
3. a reduction of the multifeature space,
4. indicating the level of the socio-economic development of the researched units,
5. a classification of regions at the level of the socio-economic development based on the ranking created according to the diminishing value of the synthetic gauge.

At the first stage, based on the review of literature conducted, comprising the concept of the regional development, the most important subcomponents have been specified, i.e. the factors of the regional development. A factor of development may be a component, a property of the region or an occurrence which exerts an influence over the socio-economic development (Feldman, 1999; Naydenov, 2019; Khasanova et al., 2020; Yun et al., 2017). The article undertakes to characterize the socio-economic development based on its three subcomponents, called for the purpose of the study: „the human capital”, „the natural environment” as well as „entrepreneurship and innovativeness”. The „human capital” subcomponent has been specified through the indicators presenting a population potential of a particular region, referring to the migration balance and the birth rate, fertility, the level of education, the risk of falling into poverty as well as the age structure. Within the „natural environment” category, indicators concerning the use of land have been taken into account as well as the structure of farms, urban waste, the burden connected with road transport of products as well as the use of energy for the purpose of heating and freezing the living quarters, as well as the mortality rates due to cancer and because of poisoning as well as toxic substances. Within the „entrepreneurship and innovativeness” factor, the indicators concerning entrepreneurship have been taken into account, the structure of the employment, GDP, the unemployment rate, the length of highways per 1000 km², the scale of using the Internet as well as the scale of innovativeness measured by the number of trademarks and consumables. All the abovementioned factors of the regional development are interrelated. In the striving towards a competitive development of the region, the factors should be included into the long-term strategy (Palvia et al., 2018). As Smętkowski (2015) claims, one may thus assume that the regional development comprises both the dynamic processes taking place under the influence of specific factors which determine the character, the direction and the speed of the socio-economic changes, as well as the purposefully directed changes which, through the pro-development factors, are aimed at realizing the tasks within the regional policy. Publicly available Eurostat data has been used in the research. The authors of the article realize the shortcomings and inadequacies inherent in the construction of the

respective indicators characterizing the factors of development. The respective characteristics might have been built more accurately, however all available public data have been taken into account, data which may determine the level of the development of the respective subcomponents of the development. In the future, it is worth considering whether to complete a wider spectrum of indicators, e.g. from different sources.

Table 1.

Indicators considered within the analysis specifying the regional development subcomponents

Factor of development	Indicators
Human capital (14 variables)	The migration balance per 1000 inhabitants; the birth rate per 1000 inhabitants; the feminization coefficient in total; 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; the number of people at the post-production age per 100 people; the median age of the population; the total fertility rate; the average age of women at birth; the share of the unemployed, not-in-education and not in training (the so-called NEET indicator); risk of poverty; the share of households with the access to the Internet
The natural environment (12 variables)	the share of farmland as well as natural green spaces in the total area; the share of farms under 5 hectares in the total number of farms; the share of farmers – owners of farms under 35 years of age in the total number of farm owners; the registered minor offences and crimes concerning the natural environment per 1,000 inhabitants; road transport of goods measured in tonnes per 1,000 inhabitants; the use of electricity for the heating of living quarters (as the EU average), the use of electricity for the freezing of living quarters (as the EU average), the number of accommodation places per 1,000 inhabitants; urban waste per 1 inhabitant; the cancer mortality rate; mortality rate due to poisoning and toxic substances
Entrepreneurship and innovativeness (16 variables)	The share of microenterprises in the total number of economic entities; the rate of new enterprises being created; the share of the employed in farming in the total number of the employed; the share of the employed in the information and communication sector in the total number of the employed; the share of the employed in the finance sector 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 the services in the total number of the employed; the number of trademarks per 1 mln inhabitants; the number of consumables per 1 mln inhabitants; GDP per 1 inhabitant (as the EU average); the share of the employed in the R&D and Science sectors in the total number of the employed; the share of the employed in the Technology and knowledge-based sectors in the total number of the employed; the percentage of people using the Internet to interact with public authorities; the percentage of people ordering goods or services through the Internet; the unemployment rate; the length of highways per 1,000 square kilometers

Source: own research.

At the second stage of the research procedure conducted, a matrix of geographical information based on 42 indicators was built (table 1), which specified the level of the development of the NUTS-2 units in 2019 as well as the changes in the level of the development in the years of 2010-2019 in relation to the three subcomponents of the development: the human capital, the natural environment as well as entrepreneurship and innovativeness. Next, Pearson's linear correlation coefficients were calculated between all the departure indicators researched separately for 2019 and separately for their change in the years between 2010-2019. It is extremely important for the indicators selected for a synthetic gauge of the distance from the established pattern to be weakly correlated with one another. Thanks to that the information capacity of those indicators is varied.

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). Z. Hellwig's reduction method uses for calculation 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):

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

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 method having been conducted, the eliminated variables were the ones that were significantly statistically correlated with the diagnostic feature (called satellite features). At every subsequent step, there was a reduction of the correlation matrix by the central feature and satellite features. Z. Hellwig's method is repeated by means of obtaining new reduced correlation matrices until the collection of features is exhausted or the isolated features are separated (Hauke, Kossowski, 2011). The procedure of variable reduction has been conducted eightfold: separately for the level of the socio-economic development as a whole and separately for the level of the development of each of the three subcomponents of the development both in the static (for the date for 2019) and the dynamic (for the data for the years between 2010 and 2019) dimension.

At the subsequent stage of the research procedure, a pattern and an anti-pattern of the socio-economic development have been devised. The pattern has been considered the maximum standardized values of the respective diagnostic features, and an anti-pattern – their minimum values (Spychała, 2020). Within the next step, a taxonomic distance of each NUTS-2 region researched from the pattern of the development based on the pattern hereinbelow has been specified (Reiff et al., 2016):

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

where:

d_{i0} – the taxonomic distance of the i region from the assumed pattern of development,

z_{ij} – the standardised value of the j indicator (feature) for the i region,

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

At the final stage of the research procedure, a synthetic gauge for each NUTS-2 region has been devised, being an indicator of the level of the development in a particular region. The value of the synthetic gauge has been calculated for the general level of the socio-economic development and separately for each of the three factors of the development. The synthetic gauge has been calculated based on the following pattern:

$$v_i = 1 - \frac{d_{i0}}{d_0} \quad (3)$$

where:

v_i – a synthetic gauge of the level of development of the i region,

d_{i0} – the taxonomic distance of the i region 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 the development takes values from 0 to 1, with a proviso that the higher its value, the higher the level of the development of a researched phenomenon. Based on the indicators calculated, a ranking of 281 NUTS-2 level regions was established in the EU countries, and next, they were divided into five groups: at a very high (20% of the regions at the highest value of the synthetic gauge – the first group – places within the ranking 1-56), high (the subsequent 20% of the regions – the second group – places within the ranking 57-112), average (NUTS-2 units located in places 113-169 taking account of their decreasing placing based on a particular synthetic gauge – the third group), low (regions in places 170-225 – the fourth group) and very low (20% regions at the lowest value of the synthetic gauge – the fifth group – places 226-281) level of development. Taking account of the research conducted within the dynamic dimension, NUTS-2 regions for whom the indicator took the highest values (20% of the researched units), have been classified into the group at a very change in the development of a particular phenomenon for whom the indicator took the lowest values (20% of the researched regions), have been classified into the group at a relatively low change in the level of the development of a particular phenomenon.

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-2 region	Value	Item	The NUTS-2 region	Value
The human capital					
1	Eastern and Midland (IE)	0.426	281	Liguria (IT)	0.182
2	Outer London - East and North East (UK)	0.419	280	Molise (IT)	0.184
3	Flevoland (NL)	0.410	279	Severozapaden (BG)	0.186
4	Southern (IE)	0.396	278	Principado de Asturias (ES)	0.197
5	West Midlands (UK)	0.396	277	Ipeiros (EL)	0.200

Cont. table 2.

The natural environment					
1	Ionia Nisia (EL)	0.479	281	Dytiki Makedonia (EL)	0.246
2	Corse (FR)	0.471	280	Région de Bruxelles-Capitale (BE)	0.326
3	Notio Aigaio (EL)	0.468	279	Eesti (EE)	0.354
4	Salzburg (AT)	0.417	278	Tees Valley and Durham (UK)	0.358
5	Cornwall and Isles of Scilly (UK)	0.408	277	Övre Norrland (SE)	0.359
Entrepreneurship and innovativeness					
1	Inner London-West (UK)	0.585	281	Nord-Est (RO)	0.069
2	Luxembourg (LU)	0.474	280	Severozapaden (BG)	0.085
3	Noord-Holland (NL)	0.381	279	Sud-Vest Oltenia (RO)	0.090
4	Noord-Brabant (NL)	0.365	278	Severen tsentralen (BG)	0.093
5	Utrecht (NL)	0.362	277	Sud-Muntenia (RO)	0.107
The level of the socio-economic development in general					
1	Inner London - West (UK)	0.443	281	Dytiki Makedonia (EL)	0.185
2	Luxembourg (LU)	0.422	280	Severozapaden (BG)	0.199
3	Stockholm (SE)	0.377	279	Severen tsentralen (BG)	0.220
4	Utrecht (NL)	0.375	278	Ipeiros (EL)	0.227
5	Inner London - East (UK)	0.373	277	Peloponnisos (EL)	0.228
6	Eastern and Midland (IE)	0.372	276	Molise (IT)	0.228
7	Noord-Holland (NL)	0.371	275	Anatoliki Makedonia, Thraki (EL)	0.233
8	Hovedstaden (DK)	0.366	274	Thessalia (EL)	0.233
9	Flevoland (NL)	0.360	273	Sterea Ellada (EL)	0.234
10	Zuid-Holland (NL)	0.359	272	Sud-Vest Oltenia (RO)	0.235

Source: own research.

Table 3.

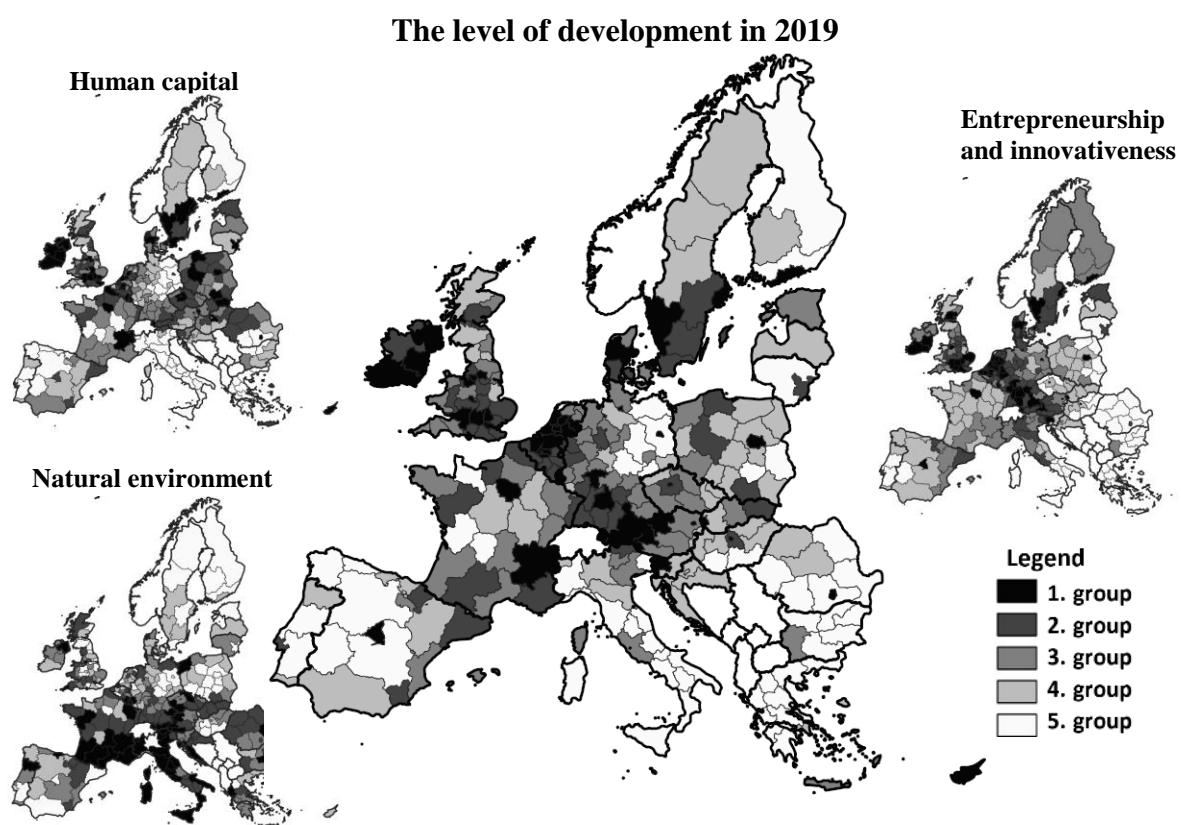
The highest and the lowest values of the synthetic gauge within the respective subcomponents of the socio-economic development in the years 2010-2019

The highest values of the synthetic gauge (2010-2019)			The lowest values of the synthetic gauge (2010-2019)		
Item	The NUTS-2 region	Value	Item	The NUTS-2 region	Value
The human capital					
1	Bucuresti-Ilfov (RO)	0.554	281	Ciudad de Melilla (ES)	0.303
2	Berlin (DE)	0.538	280	Martinique (FR)	0.318
3	Koblenz (DE)	0.536	279	Ciudad de Ceuta (ES)	0.336
4	Mittelfranken (DE)	0.533	278	Etelä-Suomi (FI)	0.371
5	Bremen (DE)	0.533	277	Drenthe (NL)	0.387
The natural environment					
1	Dytiki Makedonia (EL)	0.473	281	Åland (FI)	0.212
2	Valle d'Aosta (IT)	0.431	280	Malta (MT)	0.302
3	Rhône-Alpes (FR)	0.423	279	Niederbayern (DE)	0.320
4	Kriti (EL)	0.416	278	Eastern Scotland (UK)	0.326
5	Cornwall and Isles of Scilly (UK)	0.415	277	Oberpfalz (DE)	0.329
Entrepreneurship and innovativeness					
1	Bucuresti-Ilfov (RO)	0.355	281	Bratislavský kraj (SK)	0.177
2	Malta (MT)	0.355	280	Guadeloupe (FR)	0.199
3	Inner London-West (UK)	0.339	279	Attiki (EL)	0.203
4	Praha (CZ)	0.332	278	Guyane (FR)	0.203
5	Luxembourg (LU)	0.332	277	Vzhodna Slovenija (SL)	0.204

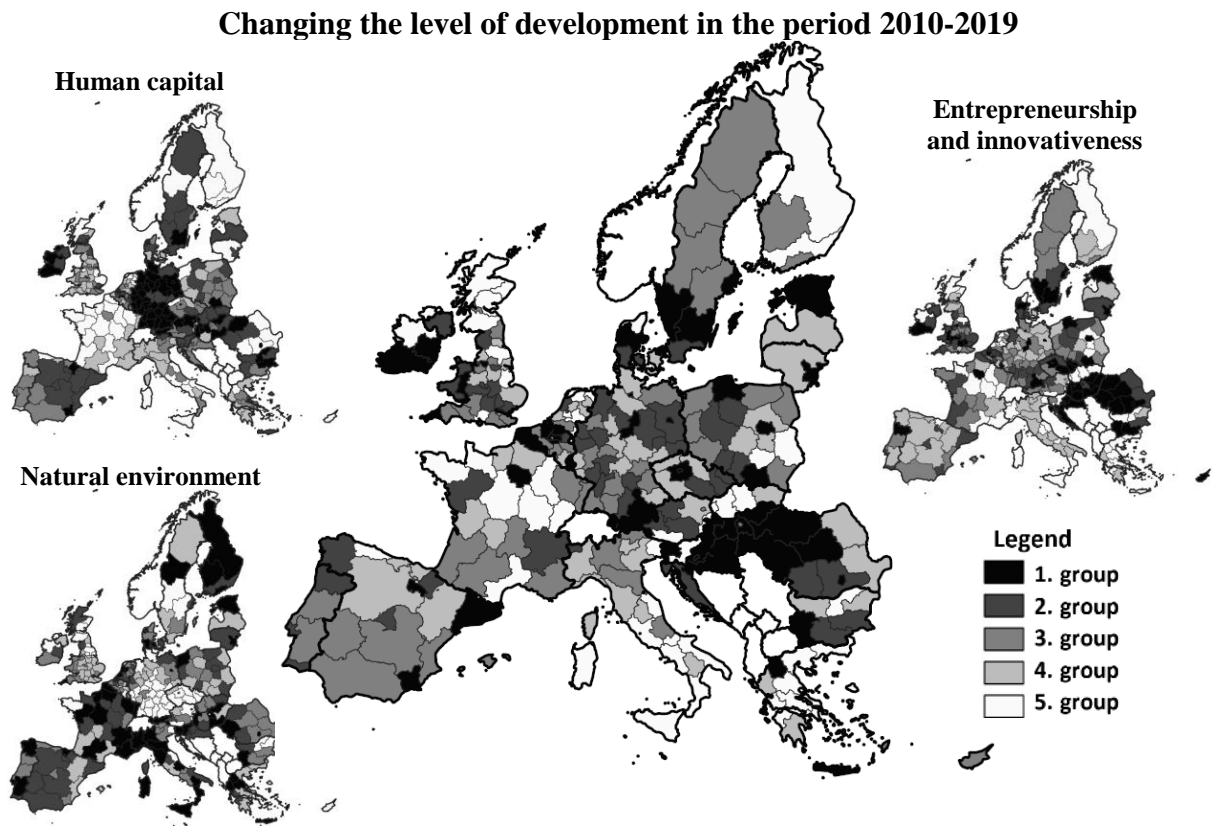
Cont. table 3.

The level of the socio-economic development in general					
1	Bucuresti-Ilfov (RO)	0.402	281	Åland (FI)	0.266
2	Praha (CZ)	0.380	280	Martinique (FR)	0.282
3	Berlin (DE)	0.375	279	Guadeloupe (FR)	0.294
4	Nyugat-Dunántúl (HU)	0.371	278	Ciudad de Melilla (ES)	0.299
5	Luxembourg (LU)	0.368	277	Ciudad de Ceuta (ES)	0.302
6	Yugozapaden (BG)	0.368	276	Bratislavský kraj (SK)	0.305
7	Sostines regionas (LT)	0.366	275	Languedoc-Roussillon (FR)	0.305
8	Bremen (DE)	0.364	274	Attiki (EL)	0.305
9	Eesti (EE)	0.364	273	Anatoliki Makedonia, Thraki (EL)	0.306
10	Közép-Dunántúl (HU)	0.363	272	Marche (IT)	0.307

Source: own research.

**Figure 1.** Variation in the level of the socio-economic development in EU regions.

Source: own research.



Cont. Figure 1. Variation in the level of the socio-economic development in EU regions.

Source: own research.

In figure 1 as well as in table 2 and 3, the results of the research conducted have been presented. Table 2 presents the NUTS-2 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-2 regions of the extreme values of the synthetic gauge were compiled calculated for the changes in the years of 2010-2019. Figure 1 contains choropleth maps representing the spatial variation of the socio-economic level of the NUTS-2 regions located in the Continental part of the European Union in 2019 as well as the changes of the level of the development in the years of 2010-2019.

4. Results – conclusions based on the research conducted concerning the respective subcomponents of the development

As a result of the research procedure conducted, spatial variation of 281 NUTS-2 level regions in the European Union in the 28 EU member states was presented with respect to the level of the socio-economic development as well as three subcomponents constituting the factors of that growth (fig. 1). In the researched group of units, the value of the synthetic gauge representing the level of the socio-economic development in 2019 ranged from 0.185 to 0.443

(tab. 2). The value of the gauge representing the change in the level of the socio-economic development of the regions in the years of 2010-2019 ranged from 0.266 to 0.402 (tab. 3). A similar differentiation was observed in the case of the human capital (0.182-0.426 for 2019 as well as 0.303-0.554 for the change in the years of 2010-2019), the natural environment (0.246-0.479 as well as 0.212-0.473 respectively) as well as the entrepreneurship and innovativeness (0.069-0.585 respectively as well as 0.177-0.355). Thus, it is well worth noting that the highest variation of the regions was registered in the areas of entrepreneurship and innovativeness in 2019 and the biggest similarity of the researched units was observed in the case of the changes in the general level of the socio-economic development in the years 2010-2019.

Taking account of the level of the development of the „human capital” subcomponent, the highest value of the synthetic gauge in 2019 was registered in the following regions: Eastern and Midland (IE – comprising the capital – Dublin), Outer London - East and North East (UK) and Flevoland (NL – the youngest of the Dutch provinces, are created as a conclusion of the project consisting of creating five new polders having built the Afsluitdijk degradation lock), and the lowest – in the following regions: Liguria (IT), Molise (IT) and Severozapaden (BG). The high position of the indicated NUTS-2 units was decided on by: a favourable age structure of the population, a significant share of people with higher education, a high balance of migration as well as a relatively high fertility ratio. A low position of the respective units was decided on by: the negative birth rate, a high percentage of young people who are unemployed, not in education and not in training, a very high percentage of people at the post-production age in the total number of people. Taking account of the analysis conducted in the dynamic dimension, the biggest change in the level of the development of the „human capital” in the years between 2010 and 2019 subcomponent was observed in the following regions: Bucuresti-Ilfov (RO), Berlin (DE) as well as Koblenz (DE). On a general level, the biggest improvement of the human capital in the researched years was observed in German regions: among 20 NUTS-2 units in which the highest values of the synthetic gauge representing a change in the level of the human capital were registered in 2010-2019, 17 regions were located in Germany. The lowest change in the level of the „human capital” change was observed in the following units: Ciudad de Melilla (ES), Martinique (FR) and Ciudad de Ceuta (ES). A weaker position of the indicated NUTS-2 units in the research on the change in the level of the development of the human capital was decided on by: a significant deepening of the negative migration balance, an increase in the indicator of the demographic growth, an increase in the indicator of the risk of poverty as well as a decrease in birthrate. A high position within the ranking of the respective regions was decided on by: a relatively high decrease of the average age of women at birth, a very high increase in the migration balance, as well as an increase in the share of people at the production age in the total number of people as well a significant decrease in the demographic burden indicator.

With respect to the natural environment, the highest value of the synthetic gauge in 2019 was registered in island regions: Ionia Nisia (EL), Corse (FR) as well as Notio Aigaio (EL), and the lowest – in units: Dytiki Makedonia (EL), Région de Bruxelles-Capitale (BE) as well as Eesti (EE). A high position of the NUTS-2 units in the research was decided on by: a significant share of farmland as well as natural green spaces in the area in total, the number of accommodation places per 1,000 inhabitants as well as a low scale of road transport of goods. A low position in the ranking of the abovementioned regions was decided on by: a high cancer mortality rate coefficient, a low share of farmland as well as natural green spaces in the total area as well as a high number of petty crime registered and crimes concerning the natural environment per 1,000 inhabitants. Taking account of the analysis conducted in the dynamic dimension, the biggest improvement of the state of the natural environment in the years between 2010-2019 was observed in the following regions: Dytiki Makedonia (EL), Valle d'Aosta (IT) and Rhône-Alpes (FR), and the lowest – in the following units: Åland (FI), Malta (MT) and Niederbayern (DE). The weak position of the units within the research was decided on by: a high increase in the mortality rate due to poisoning and toxic substances, as well as an increase in the amount of urban waste per 1 inhabitant. A high position in the ranking of particular units was decided on by: a decrease in the tediousness of road transport of products (the highest decrease was registered in the Dytiki Makedonia region), a high increase in the share of natural green areas in the area in total (the biggest improvement was observed in the Valle d'Aosta region) as well as a significant increase in the percentage of the neutralized waste (the highest increase in the period researched was registered in the Île de France and Rhône-Alpes region).

Taking account of the level of the development of entrepreneurship and innovativeness, the highest value of the synthetic gauge in 2019 was registered in the following regions: Inner London-West (UK), Luxembourg (LU) as well as Noord-Holland (NL – comprising the capital – Amsterdam) – in those regions the highest share of the employed in the financial sector in the total number of the employed, the highest number of trademarks per 1 mln inhabitants as well as the highest GDP per 1 inhabitant were registered. The lowest value of the synthetic gauge was registered in the following units: Nord-Est (RO), Severozapaden (BG) and Sud-Vest Oltenia (RO) (of the highest share of the employed in farming, the lowest share of people using the Internet to contact the public authority as well as a very low GDP per capita). Taking account of the analysis conducted within the dynamic dimension, the biggest progress in the level of the development of the „entrepreneurship and innovativeness” subcomponent in the years between 2010-2019 was observed in the units: Bucuresti-Ilfov (RO), Malta (MT) as well as Inner London-West (UK), and the smallest – in the regions: Bratislavský kraj (SK), Guadeloupe (FR) and Attika (EL). The position of the NUTS-2 units in the research conducted in the dynamic dimension was decided on by: the share of the employed in the advanced technology sector as well as a knowledge-based sector in the total number of the employed, the number of trademarks per 1 mln inhabitants as well as (in all three indicators, the highest increase was registered in Malta), as well as the share of the employed in the sector of

information and communication in the total number of the employed (the highest increase in the Bucuresti-Ilfov region), the length of highways per 1000 square kilometers (the highest increase in Prague) as well as a relatively high increase in the percentage of people using the Internet to contact the public authority.

5. Discussion – the general level of the socio-economic development of the NUTS-2 regions in the EU member states

Summarizing the results of the research conducted on the socio-economic development of 281 NUTS-2 regions in Central-Eastern Europe, one may indicate the following conclusions. The level of the general development of regions in 2019 was specified based on 42 indicators subcategorized within three subcomponents of the development: the human capital, the natural environment as well as entrepreneurship and innovativeness. The highest value of the synthetic gauge was registered in the regions comprising the capitals of the respective states: Inner London-West (UK), Luxembourg (LU) and Stockholm (SE). A hypothesis stated at the beginning of the article was positively verified. Moreover, on the list of the first twenty best developed NUTS-2 regions in the European Union were 12 capital units – comprising the capitals of the respective countries, and the group of 20% of the best developed units includes 20 out of 28 units comprising the capitals of the respective EU states (which is 71% of their population). Taking account of the analysis conducted in the dynamic dimension, the biggest change in the level of the socio-economic development in 2010-2019 was observed in the following regions: Bucuresti – Ilfov (the 1. position), Praha (the 2. position) and Berlin (the 3. position). Among the capital regions, the top ten in the ranking includes also: Luxembourg (the 5. position), Yugozapaden (the 6. position), Sostines regionas (the 7. position) and Eesti (the 9. position). The group of 20% of regions, however, of the biggest change in the level of the socio-economic development includes 18 out of 28 of the regions including the capitals of the respective EU countries (which constitutes 64% of all the capital regions). Apart from the regions mentioned heretofore, the group includes also: Inner London-West (the 12. position in the ranking), the Warszawski capital region (the 17. position), Stockholm (the 20. position), Hovedstaden (the 27. position), Kontinentalna Hrvatska (the 29. position), Malta (the 32. position), Eastern and Midland (the 37. position), Île de France (the 39. position), Zahodna Slovenija (the 50. position), Área Metropolitana de Lisboa (the 53. position) and Noord-Holland (the 56. position). In the first half of the compilation, also the following regions have been found: Comunidad de Madrid (the 70. position), Kypros (the 125. position), Helsinki-Uusimaa (the 132. position) and Wien (the 140. position). Budapest in turn was classified on the 167. position, and the lowest position among the capitals were: Lazio, Région de Bruxelles, Attiki and Bratislavský kraj (the 260, 263, 274 and 276 position respectively). It is well worth

noting a fact that the regions at a very high level of the socio-economic development are usually the units in which the biggest change in the level of the development in the years between 2010-2019 was registered (and the other way round). Apart from the capitals indicated, the group of regions of the highest level of the development in 2019 included, among others several units of the Benelux countries, as well as Alpine regions, and within the group of units with the biggest change in the level of the socio-economic development – apart from the capitals – among others, the Carpatian and Scandinavian regions were placed. On the other hand, the regions with the weakest level of the socio-economic development includes the NUTS-2 units located at the periphery as well as away from the strongest regions, for example the NUTS-2 units located in southern Italy, eastern Greece, or the farthest overseas departments and dependent areas, such as: the French Guyana, Martinique, Guadeloupe, Ciudad de Melilla, Ciudad de Ceuta as well as Madeira and the Azores.

One may thus conclude that – on one hand – the current level of the development of the respective EU countries is to a large extent decided on by the activity taken within the last decade, and on the other hand – bigger and bigger developmental discrepancies are being observed at the level of the NUTS-2 units, as to the largest extent the level of the socio-economic development increased in the economically strongest regions – in the relatively weaker developed regions, usually located away from the socio-economic centre of Europe, located in the area extending from London, through Benelux, up until the Alpine regions. Significant developmental discrepancies may also be observed in the respective states. Within the area of almost each of them, regions both at a very high level of the socio-economic development and the units subcategorized as the 20% of the weakest developed NUTS-2 units in the researched countries are located.

The research procedure conducted is unique, as in the subject literature, it is not possible to find a different publication in which the level of the regional development of the EU was, first of all, conducted in a holistic manner for all 28 EU member states at the level of all 281 NUTS-2 regions, and second of all – a synthetic gauge of the development created on the basis of Z. Hellwig's reduction method would be used. The conclusions of other authors researching the EU regional development who use different methods are, however, similar. They also specify the highest level of the development of the capital regions, and the level thereof usually decreases together with the distance from the central units. Similarly, analyses conducted by Eurostat based on GDP per capita, the richest regions include capital units. The abovementioned comparison thus confirms the correctness of the results obtained – irrespective of the method taken up, classifying of a particular region into the group of better or worse developed regions is appropriate.

6. Conclusions

Summarizing the research conducted, it is also worth looking into the results within the dimension of the respective states. The level of the socio-economic development is highly varied also in the respective countries, which was presented in the table 4 (obviously apart from the states in which only one NUTS-2 region is subcategorized, i.e. Estonia, Cyprus, Latvia, Luxembourg and Malta).

The largest developmental discrepancies measured by the value of the synthetic gauge were registered in the UK. The largest socio-economic developmental discrepancies measured by means of the position within the ranking of the best developed regions were observed in Germany. The states of high variation of the level of the socio-economic development are also: Greece, Bulgaria, France, Spain, Italy, Finland, Poland and Romania, whose capitals are mostly subcategorized as a group of 10% of the best developed regions, and a lot of NUTS-2 units were found on the last positions within the ranking. Taking account of the value of the synthetic gauge as well as the positions of the respective NUTS-2 units within the ranking, the states of the lowest developmental discrepancies are: Belgium, Ireland and Croatia.

Table 4.

The NUTS-2 regions at the highest and the lowest level of the socio-economic development among the countries of European Union in 2019

Country	The most developed region NUTS-2			The least developed region NUTS-2		
	The name of the region	Value	Place	The name of the region	Value	Place
Belgium	Région de Bruxelles-Capitale	0.358	14	Prov. Hainaut	0.306	109
Bulgaria	Yugozapaden	0.299	133	Severozapaden	0.199	280
Czech Republic	Praha	0.356	17	Severozápad	0.276	215
Denmark	Hovedstaden	0.366	9	Sjælland	0.292	159
Germany	Hamburg	0.352	22	Chemnitz	0.246	262
Estonia	Eesti	0.301	122	Eesti	0.301	122
Ireland	Eastern and Midland	0.372	6	Northern and Western	0.322	65
Greece	Notio Aigaio	0.300	129	Dytiki Makedonia	0.185	281
Spain	Comunidad de Madrid	0.330	50	Principado de Asturias	0.243	266
France	Île de France	0.351	20	Limousin	0.255	248
Croatia	Kontinentalna Hrvatska	0.276	213	Jadranska Hrvatska	0.276	214
Italy	Provincia Autonoma di Bolzano	0.325	60	Molise	0.228	276
Cyprus	Kypros	0.332	45	Kypros	0.332	45
Latvia	Latvija	0.280	202	Latvija	0.280	202
Lithuania	Sostines regionas	0.318	73	Vidurio ir vakaru Lietuvos regionas	0.262	244
Luxembourg	Luxembourg	0.422	2	Luxembourg	0.422	2
Hungary	Budapest	0.328	52	Dél-Dunántúl	0.266	239
Malta	Malta	0.342	32	Malta	0.342	32
Netherlands	Utrecht	0.375	4	Groningen	0.297	144
Austria	Salzburg	0.346	27	Burgenland	0.275	221
Poland	Warszawski stoleczny	0.358	13	Swietokrzyskie	0.261	245
Portugal	Área Metropolitana de Lisboa	0.308	107	Alentejo	0.235	271
Romania	Bucuresti - Ilfov	0.328	53	Sud-Vest Oltenia	0.235	272
Slovenia	Zahodna Slovenija	0.333	43	Vzhodna Slovenija	0.281	195

Cont. table 4.

Slovakia	Bratislavský kraj	0.354	19	Západné Slovensko	0.289	171
Finland	Helsinki-Uusimaa	0.354	18	Pohjois- ja Itä-Suomi	0.266	238
Sweden	Stockholm	0.377	3	Övre Norrland	0.279	203
United Kingdom	Inner London - West	0.443	1	Lincolnshire	0.276	211

Source: own research.

In the results of the research discussed heretofore, the most frequently mentioned were British, German and French regions, thus one may get an illusory impression they are the best (the least) developed. A higher frequency of the appearance of the regions from those states in the results of the research is a result of the UK subcategorizing as many as 41 NUTS-2 units (15% among all the ones being the subject of the research), in Germany – 38 regions (14% of the researched group), and in France – 27 units (10%). It is related to an assumption that a NUTS-2 region has to count – apart from certain extraordinary situations – at least 800,000 inhabitants, and a maximum of 3,000,000 people, therefore most such units were created in the most highly populated EU states and the other way round.

Table 5.*Average values of the synthetic gauge in the regions of the researched states*

Item	Belgium	Bulgaria	Czech Rep.	Denmark	Germany	Estonia	Ireland
Number of NUTS-2 regions	11	6	8	5	38	1	3
The level of development in 2019							
General - the average value of the synthetic measure	0.328	0.246	0.299	0.320	0.302	0.301	0.348
The human capital - the average value of the synthetic measure	0.341	0.262	0.338	0.330	0.291	0.344	0.404
The natural environment - the average value of the measure	0.404	0.415	0.417	0.392	0.406	0.354	0.408
The entrepreneurship and innovativeness - the average value	0.262	0.120	0.180	0.258	0.241	0.218	0.250
Changing the level of development in the period 2010-2019							
General - the average value of the synthetic measure	0.336	0.336	0.341	0.338	0.337	0.364	0.339
The human capital - the average value of the synthetic measure	0.471	0.490	0.475	0.469	0.518	0.459	0.511
The natural environment - the average value of the measure	0.363	0.364	0.346	0.369	0.351	0.379	0.359
The entrepreneurship and innovativeness - the average value	0.259	0.253	0.283	0.259	0.256	0.311	0.257

Item	Greece	Spain	France	Croatia	Italy	Cyprus	Latvia
Number of NUTS-2 regions	13	18	27	2	21	1	1
The level of development in 2019							
General - the average value of the synthetic measure	0.250	0.282	0.302	0.276	0.266	0.332	0.280
The human capital - the average value of the synthetic measure	0.260	0.289	0.336	0.282	0.237	0.369	0.305
The natural environment - the average value of the measure	0.421	0.410	0.430	0.439	0.438	0.398	0.398
The entrepreneurship and innovativeness - the average value	0.129	0.190	0.185	0.164	0.185	0.246	0.173
Changing the level of development in the period 2010-2019							
General - the average value of the synthetic measure	0.323	0.331	0.326	0.343	0.323	0.334	0.328
The human capital - the average value of the synthetic measure	0.463	0.464	0.434	0.468	0.448	0.437	0.488
The natural environment - the average value of the measure	0.382	0.370	0.376	0.357	0.376	0.349	0.362
The entrepreneurship and innovativeness - the average value	0.221	0.247	0.242	0.281	0.230	0.279	0.237

Cont. table 5.

Item	Lithuania	Luxembourg	Hungary	Malta	Netherlands	Austria	Poland
Number of NUTS-2 regions	2	1	8	1	13	9	17
The level of development in 2019							
General - the average value of the synthetic measure	0.290	0.422	0.288	0.342	0.336	0.317	0.291
The human capital - the average value of the synthetic measure	0.327	0.374	0.319	0.351	0.327	0.320	0.333
The natural environment - the average value of the measure	0.394	0.431	0.398	0.397	0.402	0.435	0.397
The entrepreneurship and innovativeness - the average value	0.182	0.474	0.182	0.291	0.300	0.234	0.177
Changing the level of development in the period 2010-2019							
General - the average value of the synthetic measure	0.347	0.368	0.354	0.350	0.324	0.334	0.335
The human capital - the average value of the synthetic measure	0.441	0.461	0.485	0.440	0.437	0.490	0.471
The natural environment - the average value of the measure	0.374	0.365	0.373	0.302	0.373	0.365	0.366
The entrepreneurship and innovativeness - the average value	0.285	0.332	0.286	0.355	0.239	0.247	0.256

Item	Portugal	Romania	Slovenia	Slovakia	Finland	Sweden	UK	UE
Number of NUTS-2 regions	7	8	2	4	5	8	41	281
The level of development in 2019								
General - the average value of the synthetic measure	0.267	0.267	0.307	0.312	0.298	0.311	0.318	0.298
The human capital - the average value of the synthetic measure	0.281	0.314	0.328	0.358	0.297	0.332	0.341	0.312
The natural environment - the average value of the measure	0.403	0.419	0.406	0.417	0.395	0.388	0.405	0.411
The entrepreneurship and innovativeness - the average value	0.163	0.121	0.217	0.196	0.231	0.234	0.236	0.209
Changing the level of development in the period 2010-2019								
General - the average value of the synthetic measure	0.334	0.351	0.331	0.316	0.312	0.340	0.333	0.333
The human capital - the average value of the synthetic measure	0.454	0.456	0.486	0.494	0.406	0.482	0.461	0.468
The natural environment - the average value of the measure	0.370	0.372	0.381	0.368	0.353	0.359	0.358	0.365
The entrepreneurship and innovativeness - the average value	0.256	0.291	0.230	0.207	0.241	0.267	0.259	0.253

Source: own research.

In table 5, a different approach to specifying the level of the development was presented within the framework of the respective states. The level of the socio-economic development as well as the changes in the said development in the NUTS-2 regions of the EU member states were presented, taking account of the average values of the synthetic gauge of all the regions of a particular state. The highest average value of the synthetic gauge of the general level of the socio-economic development as well as the changes of the development, as well as the „entrepreneurship and innovativeness” subcomponent was registered in Luxembourg. It stems from the fact that in Luxembourg, there was only one NUTS-2 region subcategorized, the region which is at the same time the second best developed region of the EU. Among the states in which at least two NUTS-2 units were subcategorized, the highest average value of the synthetic gauge of the general level of the socio-economic development was registered in Ireland, the Netherlands and Belgium, and the highest average value of the synthetic gauge of the changes in the level of the development was observed in Romania and in Hungary. The highest level of the development of the „human capital” subcomponent in 2019 was observed in Ireland, and the biggest change in the subcomponent in the years between 2010-2019 was registered in German regions. The highest value of the synthetic gauge within the „entrepreneurship and innovativeness” subcomponent, among the states with at least two NUTS-2 regions, in the static dimension, was registered in the Netherlands, and in the dynamic dimension – in Romania. Within the natural environment, the highest average value of the synthetic gauge in the static dimension was observed in Croatia, and the biggest improvement in the state of the natural environment in the years between 2010-2019 was registered in Greece. In summary, one may thus conclude that in the analysis comprising the respective NUTS-2 units, British, German and French units dominate with respect to their biggest number. Taking account of the average value of the respective synthetic gauges, the best results were registered in the case of Irish, Dutch and Romanian regions. The abovementioned considerations, the research conducted as well as the results obtained may thus constitute both an impulse towards conducting deeper analyses in that direction, as well as being a potential inspiration for the EU organs within the scope of the manner of specifying the richest and the poorest EU regions with the purpose of securing an effective management of the cohesion policy in the conditions of spatial concentration.

References

1. Albulescu, C., Goyeau, D. (2014). EU Funds Absorption Rate and the Economic Growth. *Timisoara Journal of Economics and Business*, 6(20), 25-26.
2. Arranz, N.F., Arroyabe, C., 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>

3. Avgerou, C. (2008). Information systems in developing countries: A critical research review. *Journal of Information Technology*, 23(2), 133-146. <https://doi.org/10.1057/palgrave.jit.2000136>
4. Azis, I.J. (2020). Regional Development and Noneconomic Factors. In: *International Encyclopedia of Human Geography*. <https://doi.org/10.1016/b978-0-08-102295-5.10117-9>
5. 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>
6. 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>
7. 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>
8. 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>
9. Bystrova, T.Y., Larionova, V.A., Osborne, M., Platonov, A.M. (2015). Introduction of open E-learning system as a factor of regional development. *Economy of Region*, 4, 226-237. <https://doi.org/10.17059/2015-4-18>
10. 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>
11. De Castro, E.A., Marques, J., Viegas, M. (2018). The Schumpeter creative destruction hypothesis: A spatial assessment on Portuguese regions. *Global Business and Economics Review*, 20(2), 198-212. <https://doi.org/10.1504/GBER.2018.090069>
12. 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>
13. 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>
14. 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>
15. Emami-Langroodi, F. (2018). Schumpeter's Theory of Economic Development: A Study of the Creative Destruction and Entrepreneurship Effects on the Economic Growth. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3153744>

16. Eurostat (2021). *Regional statistics by NUTS classifications*. Retrieved from: <https://ec.europa.eu/eurostat/web/main/data/database>, July 05, 2021.
17. 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>
18. 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>
19. 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>
20. Friedmann, J. (1983). Life space and economic space: contradictions in regional development. *The Crises of the European Regions*. https://doi.org/10.1007/978-1-349-06588-2_9
21. Grosse, T.G. (2018). EU Cohesion policy and the peripheries of the new Member States. In: *Regional Development in Central and Eastern Europe: Development processes and policy challenges*. <https://doi.org/10.4324/9780203855386-17>
22. 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>
23. 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>
24. Illeris, S. (1993). An inductive theory of regional development. *Papers in Regional Science*, 72(2), 113-134. <https://doi.org/10.1007/BF01557454>
25. Jašková, D., Havierníková, K. (2020). The human resources as an important factor of regional development. *International Journal of Business and Society*, 21(3), 1464-1478.
26. Khasanova, A., Amirova, N., Sargina, L. (2020). Natural resource potential as a factor of regional development. *CITISE*, 24(2). <https://doi.org/10.15350/2409-7616.2020.2.22>
27. 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>
28. 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>
29. Liu, G., Liu, Y., Zhang, C. (2018). Factor allocation, economic growth and unbalanced regional development in China. *World Economy*, 41(9), 2439-2463. <https://doi.org/10.1111/twec.12572>

30. 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>
31. 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>
32. 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>
33. 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>
34. Moroshkina, M. (2020). Geographical Factor in Regional Development. *Vestnik Volgogradskogo Gosudarstvennogo Universiteta. Ekonomika*, 4, 90-98. <https://doi.org/10.15688/ek.jvolsu.2019.4.9>
35. 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 and Management Systems*, 19(2), 460-475. <https://doi.org/10.7232/iems.2020.19.2.460>
36. Naydenov, K. (2019). Human resources development as a factor for regional development. *International Multidisciplinary Scientific GeoConference Surveying Geology and Mining Ecology Management, SGEM*, 19(5.4), 475-481. <https://doi.org/10.5593/sgem2019/5.4/S23.063>
37. Nistor, R.L., Glodeanu, A.-C. (2014). Regional economic development influenced by the EU funds absorption rate. *Managerial Challenges of the Contemporary Society. Proceedings*, 7(1), 115-118.
38. 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>
39. 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\(7\)](https://doi.org/10.9770/jesi.2018.5.4(7))
40. Palvia, P., Baqir, N., Nemati, H. (2018). ICT for socio-economic development: A citizens' perspective. *Information and Management*, 55(2), 160-176. <https://doi.org/10.1016/j.im.2017.05.003>
41. 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>
42. 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>

43. 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 (Special Issue 2), 323-337.
44. 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).
45. Smętkowski, M. (2015). Spatial patterns of regional economic development in central and eastern European countries. *Geographia Polonica*, 88(4), 539-555. <https://doi.org/10.7163/GPol.0033>
46. Spychała, M. (2020). The absorption of EU funds and the socio-economic development in the subregional dimension in Poland. *Prace Naukowe Uniwersytetu Ekonomicznego We Wrocławiu*, 64(3), 78-91. <https://doi.org/10.15611/pn.2020.3.07>
47. Vučković, S.Đ., Đorđević, J., Jovanov, J.M., Bibić, L.I., 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), 217-232.
48. Yun, J.H.J., Won, D.K., Park, K.B., Yang, J.H., 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>
49. Zemtsov, S.P., Smelov, Y.A. (2018). Factors of regional development in Russia: Geography, human capital and regional policies. *Zhournal Novoi Ekonomicheskoi Assotiacii*, 40(4), 84-108. <https://doi.org/10.31737/2221-2264-2018-40-4-4>