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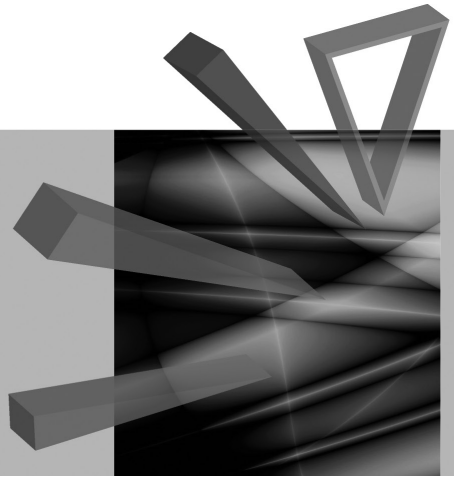

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POLISH REGIONS AGAINST THE BACKGROUND OF EUROPEAN REGIONAL SPACE WITH REGARD TO SMART GROWTH – AGGREGATE PERSPECTIVE*

Summary: This study presents the assessment of ranking regarding Polish NUTS 2 level regions against the background of European space, with regard to aggregate measure values in smart growth pillars, i.e. smart specialization, creativity and innovation. Each of them was depicted by a set of characteristics. The evaluation of Polish regions' positions was also performed considering the aggregate assessment of smart growth level.

Keywords: aggregate measure, smart growth, position, Polish regions.

1. Introduction

Smart growth is included among the three priorities of *Europe 2020* Strategy [*Europa 2020. Strategia*... 2010] and is understood as the development of a knowledge-based economy and innovation. The implementation of seven flagship projects is expected to facilitate the accomplishment of ambitious strategic objectives. In Poland the realization of a national operational programme is planned in the course of the next funding period. The programme, under the working name of "Smart growth", is focused on innovation, research work and their relations with the business sector.

The objective of this study is to evaluate the position of Polish NUTS 2 level regions against the background of European space with regard to the values of aggregate measures referring to smart growth and also in relation to the selected pillars, i.e. smart specialization, creativity and innovation, of which each one is illustrated by an appropriate set of characteristic qualities.

* The study was prepared within the framework of the research grant No. 2011/01/B/HS4/04743 entitled: Classification of European regional space in the perspective of intelligent development concept – dynamic perspective.

2. Smart growth – the strategic objective of Europe 2020

The development of European and global civilization faces on-going challenges. *Europe 2020* Strategy [*Europa 2020. Strategia*... 2010] which is the continuation of the Lisbon Strategy, constitutes a part of the development oriented vision for the European continent covering three related priorities [*A strategy for smart*... 2010]:

1) smart growth: knowledge and innovation based economy growth;

2) sustainable growth: support for an efficiently operating economy, taking effective advantage of the available resources, more environmentally friendly and more competitive;

3) inclusive growth: support for an economy featuring a high level of employment, ensuring social and territorial cohesion.

The accomplishment of the goals listed above requires harmonized activities at each of the following levels: European, national, regional and local. The EU member states, by entering into partnership cooperation with regional and local entities, are supposed to implement the National Reform Programmes decided on and agreed by each of them, since they define the methods responsible for carrying out both the priorities and the objectives of the Europe 2020 strategy. The primary support instruments applied by the European Commission with reference to the implementation of these priorities and objectives, take the form of the following projects:

- Innovation union: the concentration of research, development and innovation policy on major challenges and activities focused on eliminating the gap occurring between science and the market, which is expected to result in transforming innovation into products,
- Youth on the move: actions aimed at the improvement of quality and international attractiveness of the European higher education system by means of promoting the mobility of students and young professionals,
- A digital agenda for Europe: increased sustainable socio-economic advantages as the result of a uniform digital market based on the ultra-fast Internet,
- A resource-efficient Europe: support for reorientation towards a low-carbon economy using its resources more efficiently,
- Industrial policy for Europe: support directed towards the European industrial base, mainly referring to competitiveness, the promotion of entrepreneurship and learning new skills,
- Agenda for new skills and jobs: establishing conditions for the transformation of job markets, which is supposed to enhance employment rate increase and the sustainability of social models,
- European agenda for fighting poverty: ensuring economic, social and territorial cohesion implemented as the form of support for the poor or individuals suffering social exclusion, and in consequence facilitating their active social participation.

With reference to each of the above projects, measurable targets were defined regarding the economy in the united Europe, i.e.:

- share of expenditure on R&D in the EU GDP – not less than 3%,
- workforce participation rate of people aged 20–64 at the level of 75%,
- less than 10% share of student dropouts,
- at least 40% share of university graduates aged 30–34,
- reduced greenhouse gasses emission by at least 20% compared to the 1990 level and the improvement of energy efficiency by 20% where the share of energy originating from renewable sourced makes up 20% of the overall energy,
- reduction – by at least 20 million – of the number of people at risk of poverty and social exclusion,

the achievement of which is supposed to be finalized by 2020.

3. Aggregate approach in measuring the complex phenomenon of smart growth

In the EU strategic documents, smart growth is defined as the development of a knowledge-based economy and innovation [*A strategy for smart*... 2010]. In flagship initiatives and priorities, as well as other documents, the more effective support for research, development and innovation has been emphasized as particularly significant. It is also crucial to strengthen the knowledge triangle along with digital economy potential optimization. The increase of qualified workforce resources is of fundamental importance, so that it can more intensely respond to the job market requirements. The emphasis is also on lifelong learning and on-going efforts towards the improvement of both the quality and efficiency of the functioning education systems and training. More and more people deciding to undertake university education (or the equivalent) are also of key importance along with the decreasing share of people who drop out of the education system prematurely.

The suggested approach is in line with the measurement concept prepared by the World Bank for the assessment of a Knowledge-Based Economy (KBE). Within the framework of the KBE evaluation, it was accepted that knowledge creation becomes more and more effective as well as its acquisition, transfer and implementation in companies, organizations, and by individuals and communities, since this facilitates economic and social development [*Knowledge Assessment*... 2006; Kukliński 2001; Woroniecki 2001; Zienkowski 2003].

Regarding the concept of KBE, it was agreed that it is composed of four pillars: education and training, information technology infrastructure, economic incentives and institutional conditions and also innovation systems. The study presents an analysis of Europe 2020 strategy objectives, a review of smart growth flagship projects and statistical resources of databases for the EU NUTS 2 level regions, in

order to indicate areas allowing for the identification of pillars and to specify the initial set of smart growth measures. The performed analysis assumes that three pillars represent smart growth components: smart specialization, creative regions and innovation, for which the following measures, facilitating smart growth identification, were suggested.

Pillar I – smart specialization (SS), smart specialization indicators (whether a given variable is a stimulant (S) or a destimulant (D)was indicated in brackets):

SS_1 – workforce employed in knowledge-intensive services as the share of workforce employed in services (S),

SS_2 – average growth rate of workforce in knowledge-intensive services as the share of workforce employed in services (S),

SS_3 – workforce in mid and high-tech industry sector (as % or workforce employed in industry) (S),

SS_4 – average working rate of workforce in mid and high-tech industry sector (as % of workforce employed in industry) (S).

Pillar II – creative regions (CR), creativity indicators:

CR_1 – share of tertiary education workforce in total workforce number in the region (S),

CR_2 – share of population aged 25–64 participating in life-long learning in a region (S),

CR_3 – human resources in science and technology as % of working population (S),

CR_4 – people aged 15–64 born in a different country as % of population aged 15–64 (S),

CR_5 – unemployment rate as % of active population (D),

CR_6 – basic creative class (% of population aged 15–64) (S),

CR_7 – share of residents in their working age who moved from different EU regions in the recent year (S),

CR_8 – tertiary education graduates aged 30-34 (% of population aged 30–34) (S),

CR_9 – access to broadband Internet (% of households) (S).

Pillar III – innovation (I), indicators of innovation potential, capacity and effects:

I_1– patents registered in the European Patent Office (EPO) per 1 million of workforce (S),

I_2– productivity in industry and service sectors (PPS per worker) index EU27 = 100 (S),

I_3– employment rate (% of population aged 20–64) (S),

I_4– investments in private sector per 1 inhabitant by purchasing power parity (S),

I_5– R&D expenditure in business sector (% of GDP) (S),

I_6– R&D expenditure (% of GDP) (S).

The list presented above represents, on the one hand, the consensus between the ambitions and desires of the authors, and on the other the possibility of obtaining indispensable information necessary for further database calculations.

Aggregate measures become useful in analyses referring to the development level evaluation of multidimensional phenomena and resulting in the comparison of objects (regions) and their linear arrangement with regard to the analysed phenomenon level.

Regional comparisons may be performed considering the available set of diagnostic variables characterizing the discussed problem, which cannot be directly investigated or assessed, since it is impossible to measure the smart growth level directly as well as the pillars which comprise it. Synthetic variables are most frequently applied (taxonomic measures of development) in order to describe the aggregate complex phenomena.

While selecting diagnostic variables, it is crucial to define the synthetic criterion precisely. Variables chosen for the description of the analysed problem may refer to it either directly or indirectly, however, the direct relation means an opportunity to measure the particular aspect of a given phenomenon, while a direct one facilitates the presentation of broader immeasurable aspects.

An agreed set of variables was prepared, as has already been indicated, in the process of their substantive selection and the analysis of data availability in databases. In order to compare variables, the nature of each of them was defined (stimulant, destimulant, nominant) and next, by means of applying unitarization [Kukuła 2000], i.e. dividing variable value, or its distance from one of the variability extreme values by the range, due characteristics were normalized. The variables were transformed using the following formulas:

$$x_{ij}^{'} = \frac{x_{ij} - \min_i \left\{ x_{ij} \right\}}{\max_i \left\{ x_{ij} \right\} - \min_i \left\{ x_{ij} \right\}};\ \text{stimulant},$$

$$x_{ij}^{'} = \frac{\max_i \left\{ x_{ij} \right\} - x_{ij}}{\max_i \left\{ x_{ij} \right\} - \min_i \left\{ x_{ij} \right\}};\ \text{destimulant},$$

where: i – object (region) number,
j – characteristics number,
max, min – extreme values in the set of a given characteristics objects.

The fixed range of normalized characteristics variability, which take values in the range of [0; 1], was obtained as the result of the above method application.

An aggregate measure, applying comparable variables, was prepared as the synthetic index ranking for each pillar separately (smart specialization – 4 variables, creative regions – 9, innovation – 6 variables) and in total for all variables (19 variables). A synthetic indicator was separately defined for each of EU NUTS 2 level regions and calculated based on the following formula:

$$W_i = \frac{100}{m} \sum_{j=1}^{m} a_j x_{ij}^{'},$$

where: m – number of characteristics considered (depending on the pillar: 4, 9, 6 and for smart growth, total of 19),
α_j – weight of j-th variable.

Since it was assumed that all variables influence regional smart growth to the same extent, the weights assigned to the variables were set at a fixed level (equal to 1) – therefore, the above formula took the following form:

$$W_i = \frac{100}{m} \sum_{j=1}^{m} x_{ij}^{'}.$$

Index values may be included in the range of [0; 100], the higher the index value the higher the level of smart growth (or a particular pillar) in a region.

4. The position of Polish regions regarding aggregate measures of smart growth and the respective pillars

The assessment of the position of Polish regions against the background of other EU territorial units was prepared for NUTS 2 level [*Regions in the European Union*... 2007], however, not for the total of the 271 regions. The analysis does not cover French overseas regions (Guadeloupe, Martinique, Guyane, Réunion) and two Spanish regions (Ciudad Autónoma de Ceuta, Ciudad Autónoma de Melilla) due to the absence of all data – the discussion refers to 265 regions. The timeframe of the study, resulting from data availability in the Eurostat base and EU reports as well as their presentation, covered mainly the period of 2000 – 2010. Therefore, it referred to the year 2007 for CR_6, I_2, I_5, I_6, 2008 (for CR_1–CR_5, CR_8, I_1, I_3) and 2009 (CR_9) and also 2010 (SS_1 and SS_3). Additionally, in the case of I_4characteristics it was the mean value covering the period of 2002-2006, the mean value referring to 2007–2008 for CR_7, while in the case of SS_2 and SS_4 characteristics – the geometric mean for the period of 2000–2010.

The highest values of aggregate measure for the overall smart growth assessment in the European regions – over 60 – was obtained for the British region of Inner London (65.7) and Danish Hovedstaden (61.9), while the lowest values – below 20 – for the twelve following regions: Romanian – Nord-Est (16.7), Centru (17.1), Sud-Est (19.2), Sud-Muntenia (19.7), Italian – Sicilia (16.8), Campania (18.1), Puglia (19.7), Calabria (19.9), Bulgarian – Severozapaden (17.2), Yuzhentsentralen (19.7), Severoiztochen (19.8) and the Greek region Ionia Nisia (18.5). The relation of measure values for regions ranked at extreme positions amounts to almost 4.

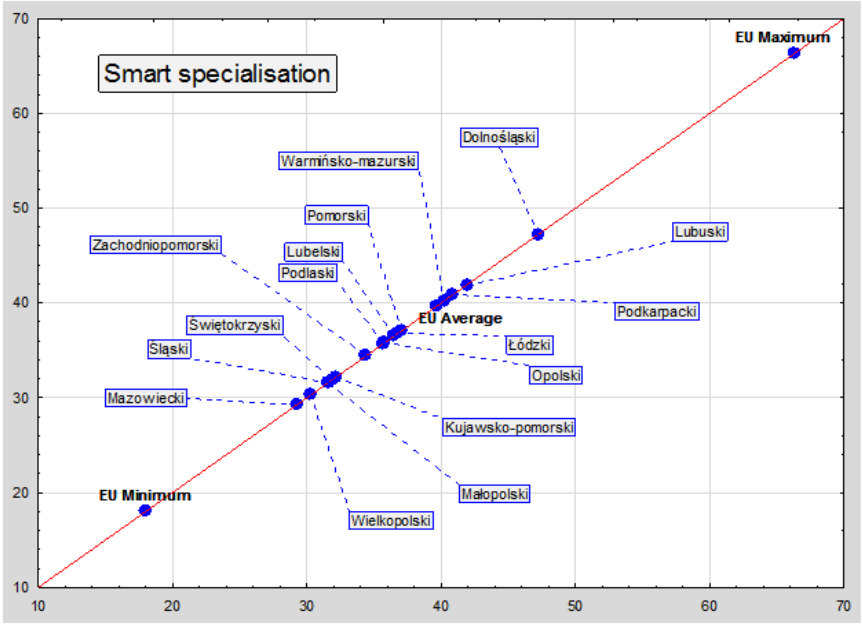
Having analysed the particular smart growth pillars the leading regions could be indicated, as well as those which were ranked at the bottom regarding aggregate measures values:

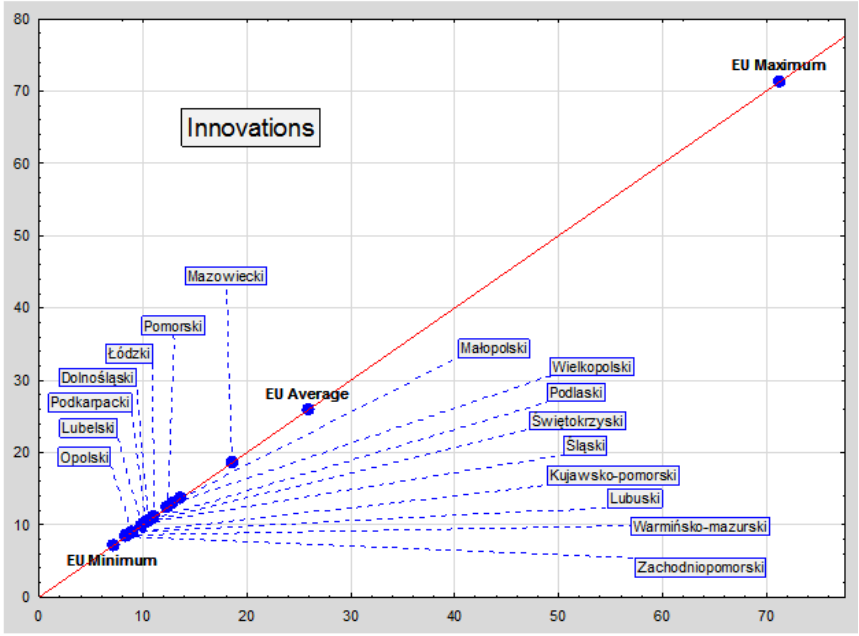
- smart specialization: measure value not less than 60 features four German regions, i.e. Bremen (66,3), Kassel (64,7), Saarland (62,1) and Braunschweig (60,0) and also French Corse (62,4), measure values below 20 for the Spanish region Comunidad Valenciana(18);
- creative regions: among eleven regions the measure of which was not less than 60, four British ones were included (Inner London – 89.5, Outer London – 70.7, Berkshire, Buckinghamshire and Oxfordshire – 64.3 and Surrey, East and West Sussex – 60.3), Danish Hovedstaden (69.9), two Dutch regions (Utrecht – 67.9 and Noord-Holland – 63.5) and two Belgian ones (Prov. Brabant Wallon – 62.3 and Prov. Vlaams-Brabant – 60.0), Swedish Stockholm (67.4) and Finnish Etelä-Suomi (60.8), while the lowest measure value – 20 and less refers to five Greek regions (Ionia Nisia – 17.5, Dytiki Makedonia – 18.6, Peloponnisos – 18.9, Sterea Ellada – 19.1, Notio Aigaio – 19.1), four Romanian regions (Sud-Muntenia – 16.0, Nord-Est – 18.2, Sud-Vest Oltenia – 18.8, Sud-Est – 19.3) and the Italian region Sicilia (19.6);
- innovation: measure value above 60 was recorded only for the German region of Stuttgart (71.3), in the case of 86 regions the measure value did not exceed 20, while among regions for which the value of less than 10 was assigned, three Hungarian regions were included (Észak-Magyarország – 7.2, Dél-Dunántúl – 7.6, Észak-Alföld – 9.1) and three Romanian (Sud-Est – 7.7, Centru – 9.6, Nord-Vest – 9.6), two Bulgarian (Severentsentralen – 7.8 and Severozapaden – 8.4) and two Italian (Calabria – 7.9 and Sicilia – 9.9) and as many as six Polish regions (Zachodniopomorski – 8.3, Warmińsko-Mazurski – 8.5, Lubuski – 8.9, Kujawsko-Pomorski – 9.0, Opolski – 9.0 and Lubelski – 9.9).

Polish regions, with regard to the aggregate measure values referring to particular smart growth pillars, are ranked at the bottom of the list in relation to innovation, since as many as the six listed above presented, for this particular pillar, have a measure of less than 10, additionally 15 of them are listed among the last three hundred EU regions – see Table 1. Only the Mazowiecki region, characterized by an 18.6 measure value, is listed as 192 out of the 265 analysed EU regions. Additionally, it should be also indicated that none of the Polish regions presented a measure value above the EU average, while the measure for the Mazowiecki region amounted to 75% of the EU mean value (see Figure 1).

With reference to smart specialization, which evaluates workforce share in the sector of knowledge-based services and in high and mid-tech industry, as well as the average rate of changes recorded in these shares within the last decade, Polish regions are ranked at positions from 56 – Dolnośląski presenting a measure value at the level of 47.2 (the only one in the top one hundred) down to 234 – Mazowiecki featuring

a measure value equal to 29,3. Measure values exceeding the EU average of 39.7, apart from the Dolnośląski region, were also recorded in the case of Lubuski (41.9), Podkarpacki (40.9) and Warmińsko-Mazurski (40.2) – see Figure 1.





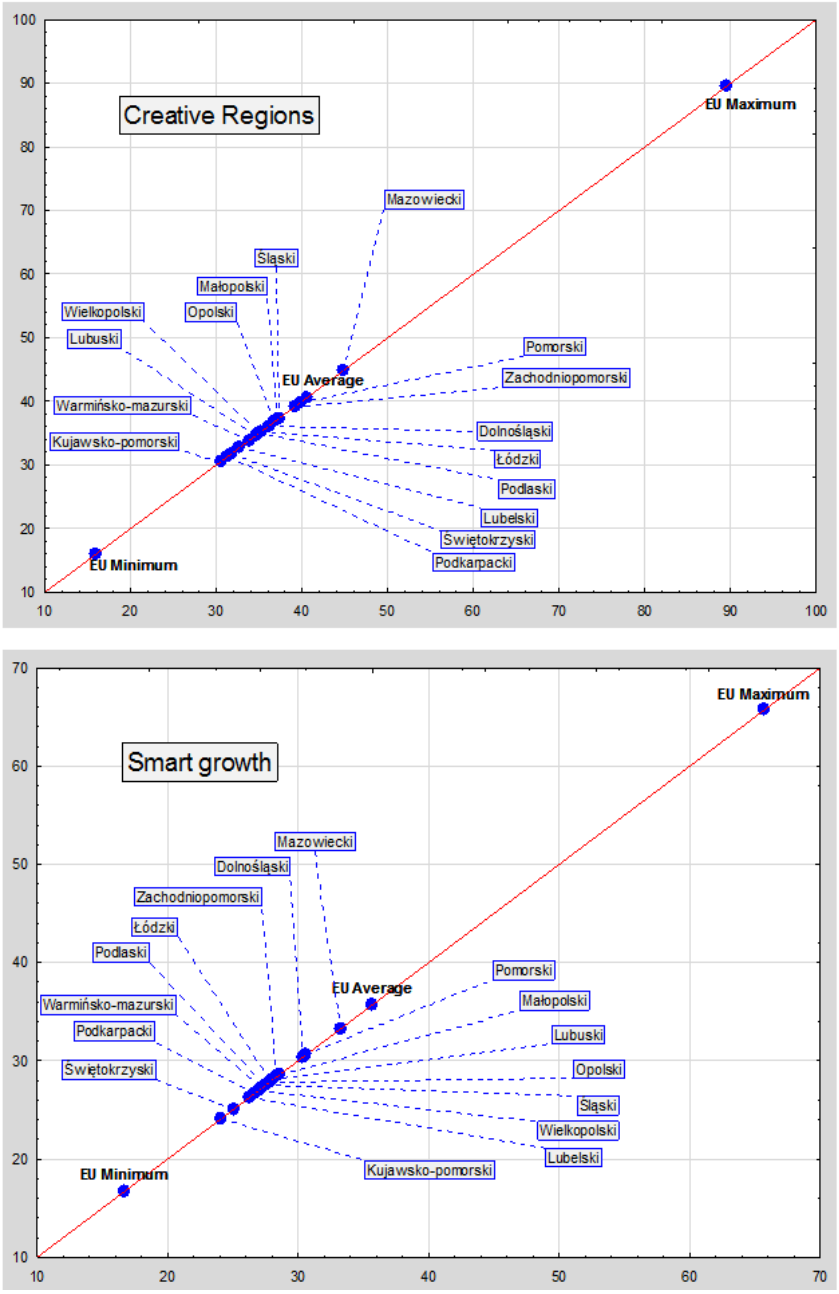


Figure 1. Aggregate measure values against the background of adequate EU results

Source: authors' compilation by means of the Statistica programme.

The Mazowiecki region, with regard to the aggregate measure value illustrating the pillar of creative regions, concludes the first one hundred on the list of the EU NUTS 2 level regions – the due measure value is 44.8, the regions listed among the third hundred ones are: Kujawsko-Pomorski – position 207, a measure value equal to 30.6 and Podkarpacki – position 204 (measure – 31.3).

Table 1. Regions ranked regarding aggregate measure values against the background of the European space

Region	Positions regarding aggregate values for pillars			Positions regarding aggregate measure values for smart growth
	SS	CR	I	
Łódzki	171	178	234	209
Mazowiecki	234	100	192	162
Małopolski	218	164	222	202
Śląski	217	163	248	213
Lubelski	174	197	251	223
Podkarpacki	114	204	247	220
Świętokrzyski	214	199	245	233
Podlaski	184	180	236	214
Wielkopolski	229	179	226	218
Zachodniopomorski	197	148	260	203
Lubuski	105	183	257	208
Dolnośląski	56	173	239	186
Opolski	182	167	255	211
Kujawsko-Pomorski	211	207	256	237
Warmińsko-Mazurski	123	192	258	216
Pomorski	169	140	229	183

Source: authors' estimations based on Eurostat data.

The globally assessed smart growth allows for indicating whether only three regions are ranked among the second hundred, including the Mazowiecki– presenting a measure value of 33.3 at position no. 162, Pomorski (measure – 30.6), ranked as 183 and Dolnośląski (30.4) listed as 186, while the other 13 are ranked at positions from 202 (Małopolski) to 237 (Kujawsko-Pomorski).

The globally assessed smart growth allows for indicating whether only three regions are ranked among the second hundred, including Mazowiecki – presenting a measure value of 33.3 at position no. 162, Pomorski (measure – 30.6), ranked as 183 and Dolnośląski (30.4) listed as 186, while the other 13 are ranked at positions from 202 (Małopolski) to 237 (Kujawsko-Pomorski).

5. Final remarks

The ranking of Polish regions regarding aggregate measure values for particular pillars, i.e. smart specialization, creative regions and innovation, as well as the aggregate assessment of smart growth, are far from satisfactory due to the fact that

the only place among the first one hundred is occupied by the Dolnośląski region with regard to smart specialization, or position no. 100 for Mazowiecki in relation to the measure value for regional creativity assessment; also places among the second hundred taken by thirteen other Polish regions do not present high results against the background of the European space at NUTS 2 level.

This is also true regarding innovation, since the ranking presents very distant positions of Polish regions too – the first of the Polish regions is ranked as low as 192 (Mazowiecki) and positions 162 (Mazowiecki), 183 (Pomorski) and 186 (Dolnośląskie) place Polish regions also down the list with reference to the assessed synthetic smart growth.

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POLSKIE REGIONY NA TLE EUROPEJSKIEJ PRZESTRZENI REGIONALNEJ W KONTEKŚCIE INTELIGENTNEGO ROZWOJU – UJĘCIE AGREGATOWE

Streszczenie: W pracy dokonano oceny pozycji polskich regionów szczebla NUTS 2 na tle europejskiej przestrzeni z uwagi na wartości miar agregatowych w filarach inteligentnego rozwoju, tj.: inteligentnej specjalizacji, kreatywności i innowacyjności, z których każda została zilustrowana zestawem charakterystyk. Dokonano także oceny pozycji regionów Polski z uwagi na oceniany sumarycznie poziom inteligentnego rozwoju.

Słowa kluczowe: miara agregatowa, inteligentny rozwój, pozycja, regiony Polski.