
The Economic Dimension of Space

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Abstract:

Purpose: The main purpose of this study is to identify and analyze the impact of economic space diversity on economic development processes.

Design/Methodology/Approach: The paper uses the method of literature studies. The data underwent quantitative analysis with the use of descriptive and parametric (r-Pearson correlation index) statistics. The study analysed the structure, dynamics and intensity indices, as well as the r-Pearson correlation index.

Findings: The paper identifies the features of space (i.e. limitation, resistance and diversification). Space can influence development processes by influencing sales revenues and production costs of enterprises. Space is created by places of varied value for people, therefore the economy develops unevenly in space.

Practical Implications: The results of the research can be used by decision-makers to shape public aid instruments. The results of the conducted research indicate that in the next programming period there will be a further reduction in the maximum intensity of regional investment aid for Polish regions, which creates the need to seek new development impulses.

Originality/Value: The paper shows the simultaneous existence of two processes, i.e. narrowing of the development gap between Polish and EU regions and deepening of regional development disparities in Poland. There is no consensus in the literature on the existence and nature of a link between public aid and economic development processes. This study shows that other factors had a stronger impact on the pace of regional development in Poland than the maximum regional aid intensity.

Keywords: regional development, space, regional state aid, regions in Poland, NUTS 2

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1. Introduction

Space is a multidimensional concept with a varied definition in literature. This is also related to the fact that the concept of space is used by specialists from many disciplines (e.g. surveyors, geographers, architects, urban planners and economists). For economists, the issue of the impact of space on economic development processes is of particular importance. This is an important issue that is part of the ongoing literature discussion on the pros and cons of place-neutral versus place-based policies for economic development (Barca *et al.*, 2012). Therefore, the main purpose of this study was to identify and analyse the impact of economic space diversity on economic development processes. In the first part of the study, the analyses were based on literature studies, while in the second part, an attempt was made to analyse the impact of space on regional development processes in Poland using quantitative analysis methods. The following secondary objectives were used to achieve the main purpose:

- identification and analysis of the features of space that are economically significant;
- identification and analysis of contemporary regularities guiding spatial processes and their influence on economic development processes;
- identification and assessment of the impact of regional public aid on economic development in the light of the literature;
- identification and assessment of the impact of regional investment aid on regional development on the example of NUTS 2 regions in Poland²;
- identification of the NUTS 2 regions in Poland eligible for regional investment aid in the 2021-2027 programming period and the estimated maximum intensity of that aid.

The subject of analysis in this study was the economic space in which people operate of importance to the course of economic development processes. In this context, the features of space are particularly important, i.e., its limitation and resistance to human activity. Another important feature of space is its diversification, which implies possible ways of its use by humans and contributes to differences in the effectiveness of this use. It is also worth noting that space is subject to certain changes according to the course of spatial processes. The described features of space, as well as the existing spatial processes, contribute to the creation of specific conditions for the management of a given area, and thus affect the diversification of the level and pace of economic development of individual areas.

²*Classification of territorial units for statistics (NUTS in French: Nomenclature des Unités territoriales statistiques) is a geographical nomenclature which divides the EU into regions of three different levels (NUTS 1, 2 and 3). The NUTS classification is hierarchical - it divides each EU Member State into NUTS level 1 territorial units, each subdivided into NUTS level 2 territorial units, which in turn are subdivided into NUTS level 3 territorial units (Regulation (EC) No 1059/2003).*

2. The Features of Space and its Impact on Development Processes

According to the definition of the Dictionary of Polish Language (2019), space is “*an unlimited three-dimensional area in which all physical phenomena occur*”, as well as “*a part of such area included within some borders*”. There are many different classifications of space. The economic and spatial analyses use three categories of space, i.e., geodetic, geographical and economic space. The geodetic space (i.e., the globe space) does not take into account actual surface diversifications. Geographical space is the heterogeneous, real surface of the Earth, qualitatively diversified in terms of physical, biological, geochemical features (it is formed by ecumene, subecumene and anecumene). Economic space is a three-dimensional space filled with both natural objects shaped by nature, and with people themselves and the fruits of their work. Hence, space may be primary or secondary (derivative) space, open or closed space, complex or selective (monocultural), continuous or discontinuous. In this space, people carry out various social and economic activities, the distribution of which influences the formation of a real spatial network (systems), called a spatial structure (Becla and Czaja, 2004). The subject of analysis in this paper is economic space, which henceforth will be referred to as space.

It should be noted that space is characterised by certain features, among which are limitation, resistance and diversification (Malisz, 1984). Limitation of space is related to the size of the planet, which results in a shortage of free land for economic activities (agriculture, industry, housing, transport, etc.). Space is becoming more and more a rare good that cannot be replaced and cannot be increased in quantity in the production process. However, it is possible to increase the efficiency of land use by substituting it with labour and capital inputs using scientific and technical progress.

Considering the limitation of space, systems have been introduced that secure space as a higher good (e.g. legal regulations, institutions, spatial policy mechanisms or spatial planning formulas), thus creating a regulated market conducive to economic rationality and protecting the public interest. It should be noted, however, that running a business activity in overcrowded and intensively developed areas causes competition for resources, including the land itself, and may also lead to spatial conflicts. This is particularly evident in areas of concentration of different activities and mainly concerns those areas that are attractive for different types of human activity. Therefore, it is important that the space is managed rationally (in the sense of economic rationality) while maintaining the principles of spatial order and general social interest. The economic rationality is based on the principle of maximising effects within the available spatial resources or minimising the amount of space required to achieve certain effects. The principle of maximising effects may pertain, for example, to the maximisation of profits or other benefits, which may lead to overuse of space. The principle of cost minimization most often concerns the total

costs of economic undertakings, one of the elements of which is the cost of space use (Domański, 2006).

The second feature of space is its resistance to human activity, which is related to the amount of expenditure incurred to carry out socio-economic activity in the area. The intensity of development and use of space is related to communication accessibility and technical progress (Brzeziński, 2015). It should be noted that the movement of resources in space also depends on the distance and the degree of mobility of resources (e.g., building sites, buildings, roads, municipal facilities are immobile, people have limited mobility, while information moves the fastest).

Another feature is the diversification of space in terms of its natural and anthropogenic features resulting from its filling with various types of elements, which determines the structure of the space. This feature predestines individual fragments of space to a specific use. Among these elements (forms of land use) the following should be mentioned:

- zonal (surface) elements - areas with specific natural features that make them suitable for certain functions (e.g. agricultural production space, economically used forests and water reservoirs, areas of natural resources extraction, wasteland, etc.);
- linear elements - stretches and strips of technical infrastructure which are the basis for links between elements of stationary use, forming elongated zones with favourable conditions for development (e.g. roads, railway lines, pipelines, energy and information transmission lines); they tend to bundle and develop networks;
- point (concentrating) elements - showing a tendency to concentrate on intersections of technical infrastructure lines (e.g. settlement network, production, commercial or service facilities).

Between these elements, various interactions and feedback occur, creating a so-called band-node system, in which nodes are point elements, while bands are linear elements. The zonal forms fill the so-called “meshes” of this net (Ossowska and Janiszewska, 2014).

Human activity in space creates different arrangements with a specific spatial structure. The notion of spatial structure is understood as “*existing in reality, arranged in a certain orderly manner systems of economic (production or non-production) or social units together with various mutual economic and spatial links taking place in the set of units forming these systems*” (Kuciński, 1994). It is worth stressing that particular economic space systems (i.e. spatial development zones) form the spatial structure of the national economy. The elements of this structure are: geographical environment, population distribution, distribution of production processes and service activities, distribution of permanent elements of activities, spatial distribution of national income, distribution of supra-economic activities,

territorial diversity of living conditions. The links between the above elements and their nature (strong or weak) are important.

Changes leading to qualitative transformation of the spatial structure are referred to as spatial processes. Among the regularities governing such processes are: the principle of rational management and tendencies to concentrate and search for places characterised by large and diversified location values (these are the so-called attractiveness niches). This implies an increase in the diversity of space and an uneven level of its development, forming a core-periphery model. The core may represent a service centre or point of supply for the hinterland, which would comprise its market area (Parr, 2014). Spatial processes may be caused, among others, by the location of new investments or technical and social innovations (so-called induced processes), the influence of internal factors of the centre (autonomous processes), adaptation of the service sector to the developmental needs of the production sector (adaptation processes), overlapping of new socio-economic phenomena with earlier ones (continued processes), intended decisions of the authorities (stimulated processes) (Kuciński, 1994).

It should be noted that the spatial structure of the economy is characterised by a relatively high level of inertia and low susceptibility to spatial processes - especially in peripheral regions with a relatively low level of socio-economic development. For example, the r-Pearson correlation coefficient between the entrepreneurship indicator at the commune level in Poland in 2008 and the analogous indicator for 2018 was 0.905 (the entrepreneurship indicator was expressed by the number of business entities registered in the REGON system per 10000 inhabitants of working age) (Central Statistical Office data, 2019). It should therefore be concluded that this is a strong correlation (correlation coefficient is greater than 0.6) (Czaja and Preweda, 2000). This shows that there were small spatial changes in the analysed index in the analysed period.

Nowadays, there is an interdependence of simultaneously occurring processes of technological revolution based on information technologies, the formation of the global economy, as well as the transition from industrial to knowledge-based economy. As a result of the above mentioned processes, the importance of science and innovation is growing, as well as the network economy, which is a spatial effect of the spread of knowledge-based economy. The importance of network interaction and regional cooperation in stimulating knowledge and innovation-based development is widely discussed in the literature (Cooke and Morgan, 1993; Fromhold-Eisebith, 2004; Lee *et al.*, 2012; Martinez-Fernandez, 2004; Oinas and Legendijk, 2005; Murdoch, 2000; Sternberg, 2000; Belso-Martínez *et al.*, 2017). These processes result in growing links between the areas within the network, concentration of different types of activities, which contributes to the deepening of disproportions in development between individual areas, as well as the creation of metropolises. It is in these areas of space that strong developmental impulses appear, which then diffuse to other areas - not necessarily in the vicinity of the metropolis. It

is therefore worth stressing that both globalisation is selective, i.e., it takes place with different degrees of intensity in different places, and the economic structure that is being created is not continuous (Korenik, 2011). This implies an increase in the diversity of pace and level of economic development between different areas.

Changes in the contemporary world related to, among others, the IT revolution, development of new communication technologies, virtualization of various aspects of human life and economic activity, globalization, political integration of Europe cause changes in the perception of the role of space. The influence of spatial factors on development processes is changing - the importance of distance is decreasing, while the role of regional and local development factors connected with specific, unique features of the area is increasing. On the other hand, space is changing from local or regional to global. For example, processes of foreign trade influence the internal spatial structure of the economy, contributing to the acceleration of growth in some cities or regions. This has a negative impact on other cities, where the problem of depopulation and land depreciation may arise. This results in the persistence of inequalities in development at both regional and urban levels (Venables, 2018).

Space can influence development processes by influencing sales revenues and production costs of enterprises. In regions with higher level of income within the population, entrepreneurs can more successfully apply a high price strategy. Location of a company close to consumers may facilitate the identification of their needs and changes in their preferences, and thus result in higher efficiency of the marketing instruments used. Moreover, in some industries (e.g., food or tourism) it is possible to build a brand based on the location of the company. Cost leadership strategy can also be based on spatially variable factors. Such sources of cost advantage include, among others, the availability of cheaper production factors or the possibility of obtaining resources of higher quality than competitors at the same cost.

Another source of cost advantage is the benefits of production scale achieved by the company, which are conditioned, among other things, by the availability of employees (adequate number and specialization) and the amount of costs in the investment phase (including the costs of construction and equipment of the company). Of importance are also the spatially differentiated costs of municipal services, administrative incentives in the form of tax exemptions or reductions for entrepreneurs, as well as the possibility to take advantage of various forms of public aid. Among the forms of public aid granted to entrepreneurs, the following are distinguished: subsidies, tax reliefs, capital-investment subsidies, so-called soft loans (e.g., preferential and conditionally redeemed loans, as well as deferrals and instalments), as well as guarantees and warranties. State aid, by increasing the availability of funds for enterprises, contributes to increasing their expenditures, which in turn leads to the development of enterprises and the economy (Kožuch, 2011).

It should be noted that The Treaty on the Functioning of the European Union (2012) provides that State aid is aid granted by a Member State or from State resources in any form whatsoever which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods, in so far as it affects trade between Member States. However, the Treaty allows Member States to grant State aid to promote the economic development of regions where the standard of living is abnormally low or where there is serious underemployment. Within the public aid available to entrepreneurs, horizontal, sectoral and regional aid is distinguished.

Horizontal aid is addressed to enterprises (mainly to SMEs) regardless of the economic sector and region and is granted, *inter alia*, for research, development, innovation, environmental protection, training. Sectoral aid is granted to entrepreneurs from selected sectors of the economy regardless of their location and is not available to entrepreneurs operating in other sectors (in Poland this aid is currently dedicated, among others, to the coal mining, energy, natural gas, telecommunications, cinematography and banking sectors).

Regional aid is distinguished from other forms of aid by its geographical specificity, which means that the aid is dedicated to enterprises operating in a specific area and is not available to enterprises located outside the area eligible for spatial aid. This is an example of the direct impact of space on economic development processes. The purpose of state aid is therefore to accelerate development in regions with a lower level of development. The result is to reduce disparities in regional development, reduce space diversity and increase social and economic cohesion. Regional aid is intended to contribute to increasing the investment attractiveness of underdeveloped regions by financing additional costs (e.g. lack of infrastructure, lower quality labour force) that entrepreneurs have to bear in connection with investing in such areas (Ambroziak, 2015).

Regional state aid is an important instrument to overcome barriers to the development of entrepreneurship in less developed regions. It should be noted that the development of entrepreneurship is one of the fundamental factors of regional development (Postuła, 2008). State intervention in the economy is mainly justified by the need to correct market failures leading to increased long-term productivity and competitiveness and to strengthened social cohesion (Wishlade, 2003; Bilal and Nicolaides, 1999). Regional aid can be used to support new investments in less-favoured regions of Europe, job creation, large investment projects, operating aid (reducing a company's current expenditure) and aid for urban development. Regional aid does not include aid for fisheries and aquaculture, agriculture and transport, which are subject to other legal arrangements.

It is worth stressing that regional state aid is intended only for those entrepreneurs who run or intend to start business activity in regions which have been qualified for such aid. Regional aid may be granted in two types of regions, i.e. areas "a" and "c". The regions where regional state aid can be granted are the NUTS 2 regions where

the GDP per capita in purchasing power standards (PPS)³ is 75% or less of the EU-27 average (based on the average of the last three years for which EUROSTAT data is available) and the outermost regions (the so-called “a” areas). In this case, the aid concerns enterprises operating in areas where the economic situation is particularly unfavourable in comparison with the European Union as a whole. In addition, in the period 2007-2013, the aid covered the so-called “c” areas, i.e. sparsely populated areas, in the period 2011-2013 - NUTS 2 regions belonging to group “a”, as well as other regions with socio-economic, geographical or structural problems.

Within the framework of regional state aid, regional investment aid is granted. Regional investment aid may be granted for a new investment (so-called initial investment), i.e., the setting-up of a new establishment, the extension of an existing establishment, diversification of the output of an establishment into new products or a fundamental change in the production process, acquisition of the capital assets directly linked to an establishment, which has closed or would have closed had it not been purchased (Commission Regulation (EU) No 651/2014, 2014). The regional aid map specifies the regions of a Member State that are eligible for regional investment aid under EU State aid rules, as well as the maximum levels of aid for enterprises in the eligible regions. The maps indicate in which geographical areas companies may receive regional aid and the percentage of eligible investment costs can be covered by the aid (this is the so-called aid intensity). Eligible costs mean the part of the total investment costs that can be taken into account for calculating aid.

The maximum allowable amount of regional aid⁴ that an entrepreneur can receive depends on the location of the investment, and an additional factor differentiating this amount is the size of the enterprise and the size of the investment project. The maximum level of investment aid intensity takes into account the nature and extent of differences in the level of development of different regions and depends on the level of economic development of the regions as measured by the value of GDP per capita in PPS in relation to the average for the European Union. The maximum aid intensities apply to investments by large companies - they can be increased by 10 percentage points for investments by medium-sized companies and 20 percentage points for investments by small companies.

The regional aid map sets out a framework for public support for productive investments, while at the same time contributing to accelerate regional development in underdeveloped regions by stimulating private investments in these areas. This contributes to reducing the costs of businesses depending on the choice of place of

³*The Purchasing Power Standard (PPS) is an artificial currency unit used by Eurostat that eliminates price level differences between countries. Theoretically, for one PPS you can buy the same amount of goods and services in a country (EUROSTAT (PPS), 2019b).*

⁴*The maximum regional aid intensity is calculated as the ratio of the value of the regional aid, expressed in gross grant equivalent, to the costs eligible for this aid (Regulation of the Council of Ministers of 30 June 2014).*

business. This should result in the reduction of disproportions in the development of individual areas. In this context, space directly influences economic development processes.

3. Regional Investment Aid as a Factor of Regional Development (Example of Poland)

The total value of public aid granted to entrepreneurs in Poland in the years 2007-2017 amounted to EUR 45,668.1 million (Table 1). The share of public aid in GDP was from 0.4% in 2007 to 1.56% in 2017. The value of public aid in Poland grew in the years 2007-2010, its level stabilised in subsequent years and in 2017 there was another increase in its value. Similar trends have also been observed with regard to regional aid. It should be noted that after Poland's accession to the European Union (on 01.05.2004), the importance of regional aid in the structure of total public aid increased and constituted over half of the aid granted in 2013. In the following years, the share of regional aid in total public aid was decreasing and in 2017 it accounted for one quarter of that aid. It is worth noting that in the entire period under study, regional investment aid had the largest share in the structure of regional aid (from 80.5% in 2007 to 98.2% in 2017). In the years 2007-2017 the value of regional investment aid amounted to EUR 16,160.8 million, which constituted 35.4% of the total value of public aid. Due to the lack of statistical data at the regional level - NUTS 2 - it is difficult to assess the spatial distribution of the value of regional investment aid actually used by entrepreneurs in particular regions of Poland.

Table 1. Public aid in Poland (excluding transport) in the years 2007-2017

Year	Total public aid		Total regional public aid		Regional investment aid		
	[million euros]	share in GDP [%]	[million euros]	share in total public aid [%]	[million euros]	share in total public aid [%]	share in regional public aid [%]
2007	1,281.3	0.40%	318.5	24.9	256.5	20.0	80.5
2008	3,276.4	0.91%	1,148.5	35.1	1,076.1	32.8	93.7
2009	3,717.6	1.20%	1,790.2	48.2	1,536.5	41.3	85.8
2010	5,316.1	1.50%	2,682.7	50.5	2,431.8	45.7	90.6
2011	4,239.7	1.15%	1,559.6	36.8	1,337.2	31.5	85.7
2012	4,055.7	1.06%	2,013.8	49.7	1,789.3	44.1	88.9
2013	3,948.0	1.01%	2,145.5	54.3	2,032.0	51.5	94.7
2014	4,624.5	1.12%	1,957.1	42.3	1,868.0	40.4	95.4
2015	3,607.6	0.84%	728.4	20.2	655.9	18.2	90.1
2016	4,319.4	1.02%	1,321.7	30.6	1,285.7	29.8	97.3
2017	7,281.8	1.56%	1,926.2	26.5	1,891.7	26.0	98.2
Total	45,668.1		17,592.2		16,160.8		

Source: Own elaboration based on: *Raport o pomocy publicznej w Polsce udzielonej przedsiębiorcom w ... 2017, 2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007.*

The regional aid map in Poland for the years 2007-2013 determined the maximum level of regional investment aid intensity and was determined on the basis of data concerning the average value of GDP per capita in PPS for the period 2000-2002 (Table 2). It should be noted that the whole territory of Poland - consisting at that time of 16 NUTS 2 units - was eligible for national regional aid for the whole period of 2007-2013. In ten NUTS 2 regions with 47.7% of the national population in 2002, the maximum aid intensity for large enterprises was 50% of eligible costs. In next five NUTS 2 regions with 38.9% of the country's population, the aid was 40% of eligible costs.

Table 2. Gross domestic product (GDP) at current market prices in Purchasing power standard (PPS) by NUTS 2 region in Poland defining the regional aid coverage for 2007-2013

NUTS 2	GDP in PPS per inhabitant in percentage of the EU average (in 2000-2002), EU-25 = 100 [%]	Share in the population in 2002, Poland =100 [%]	Maximum regional aid intensity 2007-2013 [%] *
Malopolskie	39.81	8.4	50
Slaskie	50.62	12.4	40
Wielkopolskie	48.18	8.8	40
Zachodniopomorskie	46.29	4.4	40
Lubuskie	41.09	2.6	50
Dolnoslaskie	47.52	7.6	40
Opolskie	38.28	2.8	50
Kujawsko-Pomorskie	41.80	5.4	50
Warminsko-Pomorskie	34.70	3.7	50
Pomorskie	45.75	5.7	40
Lodzkie	41.45	6.8	50
Swietokrzyskie	35.82	3.4	50
Lubelskie	32.23	5.8	50
Podkarpackie	32.80	5.5	50
Podlaskie	35.05	3.2	50
Mazowieckie	68.77	13.4	40; 30**

Notes: * The maximum aid intensity applies to large enterprises; it may be increased by 10 percentage points for investments by medium-sized enterprises and 20 percentage points for investments by small enterprises.

** maximum level of regional investment aid intensity in the Mazowieckie Voivodeship was 40% in the period from 1 January 2007 to 31 December 2010 (excluding the city of Warsaw), 30% in the period from 1 January 2011 to 31 December 2013. Maximum level of regional investment aid intensity in the city of Warsaw was 30% in the years 2007-2013.

Source: Own elaboration based on: Regional aid map 2007-2013; Regulation of the Council of Ministers of 13 October 2006.

It should be noted that economic operators located in one of the NUTS 2 statistical regions, i.e. Mazowieckie Voivodeship, in the years 2007-2010 received aid at the level of 40% of eligible costs, while in the period 2011-2013 they could receive relatively small investment aid - at the level of 30%. This was due to the fact that the Mazowieckie Voivodeship was characterized by a relatively high level of GDP per

capita in relation to the EU average (68.77%). It is worth noting that it was generated mainly in the city of Warsaw - the capital of Poland - and adjacent areas. The rest of the region had a much lower level of GDP per capita. In this context, the location of an enterprise in this part of the Mazowieckie Voivodeship - despite objective economic criteria - made it impossible for entrepreneurs to receive appropriate investment aid due to the fact that this aid was determined on the basis of the location of the enterprise in the NUTS 2 region. This indicates the direct impact of space on economic development processes. It should be stressed that the literature points out that the assessment of the degree of development of a given region in relation to the whole EU takes place at the level of relatively large territorial units, i.e. NUTS 2 (Ambroziak, 2015).

Taking into account the above, it was decided that it was necessary to make changes to the statistical division of Poland in order to adjust it to the existing spatial diversity of the level of economic development (Figure 1). In particular, the changes pertained to the region which was characterised by the highest level of diversification in the level of GDP per capita, i.e. the Mazowieckie Voivodeship. As a result of the revision of NUTS 2016 (Commission Regulation (EU) 2016/2066), the statistical division of Poland changed. Starting on 1 January 2018, at the NUTS 2 level, the Mazowieckie Voivodeship, which until then had been one statistical unit of this level, was divided into two statistical units:

- the Warsaw Capital Region, which includes Warsaw and nine districts in the immediate vicinity of the capital;
- the Mazowiecki Regional Region, which includes the rest of the Mazowieckie Voivodeship.

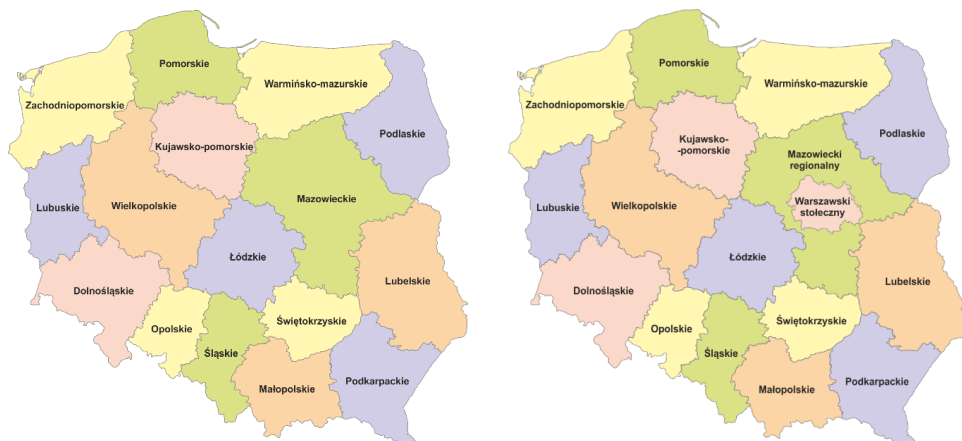
The consequence of the change in the division of Poland into NUTS 2 units was a modification of the divisions at the remaining NUTS levels - one new unit was introduced at each level.⁵ It is worth noting that in the new NUTS 2 region - Warsaw's Capital Region - GDP per capita in PPS in 2016 in relation to the EU average was 149%, while in the NUTS 2 region - Mazowiecki Regional Region - only 58% (EUROSTAT, 2019a). This indicates the existence of significant spatial disproportions in the level of GDP per capita and confirms the validity of changing the statistical division of Poland and adjusting it to the actual level of economic development of particular areas. The changes introduced to the statistical division of Poland made it possible to adjust the level of intensity of regional investment aid to the nature and extent of differences in the level of economic development of individual areas, measured by the level of GDP per capita. This was reflected in the establishment of the new regional aid map for 2014-2020 (Regulation of the Council

⁵Since 01 January 2018 there have been 97 NUTS units in Poland: NUTS 1 - macroregions (voivodeship groups) - 7 units; NUTS 2 - regions (voivodeships or parts thereof) - 17 units; NUTS 3 - subregions (powiat groups) - 73 units.

of Ministers of 30 June 2014, 2014), which was determined on the basis of the average GDP per capita in PPS for the period 2008-2010 (Table 3).

Figure 1. Division of Poland into NUTS 2 units

from 01.05.2004 to 31.12.2017. (16 units)* from 01.01.2018 (17 units)



Notes: *The NUTS classification was formally introduced in Poland on 26 November 2005. However, by virtue of agreements between Eurostat and the Central Statistical Office, this classification has been used since Poland joined the European Union on 1 May 2004.

Source: NUTS classification, Central Statistical Office, 2019.

Table 3. Gross domestic product (GDP) at current market prices in Purchasing power standard (PPS) by NUTS 2 region in Poland defining the scope of regional aid in 2014-2020

NUTS 2	GDP in (PPS) per inhabitant in percentage of the EU average (in 2008-2010) (EU-27 = 100) [%]	Share in the population in 2010, Poland =100 [%]	Maximum regional aid intensity 2014-2020 [%]
Małopolskie	51.33	8.6	35
Śląskie	64.33	12.1	25
Wielkopolskie	62.67	9.0	25
Zachodniopomorskie	52.67	4.5	35
Lubuskie	51.00	2.7	35
Dolnośląskie	65.33	7.6	25
Opolskie	49.00	2.6	35
Kujawsko-Pomorskie	50.67	5.5	35
Warmińsko-Mazurskie	44.33	3.8	50
Pomorskie	57.33	5.9	35
Lódzkie	55.00	6.7	35
Świętokrzyskie	46.33	3.3	35

Lubelskie	40.67	5.7	50
Podkarpackie	40.67	5.5	50
Podlaskie	43.67	3.1	50
Mazowieckie	96.00	13.7	Warsaw Capital Region: 20; Mazowiecki Regional Region: 35

Source: Own elaboration based on: *Guidelines on regional State aid for 2014-2020; Regulation of the Council of Ministers of 30 June 2014.*

According to the new map, areas with a GDP per capita of less than 75% of the EU average - inhabited by 86.3% of the Polish population - were still eligible for regional investment aid with a maximum aid intensity of between 25% and 50% of the eligible costs of the relevant investment projects - these are the so-called “a” areas. Whereas, in four regions inhabited by 18.0% of the country's population (as of 2010), it was possible to obtain regional investment aid in the maximum amount, i.e. up to 50% of eligible costs (for large enterprises).

On the other hand, the Mazowieckie Voivodeship - where 13.7% of the Polish population lived - was eligible for aid in the maximum intensity of 10% to 35%, as its GDP per capita exceeded 75% of the EU average (these are “c” areas, which in the previous programming period belonged to the group of “a” areas). In the area of the capital city of Warsaw, which was characterised by the highest level of GDP per capita in Poland, the maximum intensity of regional public aid was:

- 15% in the period from 1 July 2014 to 31 December 2017;
- 10% in the period from 1 January 2018 to 31 December 2020.

It is worth noting that in the period 2007-2020 the whole territory of Poland was covered by regional investment aid of different intensity. In the period 2007-2013, the majority of NUTS 2 regions in Poland were covered by aid amounting to 50% of the eligible costs (this concerned 47.7% of the country's population), in the period 2014-2020 there were only 4 such units (18.0% of the Polish population) - Table 4. This shows a faster pace of development of the Polish regions compared to the EU average.

Table 4. *Criteria for determining the maximum intensity of regional investment aid in the European Union in the years 2007-2013 and 2014-2020 with the share of NUTS 2 regions in the population of Poland*

GDP per capita in relation to the EU average	Maximum aid intensity		Share of regions in the population in Poland	
	2007-2013	2014-2020	2002	2010
up to 45% (“a” areas)	50%	50%	47.7%	18.0%
45%-60% (“a” areas)	40%	35%	38.9%	45.9%
60%-75% (“a” areas)	30%	25%	13.4%	28.7
			(2011-2013)	

sparingly populated areas, border areas ("c" areas) **	15%	15%	-	7.4%
other "c" areas **	10%-15%	10%	-	-

Notes: ** If areas with a level of GDP per capita of more than 75% of the EU average are adjacent to areas with a lower level of GDP per capita, the maximum aid intensity in NUTS 3 regions or parts thereof may be increased, if necessary, so that the difference between the intensity levels in both areas does not exceed 15 percentage points.

Source: Own study based on: Guidelines on National Regional Aid for 2007-2013; Guidelines on regional State aid for 2014-2020.

In the context of the above considerations, it seems interesting to try to answer the question which Polish NUTS 2 regions may be eligible for regional investment aid and what will be its maximum intensity in the next programming period, i.e. 2021-2027? In order to attempt to answer this question, the methodology used so far in the EU to designate the regions eligible for regional aid and the amount of such aid has been used. In the EU, in the two previous programming periods (i.e. 2007-2013 and 2014-2020) NUTS 2 regions were eligible for regional aid on the basis of their level of development measured by the average GDP per capita in the PPS in relation to the EU average. The calculation used data from the last three years for which EUROSTAT data was available. Areas where the average GDP per capita did not exceed 75% of the EU average were covered by aid. The maximum aid intensity took account of the extent of the differences in the level of development of the various regions and was determined on the basis of GDP per capita, as shown in Table 4. In the present study, the method described above, one that has been used in the EU so far, was used to designate the regions eligible for regional investment aid in Poland in 2021-2027 and to determine the maximum intensity of this aid. Whereas, the maximum levels of regional investment aid were set in accordance with the EU guidelines for the 2014-2020 programming period.

Based on the methodology used so far in the EU, the average value of GDP per capita in PPS for the period 2015-2017 was first calculated for all NUTS 2 units in Poland. The choice of the research period was related to the availability of statistical data from EUROSTAT - the most up-to-date data available was used. Then, the share of this indicator was calculated for each of the NUTS 2 regions in Poland in relation to the average for the European Union - 27 countries (i.e. without the UK). As a result of the conducted considerations, the expected maximum intensity of regional aid in the years 2021-2027 for Polish NUTS 2 regions was presented, assuming that the aid thresholds would remain unchanged in relation to the years 2014-2020 (Table 5).

In view of the above, it is expected that none of the 17 NUTS 2 regions in Poland will be eligible for investment aid at the highest possible level, i.e. 50% of the eligible costs for large enterprises. In the majority of NUTS 2 regions in Poland (i.e. ten units where 42.2% of the country's population lived in 2017) it is expected that entrepreneurs will receive aid at the level of 35% of eligible costs, in four units

inhabited by 33.2% of the Polish population - at the level of 25%. The two regions (Wielkopolskie and Dolnoslaskie) are likely to exceed 75% of the EU average GDP per capita. In 2017, 16.7% of the country's population lived in these regions. In the current 2014-2020 programming period, regions of this type had the possibility to receive support at a lower level, i.e. 10% (however, this may be increased by up to 5 percentage points during the transitional period). This was possible for the so-called "c" areas, in the situation where a region with a GDP per capita level above 75% of the EU average in the current programming period belonged to the group of "a" regions in the previous programming period (i.e. areas with a GDP per capita level below 75% of the EU average). Therefore, it was assumed that it would be possible to obtain the regional investment aid of 10-15% of eligible costs in the Wielkopolskie and Dolnoslaskie regions.

Table 5. Gross domestic product (GDP) at current market prices in Purchasing power standard (PPS) by NUTS 2 region in Poland in 2015-2017

NUTS 2 regions in Poland	GDP in PPS per inhabitant			GDP in PPS per inhabitant in percentage of the EU average [%]			GDP in PPS per inhabitant in percentage of the EU average (in 2015-2017), (EU-27 = 100) [%]	Expected maximum regional aid intensity in 2021-2027 [%]
	2015	2016	2017	2015	2016	2017		
European Union - 27 countries	28,800	29,000	29,800	100.0	100.0	100.0	100.0	
Poland	19,900	19,900	20,900	69.1	68.6	70.1	69.3	
Malopolskie	18,000	18,100	19,100	62.5	62.4	64.1	63.0	25
Slaskie	20,700	20,700	21,600	71.9	71.4	72.5	71.9	25
Wielkopolskie	21,600	21,800	22,800	75.0	75.2	76.5	75.6	10 (15)
Zachodniopomorskie	16,900	16,700	17,400	58.7	57.6	58.4	58.2	35
Lubuskie	16,600	16,700	17,300	57.6	57.6	58.1	57.8	35
Dolnoslaskie	22,200	22,100	23,100	77.1	76.2	77.5	76.9	10 (15)
Opolskie	16,100	15,900	16,600	55.9	54.8	55.7	55.5	35
Kujawsko-Pomorskie	16,300	16,300	16,900	56.6	56.2	56.7	56.5	35
Warminsko-Mazurskie	14,100	14,200	14,700	49.0	49.0	49.3	49.1	35
Pomorskie	19,200	19,300	20,200	66.7	66.6	67.8	67.0	25
Lodzkie	18,600	18,600	19,500	64.6	64.1	65.4	64.7	25
Swietokrzyskie	14,400	14,300	14,900	50.0	49.3	50.0	49.8	35
Lubelskie	13,700	13,700	14,400	47.6	47.2	48.3	47.7	35
Podkarpackie	14,100	14,000	14,600	49.0	48.3	49.0	48.7	35
Podlaskie	14,200	14,100	15,000	49.3	48.6	50.3	49.4	35
Warsaw Capital Region	43,600	43,500	45,700	151.4	150.0	153.4	151.6	0
Mazowiecki Regional Region	17,000	17,000	17,800	59.0	58.6	59.7	59.1	35

Source: Own study based on EUROSTAT, 2019a.

It is worth noting that the Warsaw Capital Region - with 7.9% of the country's population in 2017 - will probably not be able to benefit from regional investment aid. In such a situation, it would be the first NUTS 2 region in Poland to be excluded from such aid. Therefore, Poland would not be fully covered by regional investment aid for the first time since its accession to the European Union. However, it should be stressed that the entrepreneurs located on the territory of the Mazowiecki Regional Region will still be able to benefit from EU aid in the expected amount of 35% of eligible costs. If there were no changes in the statistical division of Poland, entrepreneurs operating in this area would probably be deprived of the possibility to obtain financial aid for investments. It should be noted that the nature and extent of space diversification forced the need to change the statistical division of Poland, which gave the possibility of obtaining higher funds from the EU by Polish entrepreneurs operating in less developed areas.

The simulation shows that the maximum intensity of regional investment aid for Polish regions in the next programming period 2021-2027 will be significantly lower. This indicates the need to seek new impulses for economic development. One of the proposals of this type of factors can be found in the national Strategy for Responsible Development. These are: domestically created knowledge and technology, development and further foreign expansion of Polish companies, building a system of savings, as well as increasing the quality of operation of institutions and their relations with the society. It is important to involve all social groups and all territories in the development processes (Strategia na rzecz Odpowiedzialnego Rozwoju, 2017).

There is no consensus in the literature on the existence and nature of a link between public aid and economic development processes. Some studies have shown that State aid is not an effective tool to achieve higher growth and investment in the countries of the European Union (Börke Tunali and Fidrmuc, 2015). Similar results were obtained by applying an econometric model showing that the link between the level of horizontal aid granted by Member States and the economic development expressed as a value of GDP per capita according to purchasing power parity is asymmetric (Bacila, 2010). Similarly, the case study did not confirm the impact of public aid on reducing expenditure and increasing employment in enterprises (Kangasharju and Venetoklis, 2002).

Different results were obtained by Bacila (2012), who showed that there is a positive and statistically significant relationship between State aid for research and development (as part of horizontal aid) and the level of GDP. It indicates the existence of positive correlation between State aid and economic development. The literature also provides evidence of the positive impact of State aid on entrepreneurship and job creation (Ebersberger, 2004; Girma *et al.*, 2007). Studies show that there is a positive relationship between aid intensity and the development of production, R&D and educational projects (the higher the intensity, the greater the effect) (Ginevičius *et al.*, 2008). However, the results of studies carried out in the

Turkish regions are inconclusive - although public aid has contributed to an increase in the number of registered jobs, the dominant effect of subsidies was to increase social security registration of firms and workers (Betcherman *et al.*, 2010). Polish literature stresses that the accession of our country to the European Union created new opportunities for financing business activity, which allowed entrepreneurs to reduce the costs of activities related to investments, creation of new jobs or expansion (Czemieli-Grzybowska, 2013). According to Ginter (2015), public aid is a very important financial tool. It enables the realization of many investment plans of small and medium-sized enterprises, and the amount of public aid directly influences investment decisions.

Moreover, the research of Polish authors points to the importance of public aid in Special Economic Zones, where it is possible to obtain income tax exemptions (Cieśliewicz, 2009; Lizińska and Marks-Bielska, 2013). It should be noted that, depending on the conditions, Special Economic Zones may have a positive or negative impact on regional development (Godlewska-Majkowska *et al.*, 2016). Surveys conducted among entrepreneurs in the Lubelskie Voivodeship showed that public aid improved their condition (which manifested itself in an increase in revenues, profits, number of clients and level of investments declared by the owners), but did not contribute to an increase in employment (Sosińska-Wit and Gałązka, 2013). Kubera (2013) stated that public aid in Poland is gradually ceasing to be a tool for the realization of short-term political goals, and is beginning to take on the character of aid stimulating social and economic development.

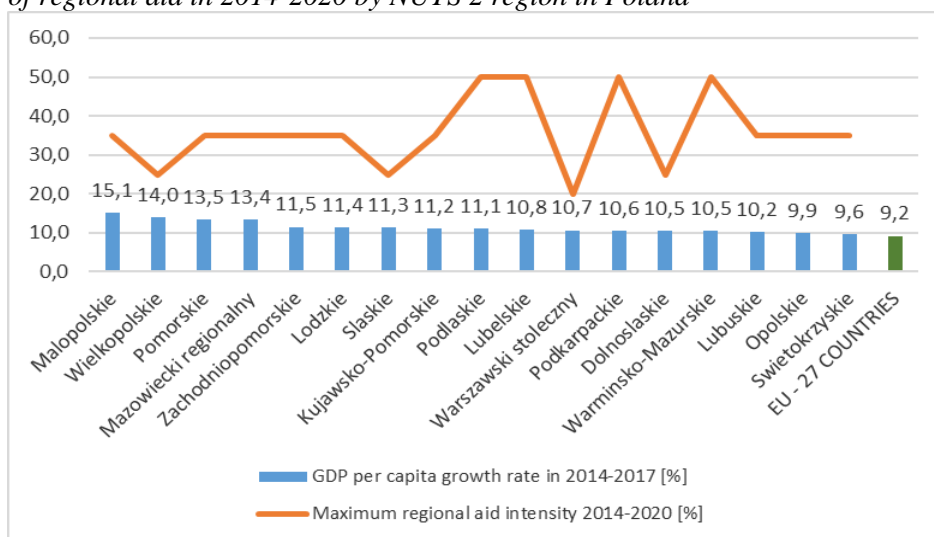
Taking into account the differences in the results of the research presented in the literature, it would be interesting to try to answer the question whether there is a relationship between the rate of regional development and the maximum level of regional investment aid intensity in Polish regions? Therefore, in the next step, an attempt was made to identify the relationship between the GDP per capita growth rate in Polish regions and the maximum intensity of regional aid. For this purpose, the growth rate of GDP per capita in PPS in all years covering the current programming period (available data covered the years 2014-2017) in NUTS 2 regions in Poland was examined. The r-Pearson correlation coefficient between the growth rate of GDP per capita and the maximum intensity of regional aid was then examined.

It is worth noting that in all NUTS 2 units in Poland in 2014-2017 there was an increase in GDP per capita in PPS. All Polish regions in the examined period were characterised by a higher GDP per capita growth rate than the average in the EU 27, for which this growth reached 9.2% (Figure 2). The corresponding figure for Poland was 12.4%. This indicates the narrowing of the development gap between Polish and EU regions. Similar research results were obtained by Sychała (2016) based on data for 2003-2013. This could indicate that the funds obtained under regional investment aid could be one of the factors of development of Polish regions. It is also worth noting that the NUTS 2 region - Mazowiecki Regional Region - was

characterised by a higher rate of development than the Warsaw Capital Region, which could also confirm the above conclusion. It should be remembered, however, that the level of the region's development (measured in terms of GDP per capita) of the Mazowiecki Regional Region was much lower than that of the Warsaw Capital Region.

The study did not show a statistically significant correlation between the GDP growth rate per capita in 2014-2017 and the maximum intensity of regional aid. The r-Pearson correlation index was negative and amounted to -0.195. This allows us to conclude that other factors had a stronger impact on the pace of regional development in Poland than the maximum amount of regional aid. In the light of the literature it can be concluded that such factors include endogenous resources, such as: human and social capital, the level of innovation of the region, infrastructure, economic structure of the region, the scale of the regional market. Therefore, future directions of research should include a study of the relationship between the value of regional investment aid and the rate of GDP growth.

Figure 2. GDP per capita growth rate in 2014-2017 against the maximum intensity of regional aid in 2014-2020 by NUTS 2 region in Poland



Source: Own study based on EUROSTAT, 2019a.

The results of the research indicate that Polish regions characterised by the lowest level of GDP per capita - i.e., the highest intensity of regional aid at the level of 50% - had a GDP per capita growth rate lower than the Polish average in the examined period. This indicates a deepening of the diversity of regional development in Poland and an uneven level of its development, which contributes to the creation of the core-periphery model.

4. Conclusions

The main purpose of this study was to identify and analyze the impact of economic space diversification on economic development processes. The paper identifies the features of space (i.e., limitation, resistance and diversification) and analyses the impact of space on economic development processes. The research has shown that space can influence development processes by influencing sales revenues and production costs of enterprises. It should be stated that space is created by places of various value for people, therefore the economy develops unevenly in space. Space evolves according to the course of development processes in time and space, creating centres and peripheries. It has been shown that contemporary regularities governing spatial processes (the principle of rational management, tendencies to concentrate and search for places characterised by large and diversified location values) cause an increase in the diversity of space and the unevenness of its development level, forming a core-periphery model. Moreover, the growth of developmental disproportions between different areas is supported by selective globalisation (i.e. taking place with different intensity in different places), progressing processes of technological revolution, as well as the spread of knowledge-based economy.

It should be noted that spatial processes (e.g., migration, capital flows, emission of environmental burdens) are a factor of social and economic changes provided that the inertia of existing structures is weak. However, it is worth noting that the spatial structures of the economy are characterised by inertia, therefore overcoming developmental disproportions often requires public aid. One of its manifestations is regional investment aid, which may be used by entrepreneurs conducting business activity or planning to start business activity in regions eligible for aid. The maximum intensity is spatially differentiated and depends on the level of economic development of the region measured by the level of GDP per capita in PPS in relation to the EU average (an additional factor differentiating this level is the size of an enterprise and the size of an investment project). This shows the direct impact of space on economic development processes. The purpose of regional investment aid is to stimulate economic development and employment in regions with a lower level of development by lowering the costs of private investment, increasing the investment attractiveness of underdeveloped regions, overcoming barriers to the development of entrepreneurship in such areas and supporting the EU's economic and social cohesion.

In the period 2007-2017 entrepreneurs in Poland received public aid worth a total of EUR 45,668.1 million, 35.4% of which was regional investment aid. In the period 2007-2020, the whole territory of Poland was covered by public aid of different intensity. Regional investment aid could therefore be one of the factors in the development of Polish regions, as evidenced by the higher development rate of all Polish regions compared to the EU average in 2014-2017. This indicates a narrowing of the development gap between Polish and EU regions. Due to the lack

of statistical data on the spatial distribution of regional investment aid at NUTS 2 level in Poland, it is difficult to determine clearly to what extent the funds provided under this aid contributed to the relatively fast development of Polish regions, and to what extent this was due to other factors (e.g., endogenous factors).

The relatively high GDP growth rate in Polish regions compared to the EU average resulted in a reduction of the level of maximum regional aid intensity for Polish NUTS 2 units in the period 2014-2020 compared to the period 2007-2013. This study attempted to answer the question which Polish NUTS 2 regions might be eligible for regional investment aid and what would be its maximum intensity in the next programming period, i.e. 2021-2027. For this purpose, the methodology used so far in the EU to designate the regions eligible for regional aid, as well as the amount of such aid (maximum levels of regional investment aid intensity were set in accordance with the EU guidelines for the 2014-2020 programming period) were used. In the light of these assumptions, the Polish NUTS 2 regions were identified as eligible for public aid and the envisaged maximum intensity of this aid.

It is expected that in none of the 17 NUTS 2 regions in Poland will it be possible to receive investment aid at the highest possible level (i.e., 50% of eligible costs for large enterprises). In most NUTS 2 regions in Poland (i.e., ten units) it is expected that entrepreneurs will receive aid at the level of 35% of eligible costs, while one NUTS 2 region (Warsaw Capital Region) is not likely to receive regional investment aid at all. In such a situation, Poland would not be fully covered by regional investment aid for the first time since its accession to the European Union. Due to further anticipated reduction of the maximum intensity of regional investment aid for Polish regions in the next programming period 2021-2027, it is necessary to seek new development impulses, among which are: knowledge and innovations, increase in exports, increase in national savings and increase in the quality of functioning of institutions.

The diversification of the level of development in Poland as measured by GDP per capita has triggered the need for changes in the administrative division of Poland in order to adjust it to the spatial diversification of the level of economic development that exists in reality. Since 1 January 2018, at the NUTS 2 level, the Mazowieckie Voivodeship, which until recently had been one statistical unit of this level, was divided into two statistical units. Hence, the number of NUTS 2 units has increased by one and currently there are 17 statistical units at NUTS 2 level in Poland. The changes introduced to the statistical division of Poland made it possible to adjust the level of intensity of regional investment aid to the nature and extent of differences in the level of economic development of individual areas, measured by the level of GDP per capita. It should be noted that the nature and extent of space diversification forced the need to change the statistical division of Poland, which gave the possibility of obtaining higher financial resources from the EU by Polish entrepreneurs operating in less developed regions.

The results of the conducted research indicate that the regions characterised by the lowest level of GDP per capita - i.e., the highest intensity of regional aid at the level of 50% of eligible costs - had a lower GDP per capita growth rate in the examined period than the Polish average. This indicates an increase in the diversification of regional development in Poland, which contributes to the creation of the core-periphery model. The research has shown that there is no consensus in the literature as to the existence and nature of a link between public aid and economic development processes. The study did not show a statistically significant correlation between the rate of GDP growth per capita in 2014-2017 and the maximum intensity of regional aid. The possibility to benefit to a greater extent from EU funds allocated for financing investment activities of enterprises under regional aid was therefore not a key factor influencing the pace of regional development in Poland. This allows us to conclude that other factors had a stronger impact on the pace of regional development in Poland than the maximum amount of investment aid. The endogenous resources of the region are among such factors.

As part of the directions of future research, the analysis of the relationship between the value of regional investment aid and the pace of development of Polish regions should be highlighted. At present, it is difficult to state unequivocally to what extent regional investment aid has affected the pace of regional development in Poland due to the lack of more detailed statistical data on the value of the funds used under regional investment aid in the regional aspect.

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