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The Analysis of the Competitiveness of Polish Regions in the Context of the Influence of Growth Centres

ABSTRACT

The article discusses the topic of regional competitiveness, which refers to the ability of a region, measured in relation to other regions, to guarantee a socio-economic environment that supports economic activity and the process of raising the general level of productivity and innovation using internal and external human, financial and material resources. The aim of the article is to examine the existence of links between the development of the region and the presence of strong growth centres in it in the form of metropolises. For this purpose, the study uses data from the European Commission on the competitiveness of regions from the reports of Regional Competitiveness Indexes (RCI), which allows for the analysis of development changes between EU regions. The *t*-Student test was used to test the hypothesis on the occurrence of statistically significant differences between the group of regions with and without metropolises. The research part of the article is supplemented by an analysis using the cluster method, which allowed the grouping of Polish regions into clusters with a similar level of competitiveness.

KEYWORDS: competitiveness of regions; centres of growths; cluster method

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INTRODUCTION

The period of functioning of Polish regions in European structures is a time of very dynamic changes that require continuous adaptation, also in the area of increasing competitiveness. This improvement is manifested by the implementation of investments, implementation of new solutions, successful entry into new markets, or a clear strategy of the region, determining its sustainable development. The Regional Competitiveness Index (RCI), launched in 2010 and published every three years, allows regions to monitor and assess their development over time and compare it with other regions (Dijkstra et al., 2011). This is the first tool that allows to look at the competitiveness of regions from a European perspective. The inspiration for its creation was the Global Index of the World Economic Forum. When Poland joined the European Union, the Polish regions were among the least affluent regions of all 24 EU countries at the time. The quality of life of the residents of Polish regions significantly differed from the average standard of living in the EU. The lower level of economic development resulted primarily from the lack of modern infrastructure enabling development. Table 1 shows the position of individual voivodeships/regions according to the synthetic RCI index over the years. The first three periods contains data for 16 Polish regions. The remaining two periods (2019 and 2022) contain data for 17 regions, since a 17th Polish region was added in 2018, due to the division of the Mazowieckie voivodeship into two regions: the capital region Warszawski stołeczny, which includes Warsaw and 10 surrounding counties, and the Mazowiecki regionalny, consisting of the remaining 32 counties.

The analysis of the data contained in Table 1 shows that most Polish regions took their opportunity to improve their competitiveness among EU regions. The index results show not only the change in the competitive position of individual regions, but also the great diversity of regions. The role that Polish regions

Table 1. Position of Polish regions according to the European Index of Regional Competitiveness in 2010–2022.

	Year										
	2010		2013		2016			2019		2022	
	Position							Position			
Name	EU	Poland	EU	Poland	EU	Poland	Name	EU	Poland	EU	Poland
Mazowieckie	159	1	147	1	150	1	Warszawski stołeczny	105	1	35	1
Śląskie	181	2	175	2	170	2	Śląskie	170	2	117	2
Małopolskie	187	3	184	3	171	3	Małopolskie	175	3	127	3
Dolnośląskie	192	4	190	4	177	4	Pomorskie	182	4	140	4
Łódzkie	200	5	197	7	181	6	Dolnośląskie	183	5	147	5
Wielkopolskie	201	6	209	11	190	7	Łódzkie	190	7	157	6
Pomorskie	202	7	194	5	179	5	Wielkopolskie	194	8	164	7
Opolskie	210	8	196	6	205	13	Opolskie	201	9	167	8
Zachodniopomorskie	211	9	207	10	198	10	Podkarpackie	208	11	169	9
Lubuskie	220	10	206	9	202	11	Zachodniopomorskie	207	10	171	10
Podkarpackie	221	11	214	14	204	12	Lubuskie	213	16	171	11
Kujawsko-Pomorskie	225	12	215	15	211	15	Kujawsko-Pomorskie	210	13	171	12
Lubelskie	227	13	204	8	197	9	Mazowiecki regionalny	187	6	177	13
Świętokrzyskie	232	14	212	13	194	8	Lubelskie	209	12	180	14
Warmińsko-Mazurskie	235	15	230	16	215	16	Podlaskie	211	14	181	15
Podlaskie	237	16	211	12	211	14	Świętokrzyskie	212	15	187	16
							Warmińsko-Mazurskie	225	17	188	17

Note. Number of regions covered by the survey: 271 in 2010, 273 in 2013, 276 in 2016, 268 in 2019, 234 in 2022.

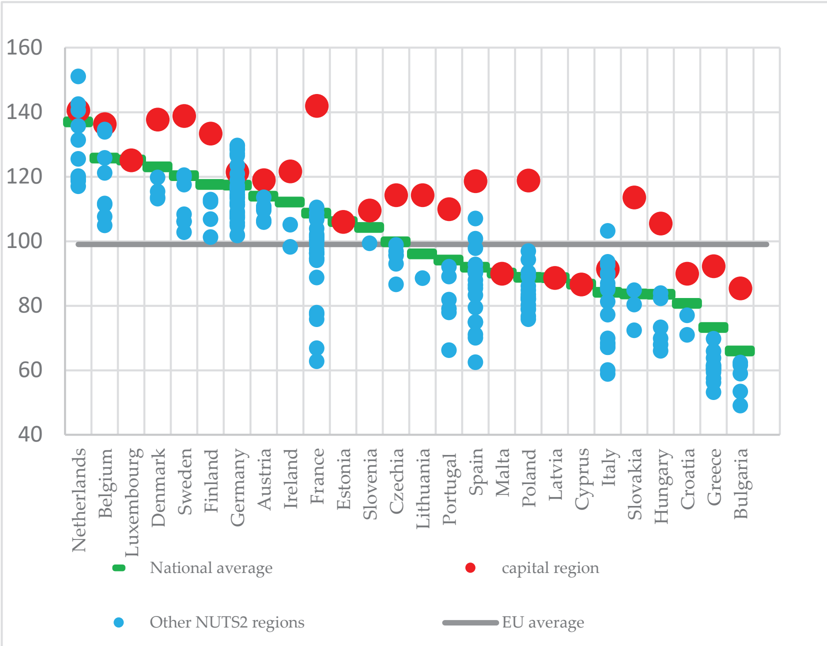
Own study based on EU Regional Competitiveness Index: RCI 2010, EU Regional Competitiveness Index: RCI 2013, EU Regional Competitiveness Index: RCI 2016, EU Regional Competitiveness Index: RCI 2019, EU Regional Competitiveness Index: RCI 2022.

will play in the European and global economy will depend on their competitive position. It should be emphasized that building a competitive region is a long and very complex process. An increasing number of researchers are paying attention to the role of the city in the development of the region, some of them pointing to the emergence of metropolitan regions, which constitute broader zones of influence of large and often the largest and most important cities for the world economy (called global cities or metropolises) (Korcelli-Olejniczak, 2012). The cores of these regions are highly urbanized metropolitan areas characterized by high functional and spatial integration, often perceived together with a given metropolitan centre. Others note that the emergence of metropolitan areas requires meeting a number of specific criteria of a primarily functional nature, as well as demographic, economic, urban, technical, social or management-related criteria (Marszał & Markowski, 2006). These areas also influence the creation of metropolitan functions. Some researchers claim that understanding the scope of the impact of subregional centres on the surrounding municipalities is one of the requirements for conducting rational regional policy in the conditions of practical implementation of polycentric development, i.e. based on many centres fulfilling various functions of metropolitan nature (Heffner & Geber, 2015). The research conducted so far shows the scale of the influence of metropolitan and subregional centres on the territorial system; an interesting supplement to these analyses could be research that would answer the question of whether the presence of a given central city/metropolis in a given region translates into greater competitiveness of the region. The aim of the work is to examine whether the competitiveness of regions depends on the competitiveness of cities in these regions. For this purpose, a hypothesis was formulated that there is a statistically significant difference in the development of the competitiveness of regions. Due to the change in the number of NUTS2 in Poland, the analysis was conducted for the last two periods of RCI: 2019 and 2022. Another method used in this study is cluster analysis, which is a statistical method to group a set of objects in such a way that objects within a group (or cluster) are more similar to each other than to those in other clusters. By identifying natural groupings in data, cluster analysis can reveal patterns, relationships, or structures that may not be immediately obvious.

THE RELATIONS BETWEEN REGIONS AND GROWTH CENTRES

The attention of researchers in relation to issues related to the European Union cohesion policy usually focuses on the significance of this policy in interregional relations. This results to a large extent from the implementation of the objectives concerning convergence or strengthening the innovativeness and competitiveness of regions in the European Union. In this context, actions aimed at reorienting the cohesion policy determine the discussion on the need to modify not only the above-mentioned objectives, but also the instruments and principles of implementing regional policy (Vinci & Russel, 2022; Strzelecki, 2008; Malkowska et al., 2024). Therefore, taking into account the fact that the literature on the subject (Pieta-Kanurska, 2010) and the practice of the European Union increasingly emphasize that the impact of the cohesion policy must also be achieved through cities that are growth centres, the study of the connections between the growth centre and the region and the relations within the metropolitan/city network as internal conditions for the development of the region is becoming increasingly important (European Commission, n.d.). This approach aims to create development strategies for individual regions, with particular emphasis on the role of urban centres, based on certain specific (endogenous) regional advantages. Figure 1 presents the values of Regional Competitiveness Index for the member states. The RCI values reveals a remarkable spatial pattern across EU regions.

Figure 1. Regional Competitiveness Index 2022:
regional variation by member state.



Note. Own study based on EU Regional Competitiveness Index (RCI 2022).

As shown in Figure 1, regional competitiveness is above the EU average in all regions in nine countries: Austria, Benelux, Germany, Estonia and the Nordic Member States. In contrast, all eastern regions, except most capital city regions, perform below the EU average. Regions in the southern EU Member States tend to perform below the EU average, with only few exceptions. Ireland, and especially France, have a mix of regions above and below the EU average. In most countries capital city regions tend to be the most competitive. The gap between the capital city region and the other regions is particularly large in France, Poland and Slovakia. This could be a cause for concern, as it puts pressure on the capital region while leaving resources untapped in other regions. In three countries, capital regions are not the most competitive: Germany, Italy, and the Netherlands. In the latter, Utrecht remains the best performing region, in Italy the best-performing Italian region is Lombardy, in Germany the best-performing region is Oberbayern. In the case of Poland the only region – Warszawski stołeczny – is above the EU average. The remaining regions are below the EU average and there is a large variation between them, the causes of which can be found in the differences in the development of the largest cities in the regions.

THE ROLE OF METROPOLISES IN POLISH REGIONS

In 2011, the Polish government adopted the National Spatial Development Concept 2030, which recognized that metropolises can be those centres (together with their functional areas) that constitute economic management centres at the national level, have a large economic potential (supranational investment attractiveness), offer a range of higher-order services and perform symbolic functions, are characterized by high external tourist attractiveness, great educational and innovation opportunities (extensive higher education, presence of scientific and research and development units), have the ability to maintain trade, scientific, educational and cultural relations with international metropolises and are characterized by high internal and external transport accessibility. The concept notes that, apart from Warsaw, other Polish cities have poorly developed metropolitan functions compared to cities in Western Europe. Therefore, metropolitan centres were designated based on criteria relating mainly to functions in the country's settlement system. The concept indicates that if it were not for such an approach, only one metropolitan area would be designated in Poland, i.e. Warsaw. The following criteria were adopted to designate metropolitan centres:

– population in the metropolitan centre above 300,000 inhabitants; employment in the market services sector (financial intermediation and real estate and business services above 40,000;
– number of students studying in a given city in the academic year 2007/2008 above 60,000;
– cooperation of scientific and research institutions in the 5th and 6th EU Framework Programmes;
– location of an airport for passenger traffic;
– location of four- and five-star hotels, international exhibitions in exhibition facilities in the years 2006–2008.

The concept includes a list of ten metropolitan centres in Poland that meet the above criteria: Warsaw, Upper Silesian Agglomeration (main centre Katowice), Kraków, Łódź, Tricity (Gdańsk, Gdynia, Sopot), Poznań, Wrocław, Bydgoszcz-Toruń bipole, Szczecin, Lublin (Resolution No. 239). This means that we can divide the regions into metropolitan and non-metropolitan regions, which allows us to compare changes in competitiveness in these two groups. Table 2 contains the values of regional competitiveness index for two groups of Polish regions.

Based on the data in Table 2, it can be seen that the average change of the indicator in the group of regions with metropolises is 7.2, while in the second group it is only 4.2. This shows that almost all regions (except for the Mazowiecki regionalny, which showed a negative change in the index) have been increasing their competitiveness, but in the case of regions with metropolises these changes are more visible. Strong urban centres create platforms for economic growth, attracting investments and creating new jobs. Metropolises often have well-developed communication, transport and service infrastructure, which affects entrepreneurship and the quality of life of residents. To check whether these differences in means are statistically significant, Student's *t*-test for independent samples was performed. The result of this test for means of independent samples shows that we cannot reject

Table 2. Difference in competitiveness between metropolitan regions and others.

Region	Metropolitan region	RCI 2019	RCI 2022	Change of RCI	
Lubuskie	No	73.4	82.1	8.7	average change = 4.2
Opolskie	No	80.2	83.5	3.3	
Podkarpackie	No	75.1	82.7	7.6	
Podlaskie	No	75.6	78.8	3.2	
Świętokrzyskie	No	72.5	76.7	4.2	
Warmińsko-mazurskie	No	72.0	75.8	3.8	
Mazowiecki regionalny	No	81.7	80.3	–1.4	
Dolnośląskie	Yes	83.3	89.1	5.8	average change = 7.2
Kujawsko-pomorskie	Yes	75.9	82.1	6.2	
Lubelskie	Yes	73.9	79.0	5.1	
Łódzkie	Yes	78.4	86.1	7.7	
Małopolskie	Yes	86.1	94.3	8.2	
Pomorskie	Yes	84.7	90.4	5.7	
Śląskie	Yes	87.0	96.9	9.9	
Warszawski stołeczny	Yes	105.6	118.8	13.2	
Wielkopolskie	Yes	80.4	84.8	4.4	
Zachodnio-pomorskie	Yes	76.1	82.1	6.0	

Note. T-test: two-sample, assuming unequal variances: t-statistic = 2.01, t-test two-sided = 2.2, $p = 0.06 > 0.05$, $df = 11$, Cohen's $d = 1.009$.

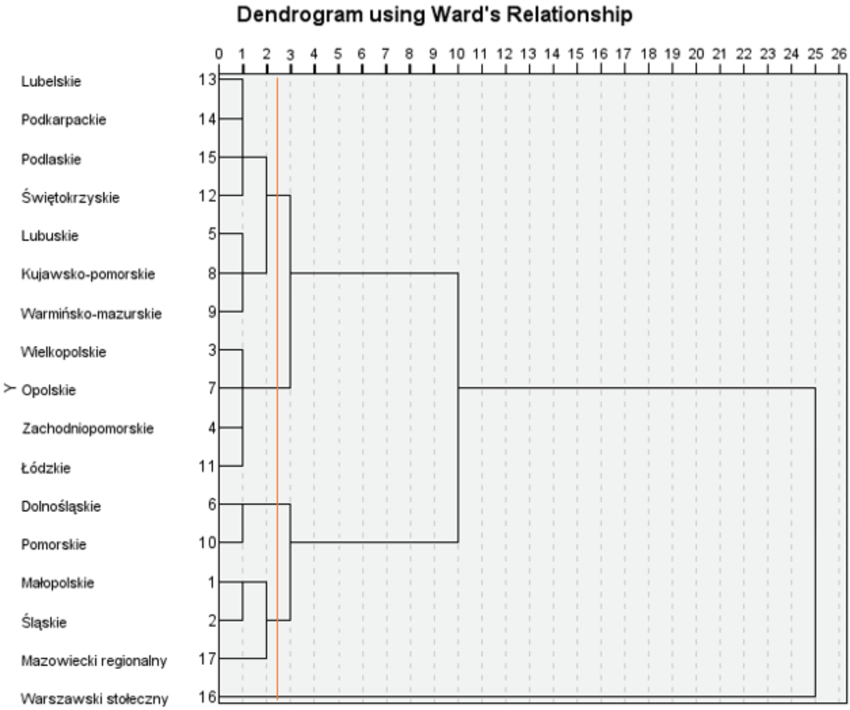
Own study based on EU Regional Competitiveness Index: RCI 2019 and EU Regional Competitiveness Index: RCI 2022.

the null hypothesis in favour of the alternative hypothesis. Thus, we claim with a probability of at least 0.95 that the mean changes of RCI index in the two groups do not differ statistically significantly.

Nevertheless, the diversity of Polish regions in terms of competitiveness has been changing. Considering the 11 factors (like higher education, labour market, macroeconomic, innovation, etc.) in the three pillars of competitiveness (basic, efficiency and innovation) from the Regional Competitiveness Index, we can group them using the cluster method. Cluster analysis is a set of methods of multivariate statistical analysis, which involves segmenting data in order to extract homogeneous objects from the studied population. This method consists in dividing the data set into groups in order to obtain clusters in which the elements are similar to each other, and at the same time different from the elements from the remaining groups. One of several agglomerative methods and a way of grouping is Ward's method. It leads to the creation of a tree structure from many parts of the analysed set, called a tree graph when horizontal, or an icicle graph, when vertical. On this basis, the effects of the algorithm's work are shown in the form of a tree showing the next stages of the created analysis. In this way, we can achieve so-called final segmentation consisting of an organized combination of divisions into segments. Figure 2 presents groups of regions according to those eleven competitiveness factors in 2019.

One way to determine the critical value (cutoff) is to analyse the agglomeration graph, a linear graph of the bond distances relative to the subsequent stages of the bonding process. After observing the largest increase, in which many clusters are created at approximately the same bond distance, a cutoff occurs, dividing the set into classes. Based on Figure 2, it can be concluded that the cutoff point is located between steps 2 and 3 (the red line). So it is possible to distinguish five clusters. The first cluster contains only one region: Warszawski stołeczny, the second cluster consists of three regions: Mazowiecki regionalny, Śląskie, Małopolskie, the third has two regions: Pomorskie, Dolnośląskie, the forth consists of four regions: Łódzkie, Zachodniopomorskie, Opolskie i Wielkopolskie. Last cluster has seven regions: Warmińsko-mazurskie, Kujawsko-pomorskie, Lubuskie, Świętokrzyskie, Podkarpackie, Podlaskie, and Lubelskie.

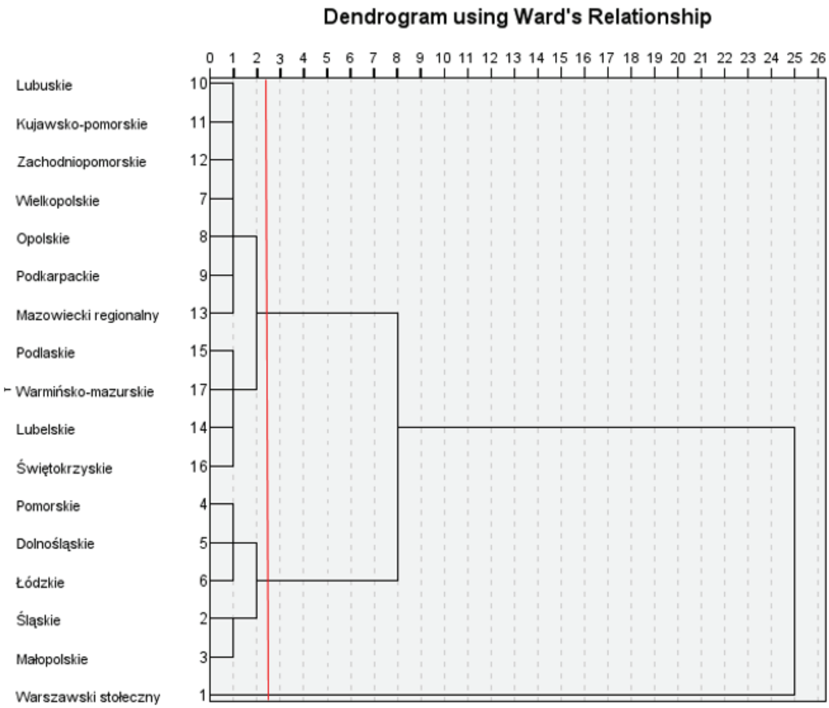
Figure 2. Dendrogram showing groups of regions according to RCI 2019 index parameters.



Note. Own study based on EU Regional Competitiveness Index: RCI 2019.

Figure 3 shows groups of regions according to the same competitiveness factors but in 2022.

Figure 3. Dendrogram showing groups of regions according to RCI 2022 index parameters.



Note. Own study based on EU Regional Competitiveness Index: RCI 2022.

Using the same cut-off point in Figure 3 as in Figure 2, i.e. between steps 2 and 3, this time we are able to distinguish only 3 clusters. The first cluster contains only one region: Warszawski stołeczny, the second cluster consists of five regions: Śląskie, Małopolskie, Łódzkie, Dolnośląskie, Pomorskie, the third has eleven regions. This shows that in 2022, compared to 2019, the differences between regions are getting smaller, five groups became three. In this analyse, one region stands out, it is capital Mazowiecki stołeczny, due to the nature of this region, which contains the capital of the country, and thus the largest institutions, the largest airport, etc. Compared to 2019, we see a smaller number of groups, which means several things: the Masovian capital region stands out and is beyond the reach for the other regions, and the remaining voivodeships are divided into a cluster of voivodeships with strong centres such as Kraków, Katowice, Gdańsk, Wrocław and Łódź, and a cluster of the remaining 11 voivodeships, where the differences between them are becoming smaller and smaller.

CONCLUSIONS

The analysis of the literature on the subject shows that the competitiveness of regions also depends on the presence of so-called growth centres, i.e. large metropolises that act as engines of economic, social and innovative development. Large metropolises attract qualified labour, investors, and scientific, research and educational institutions. Thanks to their extensive infrastructure, they are better connected both nationally and internationally, which increases their attractiveness to investors and enterprises, and thus supports the development of the entire region. Many companies and institutions operate in close proximity within metropolises, which facilitates cooperation, the creation of industrial clusters and the exchange of experiences. Metropolises often act as administrative, cultural and educational centres that influence the development of neighbouring areas. The spread of innovations, consumption patterns and living standards from large cities to smaller centres stimulates the development of the peripheries and the integration of regions. Therefore, metropolises play a key role as growth centres that accumulate resources, innovations and investments, and their dynamic development translates into an increase in the competitiveness of entire regions. The analysis has shown that there are certain differences between regions. Despite the fact that some voivodeship cities meet the conditions to be called metropolises, it is not the same as having the same influence on the region. Regions with metropolises have a higher average change in competitive position, but the difference between the two groups (regions with and without metropolises) is not statistically significant. Supporting the development of regions by supporting the development of large cities while providing mechanisms for the diffusion of benefits to less urbanized areas is one of the most important challenges of regional policy. Cluster analysis has shown that there are differences between regions that have become more noticeable over the years, especially between regions with strong metropolises (such as Warsaw, Małopolskie, Śląskie, Łódzkie, Dolnośląskie, Pomorskie) and others. This shows that despite the fact that some voivodeship cities are referred to as metropolises, their influence on the competitiveness of regions is not the same. In this analysis, one region stands out, namely the capital region (Warszawski stołeczny) due to the character of this area, where the capital of the country is located, hence the largest institutions, the largest airport, etc. In 2022, compared to 2019, we see a smaller number of groups, which means several things: the capital region stands out and is beyond the reach of the other regions, and the remaining voivodeships are divided into a cluster of voivodeships with strong centres (metropolises) such as Krakow, Katowice, Gdańsk, Wrocław and Łódź and a cluster of the remaining 11 voivodeships, where the differences between them are getting smaller. Among these 11 voivodeships, there are three voivodeships that have metropolises: Lubelskie, Kujawsko-pomorskie and Wielkopolskie. Although these voivodeships have metropolises, they differ from more competitive regions in terms of history, infrastructure, investment attractiveness and human resources. Lublin, Bydgoszcz, Toruń and Poznań are important centres, but they face challenges that are not present in more developed metropolises. This may explain why, despite having large cities, these voivodeships are less competitive compared to other regions with similar metropolises, but further explanation of these differences requires a more in-depth analysis.

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