

## **THE POTENTIAL OF CLUSTERS AS A DRIVING FORCE FOR REGIONAL DEVELOPMENT IN POLAND**

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**Key words:** potential of clusters, clusters, innovativeness, investment attractiveness, region.

### **A b s t r a c t**

In the age of economic globalization, regional development strategies have to take account of cluster-based development. The establishment of clusters encourages competition as they rely on the resources and key skills of enterprises on the one hand, and on the cooperation between enterprises within integrated production chains and on the learning process on the other. The objective of this study was to evaluate the potential of regional clusters and to determine their effect on regional development analyzed based on the levels of innovativeness and investment attractiveness. The research hypothesis formulated for the study was that the potential of clusters is correlated with the innovativeness and investment attractiveness of regions. The above hypothesis has been validated. A close positive correlation was noted between the tested variables. The benefits of clusters include increasing the innovativeness and investment attractiveness of regions, as well as improving the productivity of companies and stimulating the emergence of new businesses. Clustering contributes to reducing the unemployment rate and transaction costs, supports the absorption and diffusion of innovation and knowledge. Therefore, local authorities should promote cluster development as a driving force for regional development. This can be done through implementing cluster-based policies adapted to local conditions.

## **POTENCJAŁ POLSKICH GRON I IMPLIKACJE DLA ROZWOJU REGIONÓW**

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**Słowa kluczowe:** potencjał klastrów, grona, innowacyjność, atrakcyjność inwestycyjna, region.

### **A b s t r a c t**

Obecnie w erze globalizacji w strategii rozwoju regionalnego wiele uwagi poświęca się rozwojowi gospodarczemu opartemu na klastrach. Wydaje się, że grona to realny sposób konkurowania w warunkach gospodarki globalnej wykorzystujący z jednej strony zasoby i najważniejsze

umiejętności firm, z drugiej zaś – bazujący na współpracy przedsiębiorstw w ramach powiązań w łańcuchu wartości i na procesie uczenia się. Celem artykułu jest ocena potencjału klastrów regionalnych oraz zbadanie jego wpływu na rozwój regionu analizowany w kategoriach innowacyjności i atrakcyjności inwestycyjnej. Do tak sformułowanego celu badań postawiono hipotezę badawczą mówiącą, że siła gron jest skorelowana z innowacyjnością regionów i ich atrakcyjnością inwestycyjną. Przeprowadzone badania potwierdziły słuszność postawionej hipotezy. Stwierdzono, że między badanymi zmiennymi istnieje ścisła, dodatnia zależność korelacyjna. Podnoszenie innowacyjności regionu oraz jego atrakcyjności inwestycyjnej to tylko nieliczne z wielu korzyści generowanych przez grona, do których zalicza się m.in.: wzrost produktywności przedsiębiorstw, przyspieszanie powstawania nowych firm, zmniejszanie bezrobocia, absorpcję i dyfuzję innowacyjności i wiedzy oraz niższe koszty transakcyjne. Władze lokalne powinny zatem dążyć do rozwoju klastrów, przynoszących wymierne korzyści w rozwoju obszarów, na których funkcjonują, przez kreowanie polityki opartej na klastrach, uwzględniającej lokalne uwarunkowania.

## **Introduction**

In the age of economic globalization, regional development strategies have to take account of cluster-based development. As noted by B. Asheim, P. Cooke and R. Martin „clusters (...) became a worldwide craze, a sort of academic policy fashion item” (ASHEIM et al. 2006, p. 3). In Poland, clusters became a topic of interest at the turn of the new millennium. Initially, that interest was spurred by the Lisbon Strategy whose aim was to make the European Union the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion. The provisions of the Lisbon Strategy have been since translated into the Europe 2020 strategy which focuses on partnership in the process of stimulating economic growth and creating new jobs. The goal of the new strategy is to develop an economy based on knowledge and innovation.

Clusters seem to offer a realistic approach to competition in a global economy which relies on the resources and key competencies of companies, business cooperation as part of the value chain and the learning process. The cluster concept appeared in Marshall's industrial district model, and it was popularized by M.E. PORTER in the 1990s. According to M.E. Porter, management guru and promoter of cluster policies, clusters are ready-made business tools that support local, regional and national development (PORTER 1998, p. 207). As defined by Porter, a cluster is “a geographic concentration of competing and cooperating companies, suppliers, service providers, and associated institutions” (such as universities, agencies and business associations of various lines) (PORTER 2000, p. 15).

Porter's concept gained widespread popularity among academics, business practitioners and politicians, and it resulted in the development of a cluster-based policy. In Poland, the cluster model is promoted on account of the

benefits generated for cluster participants and the regions where the clusters operate. Clusters can be the driving force for regional development, and they offer a fertile ground for innovation and increased competitiveness (SOLVELL et al., 2006, p. 24). It has been argued that effective and conscientiously implemented cluster-based policies support the transformation of clusters into regional innovation systems that absorb and create process, product and organizational innovations (BRODZICKI et al., 2004, p. 7).

Clusters can be classified according to the following three criteria:

1. Type of initiated action – initiatives aiming to search and analyze clusters, programs for creating new clusters, supporting the existing clusters and their upgrading, i.e. the transformation of the existing clusters. The above search efforts are referred to as mapping. The results of the mapping process constituted the experimental material for this study;
2. Territorial coverage of initiatives – initiatives may be classified as local, regional, trans-border operations, national policies or international actions;
3. Key animators – local or regional authorities, associations of non-governmental organizations (e.g. entrepreneurs, universities), international organizations. Clusters also attract the interest of self-governments, business organizations, the European Union and the OECD (OLEJNICZAK 2002, p. 18).

The above criteria for cluster classification clearly indicate that there is no single approach to cluster analysis or research. According to Jacobs and de Man, clusters can be classified in one of the three categories. The first covers clusters representing the geographically focused business activity of a group of companies that operate in related market segments and cooperate with universities, research and development centers. The second category includes clusters that are vertically integrated production chains. The third category is represented by clusters covering entire markets or market segments, e.g. dairy clusters, food clusters, etc. (JACOBS, de MANN 1996, p. 426, BRODNICKI, SZULTKA 2002, p. 47).

## Methods

The research method has been developed by the European Cluster Observatory (ECO). The cluster map (database) in the EU countries accounts for two dimensions: regional and sectoral. The cluster sector is a group of all industries classified in one of the 38 cluster categories. They have been defined based on Porter's definition of a cluster, as cited above, and elaborated by the Institute for Strategy and Competitiveness of Harvard Business School. The cluster category comprises industries with similar attributes. The "agricultural products" category, for example, covers the sugar industry, agricultural services

and alcoholic beverages. A region, on the other hand, is a specific geographic area where the establishment and growth of clusters is stimulated through the advantage of agglomeration. For statistical purposes (data comparability), the European Union has been divided into 41 NUTS-2 regions that cover the territory of the new Member States.

The strength of regional clusters was evaluated with the use of the following three parameters in respect of which stars were awarded to each cluster:

- cluster size – showing whether the cluster fits in the group of the top 10% clusters in Europe in a given cluster category as regards employment. If so, the cluster is awarded a star. If employment reaches a satisfactory level (at which a star is awarded), it is assumed that the probability of the cluster generating significant and positive effects will be high;

- cluster specialization – the more specialized the cluster in a given category, the higher the probability that the desired economic effects will be achieved. The following relationship is a measure of specialization:

$$\frac{\text{employment in the region of the given cluster category}}{\text{employment in a given category in Europe}} / \frac{\text{overall employment in the region}}{\text{overall employment in Europe}}$$

The cluster was awarded a star when the specialization quotient was 2 and higher;

- employment concentration – this parameter compares employment within the cluster to overall employment in the region. If the cluster had a high share of overall employment in the given region, it was assumed that the probability of the cluster generating economic advantages was high. A star was given to a cluster in the top 10% group of all clusters in the region classified in accordance with this parameter.

The above three parameters were based on employment data. Other measures, such as productivity in the region or added value, were not applied because data could not be operationalized in particular Member States. The power and strength of clusters functioning in a specific regional environment were determined in the regional and sectoral dimension.

The objective of this study was to evaluate the potential of regional clusters and to determine their effect on regional development analyzed based on the levels of innovativeness and investment attractiveness. The research hypothesis formulated for the study was that the potential of clusters is correlated with the innovativeness and investment attractiveness of regions. The analysis was carried out with the use of secondary data published by ECO in 2008. It also relied on secondary data regarding the innovativeness and investment attractiveness of Polish regions, defined as their ability to attract investors by

providing them with an optimal combination of location benefits in the proposed investment sites. Location benefits are the potential benefits of cluster attractiveness.

### **Stars as a measure of clusters' regional strength**

As discussed in the methodology section, to receive a star, a cluster has to fulfill a set of requirements in three areas: cluster size, specialization and employment concentration (aggregation). The above factors indicate whether the cluster reached critical mass (SZULTKA 2004 et al., p. 15)<sup>1</sup>. The attainment of critical mass determines the achievement of economic results that support the growth of the region and industries in a given cluster category. The potential of clusters in Poland is presented in Table 1.

Table 1  
The potential of clusters in Poland

Voivodeship	Number of stars awarded to clusters			Total number of clusters	Total number of stars awarded
	3	2	1		
Dolnośląskie	–	1	9	10	11
Kujawsko-Pomorskie	–	3	6	9	12
Lubelskie	–	3	6	9	12
Lubuskie	–	2	6	8	10
Małopolskie	–	2	8	10	12
Opolskie	–	3	7	10	13
Podkarpackie	–	3	5	8	11
Podlaskie	–	1	6	7	8
Pomorskie	–	2	7	9	11
Świętokrzyskie	–	1	6	7	8
Zachodniopomorskie	–	1	6	7	8
Mazowieckie	1	6	7	14	22
Warmińsko-Mazurskie	1	3	4	8	13
Łódzkie	2	2	7	11	17
Śląskie	3	2	4	9	17
Wielkopolskie	3	4	4	11	21
Total for Poland	10	39	98	147	206

Source: own work based on European Observatory Cluster 2008.

<sup>1</sup> As noted by T. Szultka, the attainment of a given critical mass level implies the availability of sufficient resources for building the cluster's potential and a significant share of regional economy. Refer to: Szultka 2004.

The cluster potential in Poland is generally average or low, as demonstrated by a small number of clusters awarded three stars. Those clusters were situated in Wielkopolskie, Śląskie, Łódzkie, Mazowieckie and Warmińsko-Mazurskie voivodeships. The clusters' low potential could be attributed to short operating time. Cluster-based policies had been popular in the world for many years, but in Poland, the clustering concept began to be promoted on a large scale only in the new millennium. Programs supporting the development of clusters and cooperation, financed from the European Structural Funds, have significantly contributed to the popularization of clusters. One of them is the Innovative Economy Operational Program for 2007–2013 and measure 5.1, Support for Cooperative Connections of Supraregional Importance. In Wielkopolska, the best-known clusters include the Boiler Cluster, the Wielkopolska Furniture Cluster and the Wielkopolska Chemical Cluster. The Śląskie voivodeship operates the Innovative Silesian Cluster of Clean Coal Technologies. The Media Cluster and the Łódź Cluster have been called into existence by the local authorities to maximize the growth potential of the city and region of Łódź by involving the self-government, research and development centers, universities and local businesses in the process of creating new jobs (40 000 by 2015) and reducing unemployment (ROMANIUK 2008, p. 223–227). The leading cluster in the Warmińsko-Mazurskie voivodeship is the Furniture Cluster of Elbląg, and in Mazowieckie region – the Multimedia and IT Systems Cluster.

The majority of clusters characterized by average development potential (two stars) were found in Mazowieckie (6 clusters), Wielkopolskie (4) and Warmińsko-Mazurskie (3) voivodeship. Clusters with the lowest growth potential operated in Dolnośląskie (9 clusters awarded 1 star) and Małopolskie (8) regions. The Mazowieckie voivodeship operates Dolina Ekoprodukcji (Organic Valley) and the Construction Cluster. The Warmińsko-Mazurskie region seats food clusters (Beef Cluster) as well as Mazurskie Okna which brings together door and window manufacturers. Other regional clusters include the Raw Materials Cluster in Dolnośląskie voivodeship and Eklaster IT Cluster in Małopolska. The clusters in Podkarpackie voivodeship have been rated relatively poor. The Aviation Valley, one of the best known Polish clusters from the Podkarpackie region, has been awarded two stars in a ranking of the European Observatory Cluster.

The Polish clusters were differentiated with regard to all factors determining their regional potential (strength), i.e. size, specialization and employment concentrations. As regards size, the highest cluster potential was noted in the voivodeships of Mazowieckie (average size 1.15), Śląskie (0.93) and Wielkopolskie (0.87) (Tab. 2).

Table 2  
Determinants of cluster potential

Voivodeship	Cluster size	Cluster specialization	Employment concentration
Mazowieckie	1.15	1.96	2.29
Śląskie	0.93	1.86	3.00
Wielkopolskie	0.87	2.38	3.34
Małopolskie	0.85	2.74	2.40
Łódzkie	0.67	2.51	3.09
Pomorskie	0.63	2.72	3.48
Podkarpackie	0.61	3.13	3.45
Dolnośląskie	0.60	1.98	2.62
Kujawsko-Pomorskie	0.52	2.48	3.24
Zachodniopomorskie	0.40	2.46	4.13
Lubelskie	0.38	2.17	3.38
Warmińsko-Mazurskie	0.38	2.89	4.01
Lubuskie	0.33	3.33	3.70
Opolskie	0.20	2.13	3.16
Podlaskie	0.20	2.03	3.84
Świętokrzyskie	0.17	1.60	3.11

Source: own work based on European Observatory Cluster 2008.

Cluster specialization paints a different picture. The most highly specialized clusters delivering the highest economic benefits for their respective regions were noted in the voivodeships of Lubuskie (average specialization quotient of 3.33, i.e. 1.33 higher than the threshold of 2 points required for one star), Podkarpackie (3.13) and Warmińsko-Mazurskie (2.89). The predominant cluster categories in each region seem to be determined by the growth of industries and sectors of the national economy. North-eastern Poland is a predominantly agricultural region, whereas the voivodeships of Mazowieckie, Dolnośląskie and Śląskie have an industrial orientation. The above division explains the higher variation in cluster categories in a given area and, consequently, a lower degree of specialization. To illustrate, Warmińsko-Mazurskie and Podlaskie voivodeships are characterized by a predominance of food clusters, including the Beef Cluster or Poland's first Dairy Cluster, whereas a total of 20 cluster categories have been identified jointly in Mazowieckie and Wielkopolskie regions.

Employment concentration was the last factor determining cluster potential. The highest ranking voivodeships in this category were: Warmińsko-Mazurskie (average employment in cluster to total employment reached 4.01), Podlaskie (3.84) and Lubelskie (3.38). The regions of Mazowieckie, Małopolskie and Dolnośląskie ranked last in this respect.

## **Cluster strength, and regions' investment attractiveness and attractiveness to investors**

The regions' investment attractiveness and attractiveness to investors were compared against the strength and number of clusters in every voivodeship. Their investment attractiveness is presented in Table 3.

Table 3  
Investment attractiveness of voivodeships in Poland in 2008

Voivodeship	Investment attractiveness of the region		Region attractiveness to investors	
	value	rank	value	rank
Śląskie	0.85	1	0.02	8
Mazowieckie	0.58	2	1.20	3
Dolnośląskie	0.50	3	1.29	2
Wielkopolskie	0.41	4	1.30	1
Małopolskie	0.25	5	-0.44	11
Pomorskie	0.14	6	0.42	4
Łódzkie	0.10	7	0.33	5
Zachodniopomorskie	0.02	8	0.24	6
Lubuskie	0.01	9	0.18	7
Opolskie	-0.08	10	-0.11	9
Kujawsko-Pomorskie	-0.21	11	-0.69	13
Podkarpackie	-0.34	12	-0.45	12
Warmińsko-Mazurskie	-0.40	13	-0.17	10
Świętokrzyskie	-0.55	14	-1.06	15
Lubelskie	-0.61	15	-1.00	14
Podlaskie	-0.67	16	-1.08	16

Source: *Atrakcyjność inwestycyjna województw i podregionów Polski 2008*, Ed. T. Kalinowski, IBnGR, Gdańsk 2008, p. 6.

The ranking of investment attractiveness is topped by four regions: Śląskie, Mazowieckie, Dolnośląskie and Wielkopolskie. Those voivodeships score above average results in various attractiveness categories. They are characterized by well-developed social and economic infrastructure, large markets and high availability of transport networks. Their weaknesses include low levels of public safety (excluding Wielkopolska) and, in particular in the Mazowieckie region, very high employment costs due to a high level of wages in the region.

The ranking closes with Świętokrzyskie, Lubelskie and Podlaskie regions which received the lowest marks as regards their investment attractiveness.

The above voivodeships scored high marks in respect of public safety. Public safety contributes to investment attractiveness by fostering a feeling of personal safety and responsibility for the investor's closest co-workers and partners (*Atrakcyjność...* 2008, p. 6–8).

Voivodeships were also evaluated with regard to their attractiveness to investors. Regions that scored high marks in this respect were characterized by a high number of investment offers, high availability of promotional information and a high number of competition winners, such as the Fair Play Municipality contest. The data presented in Table 2 indicate that Wielkopolskie was the most attractive voivodeship for investors, followed by Dolnośląskie, Mazowieckie, Pomorskie and Łódzkie.

Clusters with the highest potential, i.e. with best access to resources required for growth, were situated in regions characterized by the highest investment attractiveness and attractiveness to investors. The strength of those correlations was tested by determining Pearson's correlation coefficient. A close correlation was reported between the number of stars and the region's investment attractiveness (correlation coefficient of 0.632). Similar dependencies were noted between the number of clusters and the voivodeship's investment attractiveness ( $r = 626$ ). The correlations between the number of stars, the number of clusters in the region and the region's attractiveness to investors was also studied. The coefficients of correlation reached 0.613 and 0.655, thus showing that the above variables were relatively strongly correlated.

### **Cluster strength and innovativeness**

The analyzed regions' innovativeness was compared against the strength and the number of local clusters. The ranking of voivodeships evaluated based on the Regional National Summary Innovation Index (a total of 10 indicators) and an index-based ranking is presented in Table 4. The most innovative regions that received above average scores in the RNSII ranking and an index-based ranking that takes into account the weights of 10 EIS (European Innovation Scoreboard) indicators were: Mazowieckie, Małopolskie, Dolnośląskie, Pomorskie, Śląskie and Wielkopolskie. The above regions are characterized by large populations of university graduates, considerable spending on R&D, financed by both the State and businesses, a high share of turnover generated by innovations, high level of employment in the high-tech market. The ranking ends with the voivodeships of Świętokrzyskie, Warmińsko-Mazurskie and Lubuskie. In the above regions, a relatively high number of innovations were introduced by SMEs in the industrial sector, but the remaining indicators remained low.

Table 4  
Ranking of voivodeships in the group of EIS indicators (a total of 10 indicators)

Voivodeship	RNSII (10)	Ranking according to RNSII (10)	Index	Index-based ranking
Dolnośląskie	0.5957213	3	0.0085921	3
Kujawsko-Pomorskie	0.3565590	12	0.0042267	13
Lubelskie	0.4323588	8	0.0053648	10
Lubuskie	0.2504307	16	0.0030001	16
Łódzkie	0.4104266	9	0.0054511	7
Małopolskie	0.6846804	2	0.0098792	2
Mazowieckie	0.8089620	1	0.0133084	1
Opolskie	0.3758403	11	0.0047551	12
Podkarpackie	0.3827155	10	0.0041468	14
Podlaskie	0.4391708	7	0.0060080	9
Pomorskie	0.5887526	4	0.0078180	5
Śląskie	0.5618853	5	0.0069632	6
Świętokrzyskie	0.3054953	14	0.0043671	11
Warmińsko-Mazurskie	0.2756757	15	0.0032874	15
Wielkopolskie	0.5401345	6	0.0081412	4
Zachodniopomorskie	0.3412197	13	0.0052106	8

Source: *Analiza porównawcza regionów w Polsce*, 2008, p. 47.

Coefficients of correlation were determined to investigate the dependency between the strength and the number of regional clusters and the studied regions' innovativeness. The number of clusters and their potential were compared with the voivodeship's innovativeness according to RNSII criteria to reveal a close correlation between the analyzed variables. The coefficients of correlation were determined at 0.73 and 0.56, respectively. The higher the number of strong clusters in a given region, the greater the voivodeship's level of innovativeness. Similar correlations were reported by comparing the number and the potential of clusters with the regions' innovativeness evaluated based on EIS indicators. The coefficients of correlation reached 0.75 and 0.57, respectively.

## Conclusions

The results of this study point to a close correlation between the strength and the number of clusters, the region's innovativeness, investment attractiveness and attractiveness to prospective investors. These are only some of the

benefits generated by cluster initiatives. Many authors claim that clusters are the new approach to increasing the competitive advantage of the national economy and regional economies in the international arena (BRODZICKI et al., 2004, p. 9). Effective clusters boost productivity, they contribute to the number of new businesses, they reduce unemployment, they promote the absorption and dissemination of innovations and knowledge, they lower transaction costs, they promote market specialization and contribute to overall economic growth. The above explains why clusters have attracted the interest of market actors and institutions responsible for regional growth. Local authorities should support the growth of clusters by implementing cluster-based policies that account for the specific needs and assets of the local market.

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