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**The influence of clusters on economic development.  
A comparative analysis of cluster policy in the  
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## **The influence of clusters on economic development. A comparative analysis of cluster policy in the European Union and Japan<sup>1</sup>**

**JEL Classification:** *F631, O12, O57*

**Keywords:** *cluster, effectiveness of clusters, regional development, value of regions*

**Abstract:** The development of clusters seems to be a natural consequence of the observed trends in the global economy. The increased interest in the creation and development of clusters can also be seen in most of the countries of the European Union, however, the experience of EU countries in this field is different. In addition to strong clusters with a long tradition, new clusters are created with much lower potential. Clusters compatible with the most important EU documents are to play the role of organizations supporting regional development and ensuring the growth of innovation of the European Union in the new programming period. Japanese economy is based on the important role of clusters in this area, which along with the US and the European Union is among the largest economies in the world. The experience of Japan in this area is much longer. A lot of still functioning clusters were created in this country in the XVII and XVIII centuries. The aim of this study is a comparative analysis of the socio-economic situation of the European Union and Japan, with special emphasis on the role, that clusters play in those economies. The result of the analysis is to identify the factors that allow for the effective operation of enterprises within created cluster structures. The analysis of Japan's experience in this area is a valuable source of information for policy guidelines developed to support clusters in the EU.

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## Introduction

In many countries, both in Europe and on other continents, an increased interest in economic policy has been observed in recent years, based on the concept of creation and development of clusters. In the case of Europe, this is largely due to the effect of Lisbon strategy having been implemented since 2000, whose main goal was to make Europe the most competitive and rapidly evolving, knowledge-based part of the world. Measures, that should lead to the economic growth as a result of the growth of innovation and competitiveness of the regions (thanks to regional specialization) are continued in the next strategic for the European Union document entitled Europe 2020 Strategy. This document implies the need for so-called smart specialization of regions. The strategy of smart specialization (RIS3) is defined as a national or regional innovation strategy, whose main goal is to build a competitive advantage due to the development of research and innovation capacity. This strategy also emphasizes the important role of clusters in the process of defining and developing smart specialization. It also assumed the need to develop significant clusters by exploiting the benefits of agglomeration, the scale and scope of local external benefits resulting from the production and distribution of knowledge (Europa 2020). Clusters also play an important role in the economies outside Europe. Interesting examples are clusters developing in Japan, which is regarded as the third economy in the world (after the United States and the European Union), particularly in the context of the applicability of the methods and techniques of Japanese supply chain management in other countries to which they are transposed (Witkowski, 2010).

The aim of this study is a comparative analysis of the socio-economic situation of the European Union and Japan, with a special emphasis on the role that clusters play in those economies. The analyzes were based on data available from Eurostat, the European Cluster Observatory, public statistical data of Japan and databases JETRO. The result of the analysis is to identify the factors that allow for the effective operation of enterprises in the created cluster structures. The experience of Japan in this area is a valuable source of information for policy guidelines developed to support clusters in the EU.

This paper is organized as follows: the first part comprises of a general literature review of the concepts and theories on the clustering phenomenon and presents the place of this concept in new theory of value of the region. The paper presents the proposal of the examination procedure concerning the identification of factors determining the effectiveness of the clusters and the possibility to identify interdependencies that occur between these factors.

The second part looks at contemporary research work and focuses on some indicators describing clusters. Finally, the relevant conclusions are drawn.

## **Theoretical background**

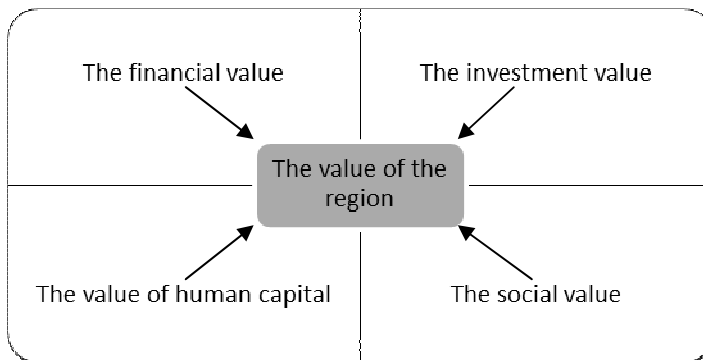
Considerations for clusters fit in at least some areas of research, such as: economic policy, economic geography and regional economics. Within these areas, in the context of clusters such issues are discussed, e.g.:

- the impact of clusters on the competitiveness of the economy, the development of regions (local development) and sustainable development (Andersson et al., 2004), (Gugler and Brunner, 2007);
- clusters and innovation and the creation and transfer of new technologies (Eisen et al. 1996), (Final Report, 2003), (Innovating Regions..., 2005);
- the place of clusters in the internationalization and development of entrepreneurship, primarily small and medium-sized enterprises (Frenken et al., 2010);
- the role of clusters in creating knowledge-based economy (Szymoniuk, 2003), (Kuah, 2002);
- the trends of supporting the clusters in cluster-based policy (Pilarska, 2010), (Solvell, 2009).

Relatively new is also a concept: value of the region, in which clusters play an important role. It is based on a new approach proposed by Michael Porter and Mark Kramer in 2006. In this conception, the authors indicated the need of transition from the traditional idea of corporate social responsibility (CSR) to Creating Shared Value (CSV) – a concept geared to attempting to solve a variety of societal issues from a business perspective – and consider what significance efforts by enterprises to implement CSV might have. Creating Shared Value is a management framework meant to reconcile the social value and the enterprise value that are generated from solving societal issues through an enterprise's business activities. The concept of "shared value" in Porter's thinking may be defined as policies and practices meant to improve the local community and economic environment in which an enterprise operates while improving that enterprise's own competitiveness. Porter advocates an approach in which social value is created by addressing social problems and needs, the result of which will be the creation of economic value. The CSV concept entails three approaches: reconceiving products and markets, redefining productivity in the value chain, and creating industrial clusters to support the region in which the enterprise is located (Porter and Kramer, 2011).

The concept of value of the region was based on that which is „...the sum of the various values produced by the region (including the financial, investment, social and human capital) (...), which created the potential of the region, on which its development may be based on...” (Jabłoński and Jabłoński, 2012).

**Figure 1.** Areas creating the value of the region



Source: own elaborations based on Jabłoński A., & Jabłoński M. (2012).

The financial value in accordance with this concept, apart from the value of the budget, includes the value of the resources which is equity. The value of an investment, primarily understood as the ability to attract external investors, also takes into account the value of own investment. The social value includes the ability to create relationships and cooperation. The value of human capital in the simplest terms is interpreted as competence potential of residents of the region allowing primarily finding a good job. The value of human capital is also, especially in the western economies, its corresponding structure (described e.g. the number of births, the relation of population in pre-production, production and post-production age etc.). Described in this way the value of the region is a multidimensional concept, with its important ability to create a competitive advantage based on the interacting entities (understood as different groups of stakeholders, e.g., the business sector and the public administration sector). One form of such cooperation, particularly in relation to small and medium-sized enterprises, are clusters.

Although the functioning of enterprises in the form of clusters is not new, in recent years this form of cooperation between enterprises is once again the subject of numerous studies and considerations (Gugler and Brunner, 2007), (McDonald et al. 2007), (Hegedus, 2008), (Porter and Kramer, 2011).

Clusters, usually, are defined as a geographical agglomeration of competing and related industries; and where there is evidence of improved performance such as a growth and profitability arising from the agglomeration of firms in a region (Porter, 2000, p. 248). Entities forming the cluster function in the value chain, which means having a certain specialization by them or business profile associated with the final product or service. The cluster can therefore create an entities representing various sectors, which are interrelated and complementary. According to the concept of EU smart specialization, clusters operating in the areas of smart specialization of regions are factors improving the competitiveness of such regions. External factors are more rarely considered. This could include endogenous potential of the region in which the cluster operates.

However, these factors largely determine the efficiency of the clusters. They should also be considered in the development of guidelines for cluster-based policy, understood as „...a set of different types of policies encouraging the development of regional systems of business organizations in the form of clusters ...”. This concept includes:

- indicated by Ch. Ketels (2004) all the efforts and the efforts taken by the government on its own and in cooperation with companies or e.g. research units focused on the development of clusters and competitiveness;
- proposed by OECD (2002) the definition according to which it is a set of actions taken by public authorities in order to stimulate the links between the companies making up the value chain;
- proposed by the IBnGR (2008) set of activities and instruments used by the authorities at various levels in order to stimulate the economy by creating new clusters.

These factors are also considered separately, while the effectiveness of the clusters is dependent on a set of mutual configured variables describing both factors directly related to the cluster as well as external factors, including the environment in which clusters operate.

### **Methodology of the research**

The research procedure presented below is a proposal for an approach to the problem of identifying the factors determining the effectiveness of the clusters. This procedure refers to the global research, whose objective is to identify factors that improve or determining the effectiveness of the clusters.

The effectiveness is understood here as the ability to create a competitive advantage for companies functioning within the cluster either directly considered in relation to these entities and countries (regions) in which clusters exist. Below the stages of the research procedure proposed are presented in synthetically way. It should be noted that the study focuses on the first three stages of this procedure. Phases IV and V require identifying the factors, that may affect the effectiveness of the clusters. The present study focuses primarily on the identification of areas in which these factors can be identified.

Stage I. The development of methodological foundations of research, including: the identification of the factors determining the effectiveness of the clusters.

STAGE II. The identification based on literature review and own research of possibility to obtain data describing the factors affecting the effectiveness of the clusters.

STAGE III. Statistical analysis of selected factors determining the effectiveness of the clusters.

STAGE IV. The construction of models describing the relationship between the identified groups of factors and the effectiveness of clusters.

The proposed test procedure involves an integrated approach to assess the relationship between the identified groups of factors and the effectiveness of clusters using multivariate methods for classification and data analysis. To identify the factors determining the effectiveness of the clusters and of relations between them the following methods will be used:

- correspondence analysis, as a factor method allows the identification of relationships between variables and objects mainly in a graphical form, (Andersen, 1997), (Panek, 2010).
- factor analysis, which is used to describe variability among observed, correlated variables in terms of a potentially lower number of unobserved variables called factors. The main benefits of factor analysis are that the analyst can focus their attention on the unique core elements instead of the redundant attributes, and as a data pre-processor for regression models (Sagan, 1998), (Bollen et al., 2009).

Recommended methods will make the identification of factors determining the effectiveness of the clusters and the interrelationships between them possible.

### **Factors determining the effectiveness of the clusters**

Clusters are perceived as the source of a lot of advantages for the entities functioning in their structures and the countries in which they are located.

Hence their significant impact on the value of region. Considering the direct benefits for enterprises functioning in clusters more and more attention is drawn to the diminishing role of factors such as e.g. an access to cheaper raw materials for the benefit of: the possibility of using a flexible division of work, an access to information and the ability to use scientific achievements and collaboration with research centers (SMEA, 2006).

However, the benefits for the countries in which clusters are located are: the development of innovation and new technology which turns into economic growth and greater competitiveness (Hegedeus, 2008, p. 81), the increase of attractiveness for foreign direct investment (Gugler nad Brunner, 2007), a positive impact on the labor market (Innovation Clusters, 2007, p. 10) and the strengthening of social capital (Boekholt and Thuriaux, 1999).

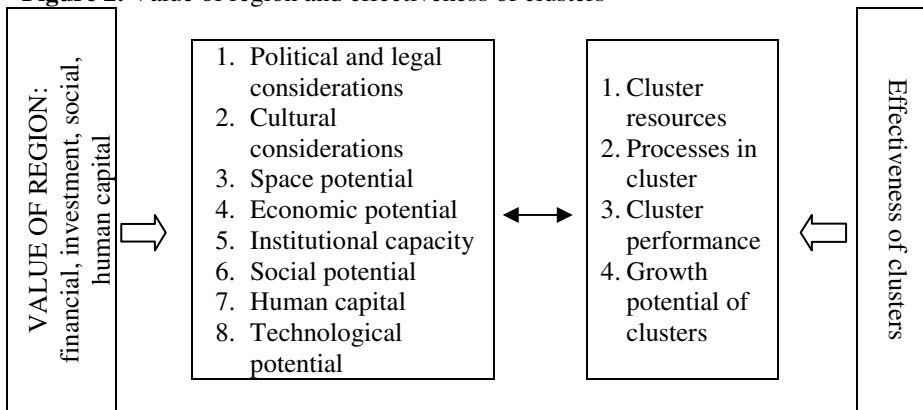
These benefits, which are part of the main objectives of regional policy concerning the strengthening of the competitiveness of regions cause, that public authorities are more and more interested in getting involved in the creation and development of clusters (Bochańczyk-Kupka, 2014).

The effectiveness of clusters is conditioned by a number of factors. These factors are both relevant from the point of view of regions in which clusters operate and enterprises operating in clusters.

The value of the region considered from the perspective of financial, investment, social value or human capital includes factors as: political and legal determinants, cultural, its space potential, economic potential or social and technological potential. This value determines directly the potential of clusters operating in the region.

On the other side, clusters due to using the potential of the regions in which they function can maximize this potential, improve it, e.g. thanks to the introduction of new technologies or stimulating the development of human capital. Between these two areas mutual relations take place. The value of region determines the potential of clusters, so it has an impact on resources, processes, results and the growth of potential clusters. However, the processes taking place in clusters affect the value of the region. It can be represented as follows:



**Figure 2.** Value of region and effectiveness of clusters

Sources: own elaborated.

The collaboration of businesses takes place in more and more turbulent environment around new technologies, whose effects are not known at the time of implementing them on the market. Therefore it is difficult to anticipate the directions of development of this type of markets. In addition, a company needs to cooperate more comprehensively requiring new skills as network management, technology transfer or more importantly the ability of acquisition, processing and exchange of information. In spite of better resource management skills and processes taking place in clusters, changes in circumstances occurring around clusters are in some economies very disturbing and have strong impact on the functioning of the clusters.

A good example of how the changes in the environment of clusters contribute to their operation is e.g. Japan. Changes in the environment of clusters in Japan and in its structure and the organization of clusters show that the factors determining the efficiency of clusters should be considered in a wider context, not only in relation to clusters themselves, but also taking into account the environment in which clusters operate.

### **The role of clusters in the development of the Japanese economy – implications for the European Union**

Although the Japanese economy, characterized by high efficiency, competitiveness and technological advancement, is considered to be the third economy in the world (after the United States and the European Union), for over 20 years has been in a state of economic stagnation. Particularly important in its case are demographic problems associated with an aging

population, low rate of female fertility or errors in macroeconomic policy. Changes in this area generally concern all areas forming the value of region and consequently the effectiveness of clusters. From the viewpoint of the European Union they are also very important (Bossak, 2010).

In recent years there have been more and more opinions indicating that the demographic processes in the EU are largely a reflection of changes taking place in Japan. Although the number of people EU-28 has increased for over the last 50 years, particularly worrisome are changes of a structure according to the age of the population of the European Union. According to Eurostat data at the beginning of 2013 the population of the EU-28 was 505,7 million and it was almost 100 million more compared to the aggregate number of the population in the EU-28 in 1960.

In spite of this growth, the increase in a load factor of the population of working age by population in the retirement age is observed, which on 1st January 2013 was 27,5 for the EU-28 and was more than 3% higher compared to 2002. In addition, further aging of the European population is anticipated within next 35 years and the proportion of the population aged at least 65 years of age with 18,22% at the beginning of 2013 to 28,1% by the year 2050 (Eurostat, 2014).

**Table 1.** The share of the population according to biological age groups in Japan and the EU-28 in the period 2002-2013

Years	People by age group – share of total population (%)					
	0-14		15-64		65 and more	
	Japonia	EU-28	Japonia	EU-28	Japonia	EU-28
2002	14,20	16,8	67,41	67,2	18,39	16,0
2003	14,05	16,6	67,03	67,1	18,92	16,3
2004	13,91	16,4	66,63	67,2	19,46	16,4
2005	13,77	16,2	66,24	67,2	19,98	16,6
2006	13,65	16,0	65,86	67,2	20,50	16,8
2007	13,53	15,8	65,47	67,2	20,99	17,0
2008	13,42	15,7	65,07	67,2	21,50	17,1
2009	13,31	15,7	64,64	67,1	22,05	17,2
2010	13,18	15,7	64,16	66,8	22,66	17,5
2011	13,03	15,6	63,60	66,8	23,37	17,6
2012	12,88	15,6	62,98	66,6	24,15	17,8
2013	12,72	15,6	62,34	66,2	24,94	18,2

Source: own elaborated on the basis of Eurostat data and public statistical data in Japan.

However, in the case of Japan, the load factor of the population in the working age by population in the retirement age was at the beginning of 2013

more than 40,0%, and is foreseen to continue to grow in the coming years. This means progressive aging of the population.

An analysis of the growth rate of the population aged 65 or more and an increase in the share of this group in the total population indicates an intensification of demographic aging in both Japan and the European Union.

In Japan in the official statistical studies it is noted that „... Japan has become the first country to reach the status of “super-aged society...” (White paper, 2014). In addition, since 2011 trends have been observed that are related to the depopulation of the population, resulting in a decrease in both the number of births and the changes associated with migration trends.

Japan particularly hard was affected by the crisis of the 2011 connected with the earthquake. This was another after the period 2007-2008, a period of decline in GDP growth. As a result of the earthquake and tsunami 656 private enterprises employing 10 757 people announced bankruptcy within one year. Although in the area of the earthquake only 12% of companies were located, the cause of the collapse of the rest were mainly disturbances in the continuity of supply (Ono and Ishiwatari, 2012).

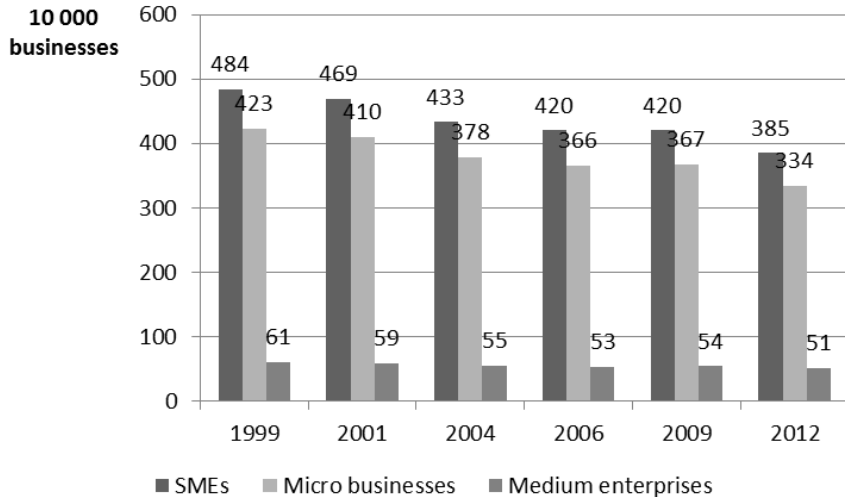
Unfavorable for Japan socio-economic trends in addition to already indicated: population decline, low birth rate and aging population are also:

1. The low rate of growth of GDP (while in the second half of 2013 there was an increase of 1,5% compared to a decline of 0,4% in the euro area). The main causes of GDP growth compared to the previous year in Japan were: an increase in private consumption and investment expenditure associated with declared changes in fiscal and monetary policy within the new strategy of the government ( a program of three arrows). It is predicted, however, that the rate of growth in the coming years may be much lower.
2. The withdrawal of investment funds from the Japanese market which shows the decline in the attractiveness of the market for investors.
3. The increase in investment of large Japanese companies in foreign markets causing a decline in orders for small and medium-sized enterprises that are subcontractors of large companies (White paper, 2006).
4. The employment growth in the service sector and a decline in the manufacturing sector.
5. A very large decrease in the number of micro-enterprises operating in the Japanese market caused both by a decline in demand and the migration of large enterprises beyond Japan.

Japan is going economic and social changes, that are making the management environment more challenging for small and medium

enterprises (SMEs ) and micro-businesses. The number of SMEs is declining long-term and it could drop further and speed the decline of regional economies.

**Figure 3.** Trends in number of SMEs in Japan



Sources: Recompiled from MIC, *Establishment and Enterprise Census, 2009 Economic Census for Business Frame*; MIC, METI, *2012 Economic Census for Business Activity*.

Micro businesses are very important to the Japanese economy, as they account for about 87% of all enterprises in the nations well as about 26% of all workers. The number of micro businesses is falling sharply as Japan's economic and social structure changes. Over the three-year period from 2009 to 2012, there was a decline of about 350 000 SMEs, among them about 320 000 micro businesses (of which 250,000 were sole proprietorships). In terms of percentage, there was a 4,8% decline in medium enterprises and 8,8% decline in micro businesses. There are now concerns that regional economic vitality will be lost with the market withdrawal of SMEs and micro-businesses, which have been important to regional economic growth.

The reduction in the number of enterprises is also reflected in the efficiency of the clusters. Currently in Japan there are over 2 million of private companies, of which only 5 thousand are large companies such as Sony, Panasonic, Toyota and Mitsubishi. The largest companies generate 50% of GDP and employs 20% of the workforce (White paper, 2012).

Many Japanese companies are operating in so-called a manufacturing vertical system. These companies employ many subcontractors which are often small companies employing housewives. This means that if you need

an immediate reduction of production (it is not taken into account as a rule previously agreed terms of the contract), it is followed by a prompt reduction in staff, mainly women. According to experts of the Japanese market it causes a significant underestimation of the level of unemployment.

The current development of Japan is mainly based on innovation and new technologies. An export of goods has been replaced for 10 years with the growth in the export of capital and technology. Japan is ahead in this respect of the leading European countries: Germany, Britain and France, but the export is lower than in the United States.

Another important factor in the performance of clusters is their specialization. According to the Small and Medium Enterprises Agency in Japan in the late 90s of the twentieth century there were more than 530 substantially different clusters representing the following industries: processing (food); textile; clothing; carpentry and furniture; ceramic, stone and glass; machine (Yamawaki, 2001, p. 132).

At present, the main specializations of clusters in Japan are according to the Japan External Trade Organization data's: automobile and transport equipment; electronic components, devices, semiconductors, precision machinery, biotechnology, healthcare and welfare; ICT and cloud computing; environment and energy; food and other industries. These specializations reflect the current stage of development of the Japanese economy based mainly on innovations.

Specializations of regions based on the clusters are also a current direction of supporting clusters in the European Union. Specializations of European clusters are much more varied. For comparison, according to the report „Star Cluster”, which presents the strongest regional clusters in the United Kingdom according to the European Cluster Observatory star rating. In total, there are 182 clusters in the United Kingdom, that have received at least one star. Specializations of clusters whose companies employ the most workers are:

- business services (1 534 002 employees);
- financial services (760 676 employees);
- education (597 577 employees).

A comparison of Japanese specialization of clusters based primarily on technological processes and clusters in UK, specializing mainly in services indicates differences between the two regions. Currently, the technology and intellectual property rights in Japan is about 5 times higher than their imports. This makes Japan a country with modern technology know-how and global network of linkages controlled by Japanese capital groups and trade. Taking this into consideration the European Union has a considerable distance to catch up.

## Conclusion

Despite the old tradition of forming clusters and a lot of experience of Japan in this respect – the cluster policy is still one of the prior directions of encouraging the economic development of Japan. In 2001-2005, METI (Ministry of Economy, Trade and Industry ) began implementation of the Industrial Cluster Plan with a budget of 5 million per year and preferential access to the funds of 350 million euros thanks to which 40 000 new companies were created (Tsuji et al., 2005). Between 2006-2011 the creation of further 40 000 new businesses were planned and works to promote foreign activities as well as self-sufficiency and independence of the created clusters (Bochańczyk-Kupka, 2014).

Currently in Japan a program has started based on three pillars, so-called an economic recovery program. ABE program, also known as a three arrows program, whose objective is a long-term growth strategy (Report, 2013). This program is different from the currently implemented in the European Union policy assuming the reduction of expenditure and reducing budgets. Announced in 2014 the last element of the developed program envisages further support of businesses operating within the clusters. Japan, as other countries is planning the creation of special economic zones, the increasing role of public-private partnerships, e.g. in infrastructure investment.

Measures leading to economic growth as a result of the growth of innovation and competitiveness of the regions (thanks to regional specialization), have also been undertaken in Europe. In accordance with the Europe Strategy 2020 document, one of the main priorities of the European Union economic development based on knowledge and innovation and the related concept of smart specialization conducted also on the base of clusters (Europa 2020).

For the past few years many new clusters have been formed in Europe. In a view of the fact that a lot of them are young organizations with a little resources both financial and human infrastructure, it is expected that much of it in the coming years will remain in the initiation phase of development. The aim of the policy conducted in the European Union is to identify clusters of strategic importance. In Poland, for example they are called National Key Clusters (clusters of strategic importance for the country) and the Regional Key Clusters (analogous: the strategic importance of the region/ regions).

Cluster support requires the identification of the determinants of the effectiveness of their operations. An analysis of the interactions that occur between these factors is also necessary (Hassink, 2005).

A good solution is to use for this purpose methods of multidimensional comparative analysis. It is also important to study the relations between

cluster environment and factors directly affecting the functioning of the cluster structures.

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