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CLUSTERS AS A FACTOR INFLUENCING REGIONAL POLICY AND COMPETITIVENESS

The regional policy is a priority of the European Union since too large disparities between and within its member states have been remaining over the past decades, which results in huge differences in regional competitiveness of the EU countries. This paper analyses the diverse impact of clusters on the competitiveness of highly developed and lesser developed regions on different stages of economic development in the world, EU and Latvia. The aim of this research is to evaluate the impact of clusters on regional policy and competitiveness. Methods used in the research include general and quantitative research methods. The methodological basis for defining the determinants of regional competitiveness is the three-stage system of economic development elaborated by the World Economic Forum. Firstly, the theoretical analysis of regional policies' features is being conducted in the EU. It also includes the analysis of the development of theoretical approach of the regional policy and competitiveness, as well as the systematisation of structural elements, indicators and factors influencing regional competitiveness. Secondly, it analyses origin and nature of the cluster from the economic theory perspective, as well as provides an empirical assessment of the clusters' impact on regional competitiveness from in the world, EU and Latvia. Finally, the paper provides conclusions on research findings about clusters' interaction with regional policy and impact on competitiveness of regions in different stages of development.

Key words: regional policy, regional competitiveness, clusters, impact.

Кластеры как фактор региональной политики и конкурентоспособности

Региональная политика является приоритетом для Европейского Союза, поскольку слишком большие диспропорции между странами ЕС и внутри этих стран остаются актуальными на протяжении последних десятилетий, что приводит к большим различиям региональной конкурентоспособности в странах ЕС, а также в Латвии. В рамках данной статьи анализируется дифференцированное влияние кластеров на конкурентоспособность более развитых и менее развитых регионов, находящихся на разных стадиях экономического развития в мире, в ЕС и в Латвии. Целью данного исследования является оценка влияния кластеров на региональную политику и конкурентоспособность при помощи общенаучных и количественных методов. Методологической основой для определения детерминант региональной конкурентоспособности является система трёх стадий экономического развития, разработанная Всемирным экономическим форумом. В рамках данной статьи проанализированы, во-первых, характерные особенности проводимой в ЕС региональной политики, включая анализ развития теоретических подходов к региональной политике и конкурентоспособности, а также систематизацию структурных элементов, показателей и факторов региональной конкурентоспособности. Во-вторых, изучены сущность и происхождение кластеров с точки зрения экономической теории, а также проведена эмпирическая оценка влияния кластеров на региональную конкурентоспособность в мире, в Евросоюзе и в Латвии. В результате исследования сделаны выводы о влиянии кластеров на региональную политику и конкурентоспособность на различных стадиях экономического развития регионов.

Ключевые слова: региональная политика, региональная конкурентоспособность, кластеры, влияние.

Introduction

The regional policy has become one of the European Union's priorities as result of widening regional disparities between its member states (Barca 2009). Many studies, such as the Report on European Competitiveness (European Commission 2014), the European Trade Union Institute (2011) and study of P. Pachura (2010) indicate huge differences in regional competitiveness of the EU countries, as well as Latvia, which is an important and unsolved challenge; comparison of the Gross Domestic Product (GDP) per capita of NUTS2 regions in the EU shows that the smallest GDP is 16% of the EU average, while the greatest is 343% (European Trade Union Institute 2011).

Sustainable regional policy and competitiveness is crucial for the balanced development of Latvia, especially, considering that important regional disparities, for example in 2015, were at a similar level as fifteen years earlier in 2000. For example, in 2015 the GDP per capita in the Riga Region was almost three times bigger than in the Latgale Region (Central Statistical Bureau of the Republic of Latvia 2019a).

The EU domestic regions differ not only in terms of GDP per capita, but also in terms of such factors as the intensity of use of the Information and Communication Technologies (ICT), which, in turn, directly and strongly correlates with the wealth of regional inhabitants – as the use of ICT is lower, as lower is the income of regional inhabitants and vice versa. Also, the use of ICT in the regions of Latvia shows a considerable inequality. For example, computer and internet were accessible to 68–69% households of the Latgale Region in 2017, while in the Riga Region this indicator was – 83–84% (Central Statistical Bureau of the Republic of Latvia 2019b).

The author analyses the diverse impact of clusters on the competitiveness of regions in different stages of development in the world, EU and Latvia, as well as availability and impact of cluster support instruments on the regional policy in EU regions and Latvia. Clusters and their impact on the regional policy and competitiveness have been a widely studied subject in theory and practice, especially starting from the beginning of 1990s, when M. Porter (1990) laid the basis for development of clusters' theory. Results of modern research provide evidence about essential and statistically approved positive impact on regional competitiveness, including ability to innovate (Solvell, Protsiv 2008), patents (Boasson, MacPherson 2001), employment (Delgado et al. 2010), productivity (Rosenthal, Strange 2008), conditions of work and living (Porter 2003), as well as average salaries and their increase (Matano, Naticchioni 2012). However, not much attention has been given to analysis of the impact of clusters on the competitiveness and regional policy on unevenly developed regions to try to prevent or to decrease these inequalities.

One of the first studies about localization of industries in the Baltic States was done by A. Vanags, J. Basarova and N. Titova (2002) who compared trends of concentration of economics activities in Latvia, Lithuania and Estonia, which reflected potential for cluster development. Later, U. Osis (2004) in his work related the development of clusters to particular regions of Latvia. During the last decade several doctoral theses have been defended, which were researching relationships between clusters and regional policy, and competitiveness. For example, V. Boronenko (2009) in her Doctoral thesis

analyses the interrelation between clusters and competitiveness of regions in the world and Latvia; A. Klepers (2012) in his thesis study the connection between clusters and place-based development in Latvia; Z. Garanti and A. Zvirbule-Berzina (2013) analyses possibilities for creation and development of regional clusters in Latvia, as well as clusters as driving forces for regional development, while I. Kassalis (2011) examines the impact of ports' clusters on the economic development of Latvia. These studies indicate that a successful cluster development is not possible everywhere, but require particular preconditions to be present in specific regions. At the same time, there are studies, which analyse competitiveness, clusters and regional policy from the perspective of depressive regions (Pessoa 2013).

Scientific understanding of the concept of region is a part of the territory with a special set of circumstances determined by nature, socio-economic situation, culture, etc. This paper considers that the main research object of the regional economy is the economic region. For the purpose of achieving the objective of this research, all territories included in the analysis – states and groups of states – will be considered as regions, because the science of regional economy views the region as a territory with specific economy and sometimes borders of the economic region do not correspond to administratively defined borders.

Methods used in the research include general and quantitative research methods. General research methods: the monographically descriptive – an analysis of scientific literature, research results and reports as well as normative documents; a retrospective analysis of clusters development in the world, in the EU and in Latvia in a context of a regional policy and competitiveness; the logical analysis and synthesis for developing a model for assessing the impact of clusters on a regional policy and competitiveness. Quantitative research methods: correlation and partial correlation analysis.

The methodological basis for defining the determinants of regional competitiveness is the three-stage system of regional economic development used by the World Economic Forum's Global Competitiveness Report (Schwab 2015). The nature of a cluster and the evolution of cluster's theories have been researched starting from the theory of A. Marshall (1890) about the effects of specialization in the industrial development regions of England in the 19th century, to the cluster theory created by M. Porter (1990) in the 90s of the 20th century and further developed in the 21st century, which signals about the impact of clusters on regional competitiveness and changes the classical view on the nature of regional competitiveness.

The theoretical and methodological rationale for the regional policy in the European Union is provided by the place-based theory, which the Organization for Economic Cooperation and Development (OECD 2005) calls as a new paradigm of regional policy. At the same time, in order to explain differences of the competitiveness of the regions, an additional attention is paid to other theoretical sources related to the geographical location of economic activities.

Theoretical foundations of regional policy and competitiveness

The theory of a modern regional policy in the EU is grounded on a place-based theory, or F. Barca's theory referring to Professor Barca's Report (Barca 2009). The Report was worked out by a group of researchers and experts under the leadership of F. Barca and contributed to the reform of the EU Cohesion Policy.

Nowadays the policy of a place-based approach is defined as a long-term strategy aimed at overcoming the potential for permanent inadequate use of certain regions of the EU reducing social exclusion level in specific locations through multi-level governance; supporting the supply of integrated products and services in a local context; promoting institutional change. In Latvia, T. Muravska and L. Baltina have studied a place-based approach and its reflection in the EU Cohesion policy planning and implementation (Baltina, 2014; Muravska, Baltina 2017).

The regional policy has a widespread economic or economic geography approach. This is due to traditional practice of considering the region as a socio-economic complex, as well as understanding of the regional development as a socio-economic development. Although economic issues occupy most of this approach, the regional policy is not only about the economy. Along with the economic policy it also involves the national politics. Similarly, the regional development issues are not limited to economic issues only and may be related to political decentralization issues.

By reducing the regional policy awareness, it can only be perceived as a territorial projection of a country's economic policy, and it loses its independence (McCallum 1979). Indeed, if the regional policy has an objective to optimize the socio-economic development of a territory, which is only one of many tasks of a national economic policy. Using this approach, the regional policy cannot be regarded as a particular independent internal policy direction. According to R. Martin (1993) , other regional policy directions are related to preserving the territorial-political system and to ensure an effective balance between the powers of central and regional authorities, and the use and control of resources, as well as relations and cooperation with other regions (Martin 1993).

The European Commission implements the regional policy, mainly taking into account the economic interests and development priorities of the EU Member States. In this respect, the EU regional policy is an investment policy that supports the reduction of disparities or cohesion between the EU's developed and less developed regions by investing in creating new jobs, increasing competitiveness, promoting economic growth and sustainability and improving quality of life to ensure the implementation of the EU's comprehensive strategy "Europe-2020". For example, in the EU programming period 2014–2020, it is planned to invest EUR 351 billion in EU regions for implementation of the Cohesion Policy (European Commission 2013). The implementation of the EU Cohesion Policy is closely linked to the process of implementation of the regional policy by the EU Member States' institutions. The EU Cohesion Policy is being implemented through three main instruments – the European Regional Development Fund (ERDF), the European Social Fund (ESF) and the Cohesion Fund (CF).

For the budget planning of the programming period 2021–2027 the EC proposes to modernize the Cohesion Policy, which is the main EU investment policy, and is one of the most important instruments for the expression of a solidarity principle. The EU investment during 2021–2027 will be implemented according to the five main goals (European Commission 2019):

1) smarter Europe: innovation, digitalization, economic transformation and support for the small and medium businesses;
2) greener, carbon free Europe – execution of the Paris agreement, investment for the transition to renewable energy and the fight against climate change);
3) more connected Europe – strategic transport and digital networks;
4) more social Europe – supporting high-quality employment, education, development of vocational skills, social inclusion and equal access to health care;
5) Europe closer to citizens – supporting a place-based development strategy and sustainable urban development.

Investment in the regional development will focus on the Objectives 1 and 2 and will account for 65–85% (depending on the welfare level of a particular EU country) from the ERDF and Cohesion Fund budgets (European Commission 2019). Under the new Cohesion Policy, the investment will continue to target all EU regions, according to the three defined categories: less developed regions, transition regions and more developed regions.

The European Commission's fifth report states: "Policies tend to develop mutually dependent impacts. Without a proper coordination, the impact of any policy may be much smaller and may even be negative. Consequently, the impact of policies should not be maximized if a fragmented approach is applied and policy decisions are taken in isolation" (European Commission 2010).

In order to address these problems, it is necessary to redefine regional policies, emphasizing the rationalization of priorities to maximize the potential for development of each region. To achieve this, it is important to transfer resources in favour of human capital development, especially in less developed regions where higher returns can be achieved, and to focus on creating a productive environment in order to improve competitiveness of enterprises throughout the region.

Nowadays regional competitiveness has become one of the most important prerequisites for successful regional policy and economic growth in each country. However, there have been many discussions, debates and publications on this topic, the Author believes that a convincing theory to explain competitiveness at national and also regional level still does not exist.

The emergence of the concept of "competitiveness" historically is related to the emergence of a competition phenomenon in the economy during the era of capitalism. If the competition is a particular type of economic environment, then the competitiveness is the ability of an economic subject to exist in this environment. The actuality and significance of competitiveness are increasing with the increasing competition in the global economy, on the one hand, and with the integration of new countries into the system of economic relations of the global market, on the other hand.

The author follows the concept of regional competitiveness defined by the European Commission: "Regional competitiveness is the ability of the region to provide an attractive and sustainable working and living environment for enterprises and citizens" (Annoni et al. 2017) and to some extent is an alternative to another approach proposed, for example, by V. Kosiedowski: "Competitiveness of a region is the sum of competitive advantages of all regional actors" (Kosiedowski 2018). However, the author's position is to perceive the competitiveness of market players operating in the region as a desirable result of the regional competitiveness, not a prerequisite.

In the context of this research regional competitiveness is understood as a region's ability to create and sustain a competitive environment for the economy. This understanding is based on the Porter's theory, as well as on the results of many studies in regional economics and is in line with the definition of the European Commission and, to a certain extent, is an alternative to the approach that recognizes regional competitiveness as a resultative value of competitiveness of market players operating in the region. The systemic analysis of regional competitiveness provided the Author with a conceptual understanding about on the dynamic process of regional competitiveness by conditionally dividing it into several phases: 1) the emergence of competitiveness; 2) the achievement of competitiveness; 3) the result of competitiveness.

As noted by the researchers at the Stockholm School of Economics in Riga, the Baltic International Centre for Economic Policy Studies (BICEPS), in the report on Latvia's competitiveness: "the concept of competitiveness is too complicated to be included in one indicator or even in a set of indicators" (BICEPS 2012). A number of factors that determine regional competitiveness and their classifications are identified in the scientific literature. Finding new factors in the area of regional competitiveness and clarifying the existing ones is one of the most popular areas for research.

Historically, the system of structural elements of the regional competitiveness in the economic theory was developed by M. Porter (1998a), who has named it the Diamond model.

Each of the structural elements of the regional competitiveness, as well as their common set, provides important preconditions for global competitiveness of regional players. If a regional environment allows and supports faster development of innovation and the accumulation of practical experience, regional operators can gain competitive advantage. When the regional environment provides a better flow of information and understanding of the needs of a particular product and / or production process, the regional market participants can gain competitive advantage. If the regional environment forces market players to develop on an ongoing basis, they gain a competitive advantage, as well as increase already existing advantages over time (Pellegrini 2006).

Applying the Porter Diamond Model in the practice of macroeconomic analysis, it should be noted that regions are developing unevenly at different stages of their economic development. This aspect has been explored in detail by the World Economic Forum's Global Competitiveness Reports (Schwab 2015) by dividing all regions into five groups, which correspond to three main stages and two transitional stages of economic development:

1) the stage of production factors, in which the GDP per capita is lower than 2000 USA dollars;

2) the transition from the stage of the factors of production to the stage of efficiency, in which the GDP per capita is between 2000 and 2999 USA dollars;
3) the stage of efficiency, in which the GDP per capita is between 3000 and 8999 USA dollars;
4) the transition from the stage of efficiency to the innovation stage, in which the GDP per capita is between 9000 and 17000 USA dollars;
5) the stage of innovation, where the GDP per capita is higher than 17 000 USA dollars.

The components of indices or sub-indices of the Global Competitiveness Index are determined directly in accordance with the classification methodology of regions and form the three factors, which play a decisive role in each of the three aforementioned main stages of the regional economic development: stage of production factors; stage of efficiency; and stage of innovation. These are the basic conditions (institutions, infrastructure, macroeconomic environment, health care and basic education), efficiency enhancers (higher education and training, product market efficiency, labour market efficiency, financial market development, technological preparation, market size) and innovation / specialization factors, including clusters (business attractiveness, innovation).

Table 1

The importance of regional competitiveness factors at each stage of the economic development

Economic development stages	Main factors of regional competitiveness		
	Basic conditions, %	Efficiency enhancers, %	Innovation and specialization factors, incl. cluster, %
Stage of production factors	60	35	5
Transitional stage	40–60	35–50	5–10
Efficiency stage	40	50	10
Transitional stage	20–40	50	10–30
Innovation stage	20	50	30

Note: for the economies with a high dependence on mineral resources the per capita GDP cannot be a decisive criterion for determining the stage of economic development.

Source: Sala-i-Martín et al. 2016.

As shown in the Table 1, for the regions that are on the stage of production factors the most important factor (60%) for improving competitiveness is the increase in efficiency (35%) and only 5% are depend on the innovation and specialization factors. For the regions which are on the stage of efficiency the significance of the basic conditions is reduced down to 40%, while the role of efficiency enhancers increases up to 50% and becomes decisive, although the importance of innovation and specialization factors at this stage is still very low – only 10%.

Regions that are on the innovation stage and, where the role of basics conditions and effectiveness enhancers is relatively high, the innovation and specialization factors are particularly significant (30%), reflecting the fact that the innovation and specialization factors, including clusters, has the greatest impact on the regional competitiveness at this very advanced stage.

The impact of factors on any socio-economic phenomenon, including regional competitiveness, may have different effects:

1) an incentive effect when a factor improves the state of the phenomenon or its structural elements;
2) braking effect when a factor worsens the state of the phenomenon or its structural elements;
3) neutral effect when a factor does not change the state of the phenomenon or its structural elements;
4) characterizing effect, when a factor – an indicator the state of the phenomenon or its structural elements, presenting it to the outside world and the participants themselves.

Therefore, according to the author, factors determining the regional competitiveness depend on the stage of economic development of a particular region – as lower it is, as more the regional competitiveness depends on the production factors. In turn, at the highest stage of economic development, the innovation, including clusters, plays a key role. Thus, clusters encourage the regional competitiveness, when the region is at the highest – innovation stage of the economic development, while during the efficiency state of the economic development, clusters indicate that the competitiveness of region is increasing and needs an additional support from cluster development, but during the stage of production factors of the economic development, clusters are non-existent. In other words, on the stage of innovation clusters, which level of development usually is high enough, promote and boost the regional competitiveness (Schwab 2015, 2016, 2017). On the lower stages of regional economic development clusters do not play a promoting role for the regional competitiveness, but act as indicators of a particular level of the regional competitiveness.

In Latvia, the clustering is a new process. The analysis of the experience of different EU countries, as well as the findings of this research, permits the author to conclude that the development of a cluster-based economy could form the basis for the long-term development vision of Latvia's economy.

The Latvian government has expressed its support for the European Cluster Memorandum and recognized the importance of clusters in the National Development Plan of Latvia for 2007–2013, in Latvia's Industrial Development Guidelines for 2004–2013, and in the National Innovation Program 2003–2006. Besides, the Latvian National Lisbon Program 2008–2010 defines the need for the development of clusters.

Table 2

Clusters registered in Latvia and their location, 2018

No.	Name of the cluster	Cluster organization	Location
1.	Gauja National Park Tourism Cluster	Association "Tourism Association of the Gauja National Park"	Pieriga – region around Riga
2.	Latvian Electronics and Electrical Engineering Industry Cluster	Association "Latvian Electronics and Electrical Engineering Industry Association"	Riga region
3.	Sustainable Tourism Cluster of Latvia	Association "Latvian Association of Travel Agents and Operators"	Riga region
4.	Metalworking Cluster	Association "Mechanical Engineering and Metalworking Industry Association"	Riga region
5.	Industrial Energy Efficiency Cluster	Association "PASSIVE HOUSE LATVIJA"	Riga region
6.	Clean Technology Cluster	Association "CLEANTECH LATVIA"	Riga region
7.	Pharmaceutical and Related Industries Cluster	Association "Association of Latvian Chemical and Pharmaceutical Entrepreneurs"	Riga region
8.	Latvian Information Technology Cluster	Association "Latvian Information Technology Cluster"	Riga region
9.	Latvian Timber Construction Cluster	Latvian Timber Construction Cluster	Pieriga region
10.	Space Technology and Service Industry cluster	Foundation "Ventspils, Ventspils High Technology Park 1"	Kurzeme region
11.	Food Quality Cluster	Non-profit organization "Latvian Food Producers Federation"	Riga region
12.	Latvian Security and Defence Cluster	Association "Latvian Security and Defence Industries Federation"	Riga region
13.	Latvian Export Cluster	Association "Latvian Chamber of Commerce and Industry"	Riga region
14.	Latvian Life Sciences' Sector Development Cluster LifeScience.lv	Association "Association of Latvian Chemical and Pharmaceutical Entrepreneurs"	Riga region
15.	Latvian Health Tourism Cluster	Association "Latvian Tourism Association"	Pieriga region
16.	Green and Smart Technology Cluster	Green and Smart Technology Cluster	Kurzeme region
17.	Smart City Cluster	Association "Automotive Association"	Riga region
18.	Print and Media Technology Cluster	Association "Latvian Printing Industries Association"	Riga region

Source: created by the author based on the information available on the website of the Ministry of Finance of the Republic of Latvia on EU funds (Latvijas Republikas Finansu ministrija 2018) and cluster websites.

The author considers that the recognition of cluster importance for the economic and regional development by including them in the aforementioned policy documents may have contributed to the fact that in the EU Structural Funds programming period during 2007–2013 and also 2014–2020 targeted support for the cluster development has become possible in Latvia known as the Cluster Support Program, which is co-financed by the European Regional Development Fund (Latvijas Investiciju un attistibas agentura 2018). When the support program was started there was only one officially registered cluster in Latvia – the Latvian Information Technology (IT) Cluster. In result of the provided support 18 registered cluster organizations have received financing for their projects during 2012–2018 (see Table 2).

Table 2 shows that the largest part – 72% – of the registered and supported clusters of Latvia are located in the Riga region, while smaller part – in Pieriga – the region around the capital city of Riga and 2 clusters in the Kurzeme region (the Western part of Latvia). At the same time there are not clusters developing on the rest of Latvia's territory. The author considers that this is an important task of the both, national regional policy makers, to support cluster development in all parts of Latvia by promoting clusters and stimulating enterprises and other players to cooperate. The promotion of the cluster development can help the regional and cluster support policy of Latvia to merge.

The serious problem is approach by the governmental institutions used for the selection of clusters for funding under the Cluster Support Program. There haven't been criteria established, which require a group of enterprises to become a real cluster organization, which, in turn, had created a precedent for any association of SMEs that meets the requirements of quality and compliance with the Cluster Support Program to apply for the financing. For example, in 2017, the Latvian Export Cluster, which was established by the Latvian Chamber of Commerce and Industry created the Latvian Export Cluster consisting of enterprises representing different sectors, but aiming for the same target – to increase their export capacity, and received a financial support from Cluster Support Program. If the selection criteria of the Cluster Support Program will not be changed then it can be considered that its purpose is not the creation and development of new clusters in Latvia, but the provision of short-term funding for SME's projects. It also shows that there is a lack of information and understanding about the nature and importance of clusters for the economic development.

There is only one cluster organization in Latvia – the Latvian Information Technology (IT) cluster, which was initiated in 2000 with the support of the EU PHARE program. The Latvian IT Cluster acted under the Latvian Information and Communication Technology Association for around seven years after it became an independent legal structure in 2007. Consequently, the cluster development in Latvia is at an early stage and the awareness of the impact of clusters on regional policy and competitiveness among policy makers and society at large is not yet sufficient. As the experience of other European countries shows, the focus of each country's and even region's cluster support policy may vary, the targeted application of support programs and funding is mainly directed for those priority areas, which are based on comparative advantages. The cluster development experience of other EU countries indicated that this process

is greatly facilitated by the economic policy instruments. Therefore, the state support for development of clusters is vital and, especially important in early stages of cluster development.

The experience of different countries for facilitating the cluster development and using the cluster's approach for innovation, business and investment promotion, as well as for improving the cluster policy implementation is very important for increasing the regional competitiveness of Latvia, achieving national and regional specialization, and exploiting more successful own competitive advantage. The fact that cluster initiatives have been actively developing in Latvia demonstrates that enterprises are beginning to recognize and use the opportunities, which are provided by clusters.

The concept of cluster and its interaction with the regional policy

The use of the term "cluster" begun simultaneously in several scientific sectors. In economics, for the first time, the concept of "cluster" was introduced by M. Porter (1990). He concluded that the emergence of one or more regional players in a regional economy with a high level of competitive advantage contributes to an increase in the competitive advantage of suppliers and consumers. M. Porter introduced the term "sectoral cluster", which is an informal union of sectoral and mixed regional markets' shareholders, characterized by the increased competitive advantage as a result of their interaction, as well as high production quality requirements. Nowadays competition in the global market is implemented by forming the groups (clusters) of market participants, but not with the help of separate regional market players, but by forming groups (clusters) (Porter 1998b). In M. Porter's view, the stronger the regions' internal market competition and the higher customer demands are, the greater is a probability of the success of regions' economic players in the global economy.

M. Porter's cluster theory was analysed by another US scientist, M. Enright (1992), who grounded the nature of the regional cluster and defined it as follows: "The regional cluster is the industrial cluster where the cluster's members are geographically close to each other. The regional cluster is a geographic agglomeration of enterprises and organizations, which operate at the same or several related sectors of economy" (Enright 1992). In Latvia the concept of the cluster in terms of belonging to a specific region was firstly mentioned in 2004 by U. Osis, an expert in cross-sectoral strategic planning, in the report "On the national program of Latvian forest and related industries" (Osis 2004).

Simultaneously, with the introduction of the term "cluster" in theory and practice of the science of economics, first attempts to investigate regularities of the formation of clusters were made. It should be taken into account that it was the beginning of the economic globalization phase, stimulated by a rapid spread of new information technology, first of all the Internet. Thus, during this period, the formation of an information society begun. M. Porter argued that the agglomeration has more prospects for success in the present conditions of globalization than it is for separate market players. Moreover, the competitiveness of market participants is determined by the economic environ-

ment where they operate (Porter 1986). By studying more than 100 industries' competition positions in different regions, M. Porter drew attention to the fact that in a global market competitive economic subjects of a particular sector are usually concentrated in the same region, and this is not necessarily coincidence. One or more economic subjects reaching a competitive edge in the global market have an impact on the surrounding environment of suppliers, consumers and competitors. On the other hand, a favourable environment positively affects the further increase in competitiveness of this economic subject. Ultimately, a "cluster" or a collection of economic subjects, which operate in the same industry emerges, promoting the competitiveness of each other as a result of mutual interaction (Porter 1990).

The appearance of clusters in the theory of economics was a result of the formation of a regional economy. It is not by a coincidence that analysing clusters' history M. Porter mentions the founder of the regional economy W. Isard (1956) who was leading development and institutionalization of the regional economy during 1950ies of 20th century. The term "cluster" contains the territorial aspect, which became topical during the period of regional economic development. Clusters can, therefore, be seen as a form of an economic interaction, which has emerged in the context of regional economic development.

The theoretical definition of the concept of "cluster" is a complex task that the Author attempts to address in this research. The problem of the definition of a cluster results from the fact that there's a large number of cluster definitions, which makes it difficult to identify the steps for developing theoretical guidelines of this concept, which distinguishes it from other concepts. At present, the science of economics encounters difficulties for defining the concept of "cluster". For example:

- different economic phenomena are understood by the term "cluster";
- content wise there are similar terms, which are differently defined;
- it is not clear, how the cluster differs from other forms of the economic interaction.

Considering different definitions of the cluster and the fact that even the definitions created by one author or institution differ during different periods, it would be logical before starting with the scientific conceptualization of the concept of cluster first of all to look at the primary source – works of M. Porter, who has introduced this concept in the theory of economics. The most recent interpretation of the term "cluster", which could be appropriately taken for this study, is the definition found on the website of the U.S. Portsmouth based Strategy and Competitiveness Institute of the Harvard Business School: "The cluster is a network of interconnected enterprises, specialized suppliers, service providers and geographical concentration of the institutions involved in a particular sphere in a country or a region" (Institute for Strategy and Competitiveness of the Harvard Business School 2018).

The cluster's main features, which are based on the classical definition of M. Porter (1998a), are:

1) the cluster is an economic subject, but it isn't a legal person (the cluster's members are legal persons);

2) although members of the cluster are legally independent, they are, however, economically interconnected;
3) in terms of type of activity and economic status, the members of a cluster may be different;
4) the cluster's members are geographically close and function in the same region.

The main thing to be understood when defining and exploring clusters: the cluster is one of the forms of economic interaction that lies between occasional market transactions, on the one hand, and fusion and exposure on the other. Thus, the cluster is a form of the economic interaction of members of the market, which at the same time meets the following main requirements: 1) legal independence of the participants; 2) economic interconnection of the participants; 3) diversity of activities and statuses of participants; 4) geographic concentration of participants in the same region.

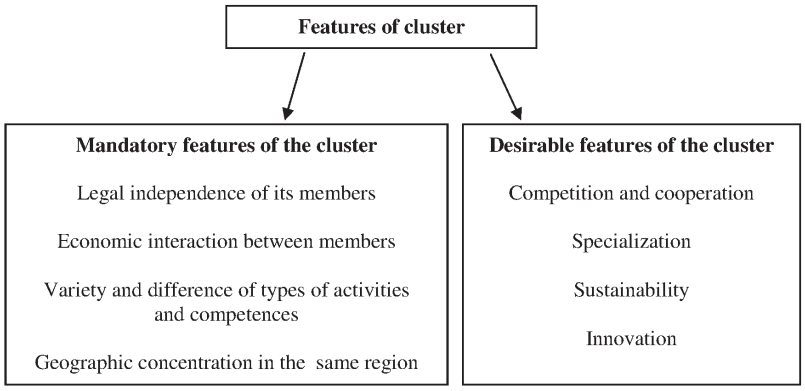
A comparative analysis with other forms of cluster and market participants' economic interaction allows us to conclude that a more distinctive feature of the cluster is the diversity of its participants and their statuses, which indicates the expansion of economic activity beyond the boundaries of a commercial production or the impossibility to achieve economic efficiency without partnership with "non-production" institutions. Another hallmark differing the cluster from other forms of market interactions is their attraction to a particular region, which suggests that the emergence of clusters in the science of economics and also in practice is linked to a necessity to increase the competitiveness of a particular region in the context of globalization. This gives a rise to the answer of question on the economic utility or advantages of clusters as compared to other forms of economic interaction between market participants: the cluster is important because regional operators can compete in the global market by organizing local production in clusters, i.e., to produce goods and provide services for export. Exports are both a goal and an empirical, quantifiable measure of the performance of a cluster.

By conceptualizing the concept of a cluster, one can also use the definition method offered in the Swedish project "The Cluster Policies White book" (Andersson et al. 2004). The authors of this project, recognizing the objective ambiguity of the concept, propose not to formulate it, but to indicate the main characterizing elements by which the concept "cluster" can be identified. Unlike M. Porter, they offer a wider list of such elements by adding the desirable cluster features: 1) specialization – the type of core activity that determines the formation of a cluster; 2) competition and cooperation – this combination reveals the link between cluster's members; 3) cluster "life cycle" – clusters and cluster initiatives are not a temporary phenomenon, they are created with a long-term perspective; 4) innovation – the cluster participants are involved in the technological, commercial and knowledge sharing process.

By synthesising studies of M. Porter and other scholars, such as the research and quantification of the intra-industrial connections by A. Host et al. (Host et al. 2018), as well as on the basis of comparative analysis of the forms of economic interaction, a scheme for the "cluster" could be created (see Figure 1).

Figure 1

Scheme of cluster's features



Source: created by the author based on Porter (1998a); Institute for Strategy and Competitiveness of the Harvard Business School 2018; Andersson et al. 2004.

The author offers a definition: the cluster is a form of an interaction between legally independent, but economically related regional players with different statuses, which is established for achieving competitiveness on the global market. This definition was developed to clarify the most significant differences between the cluster and other forms of economic interactions, i.e., the variety of diversity and statuses of its members, as well as the attraction of a cluster to a particular region.

The characteristics of the cluster life cycle are closely linked to regional politics and competitiveness. For example, clusters include affiliated industries that are important for regional competitiveness. They can be, for example, specialized suppliers of production components, production equipment, services and providers of specific infrastructure. Clusters usually include production of complementary products and side products for consumers, and particular channels, as well as similar skills, technologies and/or they are mutually related by joint investment or raw materials. Many cluster organizations involve in cooperation public administration – government bodies, as well as higher education and research institutions, agencies, "brain centres", vocational education institutions, business support organizations, etc. that provides professional and higher education, information, research opportunities and technical support. Enterprises, which create such synergies, not only by competing but also by cooperating on behalf of common interests, each create life cycles of clusters in its field of activity. The cooperation can even exist in a highly competitive environment, as these interconnected enterprises will, in turn, be linked to a different market target group and will work with other partners.

To assess the cluster's ability to influence the regional policy, first of all it's necessary to determine the existence of the cluster itself and its development potential in a particular country or region. International scientific studies on cluster's identification conducted by, for example, Swedish scholars G. Lindqvist, A. Malmberg and O. Solvell (2003), O. Solvell, G. Lindqvist and C. Ketels (2009), as well as US scientist J. Cortright

(2006), Polish scientists W. Kaminski and M. Mularczyk (2006), Danish scientists T. Andersen, M. Bjerre and E. Hansson (2006) and Italian scientists M. Maggioni and M. Riggi (2002) present the scientific basis for the application of economic indicators (enterprises, labour, value added) which, depending on the availability of statistical data, can be used to measure the territorial concentration of sectors, industries, sub-industries and clusters in countries, regions and others. etc.

The impact of a cluster on regional competitiveness in the world, the European Union and Latvia

The theoretical and methodological basis for determining the impact of clusters on regional competitiveness is reflected by M. Porter's theory, in particular, the Diamond model, which is the systemic model of regional competitiveness. One of the rhombus peaks – the cluster, is one of the prerequisites for regional competitiveness (Porter 1998a). Therefore, it can be concluded that the cluster is a regional competitiveness factor. However, given that the regions are in different stages of economic development, which have different factors influencing regional competitiveness at each stage, it can be argued that, for example, at the stage of efficiency, the cluster is not a factor, but indicator of the regional competitiveness. This means that at the stage of efficiency, unlike the innovation stage, clusters do not promote competitiveness (boosting influence), but indicate that the region has reached a chaptericular level of competitiveness (characterising effect) to be able to further develop and move to a higher stage of economic development.

At the stage of production factors the main factors of regional competitiveness are cheap labour and raw natural resources, at the next – stage of efficiency the main factors of regional competitiveness are efficiency and productivity of producing goods and services. At these two stages of economic development, the innovation, including clusters, is of a minimal importance (see Table 1).

Thus, it can be assumed that at the stage of production factors and at the stage of efficiency, the cluster is likely to be an indicator rather than a regional competitiveness factor, because clusters appear only, when the region reaches a certain level of competitiveness and at the same time indicates if the region is competitive enough and ready to move to the highest level of the economic development – stage of innovation. At the highest stage the cluster already contributes to the regional competitiveness and is a regional competitiveness factor. This means that the regional economic development stages must be taken into account when determining the impact of clusters on regional competitiveness.

The Global Competitiveness Report (GCR) of the World Economic Forum provides an empirical indicator measuring the State of Cluster Development, which, like the Global Competitiveness Index ranks regions / countries according the development of clusters. The indicator "State of the Cluster Development" measures the development of clusters corresponding to the scale from 1 to 7 – from "no cluster" state to "clusters are developed in many sectors" state. The State of Cluster Development is indicating

the ability of a region to mobilize and attract key economic players to cooperate for stimulating growth and developing innovation.

The author assumed that there is a correlation between the ranking of the competitiveness of regions included in the GCR and the development of clusters. Therefore, to empirically approve this correlation relationship and hence the effect of clusters on regional competitiveness, the certain algorithm has been worked out:

1) regions participating in the global competitiveness ranking in 2015, 2016 and 2017 have to be selected; the form for determining the correlation relationship between the cluster development and the competitiveness has to be chosen; the mathematical direction and strengths of the correlation coefficient between the competitiveness index and the State of Cluster Development indicator rankings has to be calculated.
2) the analysis of correlation strengths indicated in point 1 per groups of regions located at different stages of the economic development: the stage of production factors; the stage of efficiency; and the stage of innovation must be performed in order to determine the stage of economic development with the strongest and the most significant.
3) the analysis of the correlation per groups of regions, which differ by their membership in the European Union in order to clarify whether this relationship is stronger and more significant in the EU than outside the EU.

The implementation of such an algorithm allows empirically proves the impact of clusters on regional competitiveness. For this purpose, the ranking of each region according to the State of the Cluster Development and the competitiveness index, as well as the stage of competitiveness of each region and its membership in the EU were entered into the SPSS computer program for further processing and analysis.

According to the calculation the correlation between the two variables of the analysed ratings is strong or moderate strong: in 2015, the correlation coefficient was .744; in 2016 – .760; and in 2017 – .735, as well as very significant, since the correlation coefficient in all cases reaches the statistical significance level $p \leq 0{,}01$. In all three periods the investigated relationship is positive – this means that as higher is the region's competitiveness index, as greater is the cluster development status indicator for this region, or vice versa. Taking into account that the Spearman's ranking correlation coefficient does not indicate the "logical" (1) direction of this correlation, i.e., to which the variable has a determinative role and, to which the variable has a resultative role, this is necessary to use the above exaggerated theoretical substantiation indicating that the type of impact of clusters on the regional competitiveness depends on the stage of economic development of a particular region. In turn, the result of correlation analysis is a quantitative measurement of the strengths of this influence.

This is possible that depending on the stage of the economic development of a region, the correlation between its competitiveness and the development of clusters may vary. It can be verified by dividing the data array into groups according to stages of economic development of regions for calculating the correlation coefficient of Spierman's ranking between the region's Global Competitiveness Index and the State of Cluster Development of clusters for each group.

Table 3

Correlation between the Global Competitiveness Index and the State of Cluster Development of regions at each stage of the economic development, Spearman's rank correlation coefficient, 2015–2017

Economic development stages	2015, number of regions – 140	2016, number of regions – 138	2017, number of regions – 137
Stage of production factors	.465**	.525**	.396*
Efficiency stage	.419*	.443*	.452*
Innovation Stage	.761**	.716**	.727**

Note: * correlation is significant at a level of .05 on both sides of the statistical significance; ** correlation is significant at .01 on both sides of the statistical significance level.

Source: calculated by the author using SPSS computer program by data from Schwab 2015, 2016, 2017.

According to the calculations it can be concluded that exactly at the innovation stage the correlation between the regional competitiveness index and the cluster development status indicator is close and very significant (see Table 3). In other stages of the economic development – the stage of production factors and the stage of efficiency – the correlation between the Global Competitiveness Index and the State of Cluster Development ranking indicator is moderate and less significant.

At each stage of the economic development, the average rank of both, the Global Competitiveness Index and the State of Cluster Development varies considerably, however, a statistically significant correlation between these two variables exists at all stages, although it is much stronger at the stage of innovation, which is consistent with data from the Table 2 and shows that at the stage of innovation specialized factors, including clusters, affect regional competitiveness at the most – 30% compared to 10% for the efficiency stage and 5% for the stage of production factors.

Thus, in relation to the factors of production stage and the efficiency stage it can be concluded that as higher is the level of competitiveness of the region, as higher is the level of cluster development reached by a particular region. Conversely, as lower is the level of competitiveness of the region, as lower is the development of clusters of this region, is because low competitiveness also means poorer quality of the business environment, where clusters could be created. In turn, at the stage of innovation the level of the economic development of region and the cluster development are higher, which also means that the competitiveness of a region is higher, because the clusters at the innovation stage of the economic development of region contribute to the regional competitiveness.

The focus of this article is on EU, thus, the correlation between the Global Competitiveness Index and the State of Cluster Development should also be investigated comparing the region's belonging to the EU with those outside the EU. The result of the correlation analysis carried out by the author shows that although the close and statistically significant correlation between the Global Competitiveness Index and the State of Cluster Developmental is observed both, for the EU regions and regions outside the EU, it is still stronger for the EU regions during all three years of the

research (2015, 2016, 2017). Thus, it can be assumed that the relationship between the Global Competitiveness Index of regions and the State of Cluster Development is a "European phenomenon", i.e., more specific for the EU than for the rest of world. This assumption can be verified by a partial correlation method, which helps to control a possible impact of the stages of economic development regions on the correlation of investigated variables (see Table 4).

The close correlation between the region's competitiveness and the development of clusters has been empirically proven using a correlation analysis involving more than 100 regions included in the WEF's research. According to the results of correlation analysis the competitiveness of regions is related to the level of development of clusters, however, the type of impact of clusters – boosting, braking, neutral or characterising – depends on the stage of region's economic development.

Table 4

Partial correlation* between the Global Competitiveness Index and the State of Cluster Development of regions depending on the EU's membership, Spearman's rank correlation coefficient, 2015–2017

EU membership	Spearman's rank correlation coefficient, r	Statistical significance, p	Number of countries, n
2015, n=140			
EU countries	**.750**	.000	28
Non-EU countries	**.525**	.000	112
2016, n=138			
EU countries	**.734**	.000	28
Non-EU countries	**.556**	.000	110
2017, n=137			
EU countries	**.832**	.000	28
Non-EU countries	**.529**	.000	109

Note: controllable variable – the stage of economic development of the regions.

Source: calculated by the author using SPSS computer program by data from Schwab 2015, 2016, 2017.

By examining a "clean" (without economic development stages) correlation between the Global Competitiveness Index and the State of Cluster Development, it can be concluded that a closer link for this relationship is indeed typical for Europe, although it is also characteristic for the whole world. Also, it does not conflict with the fact that the cluster theory and clusters themselves are "born" in America. While the US leadership in terms of clustering of economics remains unquestionable, the other region of the world where the impact of clusters on the regional competitiveness is particularly pronounced, is the European Union.

For determining the impact of clusters on competitiveness of the Latvian regions, first of all they should be grouped by to the stages of economic development according to the World Economic Forum classification principle (see Schwab 2015).

Table 5

The stages of economic development of the regions of Latvia, 2015

Regions of Latvia	GDP per capita in 2015, EUR	Stage of the economic development
Riga region	20 551	Innovation stage
Pieriga region	9843	Transition from the efficiency stage to the innovation stage
Vidzeme region	8061	Efficiency stage
Kurzeme region	9047	
Zemgale region	7274	
Latgale region	6839	
LATVIA in total	12 316	Transition from the efficiency stage to the innovation stage

Source: created by the author according to the data of the Central Statistical Bureau of the Republic of Latvia 2019a and Schwab 2015.

The analysis of the economic development and competitiveness of the statistical regions of Latvia following the methodology of the World Economic Forum shows that the only region of Latvia, which is competitive on a global scale is the Riga region situated on the innovation stage (see Table 5). And from the global point of view the whole territory of Latvia can be considered as being situated on the transition from the efficiency stage to the innovation stage. Almost the rest of Latvia's territory is in the stage of efficiency indicating that its competitiveness on the global market is relatively low (in a case of the Pieriga region, which is in the transition from the efficiency stage to the innovation stage, the GDP per capita is still very close to the GDP per capita at the efficiency stage).

In order to quantify the impact of clusters on the competitiveness of the regions of Latvia, this is necessary to calculate the importance of clusters in regional competitiveness expressed by the export (which is a regional competitiveness indicator) along with some other potential regional competitiveness factors (Gaglio 2015). The method for the quantitative analysis of the impact of clusters on the competitiveness of regions of Latvia was chosen taking into account that the empirical indicator of regional competitiveness – the export indicator, is not calculated from other indicators, but is a separately measureable indicator. The multi-collinearity of factors included in the analysis was also taken into account. In result, a correlation analysis was performed between the export by regions of Latvia and each individual probability factor of regional competitiveness using the Kendel correlation coefficient (2). The correlation analysis was carried out for all regions of Latvia together and for the individual regions of Latvia, except the Riga region, in order to demonstrate that the factor influence of clusters manifests itself only in the Riga region.

According to the correlation analysis, such factors as total industrial production, State Cluster Development, number of scientific institutions and non-financial investment contribute to the competitiveness of regions of Latvia (see Table 6). As the non-financial investment indicator correlates with the number of scientific institutions

and the total amount of industrial output, it can be considered as an indirect competitiveness factor. However, the other three factors, including the State of Cluster Development, are significant factors for assessing the competitiveness of the regions of Latvia.

However, the situation is different if we look at the results of correlation analysis for the regions of Latvia, excluding the Riga region. In this case the only factor contributing to regional competitiveness is the total amount of industrial production, which is a factor that theoretically promotes the regional competitiveness on the stage of efficiency. The factors, such as the State of Cluster Development and a number of scientific institutions are innovation factors, which affect the competitiveness only in the Riga region, which is on the stage of innovation. For time being clusters aren't expected to be a competitiveness factor in Vidzeme, Kurzeme, Zemgale and Latgale regions due to a lower level of their development. In such economic and social environment clusters can develop and function indicating that a particular region of Latvia is ready to move to the next – the highest stage of economic development, which is the stage of innovation.

Table 6

The importance of various factors of Latvia's regional competitiveness, Kendel's correlation coefficient with the regions' export, 2015

Regional competitiveness – export – possible factors	Regions of Latvia including Riga region		Regions of Latvia without Riga region	
	Correlation coefficient	Bilateral significance	Correlation coefficient	Bilateral significance
1	2	3	4	5
Total industrial output (EUR) per 1 inhabitant	**.943****	.005	**.900***	.037
State of Cluster Development, points from 1 to 10	**.880***	.021	.830	.118
Scientific institutions per 100 000 inhabitants	**.829***	.042	.700	.188
Non-financial investment (at constant prices in 2016, EUR) per capita	**.829***	.042	.700	.188
Innovative enterprises per 10 000 people	.771	.072	.600	.285
Gross Domestic Product (real prices, EUR) per 1 inhabitant	.600	.208	.300	.624
Economically active enterprises (per unit) per 1000 inhabitants	.600	.208	.300	.624
Total added value (real prices, EUR) per inhabitant	.600	.208	.300	.624
Researchers (people) per 10 000 inhabitants	.486	.329	.100	.873°

Sequel to Table 6 see on the next page

Sequel to Table 6

1	2	3	4	5
Population density (persons) per 1 km^2	.486	.329	.100	.873
Employees (people) per 100 inhabitants	.486	.329	.100	.873

Note: * correlation is significant at a level of .05 on both sides of the statistical significance; ** correlation is significant at .01 on both sides of the statistical significance level.

Source: the author's calculations according to the data of the Central Statistical Bureau of the Repubic of Latvia; State of Cluster Development of Latvian regions is estimated by the author.

Based on the research of the impact of clusters on the competitiveness of Latvian regions, the author has proved that clusters of the Riga region, which is at the innovation stage, are an important factor contributing to the regional competitiveness. In turn, almost the rest of the territory of Latvia (except for the Pieriga region located around Riga) is at the stage of efficiency and, thus, is not competitive enough to promote an active development of clusters. In order to increase the regional competitiveness of Latvia, the most important factor is the productivity.

Conclusions

- The framework for the contemporary EU regional policy has been build based on the place-based theory, which emphasizes the dichotomy "environmental prosperity – human prosperity" in connection with the territorial redistribution of economic activities; the distribution of EU regional policy financial instruments is in line with its main objectives.
- The nature of regional competitiveness is expressed by the ability of the region to create and ensure a competitive environment for economic development. This conceptual understanding is based on M. Porter's theory, as well as on the results of many studies in regional economic science. It is in line with the definition of the European Commission.
- Institutional and financial instruments of the EU regional policy are important for the regional competitiveness. They are sufficiently effective being actively used by supported territories, but these support instruments alone are not enough to significantly increase their competitiveness. It is, therefore, necessary to use other innovative regional competitiveness tools such as clusters.
- The system of the structural elements, indicators and influencing factors of the regional competitiveness developed by the author includes the elements of regional competitiveness, which constitute components of the regional competitiveness as well as indicators, that characterize regional competitiveness or indicate the achieved level of regional competitiveness) and factors, which in different ways and with different force influence regional competitiveness.

- The main challenge related to regional competitiveness elements, indicators and influential factors is that the elements, indicators and factors can simultaneously play different roles. For example, any indicator can also act as an internal factor, i.e. it doesn't only characterize the regional competitiveness and indicate its level for a particular region, but this indicator can also act as a factor influencing the level of regional competitiveness.
- Competitiveness factors depend on the level of economic development of the region – the lower it is the more regional competitiveness depends on the production factors. While in the regions with a high level of economic development, a key role is played by innovations, as well as by clusters the impact of which on regional competitiveness is defined as the incentive at the stage of innovation and as the characterizing at the efficiency stage.
- The term "cluster" originally appeared in the science of economics as a phenomenon of regional economics, emphasizing the aspect of regional localization in economic interactions. The cluster is one of the forms of economic interaction between the market participants. Two features: the diversity of types and statuses of activities of its members, as well as geographic concentration in one region, distinguish clusters from other forms of interaction.
- The author offers the definition of cluster, which corresponds to the basic principles for the definition of the term established by the Terminology Commission of Latvian Academy of Sciences: the cluster is a form of interaction between legally independent, but economically related regional market participants of different statuses, which is created to achieve competitiveness on the global market. This definition is created to clarify the key differences between the cluster and other forms of economic interactions.
- The practice of clustering in Latvia is relatively new and requires constant state support. Starting from 2012, the most successful cluster initiatives in Latvia are financially supported by the state managed Cluster Support Program. If the selection criteria of selecting clusters to be supported by this programme are not improved, it can be considered that its aim is not the creation and development of new clusters in Latvia, but the provision of short-term financing for the financing of SME (Small and medium-sized enterprises) projects. In Latvia, the only one cluster organization has been active in a long-term – the Latvian Information Technology Cluster, which was officially established in 2007.
- According to the author, the state support for clusters should be implemented in two directions: 1) for competitive clusters in a form of direct funding for cluster projects proposed by the potential or actual cluster members; 2) for uncompetitive cluster initiatives, or for small, specific niche cluster initiatives, the stimulation of the environment and the creation of such ecosystem which helps to create cluster initiatives through training of entrepreneurs and employees, financing research and cooperative activities, the internationalization of enterprises etc. When creating the cluster support programmes and setting the conditions for participation in calls, the responsible institutions should take into account the characteristics and nature of the cluster in order not to result in the situations where support can be

obtained by any groupings of joint undertakings stating common objectives, such as to promote exports.

- The State of Cluster Development, as well as the trends of the economic activity concentration, which are usually visible before cluster creation, in a chaptericular territory can signal to regional policy makers about regional competitiveness achieved and regional specialization. Only in those places where clusters have already developed and operate, for example in Latvia clusters are mainly located in the Riga region, their activities can influence the decisions of regional policy makers.
- Clusters are usually not developing at the stage of the production factors of the regional economic development. At the efficiency stage, clusters are a regional competitiveness indicator, which shows that the region has reached a particular level of competitiveness, where cluster development can be promoted. While at the stage of innovation, the clusters are a regional competitiveness factor and, as the correlation analysis shows, their impact on the regional competitiveness is strong and statistically significant ($r = .727$, $p = .000$).
- When studying the impact of clusters on the competitiveness of Latvia's internal regions, the Author has proved that it is precisely in the Riga region, which is the only one in Latvia at the stage of innovation, where clusters are a significant factor of the regional competitiveness, along with some other factors having an impact on the regional competitiveness at the innovation stage. In the territory of Latvia outside Riga, the most important factor for competitiveness is the productivity of industrial production ($r = .900$, $p = .037$).

Notes:

(1) The author proposes a term to distinguish principally different directions of the nature – "logical" and "mathematical", which are always simultaneously analyzed in the process of correlation analysis.

(2) The Kendel correlation coefficient is chosen due to the variability of the correlated variables.

References

Andersen T., Bjerre M., Hansson E. (2006) *The Cluster Benchmarking Project: Pilot Project Report – Benchmarking Clusters in the Knowledge Based Economy*. Copenhagen, DE: FORA.

Andersson T., Schwaag-Serger S., Sorvik J., Hansson E. (2004) *The Cluster Policies Whitebook*. Sweden: IKED.

Annoni P., Dijkstra L., Gargano N. (2017) The EU Regional Competitivenss Index 2016. *European Commission's Working Papers*. Available: http://ec.europa.eu/regional_policy/sources/docgener/work/201701_regional_competitiveness2016.pdf (accessed on 30.04.2019).

Baltina L. (2014) *Uz vietu balstitas pieejas izmantosana regionalas attistibas planosanas pilnveidosanai Latvija*. Promocijas darbs. Riga: Latvijas Universitate. (In Latvian)

Barca F. (2009) An agenda for a reformed cohesion policy: a place-based approach to meeting European Union challenges and expectations. *Independent report prepared at the request of Danuta Hubner, Commissioner for Regional Policy*. Available: http://www.europarl.europa.eu/meetdocs/2009_2014/documents/regi/dv/barca_report_/barca_report_en.pdf (accessed on 30.04.2019).

BICEPS. (2012) *Latvijas konkuretspejas novertejums 2011*. Available: http://www.biceps.org/assets/docs/LCR_LV_1804_Final_1.pdf (accessed on 30.04.2019). (In Latvian)

Boasson V., MacPherson A. (2001) The role of geographic location in the financial and innovation performance of publicly traded pharmaceutical companies: empirical evidence from the United States. *Environment and Planning* A, Vol. 33, pp. 1431–1444.

Boronenko V. (2009) *Klasteru pieeja regionu attistibai zinasanu ekonomikas apstaklos*. Daugavpils: Daugavpils Universitates Akademiskais apgads "Saule". (In Latvian)

Central Statistical Bureau of the Republic of Latvia. (2019a) IKG10_11. Gross domestic product in statistical regions and cities (at current prices). *Statistical tables*. Available: https://data1.csb.gov.lv/pxweb/en/ekfin/ekfin__ikp__reg/IKG10_110.px (accessed on 30.04.2019).

Central Statistical Bureau of the Republic of Latvia. (2019b) ITMG010. Availability of computer/Internet at different types of households at the beginning of the year (% of total households in the respective group). *Statistical tables*. Available: https://data1.csb.gov.lv/pxweb/en/zin/zin__01ikt_datori__MS/ITMG010.px (accessed on 30.04.2019).

Cortright J. (2006) Marking sense of clusters: regional competitiveness and economic development. *A Discussion Paper prepared for the Metropolitan Policy Program*. Available: https://www.brookings.edu/research/making-sense-of-clusters-regional-competitiveness-and-economic-development/ (accessed on 30.04.2019).

Delgado M., Porter M., Sternm S. (2010) Clusters and entrepreneurship. *Journal of Economic Geography*, Vol. 10, No. 4, pp. 1–24.

Enright M. (1992) Why local cluster are the way to win the game. *World Link*, No. 5, pp. 116–142.

European Commission. (2010) *Investing in Europe's Future*. Fifth report on economic, social and territorial cohesion. Available: http://ec.europa.eu/regional_policy/sources/docoffic/official/reports/cohesion5/pdf/5cr_part1_en.pdf (accessed on 30.04.2019).

European Commission. (2013) *EU Multiannual Financial Framework 2014–2020 and EU Budget 2014*. Available: file:///C:/Users/ESC/Downloads/KV0413055ENC_002%20 (2).pdf (accessed on 30.04.2019).

European Commission. (2014) *European Competitiveness Report 2014: Helping Firms Grow*. Available: http://ec.europa.eu/enterprise/policies/industrial-competitiveness/competitiveness-analysis/europeancompetitiveness-report/index_en.htm (accessed on 30.04.2019).

European Commission. (2019) *Regional Development and Cohesion Policy Beyond 2020: The New Framework at a Glance*. Available: http://ec.europa.eu/regional_policy/en/2021_2027/#1 (accessed on 30.04.2019).

European Trade Union Institute. (2011) *Regional Inequalities in Europe*. Available: https://www.etui.org/content/download/5425/53612/file/Chap+7.pdf (accessed on 30.04.2017).

Gaglio C. (2015) Measuring country competitiveness: A survey of exporting-based indexes. *GREDEG Working Paper Series*, Working Paper No. 2015-42.

Garanti Z., Zvirbule-Berzina A. (2013) Regional cluster initiatives as a driving force for regional development. *European Integration Studies, Kaunas University of Technology*, No. 7, pp. 91–101.

Host A., Zaninovic V., Mirkovic P.A. (2018) Firm-level intra-industry links in Croatia's tourism industry. *Journal of Economics and Business* (Proceedings of Rijeka Faculty of Economics), Vol. 36, No. 1, pp. 243–262.

Institute for Strategy and Competitiveness of the Harvard Business School. (2018) *Official home page*. Available: https://www.isc.hbs.edu/Pages/default.aspx (accessed on 30.04.2019).

Isard W. (1956) *Location and Space Economy*. New York: Technology Press and John Wiley.

Kaminski W., Mularczyk M. (2006) Development and distribution of private microfirms in mid-size Polish towns during the transformation period. *Miscellanea Geographica*, Vol. 12, pp. 175–184.

Kassalis I. (2011) Industrial clusters: a factor for integrated development. *Intellectual Economics*, *Mykolo Romerio University*, Vol. 10, No. 2, pp. 212–223.

Klepers A. (2012) *Turisma telpiskas strukturas Latvija, to veidosanas, izpausmes un nozime galamerku virzibai tirgu*. Promocijas darbs. Riga: Latvijas Universitate. (In Latvian)

Kosiedowski W. (2018) *Regiony Europysrodkowo-wschodniej w procesie integracji*. Torun: Wydawnictwo Naukowe Uniwersytetu Mikolaja Kopernika, s. 65. (In Polish)

Latvijas Republikas Finansu ministrija. (2018) *ES fondu portals*. Available at: https://www.esfondi.lv/ (accessed 30.04.2019). (In Latvian)

Latvijas Investiciju un attistibas agentura. (2018) *Klasteru programma*. Available: http://www.liaa.gov.lv/lv/es-fondi/aktivitates-kuru-ieviesana-noslegusies/klasteru-programma (accessed on 30.04.2019). (In Latvian)

Lindqvist G., Malmberg.A., Solvell O. (2003) *Svenska Klusterkartor*. Uppsala: NUTEK. (In Swedish)

Maggioni M.A., Riggi M. (2002) *Clustering Dynamics and the Location of High-Tech Firms*. Heidelberg, New York: Springer-Verlag.

Marshall A. (1890) *Principles of Economics: An Introductory Volume*. London: Macmilan.

Martin R. (1993) Reviving the economic case for regional policy. In: Hart M., Harrison R. (Eds.). *Spatial Policy in a Divided Nation*. London: Jessica Kingsley, pp. 270–290.

Matano A., Naticchioni P. (2012) Wage distribution and the spatial sorting of workers. *Journal of Economic Geography*, Vol. 12, No. 2, pp. 379–408.

McCallum J.D. (1979) The development of British regional policy. In: Maclennan D., Parr J.B. (Eds.). *Regional Policy: Past Experience and New Direction*, Vol. 6, pp. 25–27. Glasgow: Social and Economic Research Studies.

Muravska T., Baltina L. (2017) What institutional arrangements for coherent EU Cohesion policy planning and implementation? In: Berkowitz P., Bachtler J., Hardy S. Muravska T. (Eds.). *EU Regional Policy: Reassessing Performance and Direction*. Routledge Taylor & Francis Group, pp. 271–283.

Osis U. (2004) *Par Latvijas meza un saistito nozaru nacionalo programmu: starpnozaru strategiskas planosanas eksperta zinojums*. Riga, 2004. gada 21. junijs. (In Latvian)

Pachura P. (2010) *Regional Cohesion: Effectiveness of Network Structures*. Berlin, Heidelberg: Springer-Verlag

OECD. (2005) *Building Competitive Regions: Strategies and Governance*. Paris: OECD.

Pellegrini G. (2006) Measures of competitiveness and attractiveness: a critical appraisal focused on Italy. *Proceedings of the Scientific Meeting of the Italian Statistical Society*, Vol. 1, pp. 355–364.

Pessoa A. (2013) Competitiveness, clusters and policy at the regional level: Rhetoric vs. practice in designing policy for depressed regions. *Regional Science Inquiry Journal*, Vol. V, No. 1, pp. 101–116.

Porter M. (1986) *Competition in Global Industries*. USA: Boston.

Porter M. (1990) *The Competitive Advantage of Nation*. New York: The Free Press.

Porter M. (1998a) *On Competition*. Boston: Harvard Business School Press.

Porter M. (1998b) *Clusters and the New Economics of Competition*. Boston: Harvard Business Review.

Porter M. E. (2003) The economic performance of regions. *Regional Studies*, Vol. 37, No. 6&7, pp. 549–578.

Rosenthal S., Strange W. (2008) Agglomeration and hours worked. *Review of Economics and Statistics*, Vol. 90, pp. 105–188.

Sala-i-Martín X., Baller S., Crotti R., Di Battista A., Drzeniek M., Geiger T., Gomez G., Marti G. (2016) Competitiveness agendas to reignite growth: Findings from the Global Competitiveness Index. In: Schwab K. (Ed.). *The Global Competitiveness Report 2016–2017*. Geneva: World Economic Forum, pp. 3–50.

Schwab K. (Ed.). (2015) *The Global Competitiveness Report 2015–2016*. Geneva: World Economic Forum.

Schwab K. (Ed.). (2016) *The Global Competitiveness Report 2016–2017*. Geneva: World Economic Forum.

Schwab K. (Ed.). (2017) *The Global Competitiveness Report 2017–2018*. Geneva: World Economic Forum.

Solvell O., Protsiv S. (2008) *Cluster strengths and regional innovation, mimeo*. Stockholm: Stockholm School of Economics.

Solvell O., Lindqvist G., Ketels C. (2009) *The European Cluster Observatory: EU Cluster Mapping and Strengthening Clusters in Europe*. Luxembourg, LU: Publications Office of the European Union.

Vanags A., Basarova J., Titova N. (2002) Industrial and intellectual capital clusters in the Baltic States. *European Regional Science Association (ERSA). Conference Papers, No. ERSA02*, Vienna, Austria. Available: http://www-sre.wu-wien.ac.at/ersa/ersaconfs/ersa 02/cd-rom/papers/248.pdf (accessed on 30.04.2019).