CLUSTERING AS A COMPETITIVE ADVANTAGE OF REGIONAL ECONOMICS

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Abstract. Nowadays, to date, there is a consensus of opinion in the scientific and methodological literature on the positive role of clustering in accelerating of socio-economic development and enhancing the competitiveness of territories. However, the activity and success of cluster formation and operation processes are regionally specific. The purpose of this paper is to develop a methodology for diagnosing regional conditions conducive to the formation of effective regional clusters. At the first stage of the study, based on international experience of cluster development, we substantiated the optimal parameters of the state of regions contributing to the emergence of clusters and proposed an algorithm for their integral evaluation. The second stage concerned with the methodology testing on the particular segment of Russian regions, the results confirmed the relation of the regional environment state, the level of cluster development and regional competitiveness.

Keywords: regional competitiveness, clusters, clustering, regional conditions for cluster formation.

JEL codes: C19, M21, O18

Introduction

There is an active searching of internal reserves for development in an increasingly competitive international environment. It is obviously, the national competitiveness cannot be entirely determined by the leading regions. The increased focus on strong agglomerations has led to serious problems such as growing regional asymmetries, increased migration to large centers, declining quality of life in smaller settlements, and others.

These issues are particularly important because of the huge territorial extent of the Russian Federation. In this context, a number of acts have been adopted in recent years: Federal Law of 28.06.2014 N 172-FZ "On Strategic Planning in the Russian Federation"; Federal Law of 29.12.2014 N 473-FZ "On Territories of Advanced Socio-Economic Development in the Russian Federation"; Forecast of Long-term Socio-Economic Development of the Russian Federation for the period until 2030; Foundations of State Policy for Regional Development of the Russian Federation for the Period until 2025; Strategy for Spatial Development of the Russian Federation for the Period until 2025; Methodological recommendations on the development and adjustment of the socio-economic development strategy of the subject of the Russian Federation and an action plan for its implementation, etc.

The successful modernization of the economy in its territories determines the future development of Russia. That involves the creation of innovation-oriented regional and inter-regional environments. Global challenges require new approaches in defining of the place and role of regions as structural elements of the national economic complex. The entities of Russia not only experience the problems associated with the formation of competitive advantages of the domestic economy, but also have their own peculiarities, requiring the scientific study and development of effective solutions in terms of regional specifics.

The difficult socio-economic situation in the country makes the regions to explore new and promising

directions related to the formation of a modern knowledge-based economy, the optimal use of available resources and the search for unrealized potential. The effective regional clusters forming is the one of the ways to solve economic, social and environmental problems. The positive experience of many countries where the cluster initiatives have been successfully implemented makes it possible to identify the cluster approach as a promising area for socio-economic development in the regions. However, the methodological aspects of diagnosing the region's readiness to form effective clusters that increase its competitiveness remain insufficiently researched. It is the relevance of the study.

Theoretical basis of the study

The theory of regional competitiveness is rich. Nowadays the world science concentrates on three major directions: construction of location models, theory of interregional specialization and international trade, and development theory (Development Theory / Development Economics). The first one explores the microeconomic factors of competitiveness of individual territories and their areas using mathematical, statistical methods and Big Data. The second is based on classical political economy and neoclassical economic theory, and complemented by the more modern Region Science & Urban Economics - RSUE, studies the relationship between regional competitiveness and the free spillover of factors of production (labor and capital) combined with free trade. The third strand emphasize that regional development is determined by a complex of factors, such as institutions, education of the population, infrastructure, production specialization, level of productivity and technologies used.

The formation of regional clusters is the one of the long-term strategies for enhancing the competitiveness of territories. The cluster approach has already found application in the Russian Federation, as evidenced by the approval of regional cluster initiatives by state authorities and the supporting measures. Territorial clusters are managed by specialized organizations and executive authorities of constituent entities of the Russian Federation. According to the Ministry of Industry and Trade of the Russian Federation official data, there are 93 industrial clusters in 43 regions in the Russian Federation (Industrial parks. Technoparks. Clusters: geographic information system (GISIP), 2020).

The formation of regional clusters can be considered as an effective tool for GRP growth, small and medium-sized enterprise development, modernization and growth of the innovation potential of the economy, which determines the competitive position of both the region and the national economy as a whole. However, the potential of cluster development has not yet been exhausted in many territories. We would like to emphasize that we are talking about cluster formation processes, which should be regulated and managed, based on a partnership between business, central and local authorities, as opposed to cluster origination initiated by the internal needs of enterprises for cooperation and collaboration. According to the above, the formation of effective clusters should form the basis of government cluster policy at both the regional and national levels. Nevertheless, many of the studies in this area focus on the advantages of this form of territories integration. At the same time, methodological aspects of the successful formation of territorial clusters to enhance the region's competitiveness remain insufficiently researched.

Cluster theory is formed by the research of Marshall (1920), Krugman (1991), Enright (1996), Malmberg and Maskell (2002), Morosini (2004), Sölvel (2008) and others. M. Porter defined an industrial cluster as "geographically concentrated groups of cooperating companies and related organizations (e.g., universities, standards agencies, as well as trade associations) in certain fields, competing but also working together" (Porter, 2000). The same definition is in methodological guidelines and reports on the status of cluster development of international organizations: The Role of Clusters in Smart Specialization Strategy (2013), Smart Guide to Cluster Policy (2016), Cluster programs in Europe and beyond (2019) and others. Thus, regional cluster theory continues to deepen and become practice-oriented.

In the foreign cluster literature, the territory's competitive positioning in the cluster formation process is characterized by a variety of advantages. These include:
- outputs of cluster members - volume of output, profit (Porter, 1990);
- outcome in the form of increased cooperation, deepening the specialisation of cluster residents (Choe

& Roberts, 2011);

- the competitive advantage, including access to new markets, investment and reputation (Tallman et al., 2004);

- benefits, including access to specialized knowledge and technology, productivity and a stronger research base (Lines & Monypenny, 2006);

- spillovers, e.g., an increase in demand when a new producer emerges or an increase in innovation activity of cluster enterprises influenced by competitors (Iammarino & McCann, 2006);

- public good as a set of social consequences for a region (Bellandi, 2002);

- effects specific to the industry or geographical scale of the cluster (Lindqvist, 2009; Bottazzi & Gragnolati, 2015).

Russian cluster literature has a lot of previous research in the fields of economic zoning, territorial economic location of industries, economic use of natural resources, creation of inter-sectoral combines, industrial hubs and territorial-production complexes (Bondareko, 2016). The significance of clusters for regional competitiveness appeared as a scientific research since the mid-2000s (Larina, 2006; Kalyuzhova, 2008; Yurasova, 2009; Dubovik, 2009; Gasanov & Kanov, 2013). Many domestic studies focus on the task of diagnosing and measuring the effects of clustering on the competitive position of a territory. However, they are mainly based on the assessment of either the cluster's external environment or individual quantitative and qualitative indicators of functioning of member enterprises and the cluster region, such as the level of innovation, geographical concentration, cooperation, investment volume, number of employees, individual indicators of economic efficiency and integration effects, improvement of the quality of life of the region's population, etc. (Markov, 2007; Nikolaev & Mahotaeva, 2012; Kozina, 2012; Klerikova, 2013; Ivanenko & Niyazova, 2018).

We can note, these characteristics have both qualitative and quantitative measures; they refer directly to the cluster members or have the long-term strategic nature for the territory as a whole. Moreover, the level of their occurrence is largely determined by the regional background, i.e., the degree of maturity of the regional environment to provide them. And the methodological aspects of diagnosing the region's readiness to form effective clusters that increase its competitiveness remain insufficiently researched.

Background and methodology

Table 1 shows the correlation between the level of cluster development and the state of regional economies.

Table 1 – Russian regions with the largest number of clusters

The Russian Federation constituent entities	Number of clusters	Have the state-supported status	Place in the 2019 Regional Socio-Economic Rankings
Moscow	6	5	1
Saint Petersburg	11	3	2
Moscow oblast	6	5	4
Tatarstan	8	8	5
Perm Territory	5	4	16
Chelyabinsk oblast	7	7	17

Source: compiled by the authors by: Industrial parks. Technoparks. Clusters: geographic information system (GISIP), 2020

According to the data, the regions with the most advanced clusters have a noticeable position in the socio-economic ranking. In other words, those regions have a significant competitive advantage where clusters are successfully formed and developed.

We have systematized the characteristics that determine the region's potential in the managed processes of cluster formation based on the description of the features of the current cluster experience. Indicators identifying these characteristics, as well as quantification of their levels of occurrence, are shown in table 2.

1. The investment attractiveness of the cluster territory forming. Indeed, the formation of modern

industrial clusters with vertical linkages in production chains (this provides synergies of cluster interactions) requires investment in new and upgraded enterprises.

It can be determined by the position of the region in the national investment attractiveness rating.

Table 2 - Parameters used in the authors' methodology for diagnosing regional conditions that contribute the effective technological clustering

Parameters	Territory's investment attractiveness	Innovation action of regional enterprises	Total R&D investment in the region	Regional enterprise support level	Population of the region employed in industry	Cluster initiatives presence	Cluster support infrastructure
High level	The region's place in the first third of investment attractiveness rating	Higher than the average level of innovation action of enterprises in a country	%, higher than average total R&D investment	Place in the first third of the ranking of regions in terms of turnover of products produced by SMEs	More than half of the working-age population	There is basic cluster initiative	Infrastructure organizations of the region
Medium level	The region's place in the second third of investment attractiveness rating	Equal to the average level of innovation action of enterprises in a country	%, equal to the average total R&D investment	Place in the second third of the ranking of regions in terms of turnover of products produced by SMEs	40-50% of the working-age population	The cluster initiative is in the final stage	Infrastructure facilities are being opened in the region
Low level	The region's place in the last third of investment attractiveness rating	Lower to the average level of innovation action of enterprises in a country	%, lower than average total R&D investment	Place in the last third of the ranking of regions in terms of turnover of products produced by SMEs	Less than 40% of the working-age population	The cluster initiative is currently being developed	Infrastructure organizations of the region are missing

Source: composed by the authors

2. Degree of innovation action of regional enterprises. Characterized by the number of enterprises carrying out research and development, having received patents and having intellectual property objects of the total number of enterprises in the region. These enterprises are becoming the core of an innovative industrial cluster.

3. Total R&D investment in the region This indicator, as well as the previous one, will determine the region's potential to form industrial clusters as part of economic modernization and to ensure the

competitiveness of the products of cluster member enterprises.

The first approach in the proposed methodology uses absolute values, the second one emphasizes the share of R&D investment in the structure of production costs.

4. Level of support for entrepreneurship in the region. We have noted the importance of a developed business environment for the formation of a cluster involving small enterprises. Since each region has its own specific characteristics, in our opinion, the most objective state of entrepreneurship measures the regional per capita turnover of products (services) produced by small enterprises, including microenterprises and sole proprietors. The proposed methodology uses a regional ranking by this indicator.

5. Population of the region employed in industry This indicator shows the industrial capacity of the region along with the existence of a sufficient number of organizations providing human resources training for the regional cluster.

6. Existence of cluster initiatives in the region, i.e., organized and documented activities, programs, projects aimed to the cluster development in the nearest future.

7. Cluster support infrastructure in Europe is The European Cluster Collaboration Platform (ECCP). In Russia this kind of infrastructure is formed by organizations created to support entrepreneurship in general.

The method was tested during the formation of a rating of competitive positions of regions by the level of conditions for the cluster's formation. The regions selected were:

a) geographically close,

b) ranking close to each other in terms of the socio-economic situation of the regions,

c) having cluster support organizations,

d) the quality level of the clusters is provided by the support of the government.

This included the Moscow, Voronezh, Lipetsk, Kaluga and Tula regions. For comparative analysis, the list was supplemented by the Yaroslavl region (Table 3).

Table 3-Regions of the Russian Federation selected for the evaluation

Oblast	Place in the Ranking of Socio-Economic position of the regions for 2019	Number of clusters	Number of clusters included in state support programs
Belgorod region	18	2	2
Voronezh region	21	6	2
Lipetsk region	22	6	6
Kaluga region	28	2	2
Tula region	29	3	1
Yaroslavl region	37	-	-

Source: composed by the authors

The indicators were then assessed using a point-based approach: a high level of characteristics was assigned a score of 3, a medium level a score of 2, and a low level a score of 1. The oblast with the best K_i indicator was taken as a benchmark. The other regions were rationed:

$$K_i = P_i / P_o,$$

where Pi is the value of an indicator of favorable regional conditions for the formation of regional industrial clusters; P_0 is the value of an indicator of the conditions for the formation of regional industrial clusters in the reference region.

The integral assessment was based on a generalization of the partial K_i coefficients using the geometric mean formula:

$$K_3 = \sqrt[n]{\prod_{i=1}^{n} Ki}$$

,

where K_3 is the integral score of the region in terms of the level of regional conditions favorable for the formation of the cluster.

The evaluated objects ranking is arranged in descending order of the level of the integral indicator. The results of the assessment are shown in Figures 1 and 2.

As Figure 2 shows, the Yaroslavl oblast ranked last in the generated rankings. Figure 3 shows the reasons for this lag and the directions for improving regional conditions. These assessments correlate with the state of cluster development in the region, where cluster initiatives have not been formalized.
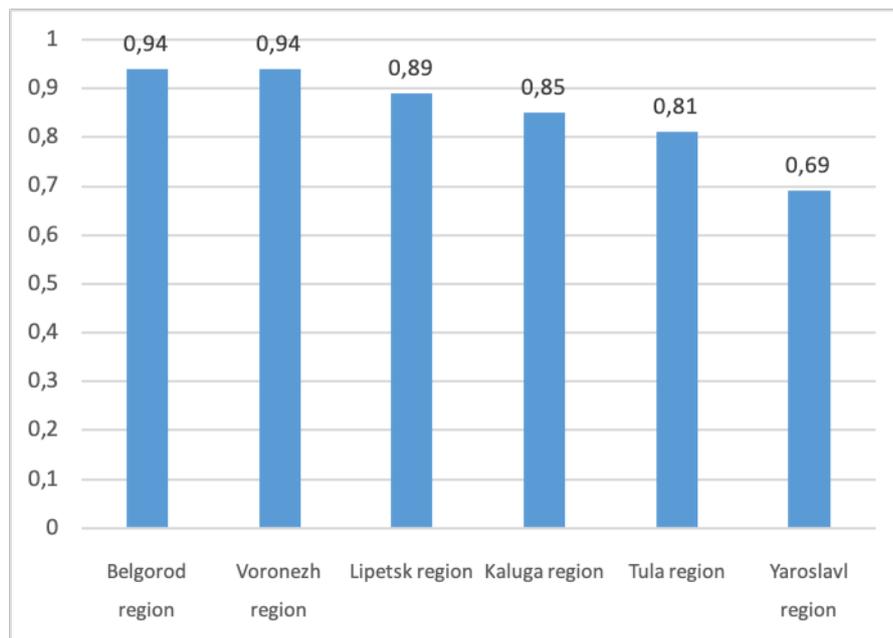
Figure 1. Assessment of the competitive positions of regions by the level of conditions for the formation of clusters

Source: composed by the authors
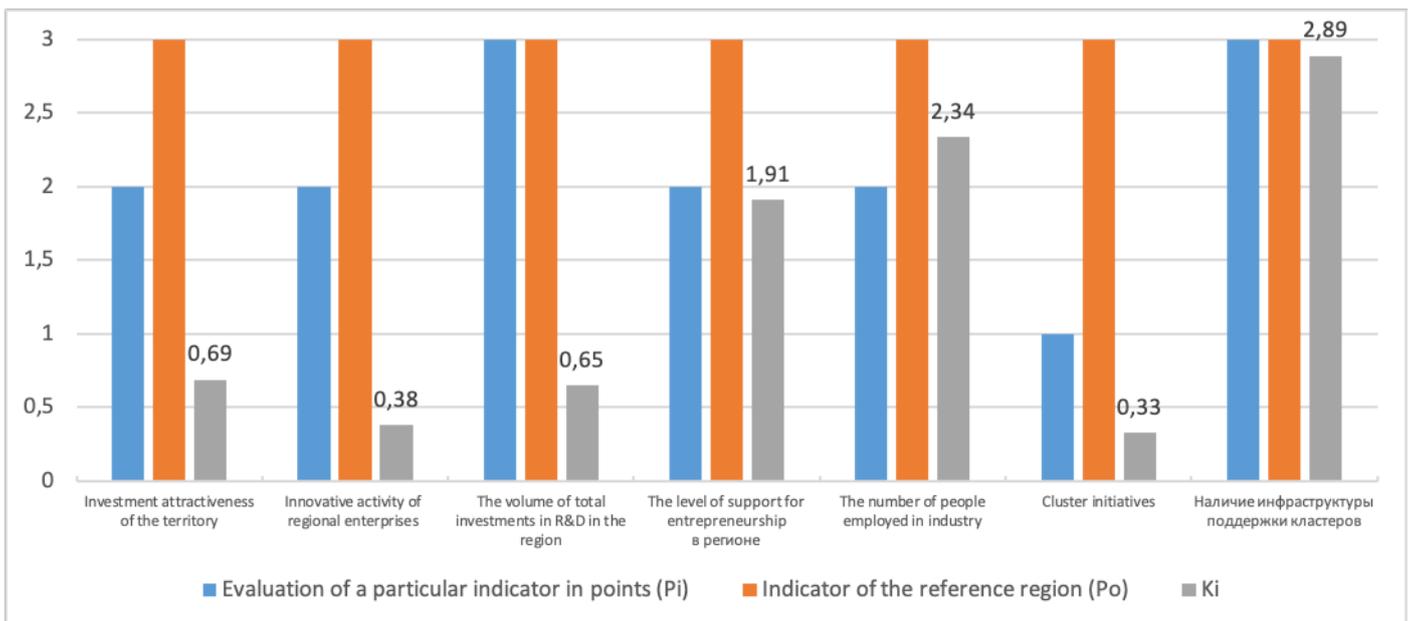
Figure 2. Comparative assessment of the regional conditions for clustering in the Yaroslavl region

Source: composed by the authors

According to the results methodology testing, the competitive positions of regions in terms of clustering conditions have not shown a direct correlation with their place in the Socio-Economic Status Rating. This can be explained by the fact that the methodology uses a larger number of social indicators, while the authors use

parameters that are directly related to cluster development.

Conclusion

The regions are competitive because of the competitiveness of their key enterprises, despite the wide variety of viewpoints on the components of regional competitiveness, as reflected in domestic and foreign academic literature. The activities of such enterprises determine the specialization of the regions, provide the bulk of tax revenues to the regional budgets and play a major role in determining of their population quality of life.

Structural and technological changes in the economy, increasing globalization and international competition, and political instability are creating the conditions for escaping from traditional regional industrial policies and a gradual moving towards a new network-based system of production organization. Radical changes in IT, innovations are based primarily on the close relationship between real production, science and education. They create the preconditions for the formation of clusters - new network structural formations - as a competitive advantage of the regions.

Nowadays, a large body of so-called cluster literature has been created. This field investigates the characteristics of the world's cluster development in different industries and regions. Also, the role of the state is discussed, various forms of cluster science and business associations are proposed, the specificity of innovation clusters is analyzed, etc. Nevertheless, many of the studies in this area focus on the advantages of this form of territories integration. At the same time, methodological aspects of the successful formation of effective territorial clusters, playing a significant role in enhancing the competitiveness of the region, remain insufficiently researched.

The assessment of regional cluster formation conditions, based on the proposed methodology, made it possible to identify the leading regions and establish their competitive advantages in terms of the individual characteristics of the assessment. But the lagging regions can realize the prospects of necessary changes to ensure intensification of cluster development processes.

The use of the proposed assessing conditions methodology for formation of regional industrial clusters will make it possible to:

- regional authorities, on the basis of identifying the problematic characteristics of regional conditions, will be able to target measures to improve them, ensuring in advance an environment conducive to the emergence and further functioning of clusters and at the same time ensuring the growth of competitive positions in cluster development;

- national authorities will be able to take the results of the diagnosis into account in the processes of determining the quality of regional governance and in regional cluster development support policies, as well as to monitor regularly the formation of regional industrial clusters and based on its results to develop new or adjust existing documents;

- the management of specialized organizations will be able, with the support of regional authorities, to improve the cluster ecosystem.

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