

Competitive regional clusters: international experience

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Abstract. Many countries is developing in the context of a multitude of global trends and challenges that noticeably change the “picture” of the world, positions, interests and opportunities of various players. An important role in the formation and change of this “picture” belongs to the sphere of science, technology, and innovation. Over the past 20 years, the European Commission has paid attention to the development of cluster policy. Today stands out several trends in the development of European cluster policy. In our opinion, economic activity in clusters tends to concentrate in certain areas, thus, clusters contribute to regional development and overcoming economic imbalances. Studying the accumulated European experience in the field of cluster initiatives and current trends allows us to identify the advantages and disadvantages of the existing mechanisms for the formation of Russian clusters. The article analyzes the Russian experience in the implementation of programs for the development of pilot regional innovation clusters and formulates signs of their sustainability.

1 Introduction

Globalization has significantly increased the role of clusters in the economy and accelerated their development [1-10]. Countries actively using cluster strategies were able to achieve GDP growth in the range from 75 to 90%. Territorial clusters are the locomotives of economic growth and an effective tool for interaction between the participants of regional innovation systems in many countries of the world [5, 6].

Clusters are informal associations of enterprises producing related products, in relation to the economy, this means that factories and factories, research institutes, universities and industry colleges work in a cooperative bundle. That is, the triad “Science. People. Production”. Developed clusters have become an effective tool for attracting foreign investment, integrating national producers into the global market for high-tech products. There are many factors and drivers that affect the emergence and development of new

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markets, technologies and products, the transformation of traditional sectors, the flow of knowledge, technology, capital, human resources, etc. Under these conditions, the need for an in-depth understanding of what is happening, a discussion of common, framework, and, often, agreed management approaches in this area.

Among the many ideas and concepts that have arisen within the cluster approach, the most significant are the works of Michael Porter. His theory of clusters has become a generally accepted concept in this area of knowledge, and the Porter cluster model is used in the development of economic policies around the world, being a tool to improve the competitiveness of the economy, region or country.

In his research, M. Porter analyzed the competitive opportunities of more than 100 industries in ten countries. It turned out that the most competitive transnational companies are usually not scattered haphazardly across countries, but tend to concentrate in one country, and sometimes even in one region of a country. This happens because one or several companies, achieving competitiveness in the global market, spread their positive influence on their immediate environment: suppliers, consumers and competitors. Success, in turn, will have an impact on the further growth of this company's competitiveness. As a result, a "cluster" is formed.

In this article we are analysing the best practices in the implementation of state cluster policy in individual countries.

2 international cluster policy experience

The world experience shows a wide variety of government organizations supporting clusters. As a rule, the implementation of cluster strategies implies the availability of grant-forming funds (institutions, agencies) supporting cluster initiatives: for example, the National Planning Agency DATAR (France), the Information System for Search and Classification of Clusters CASSIS (Luxembourg), the National Competitiveness Council (USA), the program cooperation LINK (UK).

In addition, special institutions are organized that perform the functions of developing, building network structures and their internationalization. These include centers of expertise (Finland), centers of excellence (USA), consulting, marketing and analytical and branding companies (Economic Competitiveness Group (USA)); institutes and agencies that are part of cluster initiatives (Munich Technical University). An integral part of infrastructure support cluster strategies is the creation of business incubators, technology parks, special economic zones, which, in fact, are catalysts for the formation of regional clusters.

The key role in shaping effective management approaches in the field of STI is played by the OECD. This international organization forms international standards in the field of NTI (regulatory documents - legal instruments, strategic documents, standards of statistical observation, including the Oslo and Frascati Manuals). The organization functions as a communication and information platform popular in the professional community and among politicians, providing the opportunity for conducting advanced research, political and expert dialogue at various levels. The effectiveness of the organization's activities is ensured, including through the preparation and distribution of a significant number of various documents, including documents of a strategic nature (Innovation Strategy, Green Growth Strategy, etc.)

Although contacts between Russia and the OECD are noticeably difficult today, they are developing at the political and expert levels. Their results are useful (and really used) to adapt the best regulatory experience and recommendations in the process of forming and implementing modern Russian policy in the field of STI; distribution in our country of advanced analytical approaches and methods; raising the competence of Russian

researchers and managers, etc. The OECD study presents the structured cases of 26 national cluster development programs in 14 countries.

Thus, of the 245 OECD regulatory instruments recorded in its documents now, only 39 are directly and directly related to the topic of STI. 28 belong to the group recommendations, 11 to the group declarations. There are no relevant documents in the decisions group. The OECD regulatory instruments, by and large, are aimed at improving the situation in the global economy and enhancing the productive capacity of the state. Other studies relate exclusively to European countries and are based on their understanding of the cluster concept, which is explained by the European leadership in the duration of the use of the cluster approach and the number of clusters formed.

The focus of the project of the International Alliance for the Development of Intercluster Cooperation (Transnational Alliance of Clusters Towards Improved Cooperation, TACTICS) were specialized national programs in Austria, Belgium, Great Britain, Hungary, Germany, Denmark, Spain, Italy, the Netherlands, Norway, Poland, Portugal, Slovenia, Finland, France, the Czech Republic and Sweden. The project resulted in collections of best practitioners on the promotion of innovative technologies in clusters, the use of a cluster approach for the development of developing industries, marketing and branding of clusters, evaluation of the results of implementation of cluster policy, international cooperation, etc.

World experience conventionally identifies six models of cluster formation (Table 1).

Table 1. Examples 6 cluster formation models.

Model Characteristics	Innovative Clusters
<i>Italian</i>	
Many small firms united in various associations to increase competitiveness. The model is applicable to products of low technological level with a high degree of differentiation and fluctuations in demand.	High-tech products in Pisa (Tuscany, Italy).
<i>Japanese</i>	
Formed around a leading company with large-scale production, integrating a mass of suppliers at various stages of the chain. The model is applicable to produce technologically complex products. Product development requires high fixed costs that can pay off only with a large volume of sales.	- Toyota Motor Company; - telecommunications, residential construction, environmental safety and the production of medical equipment - the Sapporo Scientific Research University in Hokkaido; - bioinformatics, robotics, bio-production, nanomaterials, clean energy in Kitakyushu.
<i>Finnish</i>	
It is characterized by a high level of innovation, supported by a powerful sector of research and development, an advanced education system. Characterized by internationalization of business. To the greatest extent, the model is applicable for small compact countries, relatively scarce in natural resources and export oriented.	Based on 20 universities in Finland, under the auspices of the municipal authorities, 22 techno-parks are functioning (the largest of them is "Technopolis", established in 1982 by the same-name joint stock company "Technopolis Pls"). All techno-parks are incorporated into the "TEKEL" Association of Science Parks of Finland, which oversees the activities of more than 1,700 innovative companies, employing about 37,000 specialists and scientists.
<i>North American</i>	
Differs pronounced competition between enterprises, the model is applicable if the production process	USA Silicon Valley (California); - aerospace engineering, information technology Seattle, Tacoma, Olympia (Wash.);

Model Characteristics	Innovative Clusters
<p>does not involve the establishment of close relationships. Due to the competition between suppliers in the cluster, as well as due to mass production, the parent company achieves low cost of the final product.</p>	<ul style="list-style-type: none"> - medical equipment Minneapolis (Minnesota), Jacksonville (Fla.); - technologies of "clean" energy Pittsburgh, Akron, Cleveland (Ohio and Pennsylvania); - Biotechnology and modern chemistry of Kansas City (Kansas); - Biotechnology Boston (Massachusetts); - Semiconductors Austin, Dallas (Texas); etc. Canada: biotech cluster (Montreal, Toronto, Vancouver, Ottawa, Halifax); - Information and telecommunications cluster (Vancouver, Calgary, Quebec, etc.); - High-tech cluster (Montreal, Ontario, etc.); - multimedia cluster (Montreal, Toronto, Vancouver); - wine cluster (Niagara); food industry cluster (Toronto) and others.
<i>India-China</i>	
<p>An important role is played by the state. The focus is on foreign investment; they bring modern technology and provide access to world markets.</p>	<p>India: there are 24 programs with more than 1,200 clusters:</p> <ul style="list-style-type: none"> - innovative clusters (Promoting Innovative Clusters, PIC); - pharmaceutical clusters in Ahmedabad (Vadorara) and Hyderabad; - Clusters of the development of the foundry industry in Samalkha, Faridabad and Kaithal. <p>China: Industrial Cluster: Integrated Circuits (Zhangjiang in Shanghai);</p> <ul style="list-style-type: none"> - computer software products (Chengdu, Sichuan province); - stamping production (city of Huangyan, Zhejiang Province); - equipment for rail transport (Zhuzhou city, Hunan province); - semiconductors and lighting devices (Yangzhou City, Jiangsu Province); - Shoe industry (Jinjiang City in Fujian Province); - engineering and construction equipment (Changsha, Hunan Province); <p>complete mechanical engineering</p> <ul style="list-style-type: none"> - Equipment in the Tesi area of Shenyang, Liaoning province.
<i>USSR</i>	
<p>Market relations and competition are kept to a minimum; production is concentrated on large firms. The model is applicable in the primary sectors of the regions with low population density and poor development.</p>	<p>Kursk Magnetic Anomaly - KMA, Timan-Pechora TPK, North-Tyumen TPK, Norilsk TPK, Sredne-Obssky TPK, Kuzbass TPK, Sayansky TPK, Krasnoyarsk TPK, Irkutsk-Cheremkhovsky TPK, Bratsk-Ust-Ilimsk TPK, South-Yakutsk TPK, West Yakut TPK.</p>

Important features. In the United States, there is no single model that allows determining with a high degree of accuracy all the necessary characteristics of a cluster, so research in this direction continues to be conducted. According to the Regional Research Institute, at present, about 20 such entities can be identified in the country, the leading center is Silicon Valley, and it accounts for 1/3 of all venture capital investments in the United States. This territory is characterized by a high density of high-tech companies

associated with the development and production of microprocessors, software, mobile communication devices and other products of the information technology industry.

Canada. A distinctive feature of regional cluster initiatives formed with the participation of NIS is that all clusters belong to networks that extend beyond their regions:

- Photonics cluster in Ottawa, whose partners are in Vancouver, Toronto, Quebec, Boston, Phoenix, etc.;
- Saskatoon cluster in the food industry, working with the Prairie research network;
- Winnipeg Biomedical Cluster, whose partners include companies in Calgary, Toronto, Halifax and Minnesota;
- Edmonton Nanotechnology Cluster, working together with Californian and Quebec companies;
- Hydrogen and fuel cluster of Vancouver, whose partners are in Alberta, Toronto, Montreal, and China;
- Saguenay Aluminum Cluster, leading collaboration with companies located in Montreal, Windsor, Waterloo, etc.

Finland. Against the general background of the EU countries, Finland has traditionally been among the most successful countries in the development of high-tech industries and in terms of the share of expenditure in GDP, the country's research and development is among the first countries in the world.

India. It can create technology incubator centers for all scientific entities.

Japan. In 2001 in Japan, the Ministry of Economy, Trade and Industry (METI) adopted a state program, within which 19 clusters were formed. Small and medium-sized enterprises closely interact with each other and located in the same regions of research organizations and university laboratories. The government has allocated from the state budget financial resources in the amount of about \$ 500 million a year. However, unsystematic government policy on clusters did not lead to the emergence of an effective innovation infrastructure but caused only a waste of budget funds. In addition, experts noted the hierarchical traditions and psychology of Japanese business, impeding the development of open scientific and industrial structures, like European and American.

3 Clusters in Russia

Russia has accumulated a vast array of scientific literature on the topic under consideration, but its level is significantly inferior to foreign research. This is primarily due to the lack of detailed information, which began to be formed only relatively recently in connection with the implementation of cluster support programs. A cluster is not just a newfangled term. The federal law on industrial policy provides for real measures to support them. Federal legislation allows enterprises - their participants to reimburse from the treasury up to 50% of the cost of implementing investment projects. Although the refund does not occur automatically - the project must be executed at the level of the Federal Ministry of Industry and Trade.

In most cases, publications relate to individual examples, and there are very few generalizing comparative works. Recommendations are often not adapted to Russian conditions and directly copy foreign practices; but it remains unclear exactly what the main shortcomings of national clusters are and which of the proposed measures are most relevant. The statistical base for Russian clusters began to expand significantly since the launch of the 2012 competition of pilot innovation clusters, within which applicants prepared quite large applications (totaling 94), which included development programs. In 2013, members of the first group (except for the Cluster of the medical and pharmaceutical industry, radiation technologies of St. Petersburg) submitted additional applications to the

Ministry of Economic Development of Russia for a federal subsidy to finance specific activities.

All these materials lay the foundation for the in-depth study of Russian clusters. A joint study of HSE and the Center for Strategic Research North-West, carried out in 2014 at the request of RVC, in which pilot clusters were surveyed (a total of 17 questionnaires were received) is worthy of attention and workshops with their participation. The emergence of new information opens opportunities for correct cross-country comparison of cluster development trends and the formulation of expert recommendations. Of course, many aspects that are analyzed in foreign studies have no analogues in our country, where cluster initiatives are at an early stage. At the same time, several problems have already emerged, the awareness of which allows us to outline directions for improving cluster policy.

From 2012 in Russia, in accordance with the Strategy for Innovative Development for the period up to 2020, a program to support innovative territorial clusters has been implemented. For this purpose, 25 pilot formations were selected, divided into two groups, which are planned to be supported in the next five years. The first included 14 clusters with the most developed, according to experts, development programs. In 2013, they received grants from the federal budget in the amount of 1.3 billion rubles and will be able to count on priority support in the coming years.

The second group included 11 clusters that did not initially receive such a subsidy but became its beneficiaries since 2014. The criteria and procedures adopted for selecting clusters and the mechanisms for their support generally correspond to similar European programs. Obviously, government funding does not guarantee success. There is a probability that in case of its termination, the clusters will cease to exist or are transformed into other formations. Such quasi-clusters can hamper the innovation activity of their participants, locking themselves on competitive technologies and business models that lose competitiveness.

Initially, the clusters developed in the expectation of import substitution. Now comes the next stage - work on export deliveries. In 2017, the assistance of the Ministry of Industry and Trade of the Russian Federation reached 1.6 billion rubles (applications from 15 projects were received, of which 9 were supported). In 2018, more than 20 applications from projects worth 12 billion rubles have been filed, of which 5 billion rubles are state support.

Currently, according to the Map of Clusters of Russia and the “Geographic Information System of Industrial Parks, Techno-parks and Clusters of the Russian Federation”, there are 119 cluster initiatives in 48 constituent entities of the Russian Federation, three-quarters of which are funded by the state. Studies empirically confirm the indirect influence of state policy on increasing the number of cluster initiatives that do not have direct access to tools that stimulate their development.

Comparison of branches of specialization of regions and areas of activity of cluster initiatives operating in these territories indicates an almost complete disregard by the state of the objective specialization of the territory in the implementation of cluster policy. It should be noted that the cluster support programs currently existing in Russia do not have uniform rules justifying the choice of cluster initiatives. There are also no requirements for their compliance with the industry specialization of the regions in whose territory they are based.

According to the principle of compliance, the cluster initiative of sectoral specialization of the regions of the Russia subjects can be divided into 4 groups [7-9]:

1. Regions with the largest number of specialization industries where cluster policy is actively pursued, with cluster initiatives formed within the framework of regional specialization sectors (20 subjects).

2. Regional specializations in which regional specializations are involved as well as outside of them (20 subjects).

3. Regions with a small number of branches of specialization in which cluster policy is pursued risky - cluster initiatives are formed outside the branches of regional specialization (7 subjects).

4. Regions with a small number of branches of specialization, in which cluster policy is not carried out (33 subjects).

It is worth noting that in regions with a small number of branches of specialization, there is a tendency to conduct unfocused or risky cluster policy, which is focused on cluster initiatives in industries that do not have a critical mass. This approach is characterized by an increased probability of error, due to which it is possible not to achieve the desired results. The likely reason for this is the deliberate policy of the authorities to improve the socio-economic sustainability of the territory through new clustering initiatives that diversify its specialization [10]. Another possible reason is the low probability of making decisions that have no justification, with the support of cluster initiatives in the context of the existence of objective priorities for regional development. In the leading regions, the situation is reversed - cluster initiatives correspond to the specializations of the region in which they are based.

4 Conclusions

There are various financial and non-material mechanisms of their state support, the purpose of which is to put such entities into the phase of sustainable development. However, the formation of a cluster and its prospects depend on many factors, so the risk remains that without state support, the cluster will not be able to reach the desired trajectory.

Effective management in the concept of "smart specialization" is implemented through strategic planning and forecasting future opportunities. On the one hand, it is necessary to identify the unique competitive advantages of the region, and on the other - to create a clear program of action within the framework of this strategy. Applied policy instruments should fully comply with the development of identified priorities.

A separate task is to build such a system of relations between entrepreneurs and government bodies that could coordinate the decisions they make and authorize business representatives to independently determine their capabilities. Thus, "smart specialization" is based on mechanisms that allow government policy to maximize the creative potential of entrepreneurs and scientists.

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