



Research Article

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The Stability of the Regional Economic System Based on the Innovative Development of the Petrochemical Cluster

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Abstract

The successful functioning and development of the regions is ensured by the symbiosis of cooperation and competition, based on the positive synergistic effects of the territorial agglomeration. Stable partnerships between enterprises provide a solution to the problems of the regional economy, associated with increased differentiation in the level of socio-economic development of individual regions, low adaptability of the regional socio-economic systems of Russia to the impact of crises. There are also problems of inefficient spatial organization of the country, leading to increased costs for the maintenance of a regional infrastructure economy, a low level of interaction between enterprises of the regions forming territorial production complexes. A promising and successfully used in practice by developed countries is the cluster paradigm of socio-economic development of regions, which is based on a cluster approach to the implementation of economic policies, providing innovative orientation in the implementation of regional strategies. Regions containing efficient clusters develop more dynamically. In a number of regions of the Russian Federation, the extraction of minerals, including hydrocarbons, is a strategic factor providing the main share of gross regional product. In accordance with the development strategy, petrochemical clusters should become the most active point of economic growth in the region in the near future.

Keywords: *economics, econometrics, economic and mathematical modeling, theory of economics, regional economy, innovation management*

1. Introduction

Regional clusters are the mechanism that facilitates the import substitution of equipment at the enterprises for the extraction and processing of hydrocarbon raw materials, one of the organizational forms of integration of the capabilities of the parties interested in achieving competitive advantages in an innovative economy. In order to link the development of the industry with the priorities of state policy, including the interests of enterprises in the oil and gas industry, it is necessary to form a regional oil and gas chemical cluster. However, the use of existing organizational models of regional clusters does not lead to the expected results. The insufficient development of theoretical and methodological aspects of the cluster approach to the innovative development of the regional economy has predetermined the need to improve the organizational and methodological support for the formation of a regional petrochemical cluster (Enright, 2003;

Hufbauer et al., 2008; Dimitras et al., 1999; Khazova, 2015).

Issues such as the identification of clusters and the assessment of the cluster potential of the regional economy remain debatable. The cluster approach provides an opportunity for regions to create regional territorial production clusters in the context of avoiding the sectoral principle of industrial management in the territories (Beilin, 2017; Beilin & Khomenko, 2018).

Modern economic development determines the need to find new forms of organization of activities of industrial enterprises, industries and complexes to ensure their development. One of the approaches to the formation of an innovative economy is a cluster one. The most important prerequisites for the formation of clusters are also the following: the presence of interacting and mutually complementary enterprises, organizations united around the production of certain products or a common field of activity and a specialized labor force; gaining economies of scale; proximity to consumer markets; ensuring access to specific natural resources (Beilin, 2017; Khmeleva & Bulavko, 2016; Zobel & Khansa, 2012; Rose, 2001; Deberdieva & Shterbova, 2015).

2. Methods

The advantages of applying a cluster approach to the development of a regional economy are manifested in the following. Regional clusters are based on the existing stable system of dissemination of new technologies, knowledge, products, united in a technological network, based on a joint scientific base. Cluster enterprises have additional competitive advantages due to the opportunities to carry out internal specialization and standardization, to minimize the costs of innovation. The presence in the structure of small enterprises allows forming innovative "points of growth" of the regional economy (Zadeh, 2002; Østergaard & Park, 2015; Khmeleva et al., 2015; Al-Qahtani et al., 2008).

According to the results of a comparative analysis, the following definition of a cluster was proposed. A cluster is an integrated economic regional entity of interacting enterprises and related organizations in a single technological chain of value creation based on proactive partnership relations. They carry out complementary economic activities in order to ensure individual, common and regional development by enhancing the region's own and competitive advantages, including those arising from the implementation of joint activities (Tardy, 1997; Crowther & Haimes, 2010; Takafumi et al., 2009; Alfares & Al-Amer, 2002).

3. Results and Discussion

Innovative orientation is a distinctive feature of clusters, since effective clusters are created, as a rule, in the area of economic activity where there is or is expected a surge in the field of engineering or / and production technology with access to promising "market niches". Clustering a region through the formation of a system of indicators characterizes its level of competitive stability. The purpose of the clusters is to use the potential of enterprises in the region for their development on an innovative basis (Braginsky & Tadevosyan, 2014; Deberdieva & Vechkasova, 2015).

The clustering potential is determined by a combination of factors. These are competitive advantages of industries (geographical location, availability of resources, etc.); availability of enterprises and infrastructure organizations in the region; the possibility of combining local competitive advantages of enterprises and organizations for further use in ensuring the development of the region. The most important role in the development of the petrochemical and chemical cluster, the realization of its scientific and innovative potential is assigned to small innovative enterprises, as well as enterprises of the services sector, including logistics, which are a link between enterprises (Corrado & Fingleton, 2012; Chen & Pouzo, 2015; Beilin, 2016).

The effectiveness of the development of industrial clusters is ensured through supporting industries, such as educational institutions, research organizations, innovation centers that increase the level of competitiveness of the region. The process of forming the petrochemical cluster includes many components. This is the creation of the institutional and organizational basis of a regional cluster (formation of a structure, organization of cluster management, a mechanism of responsibility, internal regulatory documents of the cluster) (Beilin & Arkhireev, 2011; Leamer,

2008; Fischer & LeSage, 2015).

It is also the formation of a strategy and targeted development programs based on an assessment of the situation in the market, development directions within the region and the interregional level, means and means of implementing development directions. In addition, they include action planning for the implementation of the cluster strategy (selection of potential participants, formation of financial resources, etc.) It is necessary to take into account the need to develop regulatory impact instruments (regulatory, organizational, methodological, informational, motivational, etc.) and the implementation of a set of actions and monitoring the formation of a regional petrochemical cluster (Fig. 1).

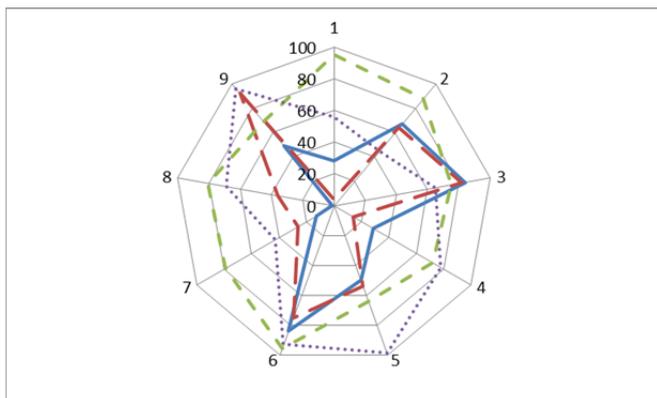


Fig.1. An example of the impact of regulatory, organizational, methodological, informational and motivational tools of regulatory impact in the formation of a regional petrochemical cluster

To implement clustering, a mechanism is needed that triggers, sets it in motion, while applying organizational and economic tools. On the basis of organizational tools, administrative activities are carried out aimed at carrying out the clustering process in the region; Regulatory regulation of cluster policy at all levels and control over the implementation of the clustering process (creation of a special controlling body) is carried out. Institutional support includes the following institutions: government, legal, financial, innovation. In the course of the study of models of innovative development of the petrochemical and chemical cluster, the following components were identified as components of the innovation development mechanism: infrastructure, information, investment, resources, institutional, methodological, organizational support based on regional support (Figure 2).

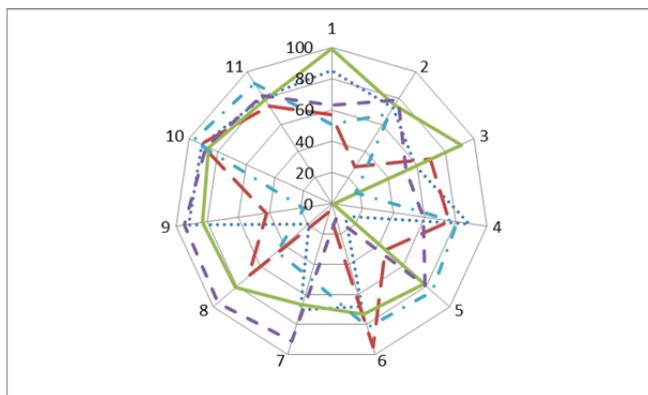


Fig.2. An example of the structuring of the constituent elements of the mechanism of innovative development of a regional petrochemical and chemical cluster

The conditions for the innovative development of a regional petrochemical and chemical cluster are determined by many factors. This is the scale of the activity, the complexity and complexity of the value chain; the focus of cluster innovation activities on technological and process innovations, determined by the content and structure of business processes in the cluster. These include established intra-corporate relations between the "core" and enterprises in the cluster; the presence in the cluster of a corporate scientific and technical complex as part of scientific and design organizations specialized in solving problems of production activities.

Next, we can formulate the requirements for the formation of the mechanism of the cluster's innovative development: the unification of the sphere of science and production; sources of innovation should be the area of known knowledge and the results of basic research. The essential condition for their implementation is the formation of stable links between all the cluster members. The most relevant areas (priorities) of the innovative development of the regional petrochemical and chemical cluster are technologies that provide increased efficiency: main gas transportation, diversification of gas supply methods to consumers; gas processing and petrochemical; gas sales and use; to increase gas storage efficiency; hydrocarbon production at existing fields; prospecting and exploration of hydrocarbon deposits, including the development of unconventional resources.

To assess the effectiveness of the innovation development of the cluster, it is recommended to use key performance indicators: the share of R & D costs in revenue; reduction of operating costs in projects through the use of innovative technologies; reduction of specific consumption of fuel and energy resources for own technological needs and losses; frequency of accidents; increase in the number of used patents and licenses; labor productivity growth; reduction of specific greenhouse gas emissions.

To assess the need for enterprises to join the regional petrochemical and chemical cluster in order to achieve their cluster effect (synergistic, innovative) it is recommended to use the integral indicator of cluster potential. This will solve the problem of determining their status and justify the cluster development strategy, form a system of indicators for assessing the cluster potential, determine the components for a comprehensive assessment of the innovation potential, the financial and economic condition of the enterprise, the factor potential and the quality management system.

The proposed system includes two blocks of indicators, measured using ordinal variables. The first block contains indicators that help identify the status of an enterprise in a cluster by affiliation to a type of activity: basic, supporting, auxiliary. The second block includes general indicators assessing the possibility of including an enterprise in a cluster: innovation potential; financial and economic condition; resource potential; availability of a quality management system; dependence on global markets; territorial proximity to sources of raw materials, consumers of products, labor resources; cooperation with other cluster members; relationship with scientific and educational institutions located in the region. From the point of view of the cluster effect, it is important to assess not only the fact that the enterprise has production factors, but also their significance, based on the specifics of its activities, as well as the effectiveness of its use. One of the most important areas of cluster potential assessment is to determine the possibility of creating integrated quality management systems, including: quality management systems, environmental management systems, and occupational health and safety management systems.

4. Summary

The developed organizational model of the regional petrochemical and chemical cluster includes status groups of enterprises and organizations: "basic", including the "core" of the cluster; cluster-forming enterprises for the extraction of hydrocarbons; "Supporting" enterprises for the supply of equipment, components, materials, services, carrying out repairs of equipment; "Auxiliary"; specialized institutions and structures that provide information, marketing and consulting services; "Complementary" financial and research institutions, educational institutions, agencies and departments for the development and setting of standards; "Enterprises with weak communication" enterprises in accompanying industries, manufacturers of related products. The sequence of stages in the formation of a regional petrochemical and chemical cluster is substantiated.

5. Conclusions

Thus, this article proposes a mechanism for the innovative development of a regional petrochemical and chemical cluster. It is based on a set of interrelated elements of infrastructure, information, investment, resource, institutional, methodological, organizational support based on regional support. The cluster is formed taking into account intra-corporate relations between the main enterprises and scientific, design, educational organizations in the oil, gas, chemical industries. This approach takes into account the rules and procedures for implementing technological and process innovations. A technique has been developed for assessing the possibility of entering into the regional petrochemical and chemical cluster of the Orenburg region and positioning enterprises in the process of its formation, the implementation algorithm of which includes: developing a system of indicators for comprehensive assessment of innovation and resource-factor potentials, financial and economic status of the quality management system; determination of the integral indicator of the cluster potential of the studied enterprises; preparation of an analytical report for the further development of the portfolio cluster strategy. Evaluation of the integral indicator of the cluster potential will allow solving the problem of determining the status of an enterprise in a cluster.

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