

Regional Clusters as the Form of the Territorial Organization of Economy

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Abstract

In this study we investigate the principal factors for regional innovative clusters on the base of regional technology companies.

We determine that the priority task of strategic planning of regional innovative system is search and balance between objective, design, process, and environmental characteristics of cluster as a whole and its organizations-participants.

The model for growing industrial companies in cluster, taking into account the influence of human capacity is offered.

Keywords: Cluster, Innovation systems, Management of a regional economy clusters.

1. Introduction

In the conditions of competition strengthening on national commodity markets, work and the capital increase of competitiveness of regional economy becomes an economic priority for countries, especially rapidly growing like Russian Federation. The urgency of development of the theoretical concepts grows, allowing proving and implementing effective forms of the territorial organization of economy and competitive strategy of social and economic development of regions. The cluster concept represents rather new approach to the territorial organization of the economic system, focusing attention to communications between firms, availability of clusters in the interconnected industries. Efficiency of that process in various industries of economy is reached at the expense of use of geographical localization of the interconnected companies and consolidation of efforts of business, the government and a science. As practice has shown, cluster form of the territorial organization of economy allows increasing labour efficiency and production efficiency, to lower transaction costs, to stimulate innovations

World experience of last decades gives many examples of formation and development of clusters in the most different segments of regional economy. For example, in the USA productions of consumer goods, the service industries function hundreds of clusters in sphere of high technologies. In Germany are generated key industrial clusters in the chemical industry, mechanical engineering and other industries. Finland also has generated national economy nine leading clusters. Development experience of clusters in developed countries has shown their prevailing role in regional growth stimulation, an improvement in employment, growth of budgetary incomes, investment attraction and, finally, growth of a total regional product.

In the XXI century cluster principles of the organization of production interaction began to be used in Russia at development of regional strategy of development. Considering necessity of increase of degree of stability Russian regions on national and cross-border markets, the maximum use of

competitive advantages of territories, actual there is a studying and specification of scientific representations about application cluster approach in regional growth as bases of increase of competitiveness of economy of territories. The urgency of a theme of research is determined by necessity of enhancement of forms of the territorial organization of regional economy.

The purpose of our research — development of the mechanism of forming clusters in regional economy and valuation methods of efficiency of their functioning on the basis of the analysis of foreign and Russian experience.

The following tasks are specified as the first ones for investigation:

- to systematize theoretical bases of cluster approach in regional economic development;
- to specify economic essence of regional clusters as forms of the territorial organization of economy;
- to classify regional cluster on types and kinds;
- to reveal competitive advantages and economic benefits of such type of consolidations of the organizations in regional economy.

More exactly we have answered in details the following tasks [1-3]:

1. The essence of concept «regional cluster» as groups of the interconnected companies localized in region and the organizations cooperating with each other in the course of production and realization of the goods and services within the limits of a uniform chain of creation of cost for achievement of concrete economic effect and implementing competitive advantages of given territory is specified, and principles of its functioning as forms of the territorial organization of economy are specified [4].
2. Classification regional clusters on types and kinds on the basis of ordering of methodological approaches and classification signs taking into account their basic properties as forms of the territorial organization of regional economy is offered: geographical concentration, specialization, innovative power, plurality of participants, interaction between them, a competition and cooperation.
3. The system of indicators and a technique of a performance evaluation of development cluster in certain territory with a view of determination of its influence on a gain of a total regional product on the basis of allocation of direct and multiplicative effects are developed [5-7].

2. Main Research Hypotheses

To the purposes of our researches let us precise the main hypotheses that we take into account [8-10].

1. In the conditions of market economy and globalization necessity of increase of competitiveness of the country's separate regions amplifies. At the same time at regional level a reserve of growth of competitiveness can become clusters as the accounting entities connected among themselves by close economic mutual relations and supplementing each other. In the course of placing of production and development of regional economy there were various forms of the territorial organization. Industrial areas, agglomerations, industrial knots, territorial and production complexes are traditionally allocated. The modern, quickly extending form of the territorial organization of economy of region, are clusters. Problems of clusters forming and realizations of regional competitive advantages as a rule are considered at level of regions. The author's approach to concept determination «regional cluster» is based on base theoretical concepts: placing theories. And concepts of competitive advantages of territories of [4] from which consideration the conclusion that competitiveness of the country and regions is determined by not so much separately taken enterprises, how many efficiency of interaction of firms and the organizations in frameworks of cluster in borders of certain territories follows. Porters [4] determination of cluster focuses attention on its three properties: geographical localization, interrelation between the enterprises and technological coherence of industries. Authors in [10-13] consider achievement possibility synergetic effect at the expense of

interaction; influence on innovative development of region; long-term alliances in the field of production. The analysis of the basic approaches to determination of clusters has shown that in the scientific literature, as a rule, reflect in this concept two moments: territorial localization of the interconnected companies and possession those the competitive advantages implemented in frameworks of cluster model of the territorial organization of economy. So here under regional cluster we would like to understand group of the interconnected companies localized in region and the organizations cooperating with each other in the course of production and realization of the goods and services within the limits of a uniform chain of creation of cost for achievement of concrete economic effect and implementing competitive advantages of given territory. Unlike other forms of the territorial organization of economy, cluster distinguishes market interaction between participants of the consolidations, based on a competition and cooperation, capability of adaptation to changing environmental conditions. Clusters are formed in the conditions of market economy when the enterprises are interested in strengthening of the competitive advantages and in reception of profits on joint activity in certain territory. Thus regional cluster as the form of the territorial organization of economy develops not only in the industries, but also in service trade. The cluster approach to the territorial organization of economy of region is directed on studying of operating conditions of the concrete enterprises and the organizations.

2. Studying of existing approaches of cluster has allowed specifying classifications that there is no standard ordered classification system of clusters. For a basis of author's typology regional cluster traditional division by economic activities kinds that has allowed to systematize industrial clusters (widely researched in the economic literature) and cluster in service trade. The knowledge of classification appears solving at a choice of key performance indicators of functioning regional clusters (the model is provided in Section 3). On a level of development [10-12] allocate following kinds regional clusters:
 - strong cluster are characterized by a high internal competition, intensive internal interaction within the limits of joint projects and work of the internal organizations;
 - steady clusters show positive dynamics of all elements of cluster and internal interactions, however, for the present have not reached a necessary level of development for reception of confident benefits from consolidation;
 - potential clusters are characterized by non-uniform development of its structure and the factors promoting the further development exist weakness of separate elements, however;
 - latent clusters unite variety of the successfully enough functioning organizations and the companies, but as a whole are rather far from high-grade structures.

Depending on a kind of integration of Porter [4] has allocated vertically-integrated clusters and horizontal-integrated clusters. We would prefer in this research to differentiate cluster depending on the forming mechanism:

- descending, formed within the limits of national or regional economic policy;
 - ascending, formed by spontaneously commercial organizations; depending on their innovative power;
 - traditional, producing sample products and services;
 - innovative-focused, using advanced knowledge and technologies and determining priority directions of scientific researches.
3. The indicators and a technique of a performance evaluation of development of regional cluster with a view of determination of its influence on a gain of a total regional product on the basis of allocation of direct and multiplicative effects are to be developed. Efficiency regional cluster is understood as productivity of joint activity of participants as the single whole, determined as the relation of the sum of individual effects of all participants of cluster taking into account arising synergetic effects to the costs which have caused their reception. Each of participants should be convinced of own benefit and in justice of distribution of general effect, otherwise it

won't enter in cluster consolidation. Thus efficiency of clusters is determined by productivity of their activity at different levels of functioning. The author's idea of a performance evaluation of development of regional cluster is based on advantages to its participants and includes complex system of performance indicators from the point of view of the separate enterprise, cluster consolidation and region of its placing. Influence of regional cluster is divided into economic development on direct and multiplicative that allows specifying sources of growth of a total regional product, as main criterion of efficiency of region.

4. Known experience of clusters formation [13-14] in regional economy is to be examined. World experience testifies that cluster approach to regional growth has character of national strategy of economic policy of increase of competitiveness. In world practice three models were generated: North American, European and Asian that are caused by traditions of development of economy of the different countries, security factorial conditions, branch structure of economy, a reservoir of the national and regional markets, and a state role in economy.

The North American model is characterized by small intervention of the federal government in process of regional clusters developments. The European region shows an active role of the federal authority in the course of realization of principles regional clusters developments, determining methodical bases, promoting organizational development, performing financial support. It is connected with dependence on external deliveries of strategic kinds of resources, narrowness of national market outlets. If in the USA they separate from each other in Europe the state cooperates with businessmen, but without direct penetration into structures of large private industrial firms that distinguishes it from the Asian model of relations "state-business". On the basis of the analysis of the experience the leading part of clusters in stimulation of regional growth, an improvement in employment, growth of budgetary incomes, investment attraction is very crucial. The companies which are in clusters have higher indicators have arrived, labor efficiency, sales volume.

The economy of Russia possesses heredity in the form of the Soviet model of the organization of the industry — territorial and production complexes. This model needs modification for conformity to market economy and globalization calls. Forming of clusters in Russia is caused, first, by historically developed system of territorial placing of production in the conditions of the according to plan-centralized economy, secondly structural shifts in transitive economy in the course of market transformation. In a number of regions there were favorable preconditions for development of clusters in those or other industries: there is a concentration of producer companies, suppliers, the organizations of a scientifically-educational complex; an active role from regional and regional authorities in forming and development clusters support (like Moscow region, St.-Petersburg region, Krasnoyarsk region, the Ivanovo, Lipetsk, Samara, Novosibirsk, Sverdlovsk areas, etc.). In the conditions of economy globalization there is a change of industries-leaders in which quality service trade industries more and more act.

3. Modelling Approach

In order to formulate an effective cluster formation strategy for a region we need a model of industrial development suitable to use the empirical studies.

It is known [3, 15] that the main three cases of cluster based regional development are to be investigated:

- Initial stage – only a number of agents with particular types of human capital that initiate the industry;
- Quantity expansion stage – imitating the best practices by a large number of new companies and firms;
- Quality improvement stage – combination of various forms of synergetic in innovations.

The specificity of developing economics (like Russia) is to be taken into account. It is a consequence of exogenous influences from developed economics (international trading, direct investments). And we ought to take into account also the endogenous factors to our model:

- Learning externalities for human capital, like advanced production technologies and new innovations in marketing methods;
- Information asymmetry between buyers and sellers in product quality (learning by doing chain, increasing the quality of the product in production cycle).

We can discuss below the simple model [15] for the three types of regional clusters. Firstly we can set up a model with learning by doing technology with the delay the entry for companies. It is obvious that the information asymmetry gives the place for innovations.

3.1. Initial model

Let us examine two levels of product quality $q = (l, h); h > l$. The equilibrium generates a time path for the product prices $\{p_t^l, p_t^h\}_{t=1}^{\infty}, t = 1, 2, \dots$ and the industry output. Company's entry and exit yields a time path for the total number of firms.

The consumer has a static utility function with a parameter: $\theta q - p, \theta > 0$. For elastic demand the consumer pays θl or θh for low or high quality product. The unit production cost is constant and socially desirable: $cq, \theta > c$.

Firms can choose between two main marketing methods:

- Anonymous transactions (zero cost, but quality is not observed by customers);
- Direct transactions (fixed cost for the period γ , but quality is observed by customers. The direct marketing cost includes the management of retail outlets.

3.2. Learning by doing

Let us include the engine of growth to the model. Let the production capacity of the firm be the result of its operation experience and growing as δ or stays at the same level if learning mechanism not operates:

$$x_{t+1} = \begin{cases} (1 + \delta)x_t & \text{if operates in period } t \text{ or otherwise correspondingly and } \bar{x} < \infty \\ x_t \\ \bar{x} \end{cases}$$

Company maximises the expected discount sum of profits, $\sum_{t=1}^{\infty} \int_{Z^t} \beta^t F(z_t) \mu(z_0, dz^t)$, where $z_t = (s_t, a_t)$ and s_t is vector of states; a_t an action to be chosen from discrete and finite set A (entry, exit, product quality, marketing methods). The evolution is described by transition function from initial state with transition probabilities Q :

$$\mu(z_0, z^t) = \prod_{i=0}^t Q(z_{i+1} | z_i).$$

State of each firm s is determined by its entry decision, product capacity x . Each company draws profit π from distribution G before the initial period. The bellman equation for dynamic optimization is following:

$$V(s_t) = \max_{a \in A} \{F(s_t, a) + \beta \int V(s_{t+1}) p(ds_{t+1} | s_t, a)\}$$

where β is discount factor. It is known that the solution of bellman equation gives the maximum value for the problem. Solution can be found numerically.

3.3. Asymmetric information case

Let us as in [15] include the most interesting case – when consumers cannot observe the product quality. It can be proved that the product traded in anonymous transactions is of the low quality. But we will regard the case of learning externalities (like development of labour market for skilled personals from cluster companies, diverse of human capital enlarging innovations opportunities).

In this case the production capacity of the firm looks like:

$$x_{t+1} = \begin{cases} (1 + \delta(X_t/x_t)^\alpha)x_t, \\ x_t, \\ \bar{x} \end{cases} \quad \text{if operates in period } t \text{ or otherwise correspondingly and } \bar{x} < \infty.$$

Here X denotes the production capacity of industrial leader, $\alpha \geq 0$ - intensity of externalities. We also assume that the technological externalities decay over the economics distance. In this case we can formulate the Bellman equation for the optimal behavior of the value function of a firm under learning spillovers [15]:

$$V(\pi, x, X) = \max\{\pi + \beta V(\pi, x, X'), W(\pi, x, X)\}$$

$$W(\pi, x, X) = \begin{cases} (\theta - c)lx + \beta W(\pi, x', X'), & x < m \\ (\theta - c)hx - \gamma + \beta Z(\pi, x', X'), & x \geq m \end{cases}$$

Where $X' = \min\{\bar{x}, (1 + \delta)X\}$, $x' = \min\{\bar{x}, (1 + \delta(X/x)^\alpha)x\}$, $m = \gamma(\theta - c)^{-1}(h - l)^{-1}$ and

$$Z(\pi, x, X) = \{(\theta - c)hx - \gamma + \beta Z(\pi, x', X')\}.$$

Production capacity is weakly growing due to learning by doing, so firm starts from $x \geq m$ high quality case. This value is represented by Bellman equation Z. For start with $x < m$ - low quality case, company switches to high quality production through direct marketing once production reaches m by learning by doing. This value is represented by Bellman equation W. Finally firm operates if its operating value is higher than the value of its outside option (Bellman equation V). Surely all equations ought to be solved numerically with parameters, estimated to fit the empirical data. All the above is to be the next stage of research.

4. Conclusions

Let us make here some conclusions for the above research. The modern theory of economic cluster has made huge impact on world economy development. Achievements of the majority of prosperous economic systems lead to conclusion on utility of the considered theories and for development of competitiveness of the countries with transitive economy, including for Russia.

In our study we tried to make some approaches for modeling the well known phenomena for regional clusters. All new companies initially produce low quality products in anonymous transactions. The number of firms increases and they form the regional economy cluster. Firms switch for high quality productions as the size increases.

The information asymmetry between firms and their customers is the key mechanism of the development for the cluster. Firms initially provide low quality products in anonymous transactions until their production capacity allows paying for direct marketing. The engine of growths is learning by doing mechanism.

The estimation of the parameters of the model is to be done on the next stage by using the empirical data for selected Russian regions.

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