

Identification and Analysis of Industrial Cluster Structure

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Abstract: The article gives reasons for the choice of management object of state cluster policy, the problems of realization of cluster policy are considered, its risks connected with information asymmetry, insufficiency of statistic information, absence of efficient tool for cluster and their prototypes' identification. Critical analysis of the existing approaches to definition of industrial enterprises' clusters is done, the author proposes his own sequential order to identify groups of interrelated enterprises with the aid of charts of potential clusters. Use of this approach allowed to identify the structure of industrial cluster and interrelation between its main participators, which are potential objects of state cluster policy.

Key words: Industrial cluster • Cluster policy of the state • Potential clusters • Primary and secondary attributes of cluster • Structure of industrial cluster

INTRODUCTION

In Russia in the conditions of significant change of institutional functions performed by constituent entities' governments the object of state management in industry must be re-defined, in order to do that new approaches must be developed. In modern economy key function is performed by such relations between economic agents, which can not be restricted neither to ordinary market contracts, nor to relations inside company executive vertical structure. Such coordination of economic activity, which is something in between market and administrative forms is called economic quasi-integration [1]. Practices of developed countries with completely formed market relations demonstrate that one of relatively new forms of quasi-integration is combination of enterprises from different industries of national economy, which is called "cluster".

M. Porter gives the following definition: "cluster is a group of geographically near to each other and interrelated companies and associated with them institutes which specialize in some common sphere and put together by common interests and add to each other" [2].

The concept of cluster is a new way of vision of national economy which emphasizes new functions of companies, state organizations and NCOs which are striving to increase in competition. The founder of this theory, M. Porter investigated the role of clusters in competition processes, living cycle of clusters, role of "private sector" as well as other institutes in clusters improvement. By now cluster approach to economy is totally accepted strategy aimed to increase competition of industries in national economy Successful experiments in development of clusters were carried out in different world countries, among them: India, Indonesia, Malaysia, Mexico, Nicaragua, Bolivia, Madagascar, Morocco, Tunis [3]. Cluster approach is also used in state investment policy in order to find out prioritized areas for attraction of direct foreign investments [4].

Popularization of cluster approach in economy of developed countries led to active development of M. Porter's ideas. Having analyzed existing approaches (UNIDO, Eurasia Fund) [5-8, 11] we could formulate the following definition of industrial cluster. Industrial cluster is a group of geographically close and interacting leading companies and affiliated organizations which act in specific economy sphere of the region, which are closely

connected with each other in the framework of industrial, technological, scientific and other kinds of interaction in the process of production of key products. Cluster is concentrated around its center - its core part, which is formed, as a rule, by companies producing end products and services. Distinctive feature of a cluster is keeping of competitive relations between cluster enterprises which are in similar production positions.

The Problem: Industrial policy of a state which is oriented to development of clusters on regional or national economy's scale is called the policy of concentration or cluster policy. Impact on the cluster is possible in direct form: subsidies, creation of privileged customs and tax regimes, targeted allocation of scarce resources and creation of infrastructure, individual follow-up of the projects of the chosen cluster and indirect: carrying out of competitive policy.

Today in scientific literature everybody is engaged in active debates about the degree and possibility of state influence on the economy while realizing tools of industrial policy [9]. We share the point of view that state abilities to form and develop clusters which consist of industrial enterprises are very restricted because of the following reasons:

- State officers have restricted opportunities to define the best ways of industries development because of information asymmetry. Social choice theory says: "because of the constant information asymmetry and strategically determined behaviour of politicians and state officers "state failures" occurs with the same frequency as "market failures".
- Experience of the developed counties showed that best development of cluster and its competitiveness can be achieved in competition environment, where direct state support of separate market participators will be harmful.
- Appearance of industrial cluster is the result of coincidence of many factors: geographic, historical, psychological and human, which can not be defined and influenced directly.

Key risk of cluster policy is incorrect choice of the research object because of information asymmetry, insufficiency of statistic information, absence of efficient tools for cluster and their prototypes' identification.

Many states try to follow world trends and support high-tech industries. Involving themselves into this world-wide innovation race most countries rely on the

same activities - as a rule, these are information, bio- and nano-technology clusters. But real competitive advantage can be obtained by a cluster not due to copying the competitors but to launching unique product onto the market. Such policy also leads to duplication of investments which are made into the same high-technologies. This "herd effect" can result in surplus capacities, formation of bubbles and crisis after which only the strongest will survive [9]. In this situation we also have risks determined by the lack of institutional infrastructure in the region which will just copy successful and interrelated industries and enterprises in other regions.

In the same time state support of traditional and already formed in regions industries and enterprises is also risky. On the one hand, these enterprises often employ a lot of people in the region, they may be even city-forming, on the other hand, there is a danger that such enterprises will not survive without state support and subsidies. Subsidies for traditional industries very often do not help to restructure companies, but on the contrary, "legalize" inefficiency of their activity. The representatives of institutional school in economic geography point out that traditional industrial regions are especially liable to it [9]. Such state policy, while solving partially social problems of the region, worsens competitive environment which is basic factor of formation and development of cluster.

Taking into consideration main risks of industrial policy of the state when the management object is cluster, we shall focus on the analysis of existing methods of cluster identification and make proposals on their improvement. Risks can be minimized when the object of state cluster policy is defined correctly.

Methods of Study: It is not easy to identify clusters in practice because all industries in the economy are exchangeable. For example, in the framework of Porter's definition geographic scale can vary from a district (of the city) to several nearby situated countries. That is why because of vagueness of the concept it is not easy to say where clusters starts and finishes. In Porter's opinion: "Geographic scale of clusters is connected with the distance at which the increment in efficiency in the sphere of information, transactions, symbols etc. is felt. Identification of clusters borders is often a difficult task: it is creative processes based on understanding of interrelation between enterprises and institutions which are most important in terms of competition in some sphere and how they mutually add to each other" [1].

Existing methods of identification and cartography of clusters vary greatly [10]. The most common method of identification of industries, including development of clusters charts of them, was invented by M. Porter [1].

Main data which are analyzed to identify industries included into clusters is the data from UN Annual Statistic Report on trade based on the export of the country in question. Such approach has the following disadvantages:

- It allows to find out only those industries which have already reached high level of international competitiveness and does not allow to make conclusions in regard to degree of clusterization in other spheres, which did not demonstrate such high level of competitiveness in the analyzed period, for example on country or a region' scale;
- It does not take into consideration that capacity and degree of exploration of some markets is such that industrial enterprises must not prioritize export in short term: it is less beneficial than regional expansion inside the country;
- Exclusion of the industries with domination of foreign companies in export does not seem appropriate because foreign companies, which are producers of end products and services can be included into the clusters of industrial enterprises which consist only of national companies. In this case we can refer this cluster to competitive clusters of the country.

Taking into consideration all disadvantages mentioned above we shall build alternative list with sequential order based on primary and secondary attributes of potential clusters of the region. Primary attribute is use of production factors, accessible for industrial enterprises of the region or country and their profitability.

The indicators which characterize this attribute are as follows:

- Share of production volume of subindustry in total industrial production volume of the region.
- Share of subindustry in the amount of Investments into fixed assets in industry.
- Share of subindustry in the amount of foreign investments in industry.

- Share of subindustry in the amount of financial investments in industry.
- Share of subindustry in the number of employed at industrial enterprises of the region.
- Share of subindustry in the balanced financial result of industrial enterprises.
- Share of subindustry in export volume of industrial products from the region.
- Share of subindustry in total number of industrial enterprises, registered in the region.

Potential clusters are in leading subindustries because as it is formulated in the definition of cluster, it is formed by leading companies and the number of successful enterprises in leading subindustry is higher than in outsiders. In the same time successful companies can be in subindustries-outsiders - they also can be potential clusters, but in this case it is obvious that a part of potential cluster included into this subindustry is significantly less than the subindustry itself. To identify such potential clusters other attributes are necessary.

Taking into consideration that existence of clusters is based on interaction between enterprises, the results of identification of clusters by primary attributes must be supplemented with the analysis of the degree of interrelation of enterprises:

- Availability of association of industrial enterprises which produce similar products.
- High concentration of education institutes which prepare specialists with the same specialty.
- Big number of exhibitions, seminars, conferences etc., organized in the region and devoted to one of the industry sector.
- Big number of patents and licenses concentrated in the region and intended for innovations in one sector of industry.
- Availability of regional means of mass information devoted to one industrial sector.
- Recognition of some sectors of industry as prioritized for development in this region by different regulatory documents.
- Availability of preferences of market and non-market character in the region intended for separate industrial sectors.

These indicators can be called secondary attributes of a potential cluster.

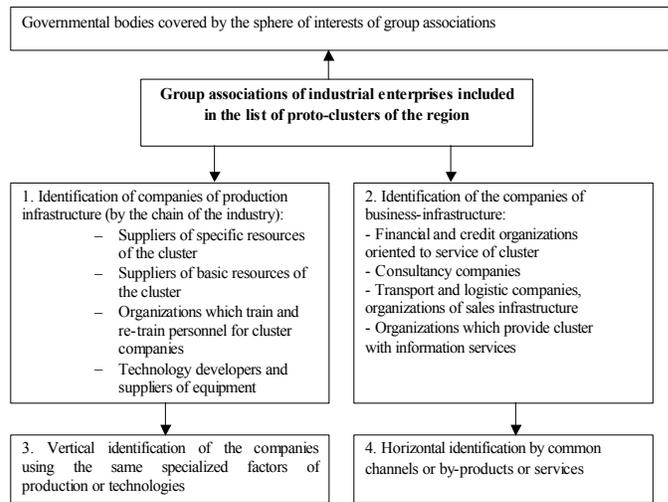


Fig. 1: Sequence of identification of proto-cluster objects

Analysis of regional industrial enterprises' complex of the region with the aid of primary and secondary attributes will allow to identify industrial sectors with different degree of aggregation which are potential clusters. Such sectors of industry which are potential clusters can be called proto-clusters. In order to obtain actual results of such analysis in conditions of transition economies with quickly changing conditions and effects of industrial enterprises' work we must have data for the last 5 years. Mentioned list of primary and secondary attributes is not finished and can be supplemented with any attributes which characterize the state and development of subindustries in the region and interrelation between them.

Every proto-cluster identified with the aid of primary and second attributes must be studied thoroughly, including proto-cluster chart building.

For developed industrial regions with multi-industrial economy and in conditions of restricted information and statistic data about the activity of enterprises we propose to use the following scheme in building proto-cluster chart, which suggests identification of all objects forming potential clusters (Figure 1).

After identification of main objects of proto-cluster it is necessary to check if it corresponds to clusters attributes. Clusters attributes corresponds to its 2 key characteristics: leadership (competitiveness) of enterprises and interrelation of their activities. Such attributes are as follows:

- Export (pre-conditions for it) which must significantly exceed the demand within the territory.

- High concentration of technologically linked productions at the restricted territory.
- High concentration of resource-related productions at the restricted territory.
- Availability of agreed medium-term and long-term strategy with the group of companies which are not tied up by legislature.
- High consumers' demand for key goods.
- Highly qualified staff or availability of a base for training such staff.
- International certification of enterprises and the goods.
- Availability of special resources at competitive prices.

International success of an industry, as a rule, is identified by availability of big export or direct foreign investments aimed for increase in production or specialists qualification improvement. M. Porter believes that use of these criteria will allow to judge about availability of real competitive advantages of this industry in the world.

Dynamics of observed attributes determines the vector of cluster's change: positive - transformation into clusters of industrial enterprises; negative - return to the state of proto-cluster. The following phenomena are most critical for cluster development:

- Geographic concentration of cluster enterprises on regional level,
- Increase in number of interrelated productions;
- Increase in competitiveness of every element of the cluster.

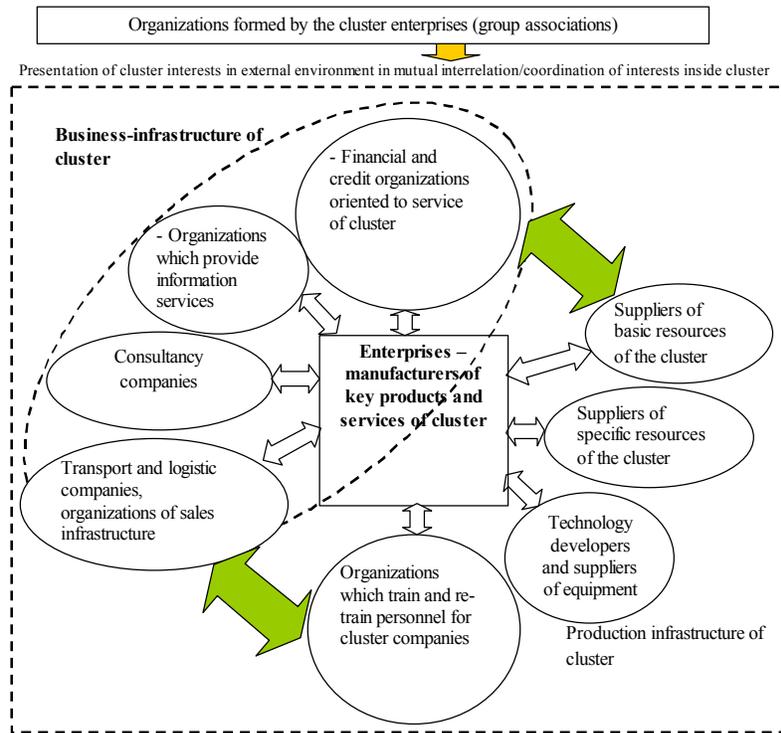


Fig. 2: Internal structure of industrial cluster

Results of Study: Use of proposed approach in practice and analysis of clusters has shown that industrial cluster has 3 basic elements, which are strongly interrelated: core, production infrastructure and business-infrastructure. The contents of every element is shown in Figure 2 in detail.

Every element of structure is of utter importance for competition of cluster. First of all, these are key companies which export their products, services beyond region's borders. Other companies which are also included into clusters can be less known. Competitiveness of key companies depends on the chain of suppliers which deliver raw materials, components, products, spare parts, repair, services etc. The quality of supplier determines well-being of the whole cluster. 60-80% of production costs are raw materials and services. And only 20-40% of production costs is under direct influence of company's directors. Thus, 80% of costs depend on the quality of supplier. Of course, these figures can vary depending on the industry. For example, in retail this figure amounts to 70% and in transport services - about 45%. Main idea is that competitiveness directly depends on efficient supply system.

Business-infrastructure of a cluster is also very important for its successful development. Availability in the region of specialized industrial financial organizations

or bank products improve the opportunities of the manufacturers of key products due to investing into research, productive and sales spheres, thanks to which reproduction process and development of cluster are achieved. Information and consultancy services are necessary for constant monitoring of raw materials markets, labour markets and sales markets: this can minimize risks of market fluctuations. Availability of a wide range of transport and logistic companies provides successful delivery of the end product to the buyer, which facilitates competition in the industry.

State policy intended for development of a cluster must solve the following tasks:

- Constant monitoring of cluster's initiatives in market environment;
- Facilitation fundamental scientific and research work and development of staff potential in the sphere of key technologies of clusters and proto-clusters;
- Information support and promotion of end products of clusters, including the system of state orders;
- Provision of financial infrastructure for doing business.

Inference: So, in order to minimize risks of state cluster policy the object of management must be chosen

reasonably. The article describes the sequence of identification of the groups of interrelated enterprises by the method of potential clusters charts based on the analysis of statistical indicators, characterizing two most important clusters attributes: competition of enterprises and interdependency of their activity. Use of this approach allowed to identify structure of industrial cluster and interrelationship of its key participators, which are potential objects of state management in the process of realization of cluster policy.

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