

Development of Methodological Approaches to the Efficiency Analysis of Territorial-Industry Cluster Formation in the Forest Sector

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Abstract

The paper presents the results of research on enterprise integration meth-cabling sector in the region in the territorial and industrial cluster. It is shown that the territorial-industry clusters act as a key tool for the development of regional economies. The authors created methodological approach to the study of the prospects of the formation of territorial-industry cluster. The necessity of evaluating the effectiveness of the furniture cluster formation on the basis of the definition of a critical mass of the cluster, the strength of interaction between participants integration emergent effect of the presence of partners. Methodical approach includes analytical system performance efficiency of formation of strategic territorial and sectorial cluster (economic, social and environmental, budgetary, international and synergistic) and an array of vectors of cluster initiatives (activation, stimulation, support). The presented method provides a basis for the study of current prospects for the formation and development of territorial and sectorial clusters and differentiation of measures to support cluster initiatives in the regions.

Keywords: territorial and industrial cluster analysis of efficiency, furniture industry, integration

1. Introduction

In a globalized economy urgent problems of competitiveness of regions, industries and enterprises increase. This problem is relevant for the regions of Russia, as well as individual industries as growing globalization will inevitably lead to increased competition in all areas of management (Surovitskaya & Frolov, 2013).

The Program of Socio-Economic Development of the Russian Federation on the medium-term perspective (2008-2020 years), one of the ways to improve the competitiveness of the regional economy defined the development of industrial clusters.

In the late 80-ies of the last century, researchers, including Michael Porter, detect-whether that of the world in different countries there are groups you can even say “bunch” of competitive enterprises in selected industries, which, despite its small territorial size, occupy a leading position in the global market. Experience of developed countries shows that the presence of clusters is a factor in the high level of competitiveness of their economies (e.g. forestry cluster in Finland, gardening - in the Netherlands, sea - in Norway, biotechnology - in Germany and the UK, the telecommunications and computer - in United States, a cluster of light industry in Italy, etc.). In the documents of the Government of the Russian Federation territorial clusters are defined as the union of companies, suppliers of equipment, components, specialized production and services, research and educational organizations located geographically close (although not necessarily within a single subject of the Russian Federation) and functionally related to each other.

For the entire economy the state clusters function as points of growth of the domestic market (Popkova et al., 2013). After the first is often the formation of new clusters, and international competitiveness of the country as a whole increases. She keeps it on strengths of individual clusters, whereas even beyond their most developed economy can only be mediocre results. According to experts, half per cent of the world's leading economies

covered by clustering (Popkova, Romanova, & Akopova, 2012). Countries that employed the cluster approach could increase the GDP in the range of 75 to 90 percent (Popkova, 2012). The experience of creating clusters in the Russian forest sector has, it is Moscow, St. Petersburg, Vologda, Kaluga. Undoubtedly, in recent studies the integration of industrial enterprises in geographically-industry clusters notable progress.

At the same time the state of the Russian forest sector, related to the denationalization and privatization leads to the conclusion that it is difficult to adapt to the ry-night conditions and the cluster innovation. Remain unresolved issues such as the forestry sector it highly structured, low levels of trust business leaders to each other, to the authorities and to any joint initiatives, Pass-particle-assessment of the prospects of development of the forestry business in Russia in general, and others.

On the projects or the creation of forest-related wood processing clusters stated many regions: Arkhangelsk, Sverdlovsk, Khabarovsk, Krasnoyarsk, and even the Krasnodar Territory. In all regions it rather successfully implemented by individual sectorial investment projects. Applications for the establishment of clusters in almost all subjects of the federation abound, but really working - while units. Moreover, most of the structures were established a few years ago at the initiative of the regions and their businesses.

It is known that in the domestic market domestic furniture is not competitive in price with them tailor furniture of similar quality due to the large share in the composition of costs of expensive materials produced on import (lined with fiberboard - 15%, MDF - 60%, Laminates - 60% of paints and varnishes - 60 percent). In this situation, the domestic furniture market actively filled by imported products.

In the structure of the furniture production enterprises the share of the Central region accounts for over 40% of all produced furniture, while the share of products manufactured by furniture makers, accounting for about 15% of all revenues timber industry. Taken at various levels of government and the laws of the project activities to promote the development of the domestic furniture market allow you to forecast its increase in 2020 by 4 times, to compare the production of plates and paper increased by 2 times, commercial timber 1.5 times.

For Russia, clustering furniture is relatively new phenomenon. In our country, information on creating clusters of furniture available in Kaliningrad and St. Petersburg.

2. Method

To determine the prospects for the formation of territorial-industry cluster as the object of study were made by the furniture industry enterprise forestry Voronezh region. For furniture enterprises in Voronezh region made a comparative analysis of the activities and the evaluation of the interaction with competitors, suppliers of raw materials, buyers and customers of products, research institutes and universities, financial institutions and others. Were examined three large and 16 small and medium manufacturing enterprises.

In a study of clustering territory and industry relied on the statistical indicators reflecting the competitive stability of the industry in the region and the potential for integration, such as:

- Coefficient of localization, which is determined by the ratio of the share of this sector in the structure of the region to the specific gravity of the same industry in the country; In-localization index equal to one means that the region has the same share of the industry in terms of employment, and the state as a whole. Localization index greater than one (typically starting from a threshold value of 1.25) means that it is possible to say about this specialization in this particular region of economic sectors.
- The coefficient of per capita production, calculated as the ratio of the share of industry in the region in the corresponding structure of the industry of the country to the specific gravity of the region's population, the country's population;
- The coefficient of the region's specialization in this sector, defined as the ratio of the specific weight of the region in the country in a given field to the specific gravity of the region in the country's GDP. In accordance with this methodology industries market specialization (or the sectors in which there are clusters) are the sectors for which estimates of greater than or equal to one, the ranking of industries in these indicators will prioritize the analysis of industries in the next step.

To characterize the cluster in the region used the following indicators:

a) localization index, which is a cluster analysis can be calculated by the formula:

$$Q = \frac{E \cdot E_{MM}}{E_p E_M} \quad (1)$$

where E is the total number of people employed in the field;

E_{MM} is number of people employed in the furniture cluster in the i -th region;

E_p is number of employees in the area i ;

E_m is the number of employees in the form of activities in the CCA.

b) the ratio of market specialization (CR).

$$CR = (V_1 + V_2 + \dots + V_n) / V_m \quad (2)$$

where $V_1 + V_2 + \dots + V_n$ - volume of sales of a certain number of the largest sellers, V_m - the total amount of the sale of goods.

In addition to consultations with the leaders of the three major manufacturers of furniture, LLC "Angstrom", JSC "Grafskoye", Holding Company "Mebel Chernosemia" by personal interview. Immediately after completion of the survey interviewers conducted verification and coding of questionnaires for further processing questionnaires used methods of statistical research. Evaluation of the activity of the enterprise collaboration party's potential cluster competitive environment was carried out according to the following criteria:

- Cooperation with suppliers assessed as active if the company: a) Started-melts mainly from suppliers located in the same region; b) is willing to provide assistance to the supplier; c) consider this cooperation as claimed;
- Cooperation with educational institutions is viewed as an active EU-whether the entity: a) attracts mainly graduates of educational institutions of their region; b) cooperate with educational institutions in two or more directions;
- Cooperation Competitors assessed as active if there is inter-action with competitors in two or more directions.

3. Results

Geographical location of the Voronezh region does not allow it to claim the creation of the timber cluster relying on logging, in view of the absence, for obvious reasons of industrial logging in our forests, but for the conditions of region to which the region, the importance of establishing a furniture cluster in which increased chance of a significant increase in the level of competitiveness of the timber sector. Historically, the market is saturated with the Voronezh region large, medium-sized enterprises, which form a stable demand for furniture products, both within the region and beyond. It is in the Voronezh region concentrated the largest furniture manufacturers - Holding Company "Mebel Chernozemia", JSC "Grafskoye", group of companies "Angstrom", LLC "Somovo-furniture" and other major manufacturers a total of 16 companies, as well as dozens of small and medium-sized enterprises.

Efficiency of formation of territorial-industry cluster in the forest sector was evaluated in stages.

In the first stage were estimated propensity territories and sectors to the cluster-tion. In order to analyze the localization of the indices we used and the concentration of enterprise-prises. At this stage, we investigate the location of critical raw material suppliers and services, educational institutions, industrial relations and all forms of cooperation with competitors that companies use or are willing to use in the way of clustering. The result of such an assessment becomes an integral indicator of the effectiveness of cluster initiatives.

Voronezh furniture cluster - is historically established business community of manufacturing and trading companies, private entrepreneurs and companies, which will focus on a few acres of the industrial park.

Using expert judgment and the coefficients of localization, as the most simple and low-cost methods for the identification and analysis of regional industry clusters-ing, it was found that the level of localization and concentration of companies manufacturing furniture-tion Voronezh region leads in the CCA (Table 1).

Table 1. Comparative characteristic of clustering indexes for areas TSCHR

Indicators	Voronezh	Belgorod	Kursk	Lipetsk	Tambov
Index of furniture production localization	1.37	1.02	1.03	1.11	1.18
The concentration index of activity	78.2	26.3	20.1	11.8	38.4

The results of a survey of managers holding enterprises furniture manufacturers indicate that the geography of placement of the main suppliers in the furniture manufacturing sector is not limited to one region: more than half of the respondents indicated that their main suppliers are located in other regions of Russia.

At the same time, companies that have marked the emergence of new major suppliers in last year noted that their major suppliers are located in the same region. It can be viewed as an indirect signal about the importance of time-displaced factor in the formation of economic relations (with the respective you-boron).

In the sector of furniture production expressed tendency to preserve the fundamentals of composition of suppliers of raw materials for a long time: 52% of respondents indicated that the duration of cooperation with major suppliers of more than five years (Figure 1). This is due, above all, the specifics of the industry: many kinds of equipment and raw materials are produced by only a few manufacturers. However, service providers, and works in the service area of production, transportation, marketing, etc. change quite often. This is confirmed by respondents easily switch from one supplier to the other. At the same time, hardware and building materials on the market a significant number of manufacturers, but the relationship with suppliers in this sector enterprises look quite stable and that it is also important geographically concentrated.

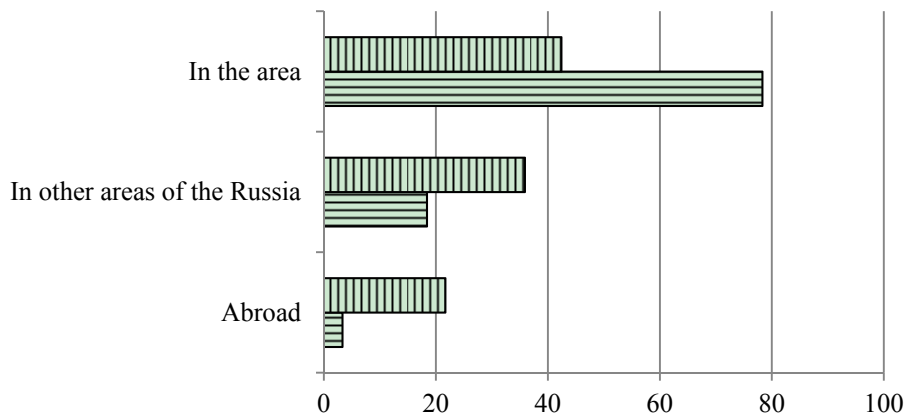


Figure 1. Placement of the main suppliers of raw materials and services

It is known that not only the accessibility, availability of production Towering STAY suggests clustering area, the main place in the co-sit the cluster is given by highly qualified personnel.

Voronezh region has a high scientific and technical potential. The city has several leading universities in the country and home to many industrial research institutes, design bureaus and NGOs. In this regard, we have studied the educational potential of the region and the relationship between the major manufacturers and educational institutions.

Localization of educational institutions whose graduates are attracted to work on me-for profitable enterprises of this industry is very high (see Fig. 2): more than 80% of pa-workers are graduates of institutions of higher and secondary vocational education, located in the city of Voronezh. In this case, the need for manpower in the manufacturing processes and the main production is covered entirely by the Forestry Academy graduates. Thus, the geographic concentration of the links between production and education is not in doubt.

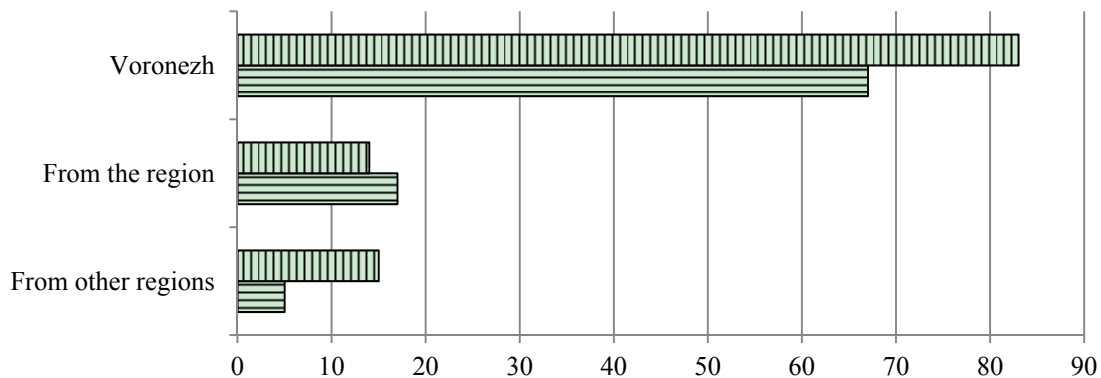


Figure 2. Localization of educational institutions

At the same time companies satisfaction level of training of graduates of educational institutions mean: that the quality of higher education to the needs of 52% of respondents indicated the sample.

A deeper analysis of responses shows that cooperation between furniture companies with educational institutions is predominantly traditional character to attract students in the labor force for the period of production or pre-diploma practice, as well as refresher courses employees are absent innovative joint projects.

In our opinion clustering can promote interaction Wu-call and producers, the appearance of the base schools and departments in higher education institutions, the activation in the adaptation of curricula to the needs of the furniture production in the level of training.

Collaboration with competitors is a distinctive feature of the cluster co-GDS, despite competition for factors of production and market the final product, companies are finding opportunities for mutually beneficial cooperation, boosting effectiveness of all participant relations. Note that this is only true for a cluster in cooperation.

Figure 3 shows the information on the forms of cooperation with competitors, which companies use or are ready to use. Hypothetically all kinds of cooperation are considered by respondents as possible, including the exchange of information on the production technology and the sharing of R & D results. In practice, however, there is no all-round cooperation, - dominates the competition factor, and the interaction is limited to the exchange of information on the state of demand and cooperation in order to develop proposals for the improvement of economic policy.

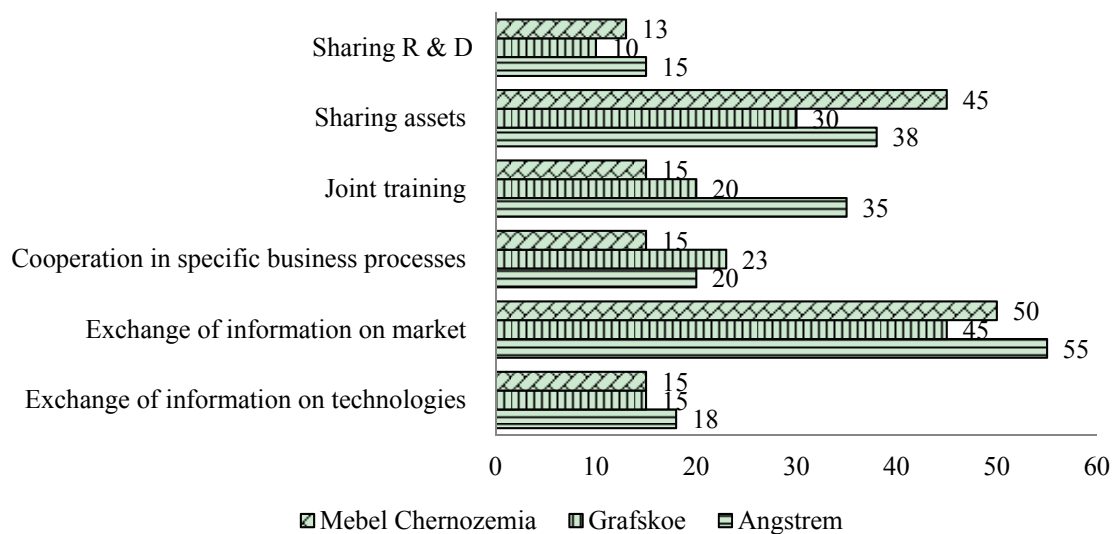


Figure 3. Forms of cooperation with competitors that companies use or are willing to use

Attitude to sharing the results of research and development in the furniture manufacture is rather negative, low interest and the exchange of the underlying technology.

It should be noted that, in assessing the interaction within the furniture cluster, respondents production emphasize the importance of co-operation with customers and kami of providers and the federal government. In other words, increasing the Competitiveness is seen as the result of deliberate government policy, the more federal than regional. To support innovative busi-ness in the region has developed a whole system of interacting public and profit organizations with a certain division of labor between them.

These results allow us to make the assumption that an increase in the competitiveness of enterprises can be achieved through collaboration with other economic agents. Furniture holdings in the performance of the cluster can be considered active cooperation of enterprises, educational and scientific cooperation with suppliers and a well-developed competitive environment (Table 2). An entity is actively cooperating with the competitive environment, if it is to evaluate cooperation with two or more groups of economic agents both active.

The second stage involves determining the critical mass of the cluster and its comparison with the E is minimal required size of a position of effective clustering (Bezrukov, Morkovin, & Jiang, 2013). In the furniture sector has developed an opportunity for CCA forms the territorial branch of the cluster.

Table 2. Performance indicators of cluster initiatives

Indicator	Companies that make up the core of the furniture cluster		
	“Angstrom”	“Grafskoye”	“Mebel Chernozemya”
Cooperation with suppliers	+	+	+
Cooperation with competitors	+	+	+
Cooperation with educational institutions	+	+	+
Interaction with regional authorities	+	+	+
Self-assessment of the availability of the cluster	+	+	+

Table 3. Indicators of achievement of a critical mass furniture production enterprises in 2012, the CCA

Indicator	Actual value of	Critical values
The share of production enterprises cluster in the production industry	0,13	>0,1
The share of products export enterprises in export production industries	0,24	>0,3
Factor of localization	1,14	>1,0
Part of the purchase of products produced by enterprises anchors cluster of international cooperation within the cluster, in the semi-finished products and materials purchased	0,42	>0,5
The number of employees in enterprises cluster in the number of employees in the industry	0,09	>0,1
Removal of value added per unit volume of sales of anchor enterprises cluster	0,31	>0,3
Fraction of the volume of production of small enterprises in the volume of production of all cluster members	0,38	>0,3
Integral level of critical mass of the cluster	0,54	0,35

The third stage aims to assess the effectiveness of the interaction partners of the cluster, the calculation of which relates to an integrated indicator of the effectiveness of functioning enterprises cluster core with index reflecting the overall average effectiveness functioning enterprises industry segment (Table. 4) (Ilyenkova, 2007).

Table 4. Characteristics of the interaction of the participants of the furniture cluster

Name of the company	Effectiveness ratio for each participant	Interaction rate
Holding Company “Mebel Chernozemya”	1.13	1.76
Ltd. HC “Angstrom”	0.97	1.01
JSC “Grafskoye”	1.4	1.85
JSC “Christina”	0.46	0.46
Ltd. “Somovchanka”	0.03	0.54
Ltd. “Gefest-mebel”	0.5	0.38

Analyzing the results of the tables and their interpretation becomes clear that a number of companies, most closely cooperating within the framework of the technological chain of Obra-form a core of the cluster and are the anchors, because the strength of the interaction with part-ramie high. For furniture cluster, it is obvious that such companies may consider Xia Holding Company “Mebel Chernozemya”, Ltd. HC “Angstrom”, JSC “Grafskoye”. At the same VRE-name place less contractors and subcontractors in the performance of a number of works in the technological chain can take and smaller companies. So JSC “Christina” and Ltd. “GeFest-mebel” are enterprises followers (perhaps cooperation on the basis of subcontracting and outsourcing), the interaction force is moderate. The fourth stage is aimed at determining the type of cluster. To do this, we have developed a typology matrix (Table 5).

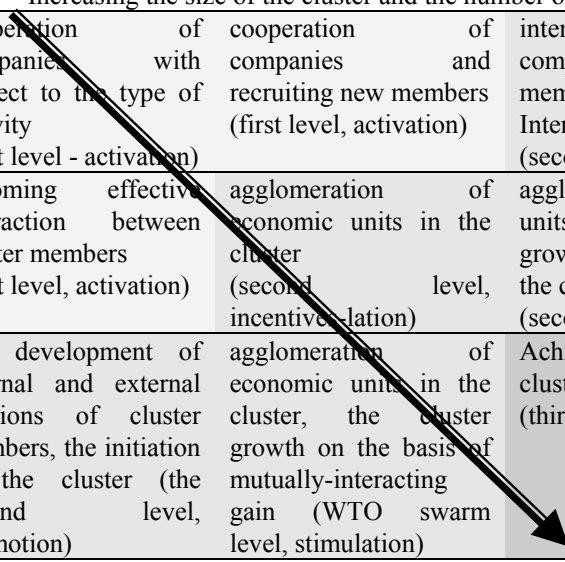
By analyzing this table it becomes clear that as we move from the upper left to the lower right is an increase in the size of agglomerations and rose-solution stability and quality of the relationship between partners.

Achieving sustainable and effective interaction between the participants state stem-Stern structure is observed when passing through the line of critical mass (0.51) and the effectiveness of the interaction (1.5).

Table 5. Typing state of cluster initiatives, depending on the level of interaction and a critical mass of participants

Efficiency of interaction between enterprises	The level of critical mass of companies		
	0.1-0.3	0.31-0.5	0.51-1.0
	Increasing the size of the cluster and the number of participants		
<0.5	cooperation of companies with respect to the type of activity (first level - activation)	cooperation of companies and recruiting new members (first level, activation)	intensive cooperation of companies recruiting new members including Inter-native initiation cluster (second level, promotion)
0.5-1.5	becoming effective interaction between cluster members (first level, activation)	agglomeration of economic units in the cluster (second level, incentive relation)	agglomeration of economic units in the cluster, the cluster growth, based on increasing the capacity of (second level, promotion)
>1.5	full development of internal and external relations of cluster members, the initiation of the cluster (the second level, promotion)	agglomeration of economic units in the cluster, the cluster growth on the basis of mutually-interacting gain (WTO swarm level, stimulation)	Achieving stability in the cluster, efficient state (third level, promotion)

Improving the sustainability and efficiency of communications



The table below shows the formation of an integrated assessment of promising cluster initiatives depending on the level of interaction between participants and the critical mass of the cluster mass. It is held by a sequential convolution of criteria critical mass and the level of interaction partners.

You can see a situation where it is necessary to increase the cluster initiatives from level 1 “satisfactory” level 2 “good”. To do this, we define the notion of optimal development options. Development options are denoted by the vector $X = \{X_c, X_{km}\}$. Components of this vector is determined evaluation criteria, respectively, efficiency relations and critical mass. Option X is optimal if there is no other option Y, having the same value of the integral evaluation scores on all criteria is not higher than that of variant X. In order to achieve the level of “well-ho” (second level) on the matrix, must have the appropriate values according to the criteria of efficiency of interaction (S_q), and a critical mass (CMC). Evaluation 2 (“good”) -Shipping (1.3), (2.2), (2.3) and (3.2). Then construct a graph containing all the best options with integrated assessment of “good”. By constructing the network optimal choices can make a choice for the achievement of the desired level of efficiency of cluster initiatives.

It is important to note that the emergent clustering effect changes with each iteration but the howl of joining or leaving member from the cluster.

In this case, the cluster is stable and has good prospects in the development of even in the event of it some of the participants as long as there is a certain set of them, providing a guide-acceptable level of synergies, covering the relevant costs to achieve it, as well as overcome the threshold of disturbance. In this context, optionally, go to determine the level of efficiency of functioning of the cluster.

The fifth stage involves determining the efficiency of the territorial branch of the cluster.

Practice shows that in order to be able to assess what is happening in the cluster events, one-sided approach on the basis of financial performance should be up-holds considering non-financial indicators. The system of performance indicators that characterize certain aspects of the activities of the integrated structure, you fissionable three main blocks: the effectiveness, efficiency, profitability. Results are elements of efficiency reflect the fundamental goals of enterprises - partners in the production activity, the sphere of innovation, environmental protection measures. Production performance is measured by indicators of the provision of consumer species, quality, quantity and value of goods set. Innovative performance can be represented by indicators such as rates of disposal and replacement of fixed assets, age structure, etc. Environmental performance should show how the cluster follows the established standards for emissions of pollutants. Efficiency (cost-effectiveness) should be considered in two aspects: as resource productivity and how the unit costs of production (cost of production). Performance resources include: 1) the specific fuel consumption,

electricity; 2) labor productivity; 3) return on assets and the data of the equipment and production facilities. Unit costs can be considered as a summary measure of economy, expressed in monetary terms. Profitability (cost-effectiveness) is finite general indicator of the company. It is formed on the basis of efficiency and economy, but is not simply the sum of these elements in the performance, and the result of a complex interaction of business structure with the environment.

At the same time, because clustering makes sense if the investment process has strengthened the competitive position of the integrated structure of the market and are effective from the perspective of investors (companies combine resources), then as a final criterion of efficiency of cluster formation could be used indicator of investors' total return (TSR) (Tzyan, 2013).

$$TSR = \frac{Div}{BPV_0} + \frac{BPV_1 - BPV_0}{BPV_0}, \quad (3)$$

where Div are dividends in the form of expected effects:

$$Div = Ydi \cdot \left(\sum_n \mathcal{E}coy_i + \sum_n \mathcal{E}\delta_i + \sum_n \mathcal{E}\kappa_i + \sum_n \mathcal{E}i \right), \quad (4)$$

where $Esot$ is social impact made by all partners in the process of cauterization;

Eb is budgetary effect achieved by all partners in the process of clustering;

Eek is the environmental impact made by all partners in the process of clustering;

Ei is economic impact made by all partners in the process of clustering;

Ydi is share of assets of an individual participant in the assets of the cluster;

$$BPN_1 = BPN_0 + \sum_{j=1}^N \mathcal{E}синерг, \quad (5)$$

where BPV_0^* is the value of the company, subject to the development of existing business and the products and services provided at the time of payment;

$Eсинерг$ is the value of synergies, as an increase in the market value of the company.

4. Discussion

On the creation of the furniture cluster in 2011, it was stated in the Voronezh region. Composed of large furniture holdings and average production pre-acceptance (Morkovina, 2011).

However, in order to have prospects in the development of territorial and industrial cluster must have the following properties:

- Be based on modern technology, transportation, technological and economic infrastructure;
- Combine R & D, production, and its most important components, as well as promotion and marketing;
- Have a high potential for innovation;
- Based on the principles of public-private partnership (Sibiryatkina, 2013);
- Have the support of the state, which is realized on the basis of effective stem-Stern policies related to strategic planning development of the region;
- To provide a positive social impact and, therefore, social support in the region (Popkova, Romanova, & Akopova, 2012).

Formation of network structures in the cluster means the development of inter-firm cooperation along the entire chain of value creation, which is implemented in a variety of contractual forms. Enterprises furniture cluster are more competitive pre-property due to the possibility to carry out an internal specialization and standardization, minimize the cost of innovation.

Benefits of creating a furniture cluster consists concentration rivals in the furniture business, their customers and suppliers, which promotes efficiency specialization of production, to engage in dialogue between representatives of the entrepreneur sector and the government to stimulate the creation of new forms of association knowledge, and even greater understanding with global business leaders employed in the forest industry (Morkovina, Cooper, & Jiang, 2013).

In our opinion, the analysis of the prospects of the formation of the territorial and sectorial clusters should be based on a number of important points:

- Firstly, to take into account the critical mass of the cluster and the ability to achieve it;
- Secondly, to take into account the criterion of the interaction force members integration;
- Third, to characterize all aspects of the cluster using financial-O and non-financial indicators;
- Fourth, consider the possible emergent effects.

When analyzing the efficiency of formation of territorial industry cluster in sectors of the economy should be determined predisposition territories and industry to the integration processes, calculate the critical mass of potential cluster, perform the evaluation of the forces of interaction partners of the cluster, and the cluster-vat positioning relative to its partners and participants.

In the formation of clusters significant role of the state in the face of the administration of domain-Step, which consists in the formation of the general conditions, initiating the development of an active cluster forms of economic organization, as well as methodological, organizational and financial support clusters.

5. Conclusion

With the increasing development of the processes of globalization and accelerate the integration of economic Russia into the world economy, increasing the relevance of research topics that affect the creation and evaluation of the effectiveness of territorial and sectorial clusters. The practice of creating Russian integrated structures, primarily clusters showed that the basis of assessment of the feasibility of their development should be based on a system of target indicators to characterize their condition from the perspective of structuring, determining the composition of the participants to achieve a critical mass of the cluster tightness and stability of the relationship between partners.

We believe that the relevance of the furniture cluster in the Voronezh region, due to the general laws of development of industrial economy at the present stage, and consists in the development of partnerships between the state, the furniture business, science and education.

Furniture cluster acts as a scheme under which all of the manufacture of products, ranging from its development, primary manufacturing to sales, is on a single economic chain that allows the conditions of globalization clearly and quickly react to changes in the internal and external environment in the furniture market, thereby enhancing the competitiveness of the domestic furniture industry.

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