The internationalization of regional clusters: theoretical and empirical issues

Today regions are becoming independent actors able to compete globally as the globalization of competition is consistent with the localization of competitive advantage. In many ways regional competitiveness is based on clustering. Changes in the global economic environment are making cluster linkages more important. Clusters are not capable of long-term excellence and development unless their members are acting in global markets and involved in international knowledge transfer. Thus, the internationalization of clusters is a new subject of innovation policy and regional development; however it lacks a strong scientific background in Russia. The paper aims at discovering a theoretical and analytical basis for clustering and internationalization, reviewing the best internationalization practices from clusters worldwide and exploring empirical issues of the internationalization of regional clusters in Russia and their comparison with the EU outputs. A special emphasis is put on the articulation of a practical guide for cluster management organizations responsible for the development of global linkages.

Key words: regional development; regional clusters; cluster management; internationalization; Russia

1. Introduction

Glocalization (Robertson 1994) increase has changed the role of regions in the national and world economy. Today regions are becoming independent actors able to compete globally as the globalization of competition is consistent with the localization of competitive advantage (Enright 2000). Regional competitiveness is often based on the clustering concept suggesting the value of agglomeration and the importance of linking human capital, knowledge and technology at a given location. Changes in the global economic environment are making cluster linkages more important. The effectiveness of regional strategies depends on the ability of clusters to evolve and fit into useful niches in global value chains (OECD 2007). This thesis is confirmed by the EU studies (Meier zu Köcker et al. 2007; 2010), stating that clusters are not capable of long-term

excellence and development unless their members are acting in global markets and involved in international knowledge transfer. The internationalization of clusters has turned out to be a new subject of innovation policy and regional development. It reflects the fact that no economy either at regional or national level can afford to ignore the globalization factor. As companies and other actors internationalize their activities, it is important that cluster initiatives and organizations supporting them also internationalize.

The clustering of regional development has gained much popularity in Russia in the last few years. According to the Russian Ministry of Economic Development (2008), with domestic clusters being included in global value-added chains it is possible to significantly raise the national technology base level, increase the pace and quality of economic progress due to the international competitiveness boost of cluster members. However, the theory and practice of regional cluster internationalization still remain underexplored. In particular, there is a lack of data, concerning the level of regional cluster internationalization in Russia and a lack of methodical background for such studies.

In the present study the internationalization of clusters is regarded as the establishment of sustainable links among clusters worldwide in trade, finance and industry as well as R&D, educational and institutional cooperation performed on a complementary basis and leading to an increase of the competitive, economic, innovative and social potential of cluster members and their locations. The paper aims at discovering a theoretical and analytical basis for clustering and internationalization, reviewing the best internationalization practices from clusters worldwide and exploring empirical issues of the internationalization of regional clusters in Russia and their comparison with the EU outputs. A special emphasis is put on the articulation of a practical guide for cluster management organizations responsible for the development of global linkages.

2. Literature review and theoretical framework development

As Charlie Karlsson notes, ‘the increased theoretical and empirical interest among economists in

where economic activities take place and why they concentrate in space has to do with its importance for core areas such as location theory and international trade theory' (Karlsson 2008, p. 2). Several researchers point out the common theoretical ground of clustering and internationalization (Sandberg 2009; Gomes-Casseres 1996; Jankowska 2010; Mariotti, Piscitello 2001).They focus on two main aspects of the issue.

The first aspect has to do with the role of clusters in facilitating their members` access to global markets and involvement in international knowledge transfer. A cluster approach may facilitate and speed up the internationalization of innovation in small high-technology companies by reducing obvious internationalization liabilities such as restricted resources, lack of critical mass, international expertise, etc. (Falize, Coeurderoy 2012). Another point is the joint marketing policy of clusters, which is regarded as the source of competitive advantage in global markets. It means that increasing a company`s market share would be ensured by the marketing activity synergy of the cluster it belongs to (Vladimirov, Sheresheva 2012). There is also the 'coopetition phenomenon' (Jankowska 2010) which is typical for clusters and can be an important advantage for the internationalization of cluster members due to strong links within the local environment. The combination of cooperation and competition enables firms to produce higher quality for a lower price. This positive feedback between participation in a cluster and successful internationalization was emphasised by Porter (1998). The local environment of the company which involves production systems, economic agents, social institutions, specific culture and collective learning may complete its unique competitive potential and support its foreign expansion (Mariotti, Piscitello 2001).

The other aspect is focused on the development of joint innovative, industrial, marketing and R&D activities of clusters worldwide. The internationalization of clusters opens broad opportunities to reorganize innovation processes across regions, based on new forms of the division of labour among firms at the international level. Increased global collaboration among clusters provides a chance to sustain competitive advantages of companies. This is due to the fact

that firms can have access to new competencies, knowledge and expertise, in addition to what is available at the local level (Di Maria, Costalonga 2004). In fact, there is commercial internationalization, presuming that local firms set up global marketing networks and thus strengthen their positions, and industrial internationalization under which local players transfer their production facilities abroad.

Moreover, the internationalization of clusters is considered a strategy towards the development of world-class clusters in the EU. European clusters, faced with fierce competition from emerging countries and persistent market fragmentation, need to come together, to forge alliances, setting up permanent consortia of three or four clusters complementing one another in the value chain and equipped with a joint management team and a common strategy (TACTICS 2010).

The review of studies on clustering and internationalization made it possible to reveal their common theoretical basis. To begin with, the key principles of local industrial specialization were for the first time articulated in the nineteenth century within foreign economic concepts: the theories of absolute and comparative advantages by Smith and Ricardo (Smith [1776] 2007; Formaini 2004). These theories are based on speculation about the international division of labour and foreign trade as well as the spatial aspects of the economy and competitive advantage acquisition. The key idea, combining clustering and internationalization, was that specialization, i.e. the concentration of manufacturing in independent sectors with specialized technological process and human recourses, was the basis for international trade.

In the 1930s the works of Coase (1937) formed the basis for the Transaction costs theory. A transaction is the exchange of goods, services or information between economic actors, taking place inside or between organizations. An increasing share of knowledge and technology embedded with other firms in value added chains cannot be obtained through simple market or industrial transactions. This has led to analyses and interpretations involving clustering.

Transaction costs include network transactions, related to the development of specific relations and long-term connections by the parties within clusters that can speed up internationalization. Foreign economic activity is more successful within a cluster, where actors cooperate with fewer network transactions (Christensen, Lindmark 1993).

In the 1950s Dunning combined the resource, location and transaction costs theories in the 'OLI-paradigm' (also known as the Eclectic paradigm) to explain the foreign value-added activities (mostly, FDI) of firms as determined by the configuration of three sets of forces:

- ownership advantage, arising from the firm's privileged ownership of income-generating assets outside their national boundaries (O);
- location advantage, arising from specific economic, social, political environment of a chosen country in a way that benefits it relative to domestic location (L);
- internalization advantage, which relates to the way the firms organized the generation and use of the resources and capabilities within their jurisdiction and those they could access in different locations (I).

The connection between the OLI-paradigm of internationalization and clustering theory is derived from the development of inter-firm relations under conditions of 'coopetition' and alliance capitalism (which is similar to the clustering process) opposite to the concept of an individual firm as the sole or independent source of intellectual capital. 'A company is better viewed as an organizer of a collection of created assets, some of which it generates internally and others which it accesses from other firms, yet the deployment of which it exercises some kind of control' (Dunning 2001, p.184).

In the 1970s Johanson and Vahlne (1977) suggested the Stage internationalization model (also known as 'U-model'). The model describes foreign market entry as a stage process, consistent of acquiring experiential knowledge which leads the firm to taking small, incremental steps to opening up new markets. The model puts special emphasis on the first (pre-

internationalization) stage, which involves gaining domestic clustering experience. It is of crucial importance for companies, mainly SMEs, at the beginning of their international expansion. Managerial, financial, HR, information, technological and other liabilities are easier to overcome as a cluster member.

In the 1980s Johansson and Mattsson (1988) modified the Stage internationalization model into the Network model. Its key distinction is that a firm's internationalization strategy emerges as a pattern of behaviour influenced by a variety of network relationships and not only from its own phases of preparedness. 'A basic assumption in the Network model is that the individual firm is dependent on resources controlled by other firms. The only way it can get access to these external resources is by establishing a position within the network' (Ofosu, Holstius 2012, p. 4). Foreign economic activity is a part of group work guided by economic and social rules. Whether companies internationalize successfully or not is the result of their networking and position within a cluster.

In the 1990s there was a remarkable contribution to the progress of both clustering and internationalization (international trade) theories by Krugman and his Economy of scale, originally derived from Marshall`s industrial districts. A firm can benefit from economies of scale when there is a capacious, i.e. global market. At the same time, economies of scale are due to geographical concentration followed by clustering effects: knowledge transfer, easier access to resources and strong networking. As Krugman states, 'the phenomenon of concentration in economic geography takes place at many scales. […] For international affairs the forces that lead to localization of particular industries are of even more interest' (Krugman 1991, p. 34).

The new approach to internationalization and clustering, which untangled the paradox of location in a global economy, was suggested by Porter and his Competitive advantage theory. The 'Ten nations study' resulted in the idea that competitive advantage of a country should be regarded through the international competitiveness of its clusters. Geographical concentration

strengthens domestic competition and, combined with globalization, forces companies to enter foreign markets, so their internationalization increases (Porter 1998).

Finally, the combination of clustering effects and internationalization is discussed within the 'Born global' concept by Oviatt and McDougall. The born globals (BGs) are small innovative enterprises that enter foreign markets quickly due to their deep specialization. BGs manage their activities through international networks providing them with information and resource benefits (knowledge about foreign partners and the new competitive market) and control benefits (trust, embeddedness among network partners) (Falize, Coeurderoy 2012). Network ties are an important tool to speed up their internationalization, because when acting within a cluster such companies develop their competences and increase their international competitiveness.

To sum up internationalization and clustering have a common theoretical background in the following features:

- specialization as the basis for international trade and industrial localization;
- location characteristics and networking as an important tool for decreasing transaction costs;
- the role of competition and innovation.

3. The internationalization of clusters: selected global benchmarks

There is no one-size-fits-all approach to cluster internationalization processes and their coordination. Different countries have gained vast experience in this field which is worth benchmarking. This section contains the review of the best cluster internationalization practices.

The European approach towards cluster internationalization is one of the most imperative and policy-driven, incited by strong fragmentation, a lack of critical mass and weak linkages among clusters and their members within the EU on the one hand, and global emerging

competitors from Brazil, India and China on the other hand (TACICS, 2010). The problem-solving here has been focused on the development of so-called world-class clusters (WCC). These clusters can be described by a set of specific criteria and requirements (Figure 1).

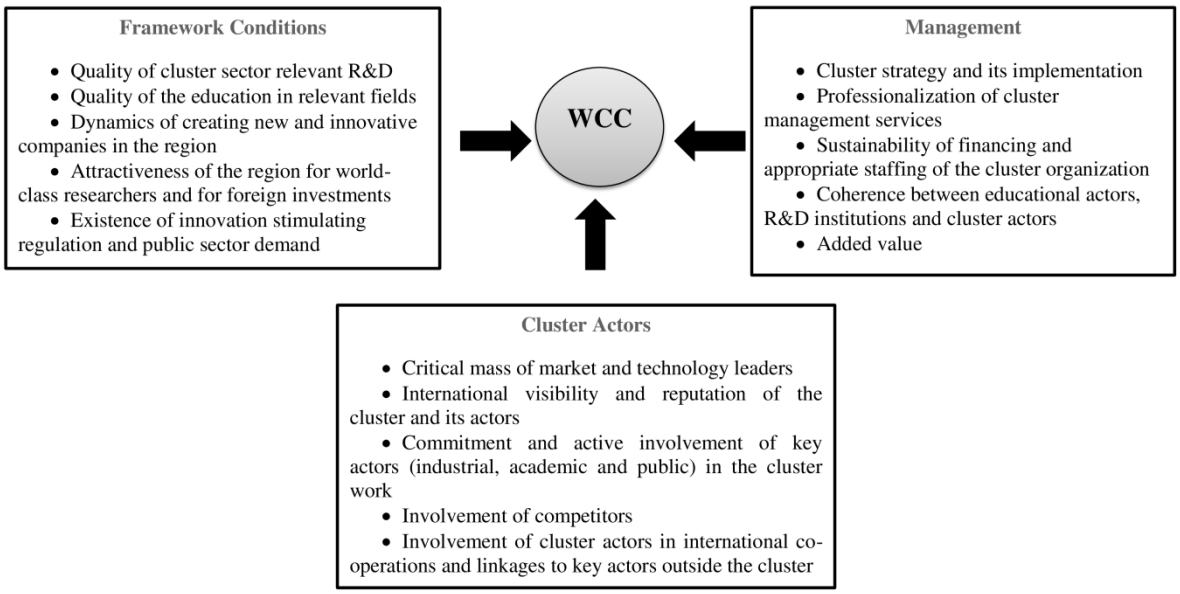

Figure 1. The main characteristics of WWC
Note: Adapted and extended from TACTICS (2010)

Fostering WCC creation is provided by a pool of programmes and initiatives to support cluster policy makers and encourage trans-national cooperation: European cluster alliance, European cluster collaboration platform, European cluster observatory, European secretariat for cluster analysis, Enterprise-Europe-Network, Foundation Clusters and Competitiveness, European cluster policy group. Table 1 contains a brief description of these programmes.

Table 1. The EU programmes and initiatives to foster cluster internationalization

Programme	Description
European Cluster Observatory	A single access point for statistical data, analysis and mapping of clusters, cluster policy and regional competitiveness conditions in Europe. It also provides a cluster library, a classroom for cluster education, offers cluster benchmarking, program evaluation and coaching of cluster organization management
European Cluster Alliance	An open platform established to maintain a permanent policy dialogue at the EU level among national and regional public authorities responsible for developing cluster policies and managing or funding cluster programmes in their countries or regions
European Cluster	An initiative established by the European Commission to deliver

Policy Group	recommendations on how to better support the development of more world-class clusters in the EU and design cluster policies in the Member States
Enterprise-Europe-Network	A one-stop shop for helping small companies make the most of the business opportunities in the European Union, find international business partners, source new technologies, receive the EU funding or finance, advise on intellectual property, going international, or the EU law and standards.
European Secretariat for Cluster Analysis	A network of cluster experts, mandated by the European Cluster Excellence Initiative, which promotes cluster management excellence through benchmarking and quality labelling of clusters and cluster management organizations.
European Cluster Collaboration Platform	An online portal launched within European Cluster Excellence Initiative which provides online quality information and networking support for clusters aiming to improve their performance and increase their competitiveness through the stimulation of trans-national and international cooperation both between cluster organizations and cluster members
European Foundation for Cluster Excellence	The ECEI-follow initiative, offering courses for trainers of cluster management excellence, monitoring of their performance and organization of an accreditation system for certifying instructors. The EFCE was set up to evaluate, raise and sustain the competitiveness of regional economic clusters worldwide. Its aim is to promote the use of clusters as an effective tool for the economic development of regions.

Note: Adapted and extended from Islankina E., Nazarov M., Fiyaksel E. (2013)

The examples of cluster internationalization supporting practices in different countries can be broadly classified under the following four headings.

(1) Targeted projects (e.g. the NICER project, West Midlands, the UK). The overall objective of the NICER project (Networks for the Internationalization of Cluster Excellence in Regions) was to identify and implement a number of strategies to support the internationalization of clusters in EU regions. The strategic focus was on the design of effective public policy for maximizing the impact of foreign direct investment on regional economic development and cluster upgrading – innovation. The University of Birmingham representing West Midlands was one of the project participants. Among regional good practices worked out within the NICER project from 2011 to 2013 were links between FDI policy and the support of cluster development; selected targeting of inward FDI related to comparative strengths (e.g. encouraging Shanghai Automotive

R&D centre to Birmingham (MG Cars)); building on financial services by attracting a Deutsche Bank processing centre to Birmingham. As the result the West Midlands was the only English region outside of London that increased foreign investment projects in 2012 (Banchelli, Caloffi, Bailey 2012).

(2) Cluster management organization (CMO) services (e.g. the MVA Ambassador Program, Skane region, Sweden and the Island of Zealand, Denmark). The MVA Ambassador Program is a unique service created solely to assist private and public organizations in Medicon Valley cluster of Danish and Swedish regions with the internationalization process and to increase awareness about Medicon Valley in the leading life science hubs around the world. MVA has three Ambassadors permanently based in San Diego, Boston and Tokyo. MVA has formal partnerships with the leading cluster organizations in these three areas giving the MVA Ambassadors unrivalled access to local networks with a strong insight into local businesses, research, academia and healthcare. Their services include business development, technology search, in- and out-licensing support, market analysis, sales support and delegation visits (Medicon Valley Alliance 2012).

(3) Regional support institutions (e.g. Clusterland, Upper Austria, the Republic of Austria). Clusterland Upper Austria is an independent entity to manage six clusters (automotive, plastics, furniture & timber construction, health technology, mechatronics and environmental technology) and three networks (human resources, design media and network energy). One of the key focuses of its mission is to enhance the internationalization of regional clusters. Clusterland Upper Austria supports international activities of the member companies through direct actions such as organizing business trips, international fairs or events and also through cooperation projects with international participation. Participation in European projects had increased because there were benefits not only for the companies, but also for the organization, improving its image and visibility and providing funds. Other indirect actions were also conducted to promote

company internationalization, such as holding round tables on topics related to international activities, and receiving foreign delegations to promote networking and increase the potential for participation in international projects (Blazquez, Berrone, Duch 2012).

(4) Specific cluster type (e.g. super-clusters, California, the USA). The super-cluster concept, often used to describe the internationalization process of regional clusters in the United States, deals with the transition of three types of relationships: weak ties, strong bonds and covalent bonds (Engel, del-Palacio 2009). Weak ties characterize the most common type of interactions between clusters, including information exchange and short-term interpersonal communication in the forms of international trade fairs and exhibitions, conferences, professional and industry forums. This kind of cooperation is the least expensive, but provides access to information. As cooperation grows more intense the exchange of contacts between clusters covers new areas (technology, services, HR), so strong links appear. Covalent bonds emerge if the relationships are permanent and the role of each cluster is embedded in the business processes or the value chain of the other. Covalent bonds are characterized by reversing the flow of information, capital or goods, with single actors performing vital functions in multiple locations — and even multiple businesses — simultaneously (Engel, del-Palacio 2009). An example of covalent bonds in foreign cluster collaboration is Silicon Valley and Israel which started with American hi-tech companies' interest in Israel's engineering and scientific skills. It resulted in the emergence of BG entrepreneurial companies within Israel. The cluster in which they operate is neither American nor Israeli, but a super-cluster of both countries, linked by covalent bonds.

4. The internationalization of regional clusters in Russia: first empirical study

4.1 *Methodology and sample layout*

Establishing a set of metrics that are capable of tracking the performance of a cluster is important for identifying its strengths and weaknesses and further appropriate interventions. The estimation of a cluster`s internationalization level in particular is rather complicated because of the following four aspects:

(1) imperfections of the cluster data base, especially concerning international activity. In general, there are three potential sources of information which might be used to assess the development of clusters: official statistics; commissioned survey work; qualitative data based on discussions with cluster members (DTI 2004, 18). At the moment clusters are not subject to analysis in terms of official statistics. Statistical bureaus do not collect data on cluster performance indicators, thus there is little unified public information for large-scale assessments. Information about clusters and their international activity is most likely to be collected within target research (interviews, questionnaires) or from specific reports (Gohberg, Shadrin et al. 2012; Meier zu Coeker et al. 2007; 2010). As Kutsenko notes, statistics on Russian clusters started to expand from the launch of a pilot innovation cluster competition in 2012, in which 94 comprehensive applications were prepared. The publication of new information opens up opportunities for proper cross-country comparison of cluster development trends and the drafting of expert recommendations. Although many aspects analysed in foreign studies lack equivalents in Russia, where cluster initiatives are still in their early stages, an awareness of the problems makes it possible to outline areas of improvement in cluster policy (Kutsenko 2015);

(2) the necessity to make assessment on a multiple basis. Clusters are not mere business entities; their international activity is performed by various groups of players, often described in terms of a many stranded helix, including private companies, universities

and research centres, supporting organizations, administrative institutions, and covers a variety of dimensions from R&D and networking to trade and production (Figure 2).

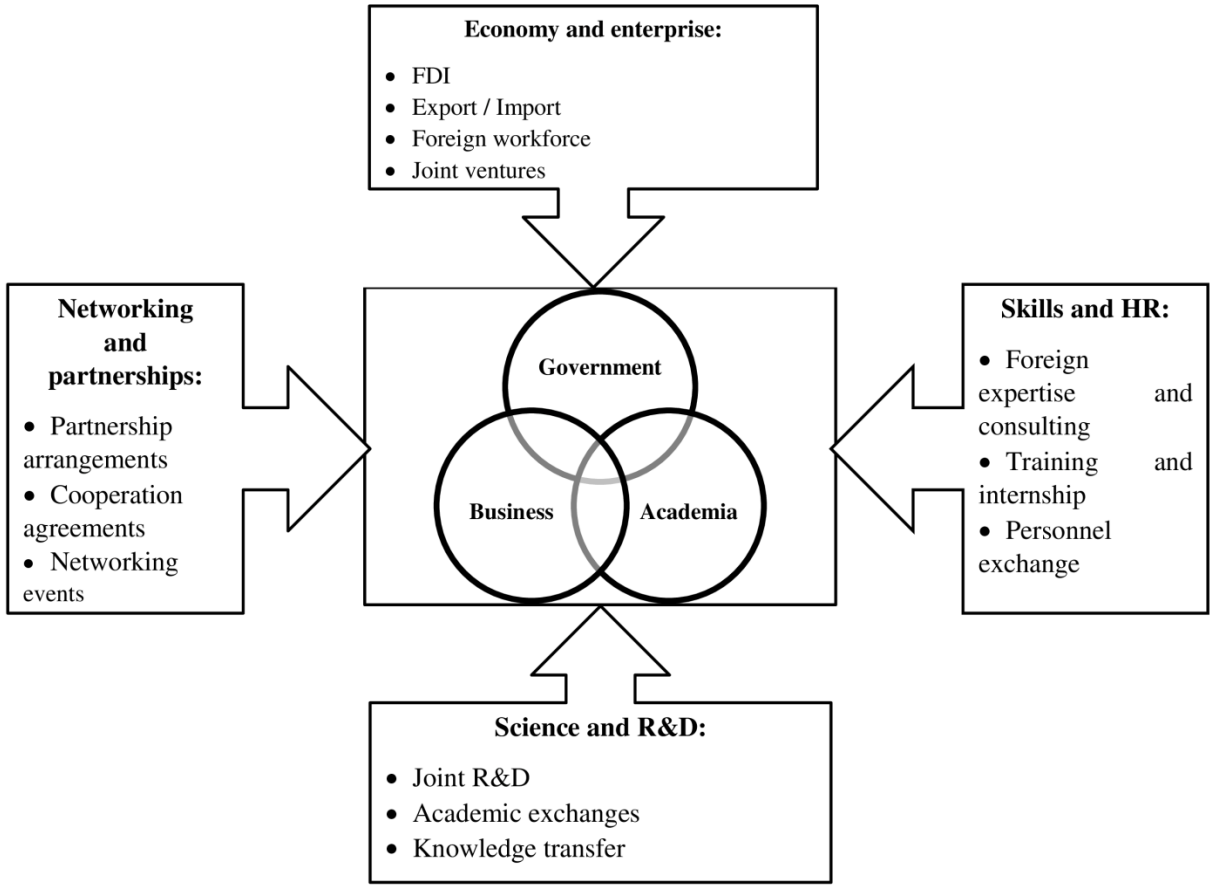

Figure 2. Cluster internationalization dimension

An international cooperation of cluster members representing academia is focused on expanding access to new knowledge, technologies and R&D. Consequently, internationalization comes in the forms of joint research projects, academic exchanges, joint educational programs, training and scientific activities. In addition, an important task is know-how commercialization. The international target setting of private companies is basically money-driven; their main activities include export-import operations, integration into global value-added chains, the creation of joint ventures, FDI. The key activities of public authorities and institutions regarding the internationalization of clusters are aimed at creating conditions, including various support programs and relevant policy, for achieving the objectives of academia and business as it enables regions to attract the best international expertise and resources to ensure the growth of the local

economies, strengthening their international competitiveness and improving life standards. The assessment of internationalization activity will be incomplete unless multiple indicators are used;

(3) the lack of a single set of internationalization indicators. Among indicators used to measure cluster performance only few are suitable for cluster internationalization assessment (e.g. export volumes, number of foreign cluster members) and they vary depending on the source. For example among cluster benchmarking indicators suggested by European Secretariat for Cluster Analysis (Hantsch, Kergel, Lämmer-Gamp, et al. 2013) there are: international participants of the cluster; thematic and geographical priorities of the cluster strategy; internationalization of cluster participants; geographical origin of external cooperation requests; characteristics of cooperation with other international clusters; degree of internationalization of cluster participants; impact of the work of the cluster organization on international activities of the cluster participants. They are suitable for both quantitative and qualitative evaluation. The Higher School of Economics and the Russian Ministry for Economic Development suggest export volumes, the number of international cluster members, joint international R&D expenditure, and the number of papers published in Web of Science and Scopus editions by cluster members employees (Gohberg, Shadrin, et al. 2012);

(4) the variety of assessment tools. They are either quantitative or qualitative, based on the analysis of statistical data, KPI or interviews, peer reviews, or surveys. The first group of tools benefits from its credibility and comparability, being at the same time rather generalized. The other group is used to conduct more in-depth research, but on a smaller scale and fewer opportunities for comparison.

With respect to these issues a two-step method for cluster internationalization assessment is suggested (Figure 3).

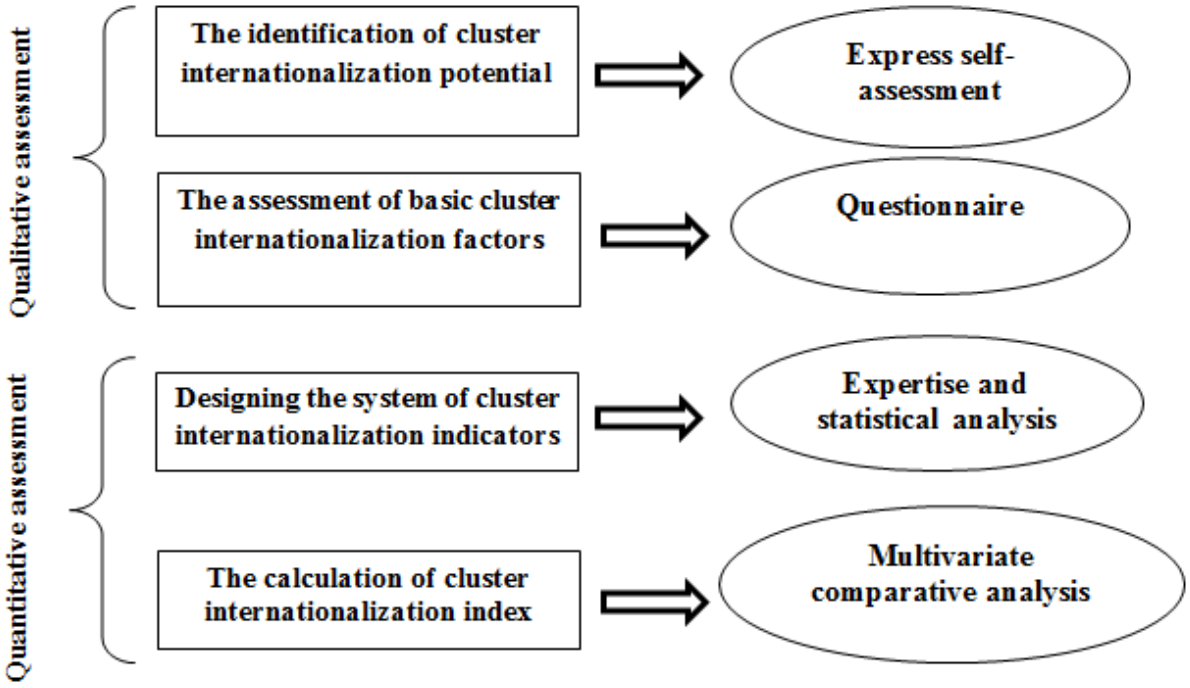

Figure 3. Two-step cluster internationalization assessment method

The method combines quantitative and qualitative analysis and involves an express self-assessment of cluster managers, which helps to identify the internationalization potential of a cluster; a questionnaire is suggested to assesses the basic cluster internationalization factors. Expertise and statistical data analysis enable us to design the system of appropriate cluster internationalization indicators that are used to calculate the cluster internationalization index by the means of a multivariate comparative analysis. Overall, the mix of various sources and methods provides the fullest understanding of the cluster international performance.

4.1.1 *Qualitative assessment*

The first step of the qualitative analysis discovers whether a cluster is internationally active to any extent and whether global performance is a shared goal for its members and CMO. For clusters with scarce internationalization ambitions or activity further quantitative assessment might be untimely. So prior to shifting to the questionnaires cluster managers are asked to go through an express self-assessment and indicate the cluster`s level of internationalization according to a seven-grade scale (Table 2).

Table 2. A scale for an express self-assessment on cluster level of internationalization

7	6	5	4	3	2	1
Obviously internationally acting cluster	Intense cross linking / partnership with one or more foreign clusters	Active, regular and intense participation of the cluster and its members in foreign projects and other events	Selective co-operations with international partners exist, but are unspecific and rather sporadic	First participation in and / or organization of international events by the cluster's management are visible.	No international activities by the cluster's management are visible, but are intended	No international activities by the cluster's management are visible or intended.

Note: Adapted and extended from Meier zu Koeker et al. (2007)

Those clusters having chosen grade 1 are not the subject to further analysis.

The next step assesses the basic factors of cluster internationalization. Data collecting is carried out by means of online questionnaires distributed among cluster managers from the selected clusters. The questionnaire is based on the survey of European cluster internationalization (Meier zu Köcker et al. 2007; 2010), Overview of cluster benchmarking indicators (Hantsch, Kergel, Lämmer-Gamp et al. 2013) and TACTICS Internationalization Handbook (Greenhalgh 2012). The questionnaire comprises of two sections: general questions about the cluster (age, number of members, management model and cluster manager or CMO functions) and specific questions about the cluster internationalization (international activity of cluster members and CMO; internationalization strategy; geographical scope, key partners and areas of cooperation; decision making and management within the internationalization process framework; barriers for international cooperation, goals and ambitions to go global).

4.1.2 *Quantitative assessment: multivariate comparative analysis*

After the quantitative assessment is completed, the cluster internationalization level is assessed using the following set of indicators (Gohberg, Shadrin 2012):

- joint international R&D expenditure;

- the number of publications in Scopus / Web of Science editions by cluster members employees;
- export volume;
- the number of international cluster members.

As the statistical data collecting is complicated, only four indicators are used. However, they cover various dimensions of a cluster international activity. The assessment method is multivariate comparative analysis.

The first step of the analysis involves the composition of a matrix of the clusters being analysed, and their internationalization indicators (Table 3).

Table 3. Matrix of cluster internationalization indicators

	Indicator 1	**Indicator 2**	**…**	**Indicator j**
Cluster 1	X_{11}	X_{12}	…	X_{1j}
Cluster 2	X_{21}	X_{22}	…	X_{2j}
…	…	…	…	…
Cluster i	X_{i1}	X_{i2}	…	$\mathbf{X_{ij}}$

As the contribution of each indicator is not equal, the value of each indicator is multiplied by a respective weighting factor α calculated according to the experts` estimations. Weighting factors used in the present study are listed in Table 4.

Table 4. Weighting factors for cluster internationalization indicators

Indicators X_j	**Number of international cluster members**	**Export volume**	**Number of publications in Scopus / Web of Science editions by cluster members employees**	**Joint international R&D expenditure**
Weighting factor α	0,21	0,31	0,22	0,26

Note: For the purpose of the present study the experts were five cluster managers

Then the maximum value for each indicator ($x_{ij\ max}$) is identified, and each value x_{ij} is correlated with the reference value $x_{ij\ max.}$ These correlations are squared, summed and the square root is extracted (Equation 1):

$$I_i^{CI} = \sqrt[2]{\sum_{j=1}^{m}\left(\frac{\alpha_j \cdot x_{ij}}{\max_j(\alpha_j \cdot x_{ij})}\right)^2} \quad (1)$$

I_i^{CI} is the cluster internationalization index

α is the weighting factor

x_{ij} is the value of *i*-clusetr`s *j*-indicator

$\max_j(a_j \bullet x_{ij})$ is the maximum value for each indicator

This method enables us to analyse the level of a certain cluster`s internationalization compared to other clusters, which is an important benchmarking tool. The limitation of the method concerns the availability of uniform data form different clusters. It is essential to use multivariate comparative analysis for assessing the internationalization level of clusters broken down by industrial affiliation to avoid a distortion of the results.

4.2 *Results of empirical implementation*

Russia launched a nationwide cluster program in 2012. The Concept of Long-term Social and Economic Development of the Russian Federation (2008) stipulates the creation of spatial clusters, which would advance business activity, encourage new investment and hiring, spark innovation, and promote continued economic growth and prosperity in respective Russian regions. In 2012 the Russian Ministry of Economic Development selected 25 pilot innovative regional clusters (out of the 94 initial applications) from 19 regions in such fields as medicine, pharmaceutics, IT, shipbuilding, electronics, nuclear power technologies, instrument engineering, automobile construction, aircraft building, chemistry, oil processing, power engineering to receive state budget and non-budget support to implement the respective development programs.

These 25 clusters were chosen as the object of the present research. Altogether 16 cluster managers from 19 Russian regions completed online questionnaires. A first contact was established preliminary to the survey usually in form of a personal telephone call, in order to

receive appropriate background information and to avoid possible misunderstandings (Islankina, Nazarov, Fyaksel 2014).

4.2.1 *The results of qualitative assessment*

The qualitative assessment is preceded by the express self-assessment of cluster managers regarding the internationalization level of their clusters. According to the results, only one cluster (6,25%) reported an obvious international acting (grade 7). Most of the clusters interviewed assess their foreign cooperation level from intense cross-cluster linkages and active participation in international projects (grades 6 and 5, totally 43,75%) to selective, unspecific and rather sporadic cooperation with international partners (grade 4, 31,25%). No cluster selected the absence of international activities (Figure 4).

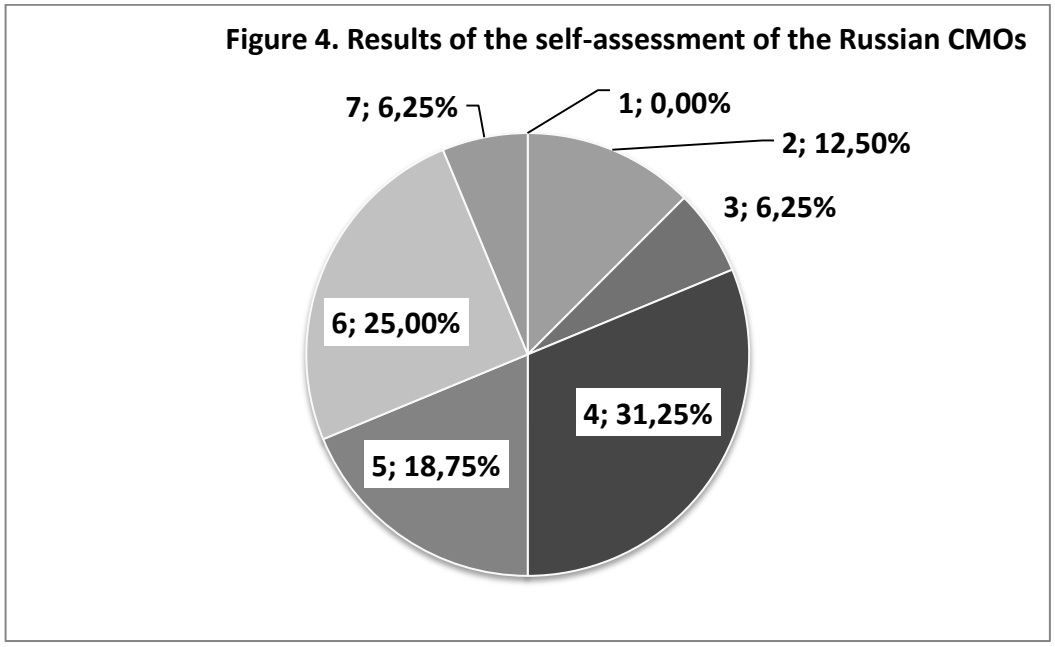

Figure 4. Results of the self-assessment of the Russian CMOs

To access the cluster members internationalization activity a scale from 0 to 4 was suggested (0 – least active, 4 – most active). Cluster members that demonstrated maximum internationalization activity were universities and big enterprises. SMEs and supporting organizations (banks, HR-agencies etc.) on the contrary were the least internationally active. It shows that a general constraint many SMEs face is relatively restricted resources as compared to what is available to larger firms (Figure 5).

Figure 5. International involvement of key cluster members

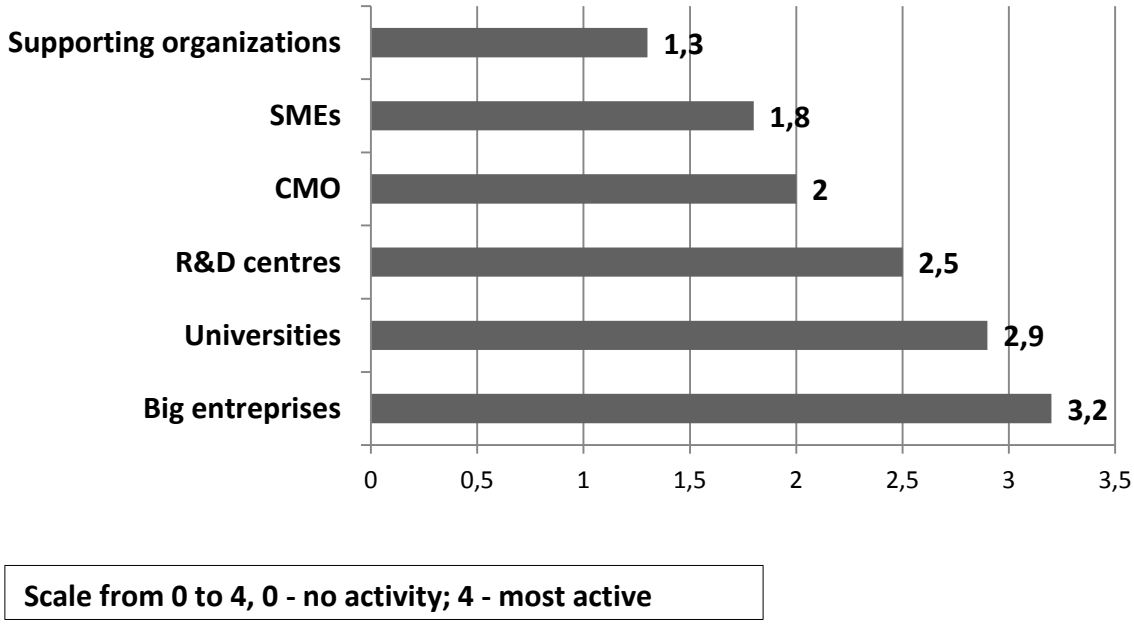

Figure 5. International involvement of key cluster members within Russian regional clusters

The internationalization process requires a level of investments and resources that smaller companies typically do not possess. Besides, CMOs also demonstrated modest internationalization activity (average rate was 2,0), which meant that they were neither drivers, nor coordinators of the internationalization process within clusters. According to EU findings, cluster managers play an important role in initiating and sustaining cluster international visibility (European Cluster Alliance 2010). Cluster organizations should focus their support on cluster members through various activities/services and even international cooperation with peers (other CMOs) is subordinated to this ultimate goal.

The most frequent international activities of clusters were in such fields as R&D and knowledge transfer and HR-development. Industrial, financial and trade cooperation turned out to be least internationalized (scale from 0 to 4, 0 – no active, 4 – most active) (Figure 6).

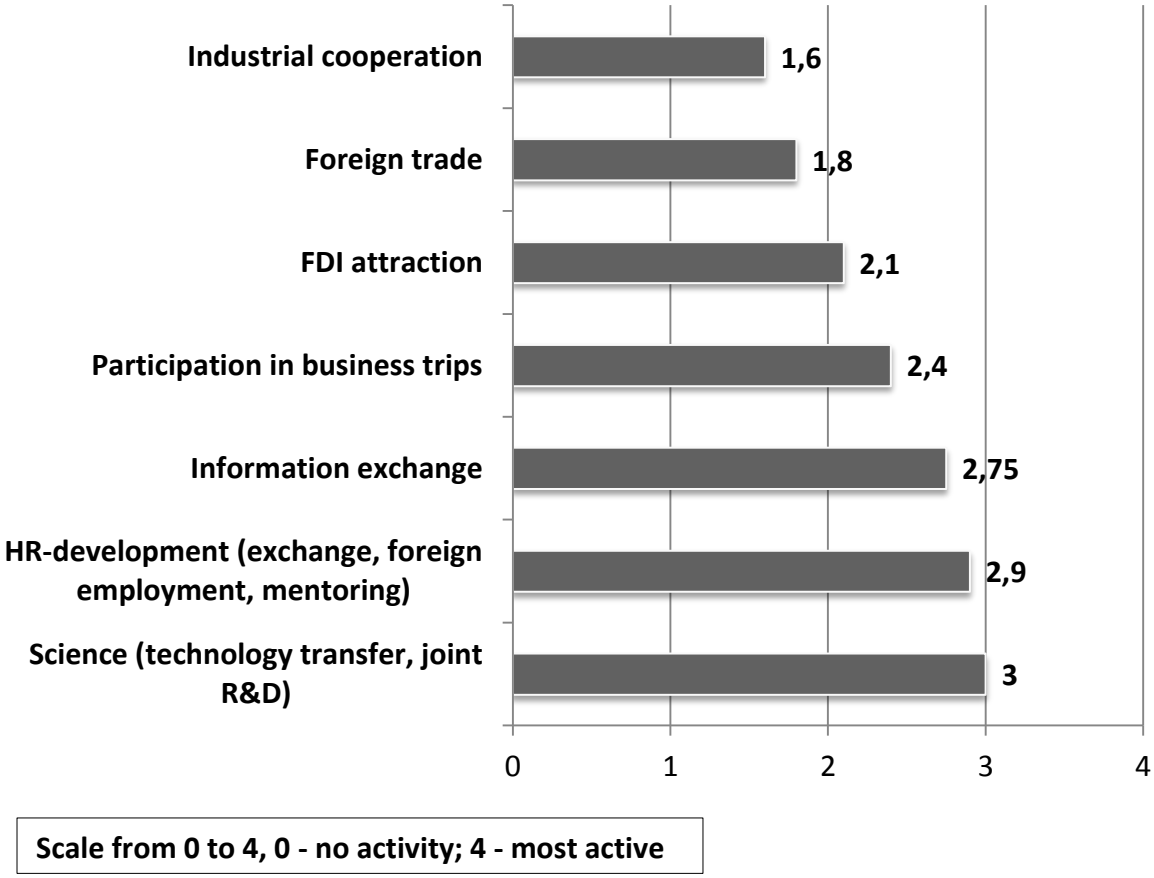

Figure 6. Internationalization activities within Russian regional clusters

As for the geographical scope of the internationalization of Russian regional clusters, the majority of partners came from the EU (50%), the USA and South-Eastern Asia (25%). It is interesting to note that only 12,5% of partners came from the CIS and the Customs Union of the Republic of Belarus, the Republic of Kazakhstan and the Russian Federation[1]. It reflects foreign economic cooperation trends in Russia in the same period. The key trade partners of Russia were the EU (49,4%), the APEC (24,7%), the CIS (13,6%) (Federal State Statistics Service of the Russian Federation 2013-a). 58% of FDI were also from the EU (Cyprus, Luxembourg, the Netherlands, Germany, France, the Republic of Ireland, the UK) and 9,5% from the USA, China and Japan (Federal State Statistics Service of the Russian Federation, 2013-b) (Figure 7).

[1] The research was conducted in 2013

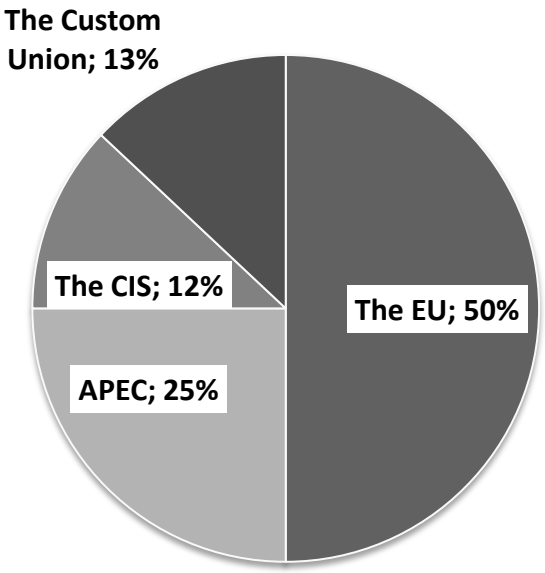

Figure 7. Geographical scope of internationalization within Russian regional clusters

As for the cluster internationalization in the EU, G. Meier zu Koeker makes a differentiation between cooperation already established within and outside of Europe, as well as within the same technology and application field or between different ones (Figure 8).

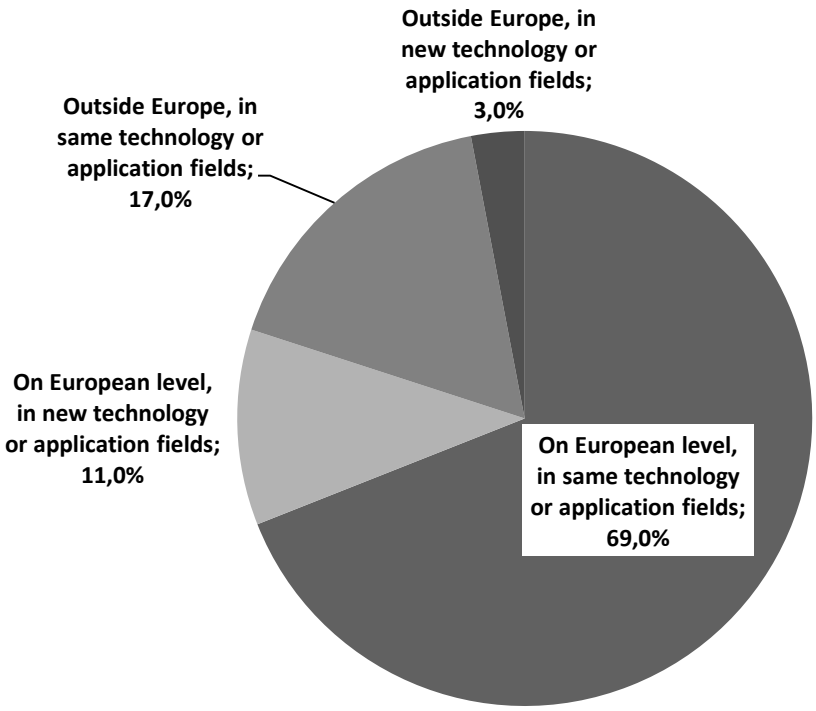

Figure 8. Breakdown of new, successful cooperation of EU clusters achieved (by regions and application fields)

Note: Adapted and extended from Meier zu Koeker et al. (2010)

The key internationalization goals of Russian regional clusters were access to know-how and technologies as well as spatial development of the cluster location, while the least important was establishing new networks in special technology or application fields (answers were provided as multiple choices) (Figure 9). In European research (Meier zu Koeker, et al. 2007, p.12) the priorities were different: attaining a worldwide leading position and easier access to target markets ranked top among reasons for the internationalization of EU clusters.

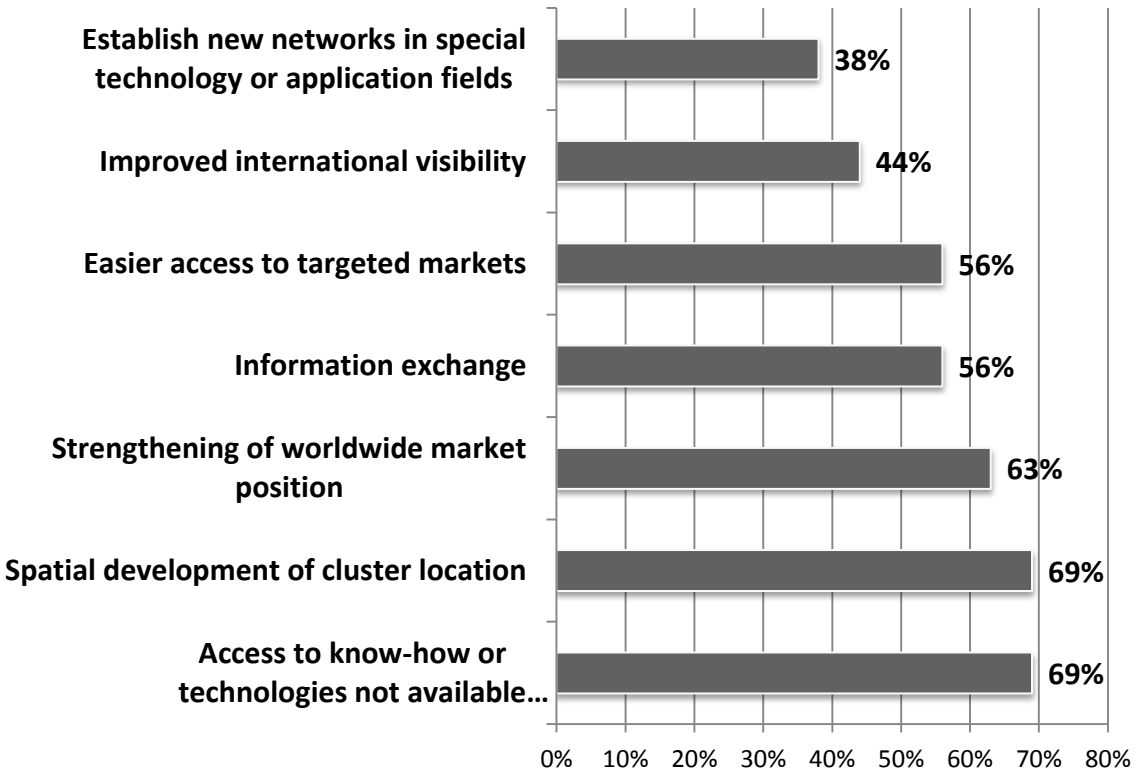

Figure 9. Internationalization goals of Russian regional clusters

The biggest barriers for cluster internationalization in Russia were lack of financial resources and well-trained HR. Cultural differences and geographical distance were the least important (scale from 0 to 4, 0 – no importance, 4 – crucial importance) (Figure 10).

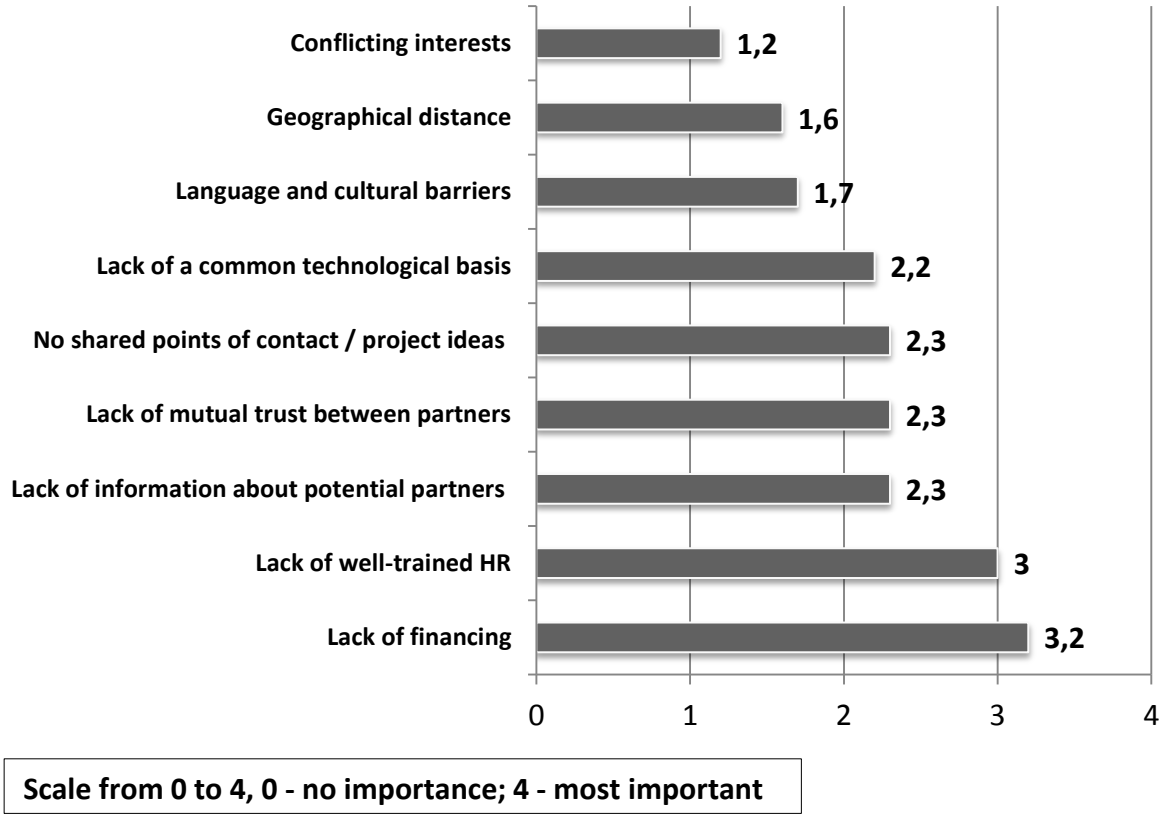

Figure 10. Barriers to internationalization within Russian regional clusters

European clusters confronted the same barriers. Critical factors in internationalization were the possession of appropriate knowledge of the foreign market, techniques of foreign operations, ways of doing business in dissimilar countries and the firm's financial, personnel and marketing resources (Meier zu Koeker, et al. 2010).

The next group of questions concerned the organizational aspects of internationalization in clusters, and namely the planning of internationalization activities, the coordination scheme, responsibility and functions of CMOs regarding internationalization.

The chart below shows the distribution of coordination schemes of internationalization activities within Russian regional clusters (Figure 11).

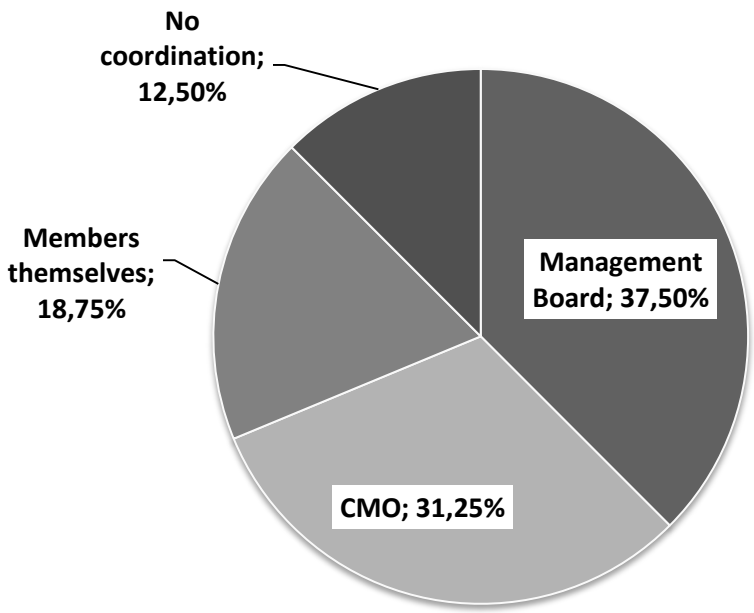

Figure 11. The coordination schemes of internationalization activities within Russian regional clusters

As we see, about two thirds of the clusters had CMOs or management boards responsible for the coordination of internationalization activities. Their responsibility was mostly centred around cluster image making, participation in conferences, fairs, exhibitions etc. CMOs or management boards were least involved in distribution of information about the cluster abroad and matchmaking. In the EU the responsibility for the internationalization of clusters generally lay with the cluster management or with the cluster members.

One of the basic managerial functions refers to planning, so it was important to know, if internationalization was subject to such planning, i.e. the existence of internationalization strategy. According to Meier zu Koeker, 'the number of European clusters implementing a strategy for internationalization has markedly increased in recent years, which lead to considerably better results than in cases where an internationalization consists of uncoordinated individual measures' (Meier zu Koeker, et al. 2010, p. 23). The chart below represents the respective outputs of the Russian clusters (Figure 12).

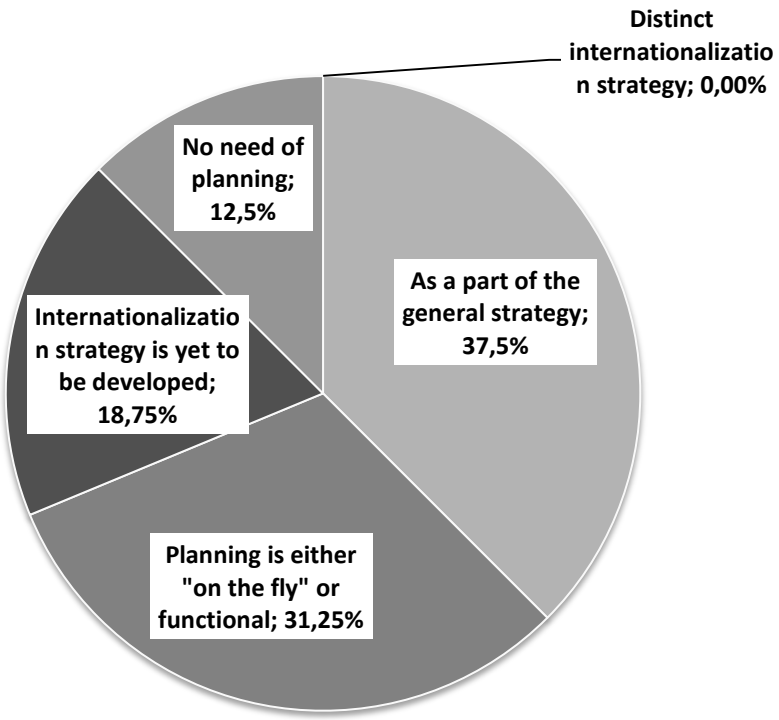

Figure 12. Internationalization strategy within Russian regional clusters

In total about two thirds of the clusters have their internationalization activities planned. However, no cluster reported of having a special strategy, two clusters neglected the need of internationalization activity planning.

4.2.2 *Results of quantitative assessment*

The values of the Russian pilot innovative clusters` internationalization index (I_i^{Cl}) were calculated by the means of multivariate comparative analysis. Table 5 contains initial data derived from the programmes of their development.

Table 5. Pilot innovative spatial clusters internationalization indicators

No.	Cluster name	Number of international cluster members	Export volume, bln rub.	Number of publications in Scopus / Web of Science editions by cluster members employees	Joint international R&D expenditure, bln rub.	Cluster internationalization index (I_i^{Cl})
	Nuclear industries					
1	Nuclear and nanotechnology cluster (Dubna, Moscow region)	0	1,2	1177	1,9	**1,1**
2	Nuclear cluster (Sarov, Nizhniy Novgorod region)	0	25	1769	1,7	**1,5**
3	Nuclear cluster (Dimitrovgrad, Ulyanovsk region)	n/a	1,8	259	1,7	**0,9**
4	Nuclear and space technologies cluster (Zheleznogorsk, Krasnoyarsk region)	n/a	18,7	3155	0,2	**1,3**
	Aerospace and shipbuilding					
5	Shipbuilding cluster (Arkhangelsk region)	n/a	12,2	84	0,07	**0,5**
6	Rocket engine building cluster "Technopolis "Noviy Zvezdniy" (Perm region)	n/a	2,5	3239	2,2	**1**
7	Aerospace cluster (Samara region)	n/a	1,06	1301	35	**1,1**
8	Aircraft and aviation cluster "Ulyanovsk-Avia" (Ulyanovsk region)	2	25	1244	1,44	**1,5**
9	Aircraft and shipbuilding cluster (Habarovsk region)	3	4,38	492	0,08	**1**
	Pharmaceutical, biotechnology and medical industries					
10	Pharmaceutical, biotechnology and biomedical cluster (Obninsk, Kaluga region)	4	0,1	1149	0,01	**1,4**
11	Biotechnology cluster (Pushino, Moscow region)	n/a	n/a	694	0,39	**0,6**
12	Medical, pharmaceutical and radiology cluster (Saint-Petersburg)	0	0,25	596	n/a	**0,6**
13	Biopharmaceutical cluster (Altay region)	0	1,2	41	0,35	**1**

Table 5 – *continued*

No.	Cluster name	Number of international cluster members	Export volume, bln rub.	Number of publications in Scopus / Web of Science editions by cluster members employees	Joint international R&D expenditure, bln rub.	Cluster internationalization index (I_i^{Cl})
14	Pharmaceutical, medical devices and information technology cluster (Tomsk region)	0	0,55	1150	8,4	**1,1**
			New Materials			
15	New materials, laser and radiation technologies (Troitsk, Moscow)	0	0,01	4458	3,3	**1,3**
16	Cluster of Moscow Institute of Physics and technology ("Phystech 21") (Khimki, Moscow region)	n/a	15,6	3028	3,8	**1,4**
17	Titanium cluster (Sverdlovsk region	n/a	22	200	2,6	**1,2**
			Chemistry and Petrochemistry			
18	Automobile and petrochemical cluster (Nizhniy Novgorod region)	7	9,6	3285	0,32	**1,4**
19	Petrochemical cluster (Bashkortostan republic)	n/a	0,35	42	0,4	**0,1**
20	"Kamsk" cluster (Tatarstan republic)	0	72,4	691	8,2	**1,4**
21	Complex processing of coal and anthropogenic waste (Kemerovo region)	n/a	16,7	146	0,15	**0,2**
			IT and Electronics			
22	"Zelenograd" cluster (Zelenograd, Moscow)	3	6,9	317	0,5	**1,5**
23	IT, radio-electronics, instrument making and communication cluster (Saint-Petersburg)	n/a	1,67	172	1,2	**0,8**
24	Energy-efficient lighting technology and intellectual lightning control systems (Mordovia republic)	n/a	0,4	877	0,22	**0,4**
25	IT and biopharmaceutical cluster (Novosibirsk region)	n/a	6,2	2532	1,55	**1,7**

Furthermore the values of the cluster internationalization index were correlated with the foreign economic activity index of the respective Russian regions also calculated by the means of multivariate comparative analysis (Table 6).

Table 6. Foreign economic activity index of the Russian regions where pilot innovative spatial clusters are located

Region	FDI per capita	Foreign trade turnover per capita	Foreign trade surplus per capita	Number of foreign-owned companies	Regional foreign economic activity index
Altay region	7,76	392,98	45,41	340,67	**0,06**
Arkhangelsk region	653,64	4254,74	3929,93	725,47	**0,68**
Bashkortostan republic	77,16	2869,76	2407,31	243,60	**0,41**
Habarovsk region	88,26	2050,22	416,10	1393,44	**0,27**
Kaluga region	924,97	8475,99	-7611,71	2371,03	**1,36**
Kemerovo region	473,79	4519,41	3897,53	690,66	**0,67**
Krasnoyarsk region	449,87	4001,97	2617,12	1071,18	**0,5**
Mordovia republic	169,61	371,64	-59,88	400,00	**0,08**
Moscow	10598,77	26268,70	6104,83	5600,62	**2**
Moscow region	758,47	4648,03	-3633,95	2630,92	**0,78**
Nizhny Novgorod region	303,05	2921,20	765,12	573,25	**0,2**
Novosibirsk region	198,49	1355,53	-351,36	2259,02	**0,41**
Perm region	649,99	2972,98	2346,90	649,94	**0,42**
Saint-Petersburg	1235,76	10918,27	-2315,61	4112,66	**0,93**
Samara region	581,60	2864,65	1424,70	892,97	**0,31**
Sverdlovsk region	363,97	2959,55	1171,07	585,09	**0,25**
Tatarstan republic	225,31	6023,03	4467,26	1009,73	**0,79**
Tomsk region	385,66	793,29	558,32	1266,54	**0,25**
Ulyanovsk region	52,65	671,61	36,97	577,22	**0,11**

Note: Adapted and extended from Federal State Statistics Service of the Russian Federation (2012)

Thus we have a matrix of four internationalization scenarios based on the Johansson and Mattson model of the firm`s internationalization (1988):

- ‘Potential internationalization’: neither a cluster, nor the region of its location are internationally active or visible yet.
- ‘Lonely internationalization’: a cluster is characterized by a high level of internationalization while the region of its location is not active in foreign cooperation. The advantage of this scenario is the pioneering position of the cluster; the disadvantage is the lack of support from regional institutions, and an underdeveloped environment within the region;
- ‘Supported internationalization’: both the cluster and the region of its location are internationally active. Thus the cluster and the region can benefit from each other`s foreign economic activities.
- ‘Late internationalization’: a cluster with low international activity is located in a region with highly-developed foreign economic relations and international visibility. The advantage is that internationalization can be speeded up due to benchmarking; the disadvantage is missed opportunities of the cluster.

The results of the cluster – region internationalization correlation are shown in figure 13. Only three clusters have supported internationalization (top right-hand quadrant): the one is from the Kaluga region and two others are from Moscow. 14 clusters have lonely internationalization; 8 clusters have potential internationalization. There was no correlation between the internationalization level of clusters and the industries they represented (Figure 13).

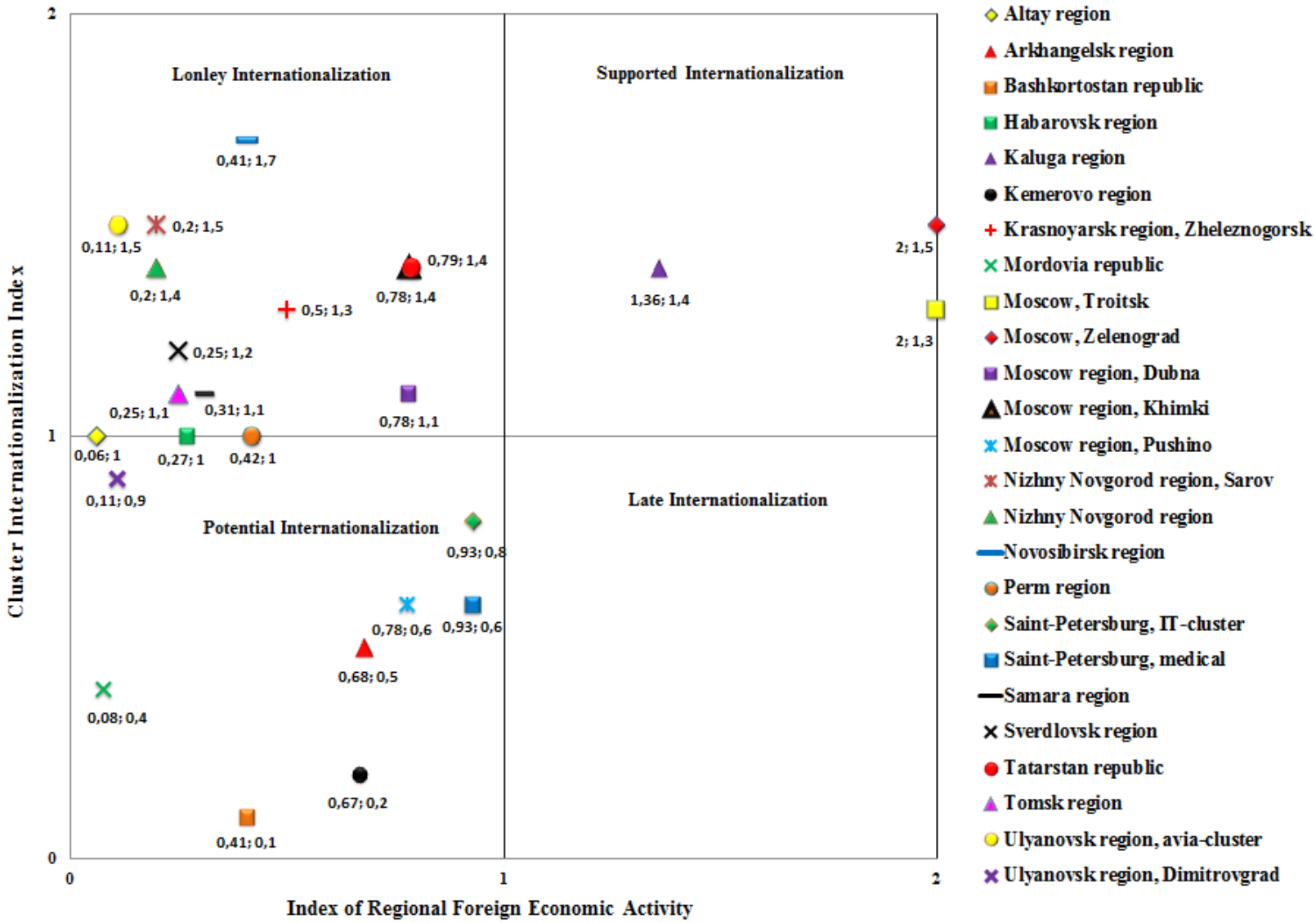

Figure 13. Internationalization scenarios of Russian pilot innovative spatial clusters

These scenarios are suggested as a guide to modify regional cluster policies either in a way to support clusters with their internationalization ambitions or to exploit their potential to foster regional outward cooperation.

5. Conclusion

The present study revealed some relevant aspects of the cluster internationalization.

First, the issue is important for all the cluster representatives interviewed, in spite of the fact that only half of them could boast of active and to some extent successful internationalization. It proves our assumption that there is a need for more detailed studies of cluster internationalization and for designing comprehensive methodical guides and recommendations for cluster practitioners, adjusted to national features.

Second, regional internationalization and clustering activities should be more harmonized. This thesis derives from the assumption of a common theoretical background of clustering and internationalization, discussed at the beginning of the paper, and also from the results of comparing the cluster internationalization index with the index of regional foreign economic activity. Being drivers of regional development clusters may increase the internationalization level of their locations.

Third, the assessment tools for cluster internationalization need to progress. The most relevant issue is a lack of public unified data of foreign activity within clusters. For example, the only systematic cluster data base in Russia has been created within the HSE Russian cluster observatory. The joint report of the HSE and the Russian Ministry for Economic Development (Gohberg, Shadrin, et al. 2012) has been the unique source of cluster internationalization data in Russia so far. In our view, it could be broadened (indicators to be included are import volume and FDI attracted within a cluster).

Fourth, successful internationalization should be subject to management and planning. This thesis has been concluded from the surveys, guides and practical outputs of foreign

researchers. Special emphasis here is put on the active role of the CMO, which is a supporting player but with a crucial role. The CMO is supposed to build a good international network and be aware of the landscape beyond its national borders. Key services of the CMO regarding internationalization of clusters include:

- monitoring relevant cluster activities world-wide (‘cluster days’, road-shows, exhibitions, conferences, etc.) combined with targeted matchmaking and benchmarking;
- information exchange with foreign partners;
- the organization of business trips,
- arranging meetings with representatives of embassies, offices of international organizations, national trade missions abroad, chambers of commerce, regional development institutions of foreign countries;
- the creation and distribution of printed materials about the cluster and its members in foreign languages; updating an English version of the cluster`s web-site;
- increasing the cluster`s international visibility via professional databases and platforms (see Table 1);
- detailed planning of international activity, enhancing joint projects in various activities (R&D, education, industry, marketing, etc.).

Over the last few years in Russia hundreds of clusters have emerged, having no less weight in the economy and prospects for development than the pilot innovative clusters analysed within the present study. However, relevant information about Russian clusters almost always concerns the 25 pilot ones. In response to this challenge in 2015 the HSE Russian cluster observatory is launching ‘The Cluster Map of Russia’ web project. Any cluster corresponding to minimum requirements may be registered in the system. The information provided is grouped into five blocks: general data, cluster priorities, management, members, partners and projects, and is aimed at encouraging inter-cluster communication via informing potential participants,

investors, entrepreneurs, and authorities in Russia and abroad about the existing cluster initiatives, therefore speeding-up their internationalization. We conclude that the combination of clustering advantages (specialization, networking, acceleration of the innovation process, transaction costs reducing, competitive cooperation, etc.) and internationalization (access to new markets and factor endowments, exchange of expertise and knowledge transfer, integration into global value-added chains, etc.) can strengthen the competitiveness of cluster members and locations.

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