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KEY FEATURES OF THE FIRST PHASE OF THE NATIONAL CLUSTER PROGRAM IN RUSSIA

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Cluster policy is recognized as one of the pivotal elements of state-of-art innovation policy. State support for clusters helps to take into account regional peculiarities and engage the most innovative local actors into the process of innovation policy drafting and implementation. Cluster development stimulates trust building and enhances knowledge spillovers among different organizations in the region. Finally the cluster approach makes innovation policy more systemic by coordinating measures aimed to support different actors (large companies, SMEs, universities, venture funds) towards comprehensive efforts linking the most perspective localized industries (ecosystems).
The development of clusters has been determined as one of the priorities of the Strategy of Innovative Development of the Russian Federation for the period to 2020 which was confirmed end 2010. In the framework of this Strategy the first national cluster program was launched in 2012.
The paper is devoted to the detailed description of the background of the national cluster program in Russia and its first phase – the selection of the pilot innovative clusters – which was implemented last year. Special attention is given to the comparison of planned design of the Russian cluster program with such widely known cluster programs as the BioRegio, InnoRegio and Les pôles de compétitivité. The similarities and peculiarities of the Russian program have been defined that allowed to identify several most significant areas for improvement.

Keywords: Clusters, knowledge spillovers, cluster policy, innovation policy.
JEL classification: O14, O17, O25, O38, O 43, P16, R11, R 53.

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Introduction

Achieving sustainable competitiveness of the Russian economy and enhancing quality of life is a challenge which requires solutions for one of the most difficult social and economic problems - the comprehensive modernization and growth of innovation activities of economic entities. International experience shows that in recent years innovation policy has taken special account of the innovation profiles' peculiarities in the different parts of the state (regions) and the active involvement of these regions in the drafting and implementation of innovation policy [Foray et al.., 2009; Camagni, Capello, 2012]. In this context, clusters are playing a more and more significant role as they are considered to produce knowledge spillovers which occur in different forms and intensity between cluster participants and also beyond the actual cluster.

Russia launched the nationwide cluster program in 2012. The selection of the pilot innovative clusters was the first phase of this program which is being continued in 2013, once the Russian government has defined the main tools for the future support of pilot innovative clusters.

In this paper we take a closer look at the first phase of the Russian cluster program' implementation. First of all, we explore the question of the extent to which this program complies with international best practice and to the extent it is determined by a number of limitations inherent in the Russian economy.

The first chapter gives an introduction on spillovers from clusters and the global emergence of cluster initiatives and cluster policies. The second chapter describes the context in which Russian cluster policy was defined, followed by the third chapter on the criteria and procedures for the selection of pilot innovative clusters and the proposed mechanism of federal support. Finally, the fourth chapter identifies ways of improving cluster policies in Russia on the basis of comparison with international experience.

1. Evolvement of cluster policies

1.1. Knowledge spillovers from and by clusters

Clusters are geographic concentrations of interconnected companies and institutions in a particular field [Porter, 2008, P.78]. Clusters are initiated and supported with the aim of generating

different positive externalities for its "residents" including reduced transportation and production costs, access to common infrastructure and labor market, etc.. Knowledge spillovers are among the pivotal positive externalities and nowadays are becoming one of most important motivations for the establishment of clusters. Knowledge spillovers per se are often spillovers of tacit knowledge, e.g. the exchange of personalized information (experience, latest news, etc.) between individuals which differs significantly from the exchange of codified knowledge. Such interaction typically requires confidence and trust between the individuals which is mainly built and generated through direct personal interactions (Zaytseva et. al 2013). Clusters at the same time aim strongly at the interaction of individuals hence the exchange of tacit knowledge. Thus clusters and networks are an important institution for the diffusion of tacit knowledge. However, clusters alone do not necessarily generate innovation in the broader sense but it seems likely that clusters grow around a knowledge base generating even more new knowledge which is not necessarily transformed into innovation at the same location. Spillovers within clusters can take a broad range of forms (table 1).

Table 1: spillovers from cluster

Direction	*Horizontal* Exchange between people and institutions at same level	*Vertical* Exchange between different levels of the value chain)
Organization	*Intra-organizational* Within organization based in cluster	*Inter-organizational* Between organizations based in cluster
Interaction	*Direct* No third party involved	*Indirect* Facilitator, cluster member involved
Process	*Technology push* Spill-over existing knowledge	*Demand pull* Search for new solutions for given challenge
Adaptation	*Imitation* Direct transfer without technical adoption	*Adaptation* Adapted solution according to users requirements

Source: Meissner, D. (2012)

Spillovers occur in different directions - horizontal or vertical. *Horizontal* spillovers mean the exchange of objects between individuals or institutions at the same level. Vertical knowledge and technology spillovers take place mainly in various stages of the innovation process, i.e. between providers (scientists, universities, research institutes, etc.) and recipients (e.g. businesses, social institutions) of knowledge and technology. However, it is possible that individual stages of the innovation process can be skipped. This is particularly important for small and medium-sized enterprises (SMEs), in which R&D and innovation activities due to a lack of resources are limited.

Empiric surveys, namely by Czarnitzik and Kraft for the German manufacturing industry using data from ZEW Mannheimer Innovationspanel, confirm that vertical spillovers have a positive sustainable impact on companies' performance while horizontal spillovers are less likely to do so [Czarnitzik and Kraft 2007]. To capture vertical knowledge, clusters normally include actors which play different roles in the innovation process: large companies, SMEs, universities and scientific organizations, governmental agencies and infrastructure organizations (technology parks, business incubators, technology transfer centers, industrial design centers. etc., Kotzemir, Meissner 2013).

Inter-organizational spillovers are the external sourcing and/or exploitation of knowledge and technology especially by companies. This is an essential part of technology and innovation management when converting inventions generated from an institution's explorative and R&D activities into innovation within an organization whereas *intra-organizational* spillovers is mainly an issue of company innovation management. Also structured hierarchical levels of institutions engaged in spillovers play an important if not crucial role.

Spillovers happen directly or indirectly. *Direct* spillovers mean that know-how and/or technology from inventing entities are transferred to recipients on their initiative and do not require support of technology intermediaries. *Indirect* spillovers are the mediated transfer of opportunities involving one or more intermediaries. Clusters play an important role for indirect spillovers, e.g. spillovers from current R&D to future R&D activities. These spillovers can be traced back to the knowledge generation process, e.g. knowledge and competences resulting from R&D activities are commonly used for further application in the form of tacit or codified knowledge. In this way cluster based R&D activities generate spillovers which contribute substantially to generating new knowledge, which in turn eventually enhances local innovators absorptive capacity to take advantage of external technology and innovation. This affects R&D prospects of cluster based companies but also the future R&D of external companies. Consequently such spillovers are realized by external companies but also research institutes and education institutions which in the long term contribute to the attractiveness of clusters since cluster members and external actors realize the resulting effects. However this is a long term effect which so far can't be measured reliably.

Technology-push spillovers mean the transfer of existing technical know-how and technologies to new fields and applications. Otherwise, possible solutions to a given problem, in form of new technologies, sought from other areas, constitute *demand-driven* spillovers.

The initiative of transfer is through a direct transfer, without any technical adaptation of the absorbing organization (*imitation*), i.e. the technology is used one to one. Hence it is merely a "relocation", while in case of *adaptive* spillovers, further activities are required to customize the application of new knowledge to the specific needs and circumstances of the recipient.

Among the many important factors for the development and growth of clusters, the personal direct interaction of individuals in a geographic proximity - despite the availability of modern information and communication technologies – is especially relevant. This is shown in various studies on different industry sectors:

- Zucker et al and Feldman showed the impacts for biotechnology [Zucker et al 1998; Feldman 2000];
- Pinch, Henry and Almeida, Kogut for motor sport and semiconductor industry [Pinch, Henry 1999; Almeida, Kogut 1999];
- Fallick et.al. for Silicon Valley computer industry [Fallick et.al. 2004];
- Niosi, Zhegu for aerospace industry [Niosi, Zhegu 2005].

The different spillover types caused and stimulated by clusters can have a varying impact on the cluster participants and the cluster as a whole (Table 2). It's obvious that clusters mainly have a long term impact which is only measurable to some extent. The main reason being causality, e.g. the interaction of cluster participants isn't quantifiable.

Table 2: Impact, measurability and time to take effect of spillovers in clusters

Spillover type		*Impact by cluster*	*measurability*	*Time for taking effect*
Direction	*Horizontal*	*Medium*	*Limited*	*Long*
	Vertical	*High*	Limited	Medium
Organization	*Intra-organizational*	*Low*	Limited	*Short*
	Inter-organizational	*High*	Measurable	Long
Interaction	*Direct*	*Medium*	Measurable	*Medium*
	Indirect	*High*	Limited	Short
Process	*Technology push*	*High*	Measurable	*Medium*
	Demand pull	*High*	Measurable	Medium
Adaptation	*Imitation*	*Low*	Limited	*Short*
	Adaptation	*High*	Limited	Medium

It should be noted here that clusters have impacts on participants but the time frame for such impacts to occur is long term rather than short term.

1.2 Evolution of cluster policies and initiatives

International studies indicate the relative "youth" of cluster initiatives; even in the most developed countries more than 60% of these projects were launched after 1999 and cluster initiatives in developing and transition countries are even younger (Figure 1). In the 2000s a period of rapid proliferation of cluster initiatives, organized either by business or academia or authorities of any kind, around the world began. Interestingly, while in 2003 more than 500 cluster initiatives around the world were identified, primarily in Europe, North America, New Zealand and Australia [Sölvell et al., 2003], in 2005 there were already around 1400 [Ketels et al., 2006].

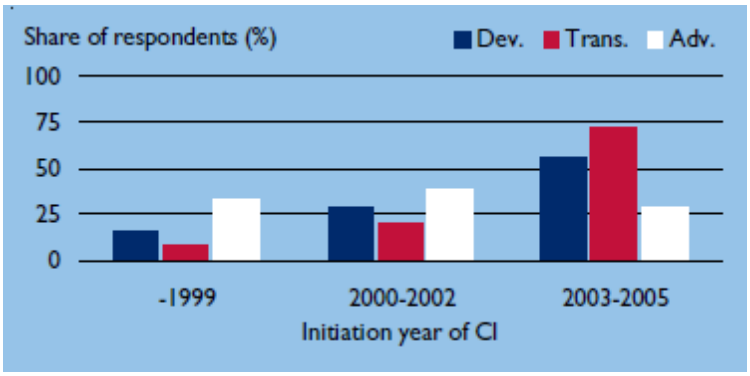

Figure 1. The initiation year of cluster initiatives in developed, developing and transition countries *(%)*

Source: Ketels C., Lindqvist G., Sölvell Ö. (2006) Cluster Initiatives in Developing and Transition Economies. Stockholm: Center for Strategy and Competitiveness. P.13.

A survey of cluster initiatives showed that in the first stage of their development, government support, not only organizational and consulting support, but also financial, is very important. Interviewing more than two hundred members of cluster initiatives around the world, the authors of the Cluster Initiatives GreenBook, came to the conclusion that most of them are financed through public funds, though the organizational role is weaker (Figure 2).

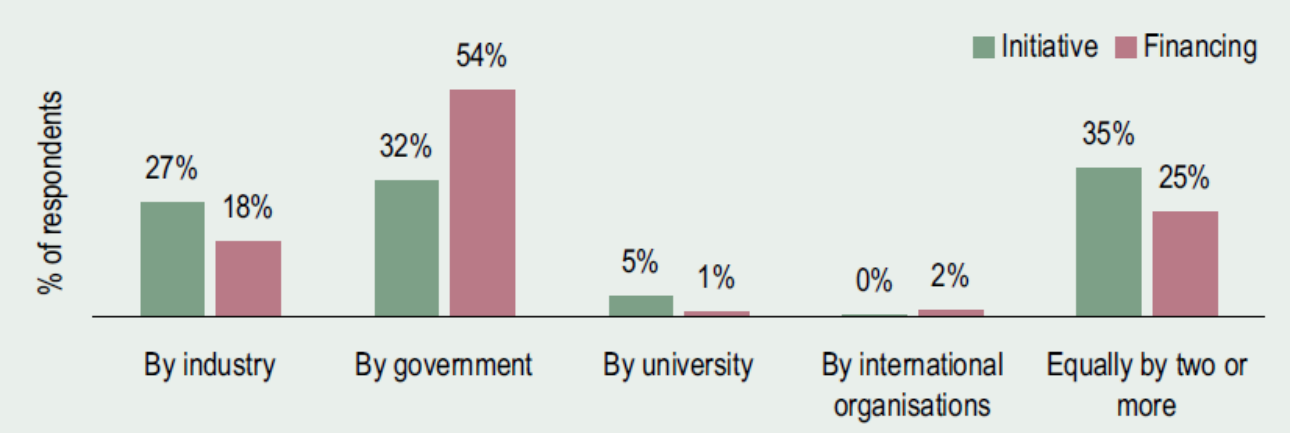

Figure 2. Initiating and financing cluster initiatives

Source: Sölvell Ö., Lindqvist G., Ketels C. (2003) The Cluster Initiative Greenbook. Stockholm: Bromma Tryck AB, P.39.

In the 1970's and 80's, prior the emergence of large-scale cluster programs at national level, local programs which share similar general principles and values have been launched in some regions. These are especially:

- Emilia-Romagna and Veneto (Italy),
- Baden-Württemberg and North Rhine-Westphalia (Germany) and
- Styria and Upper Austria (Austria).

Since the second half of the 1990s some countries have gradually begun to form national cluster programs. By the end of the 2000s national cluster programs were implemented in 26 member countries of the European Union [Oxford Research, 2008]. Currently targeted support to clusters under the umbrella of state cluster policy is given in Australia, Austria, Belgium, Britain, Denmark, Germany, India, Spain, Italy, Canada, Norway, Poland, the Republic of Korea, Singapore, Slovenia, Spain, Sweden , Japan and other countries [OECD, 2007; Pro Inno Europe, 2012].

Despite government intervention in the process of clusters evolution has been subjected to criticism [Duranton, 2011; Desroches, 2011; Martin, Mayer, Mayneris, 2008; Martin, Mayer, Mayneris, 2010], some practices of implementation of cluster policies in leading countries show the effectiveness of the this policy. In particular, the outcome of the program BioRegio, in course of which the number of companies was quadrupled and more than nine thousand jobs in the biotechnology sector were created and which will significantly reduce the gap with the traditional leaders, e.g. Great Britain, is convincing. Within BioRegio participating regions achieved more notable success compared to other federal states (Figure 3). Today, Germany is seen as the European leader in the field of biotechnology, hosting 552 biotech companies. Their overall turnover reached

2.6 billion euros in 2011 (a growth rate of 30% for the period 2005-2008), employing 16.300 people [Biotechnologie.de, 2012].

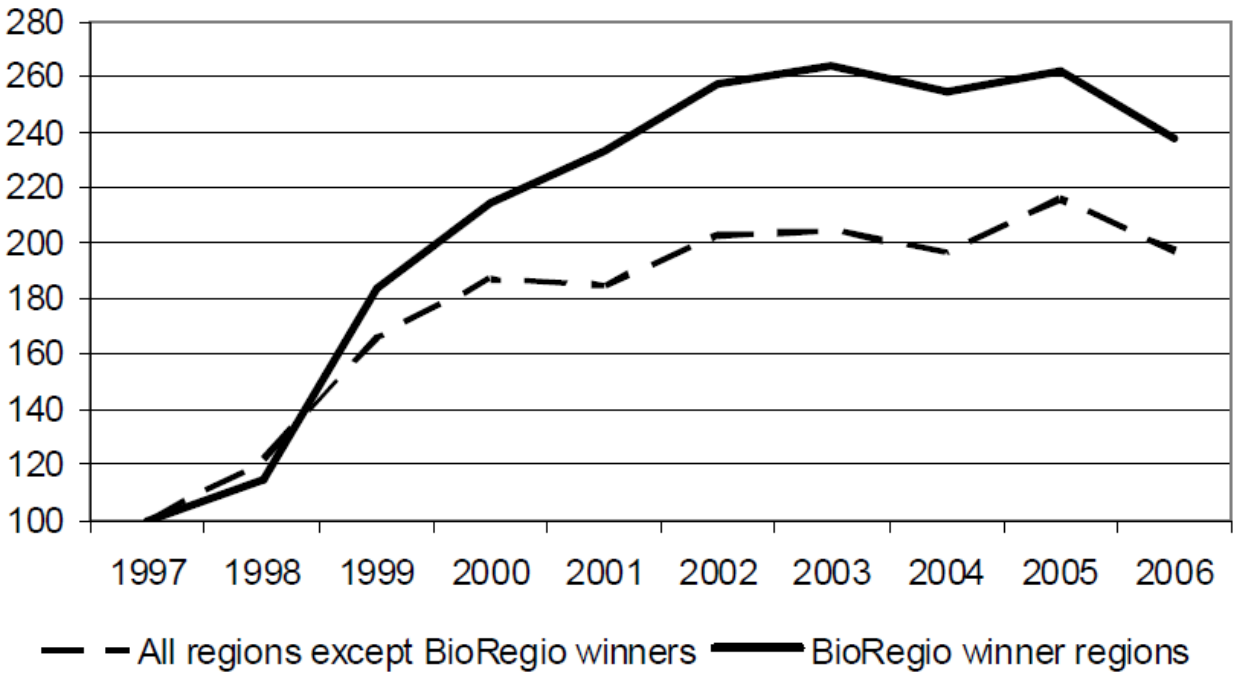

Figure 3. Increase in the number of DBFs in the BioRegio winner regions and in the rest of Germany (1997=100)

Source: Dohse D., Staehler T. (2008) BioRegio, BioProfile and the Rise of the German Biotech Industry // Working paper № 1456. Kiel, Germany. P.7. http://www.ifw-members.ifw-kiel.de/publications/bioregio-bioprofile-and-the-growth-of-the-german-biotech-industry/KWP_1456.pdf (accessed 16 August 2012).

The implementation of another well-known German cluster program - InnoRegio - during 2000-2004 has led to an increase in employment by 11% by companies included in the program. Moreover, 44% of these companies filed patents and 40% launched new products [BMBF, 2006].

The success of these and other programs inspired many regions and countries, including Russia, to design and implement their own cluster programs.

2. Background of cluster policy in Russia

The majority of the problems that hinder the innovative development of Russia fall into one of two basic categories.

The first is the low innovation activity of businesses that generate insufficient demand for innovation. The level of innovation activities of Russian companies has been around 10% since the early 2000s, giving an advantage not only to leading industrialized countries, but also to Eastern European countries. Innovation activity of enterprises is based mainly on the acquisition of machinery and equipment, rather than on R&D aimed at radical novelties [Gokhberg, Kuznetsova, 2011]. The level of intensity of both technological and non-technological (organizational, marketing) innovations is twice as low. Russia is also characterized by a low share of innovation expenditure as a percentage of sales: 1.5% whereas in Sweden the average for the whole economy was 5.4% and in Germany 3.4%. Moreover, growing innovation expenditure is not necessarily accompanied by increasing turnover with innovative products as a share of total sales. The latter was approximately 5% between 1995 - 2010 [Strategy - 2020, 2012].

The second problem is the low efficiency of the domestic R&D sector, especially its isolation from the needs of the business community. Traditionally scientific organizations in Russia are independent from universities and enterprises, most of them being incorporated in the Russian Academy of Science. Scientific organizations account for 80% of total expenditure on science, although the backbone of innovation systems in developed market economies are universities and corporations. The R&D sector is dominated by government budget-funded institutions and other forms of organizations with substantial participation of the state. The applied sciences sector is dominated by sectoral (departmental) R&D institutes rather than industrial enterprises, whose share does not exceed 7% of all organizations engaged in R&D. Only 45% of higher education institutions are engaged in R&D, and they accommodate just 7% of the national R&D expenditure total (2.5 times lower than the OECD average) (figure 4) [Strategy - 2020, 2012; Gokhberg, Kuznetsova, 2011].

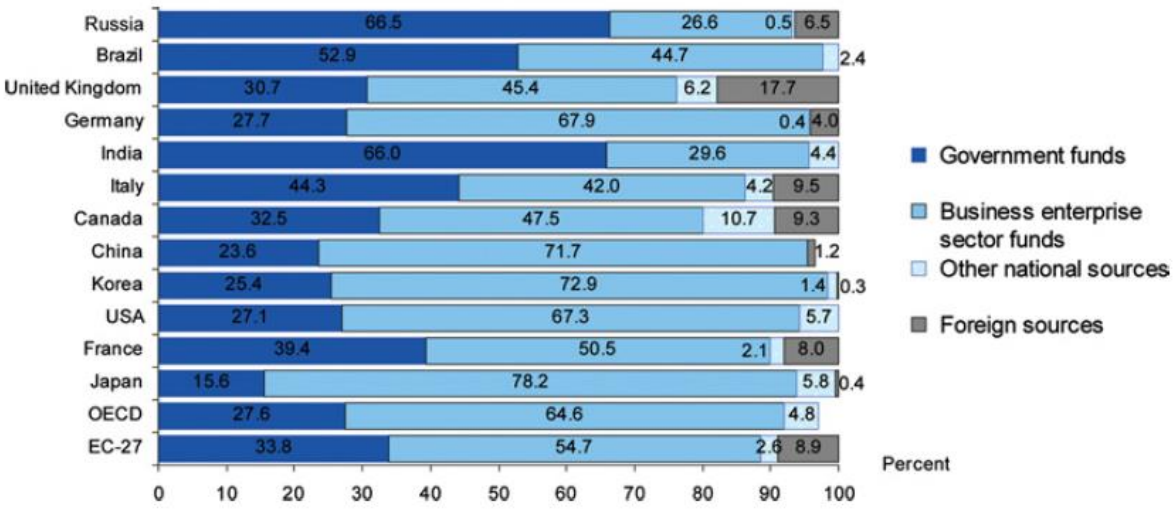

Figure 4. Percentage distribution of gross domestic R&D expenditures by source of funding, 2009.

Source: Gokhberg, Kuznetsova, 2011. P. 77.

R&D units have been generally unable to offer businesses ready-to-use, cost-effective, technologically competitive solutions and their support and customization in the implementation phase [Gokhberg, Kuznetsova, 2011].

We can conclude that both the demand for and supply of innovation are quite weak in Russia. What is even more important is that the link between them is also weak. As a result innovation processes are still too weak to influence socioeconomic progress in Russia [Gokhberg, Kuznetsova, 2011] and insignificant on an international scale (Table 3).

Table 3. Productivity Indicators of Russian S&T, 2009

Indicator	International comparisons
Percentage of publications in international scientific journals	Russia, 1.8%, ranks 14th globally (1995, 7th, 1980, 3rd); China, 15.1%, ranks 2nd (1995, 14th)
Total patents applications	Japan's performance is 9 times the United States; 12 times Korea; 4 times that of Russia
Technology exports	Russia, 0.6; Hungary, 2.7; Finland, 9.1; United States, $89.1 bn
Share in the world high-tech exports	Russia, 0.3%; Singapore, Korea, Taiwan, 4%–8%

Source: HSE 2011.

In the last decade, the Russian government has taken steps towards the stimulation of innovation. First, in recent years state funding for science has increased both in terms of basic research (by 1.6 times in the period 2006-2008) [Ministry of Economic Development of Russia, 2010] and in terms of applied research. Second, considerable efforts have been made to encourage research and innovation activities in universities, namely by support of the innovation programs' implementation for 57 universities with a budget of 750 million euros in the period 2005 -2008 in total. Almost three dozen universities were awarded the status of National Research University which allowed them to receive additional funds (more than 200 million euros) for the development of innovation infrastructure and research activities. The measures were accompanied by complementary measures including the attraction of world-renowned scientists, support of cooperation between universities and enterprises as well as the further development of the universities' innovation infrastructure (2.25 billion euros 2010 -2012) [Ministry of Economic Development of Russia, 2010].

A law authorizing universities and research organizations to create innovative small enterprises was passed. In the first year of its application about 600 small innovative enterprises from universities and research organizations were established.

Third, federal development institutions were formed to create an "innovation lift" in the economy to fund innovative companies at different development stages. Among them are the Russian Venture Company, JSC "RUSNANO", the Russian Foundation for Technological Development (RFTD), State Corporation "Bank for Development and Foreign Economic Affairs (Vnesheconombank)" (VEB), Skolkovo innovation center , etc. [Strategy - 2020 2012].

The Skolkovo Innovation Center is designed to support the most promising innovative companies in Russia through the formation of unprecedented legal regime that minimizes the administrative barriers and the tax burden for its residents.

Fourth, an attempt at "coercion to innovate" of large state-owned enterprises (SoE) was made requiring the largest SoE to formulate and implement dedicated innovation programs and invest a given share on innovation (depending on the revenues and profits of each SoE) [Ministry of Economic Development of Russia, 2010].

Fifth, a system of infrastructural support for innovative small and medium enterprises was established in the different regions of Russia including technology parks, business incubators, technology transfer centers, prototyping and design centers and engineering centers. Small

innovative companies are provided with grants and educational support and are compensated the cost of participation in exhibitions and fairs.

Finally, an inter-ministerial commission chaired by the President and Prime Minister of the Russian Federation was established (The Governmental Commission for High Technology Development and Innovations).

However, despite these measures, the level of innovation outputs in Russia isn't satisfactory yet. Moreover, due to the global economic crisis, the extensive model of stimulating innovation, which mainly focused on large-scale financing of the various elements of the innovation system, has become unjustified. Now the main challenge is to improve the efficiency of existing measures for support of scientific and educational institutions, large companies, start-ups and innovative SMEs.

According to international experience effective innovation policy requires:

- taking account of specific innovation profiles of the regions and the involvement of the regions in the drafting and implementation of federal policies;
- the coordination of innovation policy measures for support different actors (universities, research organizations, large businesses, SMEs, venture capitalists and business angels, etc.);
- improving the efficiency of interaction between actors of the regional innovation systems, including trust building.

In our view, cluster policy is, in principle, consistent with all these requirements.

Firstly, clusters per se are "assembly points", structuring local actors representing different elements of regional innovation systems (business, science, education, etc.), for implementation of joint initiatives that enhance the competitiveness of all cluster members. Cluster initiatives help to reconcile the interests and strategies of companies and other organizations, create specific strategies and projects accounting for global competition and global value chains. In this context, it makes sense if the clusters are not just an object but also the subject of innovation policy, which participate in its development, correction and implementation. Such participation helps to clarify innovation policy, making it smarter and more targeted to the specific needs and requirements of most significant and perspective groups of innovative actors in regions. Also recognition by authorities motivates clusters participants to take further action.

Secondly, the integration of the cluster approach into innovation policy requires and promotes consistency between various measures by coordination of different efforts of multiple –authorities,

namely federal and regional - and target them to the most promising industries and geographical areas.

Thirdly, the development of clusters suggests comparably limited, i.e. not so high, investment in the construction of the basic infrastructure or changes in the spatial distribution of economic agents, but aims at increasing the density and efficiency of interactions between them, developing innovation ecosystem for fostering new ideas, projects and start-ups. Not surprisingly, the development of clusters has been determined as one of the priorities of the Strategy of Innovative Development of the Russian Federation for the period till 2020 which was confirmed the end 2010. In the framework of this Strategy, the first national cluster program was launched in 2012.

3. Selection of the pilot innovative clusters: procedures and results

March 19, 2012 the Ministry of Economic Development of Russia announced the competitive selection of cluster initiatives from the regions of Russian Federation. During the following month in total 94 bids were submitted.

All applications were evaluated by 11 criteria. Four main criteria (the scientific potential, production capacity, quality of infrastructure and the level of institutional development) were considered from the point of view of the current status, prospects of development for a period of 5 years and the quality of the action plan (Table 4). The only exemption was that it wasn't required to assess the prospects for the level of institutional development. Each of the 11 assessment criteria should have been evaluated by a standardized rating scale from 1 to 3.

Table. 4. Established criteria for the selection of received cluster development projects

	Current situation	**Perspective (2017)**	**Quality of action plan**
Scientific and educational potential			
Production (sales) potential			
Life quality, level of transport and logistics, power, engineering, housing and social infrastructure on the territory of cluster location			
The level of organizational development			

A two-stage procedure of cluster projects' selection was established. The first stage was an on-line assessment by a wide group of experts (approximately one hundred) which includes the representatives of federal authorities, leading educational and scientific organizations, federal development institutions, consultants and business community. During a month (April 21 - May 21, 2012) 37 applications that had received the highest appraisals from the experts were selected to the second round.

In the second phase, in May / June 2012, the teams of all 37 clusters introduced their projects to the Working Group on Private-Public Partnerships in Innovation Sphere of The Governmental Commission for High Technology Development and Innovations which made a final selection of the 25 pilot innovative clusters (Figure 5). Some of the clusters (from the list of 37) were proposed to be merged if they are located in the same region (it concerned Sankt-Petersburg, Tomsk and Novosibirsk regions).

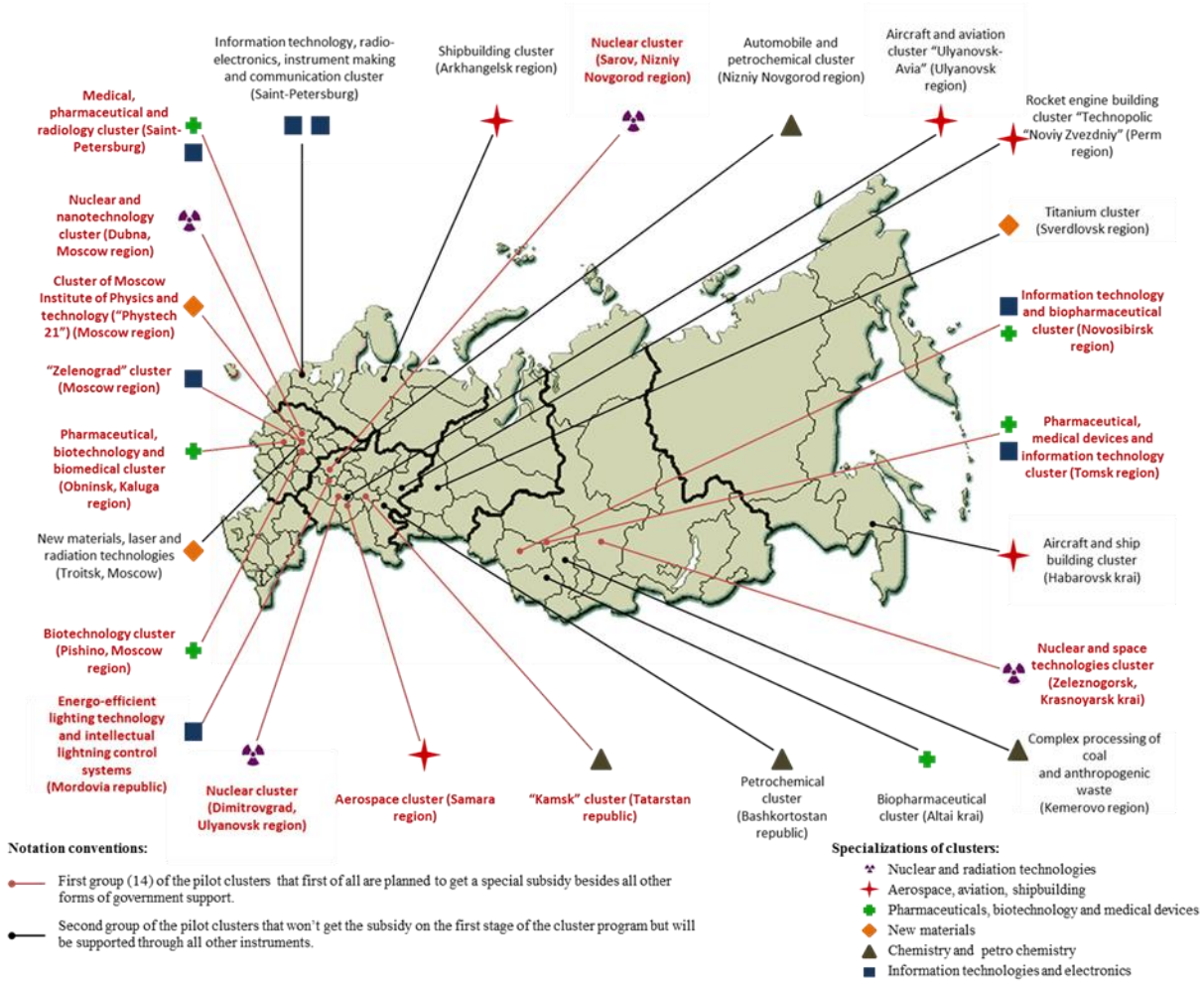

Figure 5. The pilot innovative regional clusters

Source: Abashkin V. Boyarov A. Kutsenko. E. (2012) Cluster Policy in Russia: From Theory to Practice / Forsight. T. 6. Number 3. P. 16-27.

All 25 pilot innovative clusters were divided into two groups. The first group (14 clusters) is planned to be supported with the special subsidy from the federal budget. 1.3 billion rubles (approximately 325 million euros) have been allocated for that purpose. The second group requires further improvement of its projects and clusters from that group won't receive federal subsidy (Figure 6).

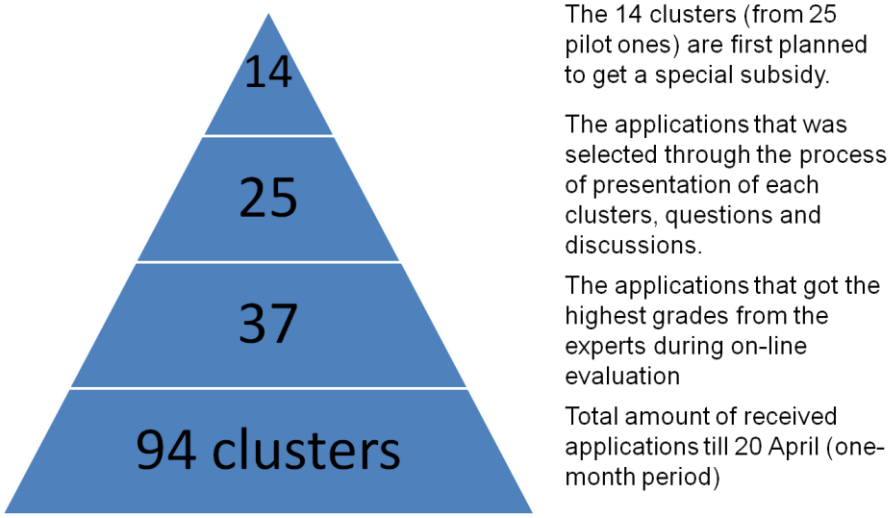

Figure 6. The results of pilot innovative clusters' selection in Russia.

Some parameters of the pilot clusters are presented in Table 5.

Table 5. Key indicators of the pilot innovative clusters' development

Index	Present value (bn euros)	Predicted value (bn euros)	Rate (%)
Total sales (except natural resources)	47 (2011)	95 (2016)	105 (growth rate)
Private investment	16 (2009-2011)	39 (2012-2016)	146 (the ratio of the average annual private investment in 2012-2016 to average in 2009-2011)
R&D expenditures	28 (2007-2011)	24 (2012-2014)	145 (the ratio of average annual R&D expenditures in 2012-2014 to average in 2007-2011)

Source: Ministry of Economic Development of Russia; pilot innovative clusters' projects.

In terms of industrial classification each of the 25 pilot innovative clusters belongs to one of six sectors: "Nuclear and Radiation Technology", "Manufacture of aircraft and space vehicles, shipbuilding," "Pharmaceutical, biotechnology and medical industries", "New Materials", "Chemicals and Petrochemicals", "Information Technology and Electronics" (Table 6). The maximum number of the pilot clusters relates to areas of "Information Technology and Electronics" and "Pharmaceuticals, biotechnology and medical industries" - 7 and 6 respectively. "Nuclear and

radiation technologies" and "Manufacture of aircraft and spacecraft, shipbuilding" being traditionally strong in Russia (and USSR) are also appeared to be fruitful areas for cluster initiatives.

Table 6. Distribution of pilot innovative clusters in terms of industrial classification

№	Name of sectors	Name of clusters
1.	**Nuclear and radiation technologies**	Nuclear and nanotechnology cluster (Dubna, Moscow region)
		Nuclear cluster (Sarov, Nizniy Novgorod region)
		Nuclear and space technologies cluster (Zeleznogorsk, Krasnoyarsk krai)
		Nuclear cluster (Dimitrovgrad, Ulyanovsk region)
2.	**Manufacture of aircraft and spacecraft, shipbuilding**	Aerospace cluster (Samara region)
		Rocket engine building cluster "Technopolic "Noviy Zvezdniy" (Perm region)
		Aircraft and ship building cluster (Habarovsk krai)
		Aircraft and aviation cluster "Ulyanovsk-Avia" (Ulyanovsk region)
		Shipbuilding cluster (Arkhangelsk region)
3.	**Pharmaceutical, biotechnology and medical industries**	Pharmaceutical and medical devices' cluster (St. Petersburg) ***
		Pharmaceuticals and medical devices' cluster (Tomsk region) ****
		Biopharmaceutical cluster (Novosibirsk region) *
		Pharmaceutical, biotechnology and biomedical cluster (Obninsk, Kaluga region)
		Biotechnology cluster (Pishino, Moscow region)
		Biopharmaceutical cluster (Altai krai)
4.	**New Materials**	Cluster of Moscow Institute of Physics and technology ("Phystech 21") (Moscow region)
		New materials, laser and radiation technologies (Troitsk, Moscow)
		Titanium cluster (Sverdlovsk region)
5.	**Chemicals and Petrochemicals**	Automobile and petrochemical cluster (Nizniy Novgorod

		region)
		"Kamsk" cluster (Tatarstan republic)
		Petrochemical cluster (Bashkortostan republic)
		Complex processing of coal and anthropogenic waste (Kemerovo region)
6.	**Information Technology and Electronics**	"Zelenograd" cluster (Moscow region)
		Information technology cluster (Novosibirsk region) *
		Information technology and electronics cluster (Tomsk region) ****
		Information technology cluster (St. Petersburg)**
		Radiation Technologies cluster (St. Petersburg) ***
		Energo-efficient lighting technology and intellectual lightning control systems (Mordovia republic)
		Radio-electronics, instrument making and communication cluster (Saint-Petersburg) **

*These clusters were combined in the Information technology and biopharmaceutical cluster (Novosibirsk region).

**These clusters were combined in the Information technology, radio-electronics, instrument making and communication cluster (Saint-Petersburg)

.
*** These clusters were combined in the Medical, pharmaceutical and radiology cluster (Saint-Petersburg)

.
**** These clusters were combined in the Pharmaceutical, medical devices and information technology cluster (Tomsk region) .

The pilot innovative clusters are mainly located in the European part of Russia. Only 7 of them are located in the Asian part. The overwhelming majority of the pilot clusters are located in the federal districts (large regions that include several ordinary regions each) with traditionally intensive innovation activity: Volga (9 clusters), Central (6 clusters, 5 of them in Moscow and Moscow Region) and Siberia (5 clusters). 70% of clusters that have applied to participate in the competition are concentrated in these three federal districts. The smallest number of applications came from the regions of the North Caucasus and the Far East federal districts.

A variety of the pilot clusters, industries of their specialization, problems, goals and collaborative projects determine the necessity for using not single or several instruments of state support, but a policy mix which can provide customized and comprehensive support. That is why a pilot cluster is supposed to be given not only support under the framework of innovation policy, but

also in areas such as development of transport and logistics, power, hosing and social infrastructure. The pilot clusters are planned to be supported within the relevant sectoral policies, federal programs and related schemes of territorial development.

To stimulate demand for innovative products produced by the pilot clusters' participants largest state-owned companies which are forced to implement innovation development programs will be engaged. It also assumes the proactive involvement of development institutions in the activities of the pilot clusters, i.e. special conditions that have turned into law for the project "Skolkovo" innovation centre. The pilot clusters will be provided a high-priority support in the SMEs development program of the Ministry of Economic Development of Russian Federation (Figure 7).

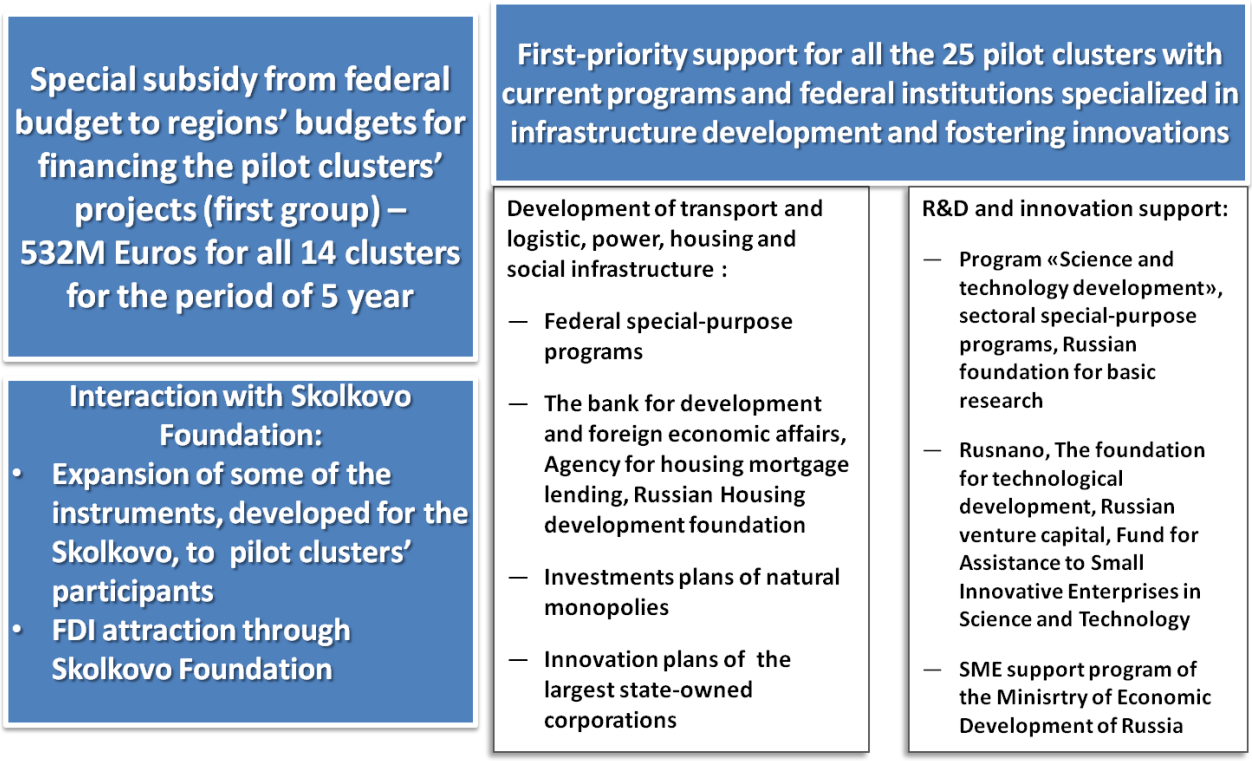

Figure 7. Proposed mechanisms to support innovative pilot clusters in Russia

4. The similarities and peculiarities of the first national cluster program in Russia.

In general, the first national cluster program in Russia is consistent with European experience, in particular with federal cluster programs in Germany.

First, we should mention that the Russian cluster concept is very similar to European common knowledge. According to the methodology of the Ministry of Economic Development of Russia to be a cluster means not only a proper objective endowment and relative significant allocation of labor force in specific industry and region, as it's considered in so called cluster mapping[3], but also self-identification, common strategy designing, organizational efforts and collaborative projects between companies – cluster participants. In other words, cluster is not only a framework for policy-makers (as it's often considered in Asian countries), but also a common framework for local companies. And in some cases (which are not so rare, even in Russia) companies can activate clusters without any policy intervention (so called cluster initiatives). As a consequence of this methodology, special attention is given to interactions between cluster participants; not only the presence of companies, their quantity and size, turnover, investment and profits. Many clusters in Russia (not only the pilot ones) have created special managing bodies (cluster organizations) which represent cluster participants in external activities.

Another important feature of the established concept of cluster is that cluster should include not only companies, but other important actors of regional innovation system, e.g. start-ups, innovative SMEs universities, science organizations, innovation infrastructure (technology parks, business incubators, technology transfer centers, engineering centers, etc.), venture funds, organizations for collaboration. In terms of value chains clusters often consist of key companies, their suppliers of different tiers, their spin-offs and competitors. Initiation of the cluster helps to strengthen interactions and develop a comprehensive ecosystem for fostering innovations. What is also worth to single out is that the pilot clusters were initiated by different actors. In some cases it were companies (Information technology cluster in St. Petersburg, the others – universities (Cluster of Moscow Institute of Physics and technology ("Phystech 21") in the Moscow region), institutes of the Russian Academy of Science (Biotechnology cluster in Pishino, Moscow region), local authorities (Nuclear and nanotechnology cluster in Dubna, Moscow region), regional authorities (Pharmaceutical, biotechnology and biomedical cluster in Obninsk, Kaluga region) or the federal state-owned companies (Nuclear cluster in Sarov, Nizniy Novgorod region).

Second, the volume of the special subsidy per a pilot cluster is consistent with well-known cluster programs in Germany and France (Table 7).

Table. 7. Characteristics of some of the national programs to support clusters

[3] European Cluster Observatory (http://www.clusterobservatory.eu/index.html), Cluster mapping in USA (http://www.clustermapping.us/).

The name of the program	The implementation period	The program's budget *(million euros)*	Number of bids submitted	The number of supported clusters	Average budget support
BioRegio (Germany)	1995-2002	90	17	4	22.5
BioProfile (Germany)	1999-2006	50	20	3	16.7
InnoRegio (Germany)	1999-2006	253	444	23	11.0
Les pôles de compétitivité (France)	2005-2011	3000	105	71	42.3
Competence centers (Finland)	1999-2005	46	-	22	2.1
Spitzencluserwettbewerb (Germany)	2012-2016	200	-	5	40.0
Russian cluster program	2013-2017	532 (plan)	94	14	38.0

Third, as many European cluster programs, the Russian program is a cooperation-contest program. This means, first of all, a "top-down-top" approach for the selection the pilot clusters. Authorities do not identify the most promising clusters (although they can identify the prior areas in which the clusters are planned to be supported) and support them according to their understanding of the problems and bottlenecks in each cluster, but hold a contest in which different groups of actors could participate. In the framework of the first national cluster program it is assumed that clusters are organized for themselves, analyze their strong and weak points, the technological and marketing trends, common barriers and, in successful cases, formulate their own identity and collaboration projects. Such projects should be first evaluated and accepted by the regional authorities. The role of federal level is to select the best cluster project and to find proper instrument of support. Thus, the focus of cluster policy is shifted from the tasks of determining 'what is a cluster' and identification clusters in the regions to the task of establishing the most effective procedure to select projects that are previously developed in the regions. This can be considered as a mix of top-down and bottom-up approaches.

Other side of the program design is a fierce competition between clusters that on its own stimulate cohesion and interaction between firms. Still not all competitors receive support (in the case of German federal cluster programs the proportion of rejected applications of total applications reached 95%). In Russia, the proportion of rejected applications is 73%. If we consider only 14

winners as the pilot clusters, the proportion rises to 85% (Table 8). High level of rejection is the condition of focus to support the best clusters and not all that pretend to be the best. The competitive nature stimulates cooperation between localized actors even if they loose. Experience from German Innoregio program shows that 40 percent of clusters whose applications were rejected nevertheless realized their project afterwards and 61 percent of them received financial support from other government programs [Eickelpasch, Fritsch, 2005].

Table 8. The Share of rejected applications in cluster programs

Program	**Share of rejected applications, %**
BioRegio	76
InnoRegio	95
Competitiveness poles	32
Russian cluster program	85 (73 with the second group)

Fourth, the Russian cluster program is not just another channel to provide subsidies to the industry. Clusters are supposed to be an assembly point for many policy measures. It's planned that comprehensive and long-term support from the government will be focused on several the most perspective clusters. For example in the Bioregio the winning clusters not only received the allocated for this particular program funds (90 mn euros) [OECD, 2007; Eickelpasch, Fritsch, 2005], but also got priority in the appropriation of funds from the ''Biotechnology 2000'' program (around 700 M euro) [Dohse, 2000] which greatly exceeds the size of the program BioRegio. The same approach we can see in Russia. On the one hand, the volume of financial sources planned for allocation under the national cluster program is no very high (around halve a billon for 14 cluster for five years). But on the other hand, the overall government support under different current programs to the participants of the 14 pilot clusters are much more significant (Figure 8).

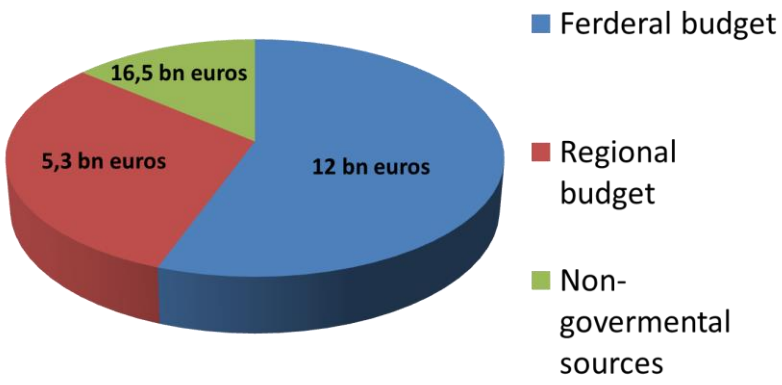

Figure 8. Planned structure of overall financial sources for development of the pilot clusters (first group) in Russia, 2012-2017 years

Source: Ministry of Economic Development of Russia; pilot innovative clusters' projects.

Described comprehensive support requires involvement of several federal ministries and agencies and strong participation of regional governments. In most European countries with on average one to three agencies participating in cluster programs implementation. The exemptions are Ireland where 7 agencies and Finland where 8 agencies were and are involved [Oxford Research, 2008]. In Russia the clusters are also supported by a number of ministries and departments as well as development institutions.

Also as many other cluster programs, the Russian one is not just national. It involves joint work between the federal and the regional levels, with the former playing the role of facilitator and the latter managing or coordinating or taking part in the clusters. The federal level program is facilitated through an inter-ministerial committee. It provides the involvement and coordinated work of several ministries, agencies and development institutions to guarantee the pilot clusters comprehensive support.

Despite the consistence with European experience there are still some path blocks that can radically decrease the efficiency of the first national cluster program in Russia. We'd like to mention here only the most obvious. There is a number of pilot clusters formed in single specialisation cities some of which have a restricted access because of state secret regime. First of all, there are the nuclear and space technologies cluster (Zeleznogorsk, Krasnoyarsk krai), Shipbuilding cluster (Arkhangelsk region), Nuclear cluster (Sarov, Nizniy Novgorod region). In the Soviet Union, these cities had an above average quality of life. However, when the USSR disappeared the quality of life in these areas decreased which led to an outflow of skilled personnel. The same negative situation is

characterized the pilot clusters located in the neighboring areas to Moscow or other regional centers. Another serious problem for future development of such clusters is the restricted access mode, which blocks attraction of foreign staff, researchers, managers and investments, the dominance of large enterprises, the rigid specialization and the focus on government demand.

The development of the pilot clusters in peripheral regions is a difficult task. Instead of common measures of cluster policy in this case priority may be given to the efforts to retain and attract specialists, world-class scientists, experienced entrepreneurs, managers and business angels. They are the true backbone of a prosperous innovative cluster in the modern globalized world. Competitiveness of clusters is built on **developed, diversified and open urban environment** which provide high living standards and is attractive for talents and capital. To make effort effective the following conditions are important:

- the creation of jobs with wages higher than for similar positions in the regional centers;
- the development of urban infrastructure in terms of restaurants, places for networking, entertainment, cultural activities;
- the economic diversification, widen career opportunities, growth of inter-firm and intraregional mobility;
- the development of cheap low-rise accommodation, the system of preferential rent, mortgage and purchase of housing for employees of companies - cluster participants ;
- the application of green technologies, environmental improvement, the development of the benefits of proximity to nature, healthy living and no traffic jams.

Only if these conditions are met or at least tackled the strategy of stimulating cluster development will be based on a solid foundation.

Another important feature of successful clusters is the **dominance of the private initiative.** Private initiative is an essential element of the innovation system. It can be assumed that some of the private initiatives will eventually even lead to company creation.

In contrast to the majority of foreign clusters, many pilot innovative clusters in Russia are clearly dominated by state-owned enterprises, their subsidiaries or public education and/or research institutions. There is a distinct lack of private initiative, which is a measure for the need and effectiveness of the cluster format of interactions between organisations, e.g. the rationality of cluster initiative, the quality of internal communications and the attraction of investment projects. Especially this role is growing, if the cluster initiative is the result of the contest announced by the state with the promise of support. Of course, it would be unreasonable to say that companies with state participation in the clusters are not needed or that the clusters are not for them. But it is important to create a balance of interests, the so-called triple helix - close interaction between business, academia and government.

Other weak point of the current design of the Russian cluster program is the lack of emphasis on innovative SMEs, start-ups and growth of new companies. There is a strong tendency that main beneficials of the program will be large companies. But in many cases cluster is unnecessary format of interactions for them. They don't need collaboration projects with many participants. PPP or strategic alliances maybe more relevant for them. On the contrary for SMEs there is a very clear reason to participate in cluster initiatives. If they don't have enough resources to solve their problems, it's natural trying to find a partner, join the group of firms with similar problems and similar opportunities. A cluster is also a good platform to interact with large companies, universities, to influence government, to enter technology platforms, etc. That is why the main beneficiaries in European cluster programs are small and medium enterprises. SMEs, mostly start-ups, received more than 60% of total funding in the BioRegio program [Dohse, Staehler, 2008]. SMEs prevailed among the participants of the InnoRegio program as well [Eickelpasch, 2008]. In the case of the Les pôles de compétitivité program the share of small and medium-sized enterprises in the overall quantity of the participants was 80% and the share of SMEs in the budget was equal to 54% [DGCIS, 2009; Pro Inno Europe, 2009]. Despite the fact that the indicators of the presence of small and medium-sized enterprises have been included in the selection criteria of the pilot clusters in Russia, it was not enough. The formal presence in the list of participants of the cluster does not mean actual participation in joint projects. The analysis of cluster applications shows that the share of projects initiated by SMEs is modest or almost negligible.

The last path block that we want to briefly describe in our working paper is the **insufficient internal competition** in the pilot clusters of Russia. Internal competition is one of the basic conditions for the development of clusters which is necessary since it is the best incentive for improvement and further development. In addition to this, competition implies the absence of high barriers to enter of people, firms and capital in and out of the cluster. Openness helps to attract the most competitive firms in a cluster and, by the rising cost of the immobile factors of production, push the inefficient entrepreneurs away.

It is important to note that competition among the cluster participants with companies outside of the cluster (e.g. foreign) is not enough to be efficient stimulus for innovation. It is believed that the distanced competition is not as sharp as for objective reasons (different costs of production, values of currencies, tax regimes, etc.), and subjective - the reluctance to lose the competition to a neighbor once there is no external factors except your own failure [Porter, 2005].

However, for the absolute majority of the pilot clusters in Russia, with the exception of the clusters in the field of information technology, biotechnology and pharmaceuticals, the need of competition to be a strong cluster is a big surprise. It is often assumed that for the creation of a cluster it is sufficient to form a model of one large enterprise surrounded by suppliers, or to localize the value chain in the region. Localization or distribution value chain, as well as outsourcing and subcontracting are not specific problems to be solved at a cluster format of interaction. It's wrong to

try to replace rational business decisions by ideology or governmental policies, including under the guise of "development of clusters". Coercion to localize in clusters, the obtrusion of suppliers and/or buyers, formation value chains from the level of state policy risks turn into losses and overall inefficiency [Kutsenko, 2012b]. Clusters can grow and enhance their competitiveness successfully without developing in the direction of the value chain formation (for example, it is typical for clusters in tourism or information technology). But without internal competition we can hardly speak about dynamic cluster which is consistently reproducing its competitive advantages.

Conclusions

In general, the cluster program in Russia is consistent with the most successful international models (first of all German ones). Still we believe it's much more useful to focus on the areas for improvement, with the aim to offer recommendations and to help the program to be successful, flexible and evolutionary, but not criticism for the sake of criticism.

Both cluster initiatives and government programs to support them are rather new instruments in Russia. However in a number of essential fields clear positive trends have appeared. One of these trends is an increasing focus on the small and medium enterprises support in the pilot clusters. Originally, it was considered that the 14 pilot clusters would be subsidized in the amount of 125 million euros in 2013. Subsequently, this amount was reduced to 32,5 million euros in total (assuming that in the remaining four years of the program implementation the budget of the program will be 125 million euros per year as it was initially planned). At the same time 50 million euros are additionally allocated for the development of the 25 pilot clusters from the budget of the program to support small and medium enterprises and just as much from the Fund for Assistance to Small Innovative Enterprises in Science and Technology, that aimes to finance innovative businesses at the preceeding level [Shadrin, 2013]. Another positive trend is the recent decision to change priorities for cluster support. Despite it was originally expected to fund mainly the development of basic infrastructure in clusters, e.g. transport, engineering, housing, power, later infrastructural imbalance was offset. The pilot 14 clusters were offered to choose two of five possible areas of spending subsidy from the federal budget: the purchase of new equipment, additional education and training, cluster management activities and external consultancy, consultancy for the preparation of investment projects in the sphere of innovation, participation in international fairs, forums, round tables, etc. [Government of the Russian Federation, 2013]. These areas of support - more than the basic infrastructure development - correspond to the idea and

principles of cluster policy. Thus, we can conclude that the cluster policy in Russia is constantly changing and improving.

As far as we know this is the first paper in English (and one of the few in Russian) that is devoted to the description and analysis of the national cluster program which was launched last year in Russia. We apologize for some demerits caused the shortened format of the working paper. But we hope that the Institute of Statistical Studies and Economics of Knowledge and just created Russian Cluster Observatory[4] will publish much more detailed report about the first phase of the national cluster program in Russia this year. In addition we are planning to strengthen analytical part of the paper, e.g. strong and weak point of cluster policy in Russia and to make more recommendations.

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