Russian innovation clusters –
Platforms for foreign R&D investments

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Abstract

This paper studies cluster agglomeration of innovation activities in Russia. Technology intensive companies and technologically highly skilled labor force are abundant in some Russian regions but are desired in many others. Largest cities, Moscow and St. Petersburg, are clearly the most important locations in clustering process, but what is the role of other regions and cities in Russia. Where foreign and local investors find the most potential for their prospective research and development (R&D) centers? Main innovation clusters are defined and their ability to act as a platform for foreign R&D investments is analyzed. Cross regional comparison of patenting activity and other innovation measures is used in order to find the main innovation clusters. Large cities and regional centers, as well as regions focused on oil production, are the most innovative and provide much potential for foreign investors. Many Russian cities have hidden innovation potential that shows up only when the innovativeness in the country level is improved.

Key words: Innovation, patenting, Russia, cluster

1. Introduction

Sustainable economic growth, desired in transitional economies, will only be achieved with increasing efficiency, innovativeness, and diversified industrial structure. For transitional economies, like Russia, it is essential to increase the competitiveness of knowledge-intensive sectors, so that the economy will not solely rely on natural resources. Improved innovation environment attracts foreign investors and further speeds up the development. Russia fulfills some basic requirements to increase the innovativeness of the country, for example educated, highly skilled labor force, and substantial science base. Thus, Russia has potential to substantially increase R&D based co-operation with developed economies.

Experience of countries like Brazil and India indicate that in the earlier stages of development R&D can take the form of imitation (or reverse engineering) of technology-intensive imports, often taking advantage of weak intellectual property regimes (Maskus, 2004). However, as the technological capabilities of the local firms increase, and the technology of choice becomes more sophisticated, there is greater inclination of the local firms as well as the developing country governments to strengthen the IP regimes.

So far the innovation activity has been modest in Russia. Partly because Russia has not been able to attract R&D focused foreign direct investments in large scale and many Russian organizations have limited knowledge absorption capabilities. This study aims to contribute to this development by identifying Russian innovative clusters; whether they

are in process of developing or have already become competitive locations for foreign direct investments.

Data from 88 Russian regions is collected from Rosstat and Rospatent databases. Cross regional comparison of patenting activity and other innovation measures and FDI statistics is used in order to find and profile the main innovation clusters. It is noticed that innovations are clustered in largest cities, like Moscow and St. Petersburg, where the most foreign direct investments are also focused. In addition to these cities, some innovation potential could be found in regions focused on oil production and refining, and old military research and production regions. Surprisingly, foreign investors have not shown much interest in these regions.

2. Literature review

Patents have been used to measure innovativeness, R&D intensity and technological knowledge in many articles before. While Criliches (1990) uses patents as an indicator of economic growth, Acs and Audretsch (1989) use them as an indicator of innovative activity. Patent statistics are considered to be one of the best measures of the output of the innovative activity. Patent statistics are tangible measures of innovations while employment in high-tech sector and R&D operations, as well as the number of R&D laboratories, are indirect measures (Ó hUallacháin, 1999). Although, when using patent statistics it has to be noticed that not all inventions are patented, the inventions patented are not always innovations, and the patenting activity is higher in certain kind of

technologies (Acs et al., 1989; Bottazzi et al., 2002). For example, manufacturing sector patents more actively than service sector (Bottazzi et al., 2002).

The studies based on patent statistic, such as Breschi (2004) and Ó hUallacháin (1999), are mostly focused on developed economies; United States, Canada or Europe. Patent offices in Europe (European Patent Office) and United States (The U.S. Patent and Trademark Office) provide plenty of classified patent information (Worgan et al., 2002). In developing countries the IPR regime is weaker, and the patenting system and organizations are inefficient compared to the ones in developed economies (Falvey et al., 2006). Weak IPR protection allows rapid knowledge diffusion and advances technological development in developing countries, where local innovative activity is weak.

Patenting is a way to protect the invention so that others do not have a right to make, sell, use or import the invention. Applying a patent is rather time consuming. If the expected value of the invention exceeds the cost of patenting the patent will be usually applied for. According to Criliches (1990) there is strong evidence that when the R&D expenditures are changed, the number of patents will similarly change. There are certain factors that are vital for high R&D activity in companies, such as educated labor force (Bania et al., 1992).

Traditionally highest innovative activity is concentrated in clusters around major urban centers. In US innovative activity occurs in coasts (Audretsch et al., 1996) and largest metropolitan areas (Ó hUallacháin, 1999). In Europe innovations have been concentrated in the central of Europe, but this concentration tends to decrease over time (Moreno et al., 2005). According to Michael E. Porter (1998) clusters are "geographic concentrations of interconnected companies and institutions in a particular field". Clusters include vertically and horizontally linked enterprises and government organizations, such as universities and trade associations. Clusters might emerge in regions where the production is specialized, for example because of natural resources (Audretsch et al., 1996). Emerge of clusters is highly dependent on industry-specific and technology-specific factors (Breschi, 2004). Specialization in innovative activity is positively influenced by specialization of production activity (Moreno et al., 2005).

The specialization and depth of clusters differs according to nation's economic development and competitive advantages. In developing countries clusters are incomplete, they lack supporting institutes, depend on imports and natural resources or cheap labor. Similar clusters exist in global level, but only few of them are truly innovative and able to compete internationally. (Porter et al., 2006)

Industry R&D centers are located in areas with high level of university research, highly skilled labor and high population density (Bania et al., 1992). Companies located in clusters tend to be more innovative than those located separately (Brenner et al., 2006).

Criliches (1990) also mentions that companies located in clusters receive more patents per R&D investment when the overall R&D activity is high inside the cluster, compared to companies not located in clusters. This high level of innovativeness in clusters is explained by spillovers, technology transfer, labor markets, high economic activity, innovative neighboring regions and social networks (Brenner et al., 2006; Feldman et al., 1994; Bottazzi et al., 2002; Moreno et al., 2005). Spillovers and technology transfer occurs in clusters when the companies share knowledge and network with each other and public organizations more intensively than isolated companies (Ó hUallacháin, 1999). Close relationships with other companies within the cluster help companies to adopt and learn new technologies fast (Porter, 1998). Clusters emerge in areas with highly skilled labor. Skilled workers are graduated from universities nearby, and advanced technology is attracting more skilled workers from outside the region. Competitive pressure causes workers to perform better and utilize personal networks. Same competitive pressure, pride and a desire to perform better than others drive executives as well (Porter, 1998).

Clusters usually have the assets, skills, and capital to commercialize innovations more actively than isolated companies. In addition, formation of new enterprises is higher in clusters, which further stimulates innovation. (Porter et al., 2006)

Clusters are in best cases accompanied with multinational enterprises as well. Multinational enterprises (MNEs) affect the innovative environment and diffuse knowledge in many ways, for example through foreign direct investments, trade,

licensing, and international collaboration. MNEs are increasingly internationalizing their R&D activities, although R&D operations are often considered to be strategically important. Two motives have been recognized; to improve the utilization of existing assets and to create new technological assets through foreign-located R&D. (Narula et al., 2005)

3. Innovation framework in Russia

Russia faces huge challenges in future. In order to keep the economical growth sustainable, Russia needs to refocus its economy. Russian economy is currently highly dependent on export of natural resources, such as oil and gas. Last eight years Russian GDP has been growing more than five percent annually, thanks to high oil and gas prices on world markets. But sustainable economic growth will only be achieved with increasing efficiency, innovativeness, and diversified industrial structure. Russia should increase the competitiveness of knowledge-intensive sectors, so that the economy will not solely rely on natural resources.

Russia has quite good basis for increasing the innovation potential of the economy. Russia has substantial science base and education traditionally focuses on technology and sciences. But so far the innovation activity has been modest. Russia spends about 1.4 percent of GDP on R&D (Rosstat, 2007). This figure is remarkably high compared to other transitional economies, for example in Poland the figure is respectively about 0.6

percent. But compared to OECD average the figure is considerable low. Traditionally R&D activity is low in resource-based economies. (Gianella et al., 2007)

Russian R&D is mostly carried out within public organizations and financed from the government budget. Approximately 60 percent of R&D is publicly financed. Business sector is minor actor in R&D, only 9.7 percent of industrial enterprises reported to have technological innovations in 2005, while the average in the European Union is 50 percent (Rosstat, 2007; OECD, 2005). Although, Russian companies are increasingly interested in creation of their own research centers, most active sector being natural resources sector and companies like Lukoil and Norilsk Nickel. Mostly industrial innovation patterns are biased towards improvements and adaptations of the existing and outdated capital stock and production processes. Science-based innovation remains marginal in Russia. (OECD, 2005)

The amount of R&D personnel in Russia is significantly high. Over 800 000 people worked in R&D in 2005, which is about one percent of total labor force (Rosstat, 2007). Only half of them work as researchers, which mean that the share of support personnel is extremely high. Russian research personnel are criticized of being too old and the research productivity of them being too low. Young scientists face extremely bureaucratic organizations with weak support systems and bad conditions for career development. Thus, young scientists try to create their careers abroad or in business sector, which mean that Russia has a problem with brain drain. (Watkins, 2003)

Surprisingly, higher education institutions are minor actors in Russian R&D. Universities account only 4-6 percent of federal funding for R&D, although they have highly skilled personnel. During Soviet times the higher education sector was not expected to be a center of R&D. Universities engaged in contract research with enterprises and academic and industrial institutes in order to supplement their funding. (Watkins, 2003; Gianella et al., 2007)

Co-operation and licensing deals with Western partners is one way to finance some research in Russia. But it is difficult to find partners when Russian scientists are not educated to prepare business plans or create new ventures. The institutes supporting commercialization of innovations are too rare in Russia. Venture capital industry in Russia is mainly foreign-owned, but on the other hand, foreign direct investments in R&D are quite small. Probably the highest foreign R&D investment occurs in the ICT sector. At least Sun Microsystems, Motorola, Microsoft and Intel have R&D or dedicated development centres, with more than 200 workers, in St. Petersburg or Moscow. (OECD, 2005)

Weak industry-science relationships, as well as the weakness of corporate R&D, are preventing the improvement of Russian innovation environment. Small and medium-sized enterprises report that the most important factors hampering their innovative activity include underdeveloped infrastructure in the area of technology commercialization, incomplete and misleading legislation, and lack of financing. (OECD, 2005)

Traditionally some clustering of business sectors has happened in largest cities of Russia, namely in St. Petersburg and Moscow. Clusters, even though very small and underdeveloped, have emerged for example in ICT, nuclear technologies, pharmaceuticals, and space technologies. Government is trying to promote the creation of clusters by issuing four technical implementation special economic zones in Russian cities; Dubna, Zelenograd, Tomsk and St. Petersburg. This is one step towards more innovative Russia.

Russia has tried to improve the IP protection of innovations, but has succeeded quite poorly. In World Economic Forum's (2006) competitiveness survey Russian executives rank Russian IP protection in 112th position among 125 countries. During Soviet times all patents were the property of government. Russian IP law was modernized in 1992 and 2003. Now the law is similar to the European Union and United States IP laws. In Russia patents are valid for 20 years and are granted to the first to file, just like in EU. Nowadays the problem is not the law itself but the enforcement of violations. About 27 000 patents are filed annually and 70 percent of them are granted. Almost twenty percent of patent grants are for foreign applicants, mostly for USA, Germany or Japan. Almost 30 percent of all patents are granted to International Patent Classification (IPC) section A, which includes i.e. agriculture, food processing, clothing and furniture, and medical science. It is estimated that only small fraction of patents became objects of commercial agreements (Gianella et al., 2007; Rospatent, 2007).

What should be done in Russia to improve the conditions for innovations? The development of innovative activities requires good macroeconomic conditions, attractive investment environment for local and foreign companies, and more easily available financing. These are factors that are also requirements for sustainable growth. In addition, greater competitiveness, better enforced IPR regime, support of commercialization of R&D outputs, public-private partnerships, well channeled government funding, restructured organizations in research institutes, favorable tax treatment, and support for small innovative companies are other means that Russia could use to boost the innovative activity. All steps intended to spur the innovations should be well-planned and carefully targeted. In order to do this Russia has published strategic guidelines to promote science and innovation up to year 2015. But these are just strategic guidelines, further action is quickly needed. (Gianella et al., 2007; Rospatent, 2007)

4. Analysis of Russian innovation clusters

Russia is a huge country in terms of population and territory. With more than 140 million people, 88 regions, and 12 cities with population over one million, it cannot be referred as one heterogeneous unit. There are very poor remote regions, as well as natural resource rich and wealthy regions. Whole cities have emerged to surround large industrial companies. Some of the regions have managed to create substantial science base for example in nuclear or space technologies. In order to start successful R&D centers, foreign and local companies should be aware of these science clusters and the

possibilities they might offer. Innovativeness measured with patenting activity and other innovation input and output measures is one good way to rank these regions.

Data was collected from Russian Federal State Statistics Service, Rosstat, and from Russian Federal Service for Intellectual Property, Patents and Trademarks, Rospatent, statistical databases. They provide up to date and detailed statistics of all Russian 88 regions. Since we are interested in the most innovative regions, a selection of top 35 regions was made according to the number of patent filings in year 2006. These 35 regions' patent filings consist 80 percent of all patent filings in Russia. Top 35 regions mentioned in Table 1 will be used in the analysis throughout the whole paper.

Table 1 summarizes the innovative activity of 35 Russian regions. Just like in Europe and United States innovations are clustered in few, most important regions. The number of patent filings is highest in Moscow and St. Petersburg, two biggest cities in Russia. These two cities are political, cultural, and clearly economical centers of Russia. Third in innovative activity is the Moscow Region, which is highly industrialized region. Moscow Region has many significant science towns dedicated to certain kind of technologies. Dubna is housing an international nuclear physics centre, and Korolev and Khimki are space technology centres. Dubna was issued a special economic zone dedicated to nuclear technologies and Zelenograd a special economic zone dedicated to micro- and nanotechnologies.

Table 1. Innovative activity of top 35 regions

Region	Number of patent filings in 2006	Percent of total patent filings in 2006	Number of patent filings in 2003	R&D expenses 2005, mln euros
Russia	27 884	100.0	24 969	6 993.5
Moscow	7393	26.5	6869	2 583.0
Saint-Petersburg	1794	6.4	1600	797.9
Moscow Region	1443	5.2	2232	658.7
Republic of Tatarstan	744	2.7	600	91.7
Rostov Region	678	2.4	615	116.8
Samara Region	650	2.3	602	233.7
Novosibirsk Region	625	2.2	632	174.4
Republic of Bashkortostan	612	2.2	563	44.4
Krasnodar Territory	596	2.1	1091	52.3
Sverdlovsk Region	588	2.1	587	191.5
Voronezh Region	555	2.0	517	64.9
Chelyabinsk Region	540	1.9	425	139.1
Perm Region	531	1.9	491	130.1
Volgograd Region	454	1.6	346	22.4
Nizhni Novgorod Region	438	1,6	583	455.7
Krasnoyarsk Territory	424	1.5	380	83.6
Tomsk Region	406	1.5	368	65.1
Stavropol Territory	366	1.3	216	9.8
Saratov Region	345	1.2	254	32.5
Kemerovo Region	275	1.0	252	9.0
Ulyanovsk Region	270	1.0	346	76.8
Irkutsk Region	260	0.9	276	36.2
Orel Region	259	0.9	173	3.3
Tula Region	234	0.8	301	27.0
Omsk Region	234	0.8	222	61.5
Altai Territory	217	0.8	175	13.0
Khabarovsk Territory	211	0.8	217	12.1
Yaroslavl Region	201	0.7	197	58.1
Belgorod Region	185	0.7	87	7.4
Ryazan Region	178	0.6	215	19.1
Tyumen Region	169	0.6	181	82.6
Primorski Krai	159	0.6	152	65.5
Kursk Region	155	0.6	148	22.1
Penza Region	154	0.6	142	43.3
Leningrad region	153	0.5	143	49.7

Source: Rospatent 2007; Rosstat 2007

Republic of Tatarstan is quite active in patenting but still far away from the level of Moscow and St. Petersburg. It is located in the Volga Federal District and is highly

industrialized region. Tatarstan mostly focuses on chemical and oil processing, machine building, and wood processing. Top ten regions have more than 50 percent of all patent filings in Russia. These top ten regions are mostly wealthy, industrialized, natural resource rich regions, major transportation hubs, and large regional centers.

Significant differences can be found in the level of R&D expenses, which were 7.0 billion euros for the whole Russia in 2005. Especially leading regions in patent filings are investing substantial amount of money in R&D, while some regions invest quite modestly but are still able to produce good number of patents. Differences between funding and R&D output could be explained for example with greater role of industry R&D, differences in organization efficiencies and better allocation of resources. It looks like the patenting activity has increased all over Russia since year 2003. Peaks in the patenting activity in Moscow region and Krasnodar Territory in 2003 are only occasional.

Table 2 measures the efficiency of Russian R&D activities. Companies in Orel and Tomsk regions seem to be rather innovative compared to the average level in Russia. Orel region is located in the Central Federal District and the main industries are food industry and engineering. Instrument manufacturing and electronics industries use high technology processes and good specialists. Tomsk region ranks high also according to the ratio of patents per 100 000 people. Tomsk is a natural resource rich region, with oil, natural gas, and metal deposits. Population is slightly over one million. Chemical and oil industries are the strongest ones. But the reason why Tomsk ranks high in innovation output ranking

is that it is a scientific and educational centre with six higher education institutes and almost 50 research institutes.

Table 2. Efficiency of R&D activity

Region	Patents per 1 000 companies	R&D expenses per patent, EUR	Patents per 100 000 inhabitants	Percent of organizations having technological innovations
Russia	5.8	250 807	19.5	9.7
Orel Region	16.4	12 666	20.7	19.6
Tomsk Region	12.3	160 383	35.6	17.1
Voronezh Region	10.0	116 865	22.3	12.2
Ulyanovsk Region	9.8	284 399	25.9	6.3
Perm Region	8.7	245 046	17.9	33.2
Republic of Tatarstan	8.3	123 281	16.0	12.7
Republic of Bashkortostan	8.3	72 620	13.9	8.0
Moscow Region	7.4	456 510	33.7	10.0
Belgorod Region	7.2	40 134	5.8	8.7
Volgograd Region	7.2	49 231	13.1	14.3
Tula Region	6.5	115 386	18.8	15.6
Krasnoyarsk Territory	6.5	197 135	13.1	6.7
Penza Region	6.4	280 897	10.1	8.4
Saratov Region	6.4	94 170	9.7	9.4
Rostov Region	6.3	172 325	14.3	11.2
Moscow	6.1	349 390	65.9	17.6
Kursk Region	6.0	142 361	12.5	10.4
Chelyabinsk Region	5.9	357 681	12.0	13.9
Samara Region	5.9	359 464	18.9	15.1
Stavropol Territory	5.7	26 842	8.0	10.5
Ryazan Region	5.6	107 182	18.2	7.0
Kemerovo Region	5.1	32 747	8.9	6.3
Nizhni Novgorod Region	5.0	1 040 525	17.1	14.7
Khabarovsk Territory	5.0	57 483	15.4	17.0
Saint-Petersburg	4.9	444 747	34.9	12.7
Yaroslavl Region	4.9	289 021	14.8	8.5
Novosibirsk Region	4.6	278 960	23.8	5.9
Omsk Region	4.6	262 609	10.9	5.3
Krasnodar Territory	4.3	87 756	21.4	4.1
Irkutsk Region	4.1	139 306	10.9	10.2
Sverdlovsk Region	3.7	325 697	13.3	18.3
Altai Territory	3.6	59 870	6.9	10.1
Leningrad region	3.5	324 997	8.7	6.9
Primorski Krai	2.7	411 936	7.5	4.4
Tyumen Region	1.8	488 938	5.4	5.8

Source: Rospatent 2007, Rosstat 2007

Quite few organizations report innovative activities in Russia. On average only 9.7 percent. Surprisingly, companies in largest cities, Moscow and St. Petersburg, do not seem to be more innovative than companies in smaller regions. The highest share of innovative organizations seems to be in Perm region. Perm is located in the Ural Federal District. City of Perm is the administrative, cultural and scientific centre. Most developed and innovative industries are chemical and petrochemical industries, and oil processing. Also globally petrochemical industries are large patent holders and Russia seems to follow this pattern.

On average in Russia R&D expenses per patent are 250 000 euros. Many regions do not achieve this level, but are still able to maintain basic research institutes. On the other hand, some regions, like Nizhni Novgorod, spend substantial amount of money in R&D without being able to produce that much visible output. City of Nizhni Novgorod is the fourth largest in Russia and it is focusing on engineering, metal working, and chemical production. There is a possibility that heavy R&D investments could boost the innovation environment in future, if patenting is seen important.

Table 3 shows some economic indicators of the selected regions. First column gives the share of people with higher education in the region. Highly skilled people live and work traditionally in big cities. Moscow and St. Petersburg are no exceptions. In Moscow more than 40 percent of workers have higher education. Tomsk region is third after Moscow and St. Petersburg. In Tomsk 27 percent of people have higher education. Tomsk was

already mentioned above as a scientific and educational centre. Higher education will certainly increase the innovativeness of the region.

Table 3. Economic indicators

Region	People with higher education, percent	GRP/cap RUR, 2004	Largest economical sector and share of workforce
Russia	24.3	80 727	Manufacturing 17.2
Orel Region	23,2	54 494	Manufacturing 19.5
Tomsk Region	27,0	100 039	Manufacturing 17.0
Voronezh Region	25,3	45 028	Agriculture 18.1
Ulyanovsk Region	23,2	43 163	Manufacturing 25.7
Perm Region	18,2	83 797	Manufacturing 23.6
Republic of Tatarstan	20,0	84 676	Manufacturing 18.6
Republic of Bashkortostan	18,4	68 574	Agriculture 17.2
Moscow Region	26,2	67 439	Manufacturing 21.1
Belgorod Region	19,1	52 762	Agriculture 19.1
Volgograd Region	20,1	51 785	Manufacturing 19.2
Tula Region	19,6	51 978	Wholesale and retailing 23.8
Krasnoyarsk Territory	20,7	96 568	Wholesale and retailing 15.5
Penza Region	20,3	34 580	Agriculture 19.5
Saratov Region	26,0	50 006	Wholesale and retailing 17.6
Rostov Region	23,5	42 313	Wholesale and retailing 19.8
Moscow	43,8	234 601	Wholesale and retailing 23.7
Kursk Region	20,6	49 621	Agriculture 21.6
Chelyabinsk Region	21,4	64 876	Manufacturing 27.2
Samara Region	25,3	85 871	Manufacturing 25.1
Stavropol Territory	25,5	40 509	Agriculture 19.5
Ryazan Region	20,5	55 491	Manufacturing 21.4
Kemerovo Region	22,1	60 035	Manufacturing 15.9
Nizhni Novgorod Region	23,2	64 552	Manufacturing 24.9
Khabarovsk Territory	30,2	86 326	Wholesale and retailing 21.0
Saint-Petersburg	39,2	94 717	Wholesale and retailing 18.7
Yaroslavl Region	22,2	78 061	Manufacturing 26.7
Novosibirsk Region	23,5	63 103	Wholesale and retailing 17.0
Omsk Region	23,7	61 419	Agriculture 16.7
Krasnodar Territory	21,9	54 075	Agriculture 19.2
Irkutsk Region	24,1	69 540	Wholesale and retailing 15.4
Sverdlovsk Region	18,2	70 864	Manufacturing 26.0
Altai Territory	22,1	35 158	Agriculture 20.7
Leningrad region	20,1	80 102	Manufacturing 20.3
Primorski Territory	24,1	60 910	Wholesale and retailing 18.2
Tyumen Region	21,1	361 028	Construction 13.4

Source: Rosstat 2007

Second column lists the gross regional product (GRP) per capita of the regions. High GRP should increase the innovativeness because more money is available for investments and people tend to be more creative if basic requirements are fulfilled in their life. Highest GRP per capita figure in Russia is in Tyumen region. The wealth of Tyumen regions consist of natural resources. Unfortunately Tyumen does not rank high on innovation comparison (see Tables 1 and 2). After the city of Moscow Tomsk region has highest GRP per capita. Tomsk region seems to be quite promising region.

Last column shows the economical sectors where the largest share of population works, and the share of workforce working in that sector. When the largest employer in the region is agriculture, it is likely that the innovativeness of the region is not very high. In some regions more than 20 percent of people work on agriculture, for example in Altai region. Altai is located in Western Siberia and has very good land for cultivation. Altai is not very innovative region (see Tables 1 and 2). Manufacturing is the largest employer in almost half of the regions. This is obvious in highly industrialized regions. Unfortunately in many regions the manufacturing sector produces very basic products, which does not require scientific, high-tech innovations. One example is Leningrad region, surrounding innovative St. Petersburg, but still very low in patent activity. Most of the basic manufacturing companies in St. Petersburg have moved to Leningrad region because of the cheaper labor and production costs.

For Russia to achieve industrial diversification and increased competitiveness, it should develop business-sector R&D collaboration with advanced industrialized economies. Unfortunately, this collaboration has been hampered by the weaknesses of the Russian business environment and limited knowledge absorptive capacity of many Russian research organizations and enterprises.

Russian FDI statistics by Rosstat provide data where and which sectors foreign companies have invested in Russia. As well known, FDI can promote international technological diffusion, when technological spillovers happen in the recipient country. Foreign direct investments to Russia amounted for 10.9 bill euros in 2005. According to Rosstat half of the FDI inflows during last five years have been received by industrial sectors. The dominating sector has been fuel industry with share of 56%, followed by food industry 10%, machine building 10% and wood processing 9%. The geographical distribution of Russian FDI inflows are presented in Table 4 below. Top 10 locations are attracting around 90% of Russian FDI. This list also includes the main innovation clusters of Russia, such as Moscow and surrounding Moscow region, and St. Petersburg. These same regions are dominating Russia's innovative activity. There are also many oil and gas producing regions as top recipients of FDI. Sakhalin is a typical example of large scale joint venture, which is founded to utilize huge natural gas resources of the region. In these projects both leading western and Russian oil and gas producing enterprises are participating.

Table 4. Geographical distribution of Russian FDI inflows

Region	FDI mln EUR 2005	Share of Russian total FDI
Russia	10 893	100.0
Sakhalin region	3 167	29.1
Omsk region	2 567	23.6
Moscow	1 717	15.8
Moscow region	915	8.4
Tyumen region	612	5.6
Krasnodar region	248	2.3
Saint Petersburg	208	1.9
Leningrad region	185	1.7
Novgorod region	149	1.4
Vladimir region	114	1.1

Source: Rosstat 2007

Russia's innovation clusters seem to have developed in the largest cities Moscow and St. Petersburg. As well as regions like Nizhni Novgorod and Perm, large military development centers during Soviet times and in oil and gas producing regions. There seems to be some common with Russian innovation clusters and foreign direct investment activity. This development provides avenues for further technological spillovers and should promote development of Russia's innovative capacities. This development has been hindered by limited knowledge absorptive capacities which have been detected in many studies such as World Bank's Large and Medium Enterprise (LME) Survey focusing competitiveness of Russian enterprises.

5. Discussion

In this study a cross regional comparison of patenting activity and other innovation measures of Russian regions was done in order to define the innovation clusters for platforms for foreign R&D investments. Innovation clusters have emerged in largest

cities, Moscow and St. Petersburg, but other prospective regions for foreign R&D investments were also found. As an example, regional centers, oil and gas production regions, and old military production and development regions, such as Perm, Nizhni Novgorod, Tatarstan and Tomsk have some innovation potential. Some of these regions differ from the regions that are traditionally popular regions among foreign investors. The reason is that most FDI occurring in Russia so far has been production oriented. This reflects the problems in Russian innovation framework.

The level of R&D spending in Russia is high compared to other transitional economies and labor force is highly educated. But still Russia is not able to improve the innovativeness of the country. Problems occur in the funding, as well as in public-private partnership, and commercialization of innovations. Russia should try to increase the knowledge absorption capacity and utilize the knowledge that spills over from foreign investors and further improve its own innovativeness. Russian innovation potential will be significantly improved when foreign investors find the regions with innovation clusters and knowledge spillovers will increase. International partnering should also increase in Russia. Authors' research on innovativeness in Russia will continue by focusing on enterprise level knowledge absorptive capacities.

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