Functioning of the Local Production Systems in Central and Eastern European Countries and Siberia

Case Studies and Comparative Studies

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1. Introduction

Siberia is a vast region of Russia, located to the east of the Urals. At the present time, the Siberian Federal District (SFD) includes 12 regions of the Russian Federation. Its territory makes up 30% of Russia's territory, and its population – 20 millions of people. The Russia's main natural resources are concentrated on the territory of Siberia such as: ferrous and non-ferrous materials, oil, gas, coal, timber, gold and diamonds. Its gross regional product makes up 11% of Russia's GDP. Minerals and metals, which are mainly produced behind the Urals, make over 3/4 of the Russian export.

However, natural resources are losing their role of main competitiveness factor in the contemporary world. The ability to create knowledge and to transform new knowledge and technologies into products and services for the national and global markets is getting the main competitive advantage in the knowledge-based economy.

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Recently, considerable efforts have been made to form the Russian innovation system on the national as well as on the regional levels. These efforts were mainly taken from the top, i.e. by the state. At the same time, while the achieved results do not meet expectations in full, the system problems still remain. Moreover, our situation became worse. Some evaluations of Russia's situation given by the international community can be found below (table 1).

Table 1. Russia's position in international ratings

Ranking type	2008	2012
The Global Competitiveness Index	51	67
The Global Innovation Index	54	51
The Human Development Index	73	55

Source: X. Sala-i-Martin (ed.), *The Global Competitiveness Report 2011–2012*, World Economic Forum, Geneva, www3.weforum.org/docs/WEF_GCR_Report_2011-12.pdf (accessed 20.06.2013); S. Dutta (2011), *The Global Innovation Index* 2012, INSEAD-WIPO, www.wipo.int/freepublications/en/economics/gii/gii_2012.pdf (accessed 20.06.2013); Human Development Index, 2013.

We can note that our position in this rating is far below the leaders (more than 140 countries have been ranked), and the development is rather slow and uncertain.

The global experience shows that the innovation development is determined by the interaction of institutions, organizations and individuals, who create knowledge, ensure the implementation of new knowledge into technologies, and use new technologies to manufacture products and services. In turn, new products and services are not only the value for consumers, but they bring in return for the companies – innovation producers. The character of such interactions, roles and functions of separate participants (the most important of them are the state and the created infrastructure), outline the innovation system, with its national, regional and industrial characteristics.

2. Literature review on innovation systems

Last years the conception of national and regional innovation systems is being actively developed and studied in many works.[1] A range of international centers, in particular SPRU (Great Britain), CIRCLE (Sweden), UMIC (Great Britain), etc. have focused their research on these problems. Among the Russian researchers, a great contribution has been made by the works of N. Ivanova,[2] L. Gokhberg,[3] I. Dezhina,[4] V. Polterovich,[5] N. Kravchenko & G. Untura.[6]

In the literature concerning the regional innovation systems, main attention is given to the description and analysis of relations between the educational system development, innovation activity and economic results of separate territories. Most works are based on the comparative empirical research of different regions, that lead to the formation of general regularities and specific characteristics of regional development. In the work of some examples of such research in Europe and Canada are given.[7] The study of regional innovation systems is often related to success stories of regional clusters or regional chains of innovation companies.[8]

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[1] B.-Å. Lundvall (ed.) (1992), *National Innovation Systems: Towards a Theory of Innovation and Interactive Learning*, Pinter, London 1992; F. Block, M. Keller, *Where Do Innovations Come From? Transformations in the U.S. National Innovation System, 1970–2006*, The Information Technology & Innovation Foundation, July 2008; P. Cooke, *Regional innovation systems: competitive regulation in the new Europe*, "GeoForum" 1992, No. 23, p. 365–382.

[2] N. I. Ivanova, *An analysis of innovation policy and the evaluation of its results*, "Innovations" 2008, No. 7, p. 44–60.

[3] L. M. Gokhberg, *Russia's national innovation system under the conditions of the "new economy"*, "Voprosy ekonomiki" 2003, No. 3, p. 26–44.

[4] I. Dezhina, *Features of the Russian "triple spiral" relations between the state, the science and the business*, "Innovations" 2011, No. 4, p. 47–55.

[5] V. M. Polterovich, *A problem of forming a national innovation system*, "Economics and Mathematical Methods" 2009, No. 2, p. 3–18.

[6] N. A. Kravchenko, G. A. Untura, *Possibilities and Prospects for Siberia's Innovative Development*, "Regional Research of Russia" 2011, Vol. 1, No. 3, p. 253–258.

[7] D. Doloreux, S. Parto (2000), *Regional Innovation Systems: A Critical Review*, Chaire de recherche du Canada en développement regional, Université du Quebec a Rimouski, http://www.ulb.ac.be/soco/asrdlf/documents/RIS_Doloreux-Parto_000.pdf (accessed 1.02.2013).

[8] B. Asheim, M. Gertler, *Understanding regional innovation systems*, [in:] J. Fagerberg, D. Mowery, R. Nelson (eds.), *Handbook of Innovation*, Oxford University Press, Oxford 2004.

Another direction of research is focused on the evaluation of institutional environment influence on the innovation and development of territories. These research results are ground for the development of innovation policy.[9]

Such research commonly results in the conclusion, that each region has its own combination of success factors and its own set of institutional characteristics and political initiatives, there is no unified model that can explain success in the development of the system of innovation.

3. Development of the Siberian innovation system

Scientific and innovative potential of Siberia is represented by a range of world-scale scientific achievements, the well-developed system of education and training, and developed production complex, including a knowledge intensive economic sector.

The generation of new knowledge is mostly determined by the academic activity of research institutes, and the system of secondary and higher education. Currently over 400 organizations are working in R&D sector of the Siberian Federal District (SFD) and the number of personnel involved makes up over 58 thousands of people.

At the comparable quantitative indicators of science employment, Siberia as well as Russia has been dropping behind the world leaders, regarding quality indices of scientists' age structure and scientific effort financing and effectiveness.

The average age of researchers in the SFD is 49 and the share of scientists aged within the age of 50– 70 years is over a half of the researchers' total number. At the same time in the USA, the share of scientists of this age does not exceed 25%.[10]

[9] P. Cooke, O. Memedovic (2003), *Strategies for Regional Innovation Systems: Learning Transfer and Applications*, UNIDO, Strategic Research and Economics Branch, http://www.unido.org/fileadmin/import/11898_June2003_CookePaperRegional_Innovation_Systems.3.pdf (accessed 13.06.2013); S. Mani, *Government, innovation and technology policy: An international comparative analysis*, "International Journal on Technology and Globalisation" 2004, Vol. 1, No. 1, p. 29–44.

[10] Indicators of science and innovations, 2012: stat. collection of works. M., GU-VShE; *Regions of Russia. Social and Economic Indicators – 2012* [in Russian], URL:http://www.gks.ru/bgd/regl/b12_14p/Main.htm (accessed 25.06.2013).

The Siberian economy is mixed. Its traditional industries are based on 3–4 technological waves. Some enterprises of the processing industry use the equipment and technologies of 5–6 waves. For example, laser equipment and technologies, accelerating equipment, electron-beam and photochemical technologies; biotechnologies; catalytic technologies; coal deep-processing technologies and coal chemistry; information technologies, etc.

The knowledge intensive sector of the Siberian economy is represented by aerospace industry; production of fuel and power engineering equipment; production of communication facilities including space and telecommunications; instrument engineering; production of medical equipment and some others.

The share of high-tech mechanical engineering (production of machines and equipment, production of electrical equipment, electronic and optical equipment, production of transport vehicles and equipment) in the structure of Siberia's processing industries is small – 11.4% (in the Russian Federation – 20.2%). In total industry structure, the share of high-tech industries makes up 8% in Siberia (in the Russian Federation – 13%, in the European Union – 16%). For the last 15 years, the lag from the developed countries in high-tech industries has increased.

At the present, Siberia's traditional industries are not characterized by high innovation activity due to the special features of industry structure as well as a result of many other factors. Innovations in the real sector of the Siberian economy (innovation activity of enterprises, implementation of new products and number of advanced manufacturing technologies in use, exchange of technologies) are developing more slowly than in the Russian Federation. In the SFD, the foreign trade turnover resulted from exporting and importing technologies and engineering services is 6.6% of domestic indicator. Siberia as well as Russia is thus a net importer of technologies.

An incomparable lag of the Russian (and Siberian) enterprises from the foreign ones, judging by the innovation activity indicator can be explained by the fact, that in the developed regions of the world, there are more expanded multi-component innovation systems. In case of Siberia, this system is still being formed.

Business sector demonstrates an extremely low demand for innovations. The competition which exists and is increasing is based on other factors – unrelated to innovation. The low demand for innovation is caused

by many problems, for example, inertia of industry structure with the predominance of medium and low-tech industries, engineering backwardness and out-of-date production facilities, lack of qualified personnel, insufficient development of market institutions and infrastructure, and many others. We can assert that innovations are not a competitive advantage under the conditions of the deformed competition, when the short-term frame of corporate development is dominating. In fact, the state is almost the only source of internal demand, either direct or by means of the state economic sector. At the present time, the demand for innovations is stimulated by the government, mainly by establishing state corporations and constraining large companies of the state sector.

The problems in the innovation sphere are well known, they are deeply rooted and they affect the economy as a whole. The functional capabilities of the current innovation system turned out to be limited: there is growth (although not always effective) in spheres where the use of state resources and capabilities is possible. According to the domestic statistical data (table 2), while science and innovation costs are obviously going up, the effectiveness of these costs is going down.[11] Although the number of patents as well as the number of newly created advanced technologies have considerably increased, the share of companies implementing innovations and the share of innovation products to be implemented remain almost at the same level.

The statistical data demonstrated that there are no significant movements in the innovation development in Siberia and in Russia as a whole.[12] Although there is an increasing total volume of expenditures for R&D, its intensity is decreasing. The number of personnel involved in R&D is also decreasing, creating a threat for the long-term development perspectives. The results of innovative activities of the corporate sector are not very optimistic.

[11] According to publications in the leading scientific journals in the ranking of countries, Russia went down from the 8th position (1997) to the 14th position (2008). For the same period China went up from the 10th position to the 2nd one. In 2008, Russia's share in world scientific publications made up 2.48% (27.5 thousand publications), but in 1997 it made up 3.77% with 27,9 thousand publications. At the same time, the USA had 29.4%, and China – 9.69%. The export of domestic technologies in 2008 made 0.833 bln $, and in the USA (1st position) it made 91.9 bln $.

[12] Indicators of science and innovations, 2012: stat. collection of works. M., GU-VShE; *Regions of Russia. Social and Economic Indicators – 2012*. [in Russian], URL:http://www.gks.ru/bgd/regl/b12_14p/Main.htm (accessed 25.06.2013).

Table 2. Indicators of Russia's Siberian and European Union innovation development

	Russia		Siberia		EU-27
Years Indicator	2008	2011	2008	2011	2010
R&D internal costs, % GDP	1.04	1.09	n/a	n/a	2
Number of personnel involved in R&D, thousand people	761	735	53.9	52.7	1560
Number of granted patents, thousand pcs.	31.5	30.9	2.1	1.8	54.4
The share of organizations implementing engineering innovations in total number of organizations (industry), %	9.6	10.4	7.7	8.8	52.9
The share of innovation products, works, services in total volume of products (industry), %	5.1	6.1	2.1	2.2	Germany – 14.1; Finland – 9.3

Source: Indicators of science and innovations, 2012.

At the same time, the leading European countries demonstrate opposite dynamics. The intensity of innovation costs (% GDP) in Russia stands for 1.09%, whereas in Japan in 2008 it is 3.45%, and in European leading countries such as Finland – 3.87%, Sweden – 3.42%, Denmark – 3.06%.[13]

Compared to the average level of EU countries, Russian enterprises show over five times lag as per the innovation activity level. There are positive trends in innovative development in Russia and Siberia but the processes are rather slow.

4. The priority innovation projects for Siberia's development

During last few years, a significant investments were put into the development of new innovative sector of the Siberian economy. Those projects were supported by different state-owned funds, among which

[13] Indicators of science and innovations, 2012: stat. collection of works. M., GU-VShE.

the "ROSNANO" JSC is the largest. The information about the approved investment projects dealing with the production of innovative products and services in summarized in the table 3.

By the end of 2010, seven projects have been supported on the territory of Siberia (3 – Novosibirsk, 1 – Tomsk, 1 – Krasnoyarsk and 1 in Irkutsk region).

Table 3. ROSNANO projects in the Siberian Federal District

Project	Investments bln rubles	Implementation period	Actual status in 2013
1. Expansion of nanoink production for digital ink-jet printing and production of UV-LED-technology based printers	1.36	2010	Production started
2. Production of oxide ceramic coatings	0.355	2010	Production started
3. Domestic production of state-of-the-art lithium-ion batteries	13.8	2010–2015	Production started
4. Nanostructured non-metallic coatings	2.44	2011	Production started
5. Large-scale production of polysilicon and monosilane	29.1	2009–2013	Postponement
6. Collagen-chitosan nanocomplexes	0.76	2010–2011	Postponement
7. The infrastructure of technopark "Academgorodok" development	11.7	2008–2014	In progress according to the plan

Source: ROSNANO projects.

The suggested innovation projects are focused on B2B market, which can cause difficulties for their implementation. For example, plants are required to change their manufacturing and engineering processes to get the commercial result from nanocoatings and it can cause some difficulties.

The implementation of these projects had met a number of problems such as:

– insufficient consideration of the innovation risks, related to the immaturity of innovative technologies and the uncertainty of market research for new products;

– poor study of alternative innovative projects in the absence or underdevelopment of the domestic market for innovations;

– low willingness of private investors to take high risks associated with innovative projects in underdeveloped hedging and insurance mechanisms;

– the lack of flexibility of tools and mechanisms of state support and the provision of long-term government support, which leads to delays in time-to-capacity projects.

Noteworthy is the fact, that the timing of the implementation of many projects delayed for several years. During this time, the market conditions, the level of market competition and global prices for similar innovative products can radically change.

The Siberian large-scale business is generally oriented to the purchase of import equipment and at the same time, R&D knowledge is in a great demand abroad. It means, that foreign companies in fact commercialize scientific achievements and transform them into a product which is in demand on the market, and it is natural that they get the most part of the added value. So the capitalization of high intellectual resource is performed outside Siberia and Russia, and the considerable means of business sector are eliminated from reproduction processes of domestic R&D sector.

The above-listed projects supported by JSC ROSNANO and being already implemented in Siberia are obviously to be considered as the beginning of future Siberian innovation production. It is necessary to emphasize, that development of the Siberian innovation sphere can not be based only on large projects. Institutional changes aimed at the increase of social and business activity, motivation of competition, and the reduction of transactional costs are required as well.

One of the most significant factors, mostly located within the managerial influence of regional authorities, is to form an innovation – favorable institutional environment, to support the development of business initiative and small business, to mobilize investors and to lobby for the interests of the Siberian territories.

There are no simple recipes for competitiveness. Creating a "knowledge economy" is not only a goal but a mean to increase the level and quality of life and it is therefore necessary not only to supplement the targeted parameters by indicators that reflect changes in the system of norms and values, culture, mentality and traditions of the Russian population, but also to develop special programs to achieve the objectives of social innovation.

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Abstract

This paper deals with the problems of development of regional innovation systems. The creation of effective innovation systems, capable to widen and increase the innovation activities, is proclaimed as one of the urgent needs for Russian economy. By now, Russian innovative activities are ranked rather low, when compared to other developed countries. According to The Global Competitiveness Report 2012–2013, Russia is ranked 67th among 144 countries. During the last decade, there were a number of state initiatives focused on increasing innovation activity. However, the achieved results were not sufficient. The most dramatic expression of this problem seems to be a low level of demand on innovations from the domestic corporate sector. During the period 2000–2012, not more than 10% of industrial enterprises implemented innovations.

The problems of Siberian innovation system are rather typical for the whole country. In this research, information about the largest innovation projects which are planned to be implemented in Siberia, are accumulated and the process of its implementation is analyzed. This analysis shows that in the medium-term Siberian economy is likely to continue to have the status of the resource-driven economy.

Key words: innovation systems, regional development, Siberia.