Assessment of the Innovative Potential of “Resource-Type” Regions

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Abstract. The problem of assessing the innovative potential of the regions is the focus of domestic and foreign scientific research. This topic becomes especially relevant for the so-called resource-type regions, where the dependence of the economy on the industrial sector has traditionally been very high. Since there is no category "resource sector of the economy" in the Russian statistical register, data on the structure of gross value added of the region were used for its allocation. And according to the structure of value added 18 regions were included to the group of resource-type regions. A system of the indicators for the assessment of the innovation potential of the recourse-type regions is suggested in the paper. The integrated indicator over 2017 year has been calculated using the geometric mean and compared with the indicator over 2013 year. The results of the analysis let the authors divide the regions into three groups according to the value of integral indicator of assessing innovative potential and detect the most significant differences and gaps in each group.

1. Introduction

Russia is one of those countries for which the regional aspect of economic development is most relevant. The main goal of such development is to achieve stable and long-term economic growth. At present, in this regard great attention, both at the federal and at the regional level, is paid to the issues of building up the innovation potential, as well as studying the regional features of the innovation activity. The regional specificity of the innovation potential is explained by a set of factors that determine the socio-economic characteristics of each territory, namely geographical location, availability of natural resources, development of transport networks, production, etc. [1]

The implementation of innovative policy, which leads to an immediate change in the requirements for knowledge, skills and competencies of employees, is one of the principles of regional development. However, innovation activity in Russia is characterized, on the one hand, by significant scientific and technical potential, and on the other, by a low resulting indicator of innovation activity. According to the analysis of the Statistical Studies and Economics of Knowledge Institute of Higher School of Economics — National Research University, in 2017 about 10% of industrial enterprises, 8% of telecommunications and information technology organizations, and 3% of agricultural organizations develop and implement innovations. In that year R&D expenditures in Russia amounted to 1.1% of GDP, which allowed it to occupy only 28th place in the overall ranking of countries. For comparison: the first place in the ranking was occupied by South Korea (4.6% of GDP), the second - by Israel (4.5%), the third – by Sweden (3.3%) [2].

However, over the past 20 years the amount of expenditures on research and innovation has remained unchanged. In this regard, the search for directions of technological transformation of production, increasing the science-intensiveness of its products, making it competitive and in demand in the sales markets is becoming especially important. The majority of Russian regions, including the resource type regions, face with similar challenges.

2. Materials and methods

The innovative potential of the region combines several complex characteristics, each of which is described by a system of indicators: human resource potential (education level and professional training); technological potential (R&D and innovation resource base); economic potential (R&D and innovation effectiveness) and information potential (the use of information and communication technologies by employees; the use of computers and computer networks, the integration of internal information systems and shared access to information within the organization) [3, 4, 5].

In the world's practice various composite indexes assessing the level of the innovation activity have been developed and implemented: EIS - is the European Innovation Scoreboard (Matei, M., 2010), the index of scientific and technological potential (Cherchye, L., W. Moesen, N. Rogge, T. Van Puyenbroeck, M. Saisana, A. Saltelli, R. Liska and S. Tarantola, 2008), an innovation index (Holliday, D.R. and H.E. Lowitt, 1984), a global innovation index (Zalewski, R.I. and E. Skawinska, 2010), etc. [6].

Foreign authors note that the main trends in methodological approaches to the evaluation of regional innovative potential pointing to the necessity of moving progressively towards a methodology taking into account interactions, both locally and externally, between the various components and actors of the innovation process. It is also underlined that “there is no single best-practice methodology in this respect” [7].

Various methodological approaches to the evaluation of the innovation potential of Russian regions are considered in the works of such Russian scientists as E.P. Maskajkin, T.V. Artser (2009), N.P. Sovetova (2014), V.N. Yakimets, I.L. Balezina, A.N. Val'vashov, A.A. Shirobokova (2012), A.A. Alekseev, E.S. Dyatlova, N.E. Fomina (2012), A.A. Maltseva (2014) and others. Most authors underline that the methodological approaches to the rating of regions in the innovation sphere need to be modified for the purposes of the operational analysis. In foreign and Russian practice the indicator or index methods based on the evaluation of the variables, interpreting qualitative and quantitative characteristics to evaluate the innovation potential are used. However, the calculation and analysis of such indicators in the domestic practice is limited because of the lack of adequate information (especially on the regional level), and absence of a proper methodology for their calculation in the context of the main components of the innovation potential. There is also no scientific foundation for the necessary and sufficient number and composition of indicators, evaluating the innovation potential [8].

For the purpose of assessment of innovation potential of resource-type regions a system of indicators and basic requirements for it were determined.

Indicators for assessing the innovative potential of resource-type regions (P):

- percentage of the employed population aged 25-64 years with higher education in the total number of employed population of the corresponding age group, % (P1);
- percentage of people with academic degrees to the total number of people employed in the region, % (P2);
- percentage of students enrolled in educational programs of higher education - undergraduate, specialty, master's programs, in total, % (P3);
- percentage of patents granted per 10,000 people employed in the region, % (P4);
- share of industrial production and service organizations implementing technological innovations in the total number of organizations surveyed, % (P5);
- share of organizations using personal computers in the total number of organizations surveyed, % (P6);

- share of organizations using the Internet in the total number of organizations surveyed, % (P7);
- share of organizations with a website in the total number of organizations surveyed, % (P8);
- share of internal R&D expenditures,% of GRP (P9);
- share of R&D expenditures, aimed at economy developing in the total internal R&D expenditures, % (P10).

These indicators have to meet the following requirements:

- the need to integrate the maximum number of factors and conditions;
- transparency and accessibility for making calculations or obtaining estimates;
- the need to ensure maximum compatibility and comparability of indicators for different conditions of its implementation, as well as for the application of these indicators in different countries [9].

The assessment of innovation activities relevant to a specific region is not always possible due to the openness of regional innovation systems, which also makes it difficult to evaluate the performance. The authors also note that there is a time lag between investment in innovation and innovation results, which is determined firstly by the scale of investment and secondly by the life cycle of the technologies prevailing in the region [10].

The complexity of the analysis of resource-type regions is associated, first of all, with the lack of a unified approach that allows one or another region to be assigned to such regions on the basis of objective indicators.

Since there is no category "resource sector of the economy" in the Russian statistical register, data on the structure of gross value added of the region can be used for its allocation. According to the specialists of The Ministry of Economic Development and the Russian Academy of Science the term “resource-producing regions” should be attributed to those regions for which the share gross value added for the group "mining" exceeds the national average. The average Russian indicator of gross value added for the group "extraction of useful fossils" ranged from 9 to 15% during the analyzed period. So we take the 15% regional limit as an allocation rate of “resource-type region”. According to the structure of value added 18 regions were included to the group of resource-type regions.

The strongest dependence of the innovative potential of the resource-type regions was established with the indicators of scientific potential and volumes of shipped products of manufacturing industries. Thus, for the innovative activity of the resource-type region, the presence of manufacturing industries with a high level of redistribution in the economy of the region, as well as the accumulated scientific potential of the territory, is essential. The analysis showed that the state policy for the innovative development of resource regions should be based on the support of manufacturing industries that stimulate the creation of innovations and the strengthening of scientific potential.

3. Results and discussion

To carry out the integrated estimation of the innovation potential of the region it seems appropriate to use the group integral indicator. Integral estimation of the innovation potential allows us to reduce the set of miscellaneous indicators to a single generalized indicator and compare the innovation potentials of the regions. The innovation potential of the region is not just the sum of its constituent elements, but their complex, intricately and multifariously interrelated. The advantage of the proposed integral indicator is that it covers all the basic innovation potentials and its constituents in a comparable form.

On the basis of the data of the Information Society Monitoring in the Russian Federation and the existing methods of comprehensive assessment of innovative potential, the authors calculated the averaged indicators of innovative potential of resource-type regions using the geometric mean. The following Table 1 gives an averaged indicators of innovative potential of the recourse-type region.

According to the data in Table 1, Tomsk Oblast (14.91) and the Republic of Tatarstan (11.46) are in the “leaders” group. The integral indicator of the innovative potential of these regions is higher than the average for the Russian Federation (10.89).

The group of “followers” regions was made up of regions in which the integral indicator was estimated in the range from 6 to 10.89. Among them are Tyumen Region (10.69), Krasnoyarsk Region (8.79), Belgorod Region (8.59), Magadan Region (8, 27), the Murmansk region (7.92), the Republic of

Komi (7.72), the Republic of Sakha (7.21), the Republic of Udmurtia (7.11) and the Orenburg region (6.16).

Kemerovo (5.88) and Arkhangelsk (5.52) regions, Khanty-Mansi Autonomous Area (5.46), Sakhalin region (5.37), Republic of Khakassia (3.97), Chukotka Autonomous Area (3.8) and Yamalo-Nenets Autonomous Area (3.8) are among the "outsiders".

"Leaders" are characterized by a relatively high level of development of education, innovation and communication infrastructure and the innovation environment.

Table 1. Averaged indicators of innovative potential of the recourse-type regions, 2017 [11].

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	$P_к$
Tomsk region	35,2	0,1	5,5	358,0	10,8	85,2	22,9	46,0	2,5	39,8	***14,91***
Republic of Tatarstan	36,3	0,01	3,9	177,4	21,2	96,9	25,2	53,8	0,7	59,5	***11,46***
Russian Federation	**35,1**	**0,04**	**2,9**	**143,2**	**7,8**	**92,2**	**23,5**	**49,7**	**1,4**	**38,3**	***10,89***
Tumen region	32,0	0,02	3,9	102,1	10,5	88,1	26,8	46,4	1,4	60,6	***10,69***
Krasnoyarsk region	30,2	0,02	2,7	101,5	6,2	96,1	25,3	51,1	1,0	27,7	***8,80***
Belgorod region	33,1	0,01	3,2	100,0	16,4	98,1	20,4	56,2	0,2	82,4	***8,59***
Magadan region	34,3	0,04	2,3	41,6	9,8	96,4	27,9	46,6	0,4	27,8	***8,28***
Murmansk region	35,1	0,03	1,2	46,4	5,9	95,4	26,9	55,0	0,5	41,6	***7,92***
Republic of Kome	30,4	0,02	1,9	47,6	2,9	97,1	26,4	49,4	0,4	66,1	***7,73***
Republic of Sakha (Yakutia)	34,3	0,03	2,5	61,2	7,1	95,1	13,6	38,5	0,3	22,7	***7,21***
Republic of Udmurtia	26,3	0,01	3,0	74,0	7,4	89,1	18,1	49,9	0,2	58,8	***7,12***
Orenburg region	27,9	0,01	2,3	54,1	6,4	96,9	18,8	56,5	0,1	60,7	***6,17***
Kemerovo region	30,5	0,01	1,9	57,9	2,6	88,4	26,8	48,6	0,2	42,8	***5,89***

Arhangelsk Region	27,5	0,00	1,7	50,4	3,4	90,8	25,9	39,7	0,4	21,6	***5,52***
Khanty-Mansi Autonomous Area	39,1	0,01	1,5	22,4	4,3	97,2	34,9	51,3	0,1	40,4	***5,47***
Sakhalin region	31,9	0,01	1,4	16,3	3,0	92,3	23,2	51,0	0,2	48,9	***5,38***
Republic of Khakassia	27,6	0,00	1,6	22,3	1,3	91,8	23,0	53,5	0,1	37,9	***3,98***
Chukotka Autonomous Area	36,8	0,01	0,4	-	8,3	97,8	19,6	48,7	0,1	97,9	***3,80***
Yamalo-Nenets Autonomous Area	42,4	0,01	0,2	76,1	7,4	94,1	30,4	53,2	0,0	9,3	***3,80***

However the balance between the indicators of each region largely depends on regional characteristics. In particular, Tomsk is one of the largest educational and scientific centers of Russia. It provides the Tomsk region with a significant advantage in the education sphere and the development of innovative systems compared to another leading region – the Republic of Tatarstan. On the other hand, Tatarstan leads in the following indicators: percentage of the employed population aged 25-64 years with higher education in the total number of employed population of the corresponding age group (P1); share of industrial production and service organizations implementing technological innovations in the total number of organizations surveyed (P5); share of organizations using personal computers in the total number of organizations surveyed (P6); share of organizations with a website in the total number of organizations surveyed (P8); share of R&D expenditures, aimed at economy developing in the total internal R&D expenditures (P10). So “leaders” are characterized as high innovative potential and relatively high efficiency of innovative mechanisms.

A lower level of education, innovation, ICT infrastructure development is characterized for the “followers” regions. However, values of some indicators in certain regions of this group correspond to or exceed the average value in the Russian Federation. For example, percentage of the employed population aged 25-64 years with higher education in the total employed population of the corresponding age group exceeds the average for the Russian Federation n the Murmansk region, Khanty-Mansiysk, Chukotka and Yamalo-Nenets Autonomous Areas. However, the percentage of people with academic degrees to the total number of employees in these regions is significantly lower than the values of this indicator in leading regions.

Tyumen, Belgorod, Orenburg regions, the Republic of Komi and Chukotka Autonomous Area have the highest values for the share of R&D expenditures aimed at developing the economy, in the total internal R&D expenditures.

“Followers” have also significant development potential, but the development level of regional innovative system (RIS) of some regions is currently ineffective.

The development level of "outsiders" in the field of education and RIS approximately coincides with the same level of "followers". It means that there is an average development level of the education system and low efficiency of RIS in this group of regions.

Thus, the share of students enrolled in educational programs of higher education in Chukotka Autonomous Area is 8, and in the Yamal-Nenets Autonomous Area 16 times less than the average Russian value. However, the share of industrial production and service sector organizations that carried out technological innovations in the total number of organizations surveyed in these regions is higher than that of "classmates" and closer to the value of the indicator of the second group. In terms of the share of R&D expenditures aimed at developing the economy, the Chukotka Autonomous Area takes the first place among all the analyzed regions in the total volume of internal R&D expenditures (97.9).

4. Conclusions

The analysis of averaged indicators characterizing the level of innovative potential development according to the data for 2017 and their comparison with the data for 2013 (see Fig. 1) allows us to formulate the following conclusions:

1. The regions of the first group (Tomsk region and the Republic of Tatarstan) demonstrated a positive increase in innovation potential. Growth is noted for all analyzed indicators. However, the percentage of people with academic degrees to the total number of employees in these regions decreased by 2 and 3 times, respectively.

The percentage of organizations using personal computers in the total number of organizations surveyed and the percentage of R&D expenditures aimed at developing the economy in the total amount of internal R&D expenditures have not practically changed in recent years.

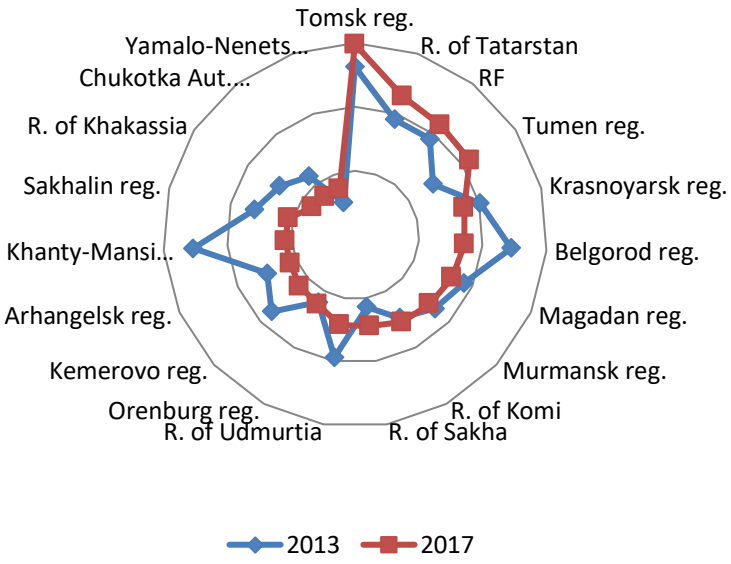

Figure 1. Level of innovative potential of "resource-type" region.

2. Among the regions of the second group, the growth of innovative potential is noted in the Tyumen and Orenburg regions, as well as in the Republics of Komi and Sakha (Yakutia). All regions showed an increase in the share of issued patents per 10,000 people employed in the region and the percentage of R&D expenditures

3. The innovative potential of the regions of the third group has significantly decreased. It is necessary to note the Khanty-Mansi Autonomous Area (a decrease in potential by 2 times) and the Republic of Khakassia (a decrease of 1.8 times). The greatest decrease is noted in the percentage of people with academic degrees to the total number of employees in the region; by the percentage of

students enrolled in educational programs of higher education; by the share of industrial production organizations and the service sector implementing technological innovations, in the total number of organizations surveyed; by the share of internal R&D expenditures. The share of internal R&D expenditures in percentage of GRP and the share of R&D expenditures aimed at developing the economy in the total volume of R&D expenditures decreased slightly or remained unchanged.

For further economic growth, the strategic goal of the regions of the second and third groups should be the transition to an innovative development scenario, which implies increasing the competitiveness of the region and the long-term prosperity of its residents on this basis. For example, the strategic goal of the socio-economic policy of the Kemerovo region for the long term is the restructuring of the economy.

This direction of restructuring due to technology and increasing the cost of human capital involves not just increasing the technological equipment of production in the basic sector of the economy, but also manufacturing or participation in the production of the technologies themselves. Thanks to this, the growth of human capital and the transition to sustainable development of resource-type regions are possible [12].

The study also revealed that the differentiation of regions into three types is based not only on a significant difference in innovative potential, but also on existing land and ecological problems [13], features of the environmental situation in the analyzed regions and its impact on the quality of life [14], share of eco-innovation in the regional GRP [15].

Thus, it was concluded that there is a specific set of factors that inhibit innovative development and create unfavorable conditions for the development of the innovative potential of the resource type regions. Among them are: 1) weaker susceptibility to innovation due to the specifics of the regional economy; lower demand for scientific research and highly qualified personnel; 2) lower quality of life, contributing to the outflow of intellectual resources; 3) a more acute shortage of financial resources associated with the uneven redistribution of financial revenues from the extraction of raw materials; 4) weaker institutional framework for innovative development; 5) lack of an effective industrial policy and system for managing the innovative development of regions; 6) problems of efficient and rational land and subsoil use.

Among the main methods of supporting and further development of recourse-type regions' innovation potential could be drawn up as follows:

1) the direct and indirect government funding of the research institutions and universities in the form of budget financing the operating costs, as well as allocating the targeted grants and placing the state orders for carrying out the research and development;

2) investing the budget funds in the capital of venture funds and other specialized financial institutions involved in implementing the innovative projects;

3) financing the business incubators, industrial parks and other infrastructure objects of the innovation activity;

4) encouraging the organizations focused on the innovation activity;

5) providing such organizations with various tax benefits (tax credits, a deferment of taxes, accelerated equipment depreciation, multiplying coefficients, which allow reducing the base for calculating the profit tax);

6) the loan and guarantee support for the small and medium-sized innovation business (low or even zero interest rates, long-term maturities, minimum requirements for securing the obligations).

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