

Innovative development: regional analysis

Case of Volga Federal District regions in the Russian Federation

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Abstract – The social demand for accumulating the aggregate potential of the Russian Federation determines the need to solve the tasks of innovative activity facilitation, preserving and increasing the scientific-technical potential of the regions. Basing on systematic approach and results of research by the Institute for Statistic Research and Knowledge Economy of the National Research University “Higher School of Economics”, the authors analyze and evaluate the level of innovative development in the regions of the Volga federal district of the Russian Federation, reveal problem zones which require managerial solutions, and define the key prospects of development. The analysis of innovative activity in the regions with a high dynamics of socio-economic development will enable one, on the one hand, to create the patterns of innovative strategies for other Russian regions, and on the other hand, to reduce possible social risks and prevent potential economic losses. The practical recommendations proposed by the authors can be used in the system of state and municipal governance in accordance with the development level of a region, i.e. they will be of either strategic or tactical.

Keywords–innovations; innovative policy; innovative development of a region; Russian Regional Innovative Index.

I. INTRODUCTION

Under the conditions of informational society and modern market economy, innovations are a driving force of economic progress. Their implementation increases the production volume, the gross domestic product, the living standards of the population and other indicators. According to the Executive Committee of the Commonwealth of Independent States, the share of new and improved products and technologies provides from 70% to 85% of the GDP growth in developed countries [1].

The global practice shows that the availability of a well-developed innovative infrastructure promotes the efficient use of the existing scientific-technical and innovative potential of territories by the maximally rapid transition of the created fundamental knowledge to the main spheres of social activity, first of all, economy, education, and healthcare.

The strategy of economy modernization and the transition to the innovative type of development, which are adopted in Russia, demand to shift a part of functions and tasks of the state innovative policy to the regional level. The objectives of the innovative policy, pursued by the regions, are stabilization and growth of the regional economy, creation of condition for innovative activity and for the efficient implementation of the budget through preservation and development of the scientific-technical potential. [2]

Thus, the topicality of innovative development of the regions is due to both the internal problems (necessity to ensure the economically balanced development of the country’s territory) and the external factors, as it is the innovative activity and innovative perceptivity of the regional economies that determines the strategic competitiveness of Russia in the global economy.

The object of our research is the Russian Federation subjects of the Volga federal district. The district comprises 14 subjects of the Russian Federation – Bashkortostan Republic, Mari El Republic, Republic of Mordovia, Republic of Tatarstan, Udmurt Republic, Chuvash Republic, Perm krai, Kirov, Nizhniy Novgorod, Orenburg, Penza, Samara, Saratov and Ulyanovsk oblasts. The Volga federal district is a dynamically developing region, thus, it requires innovations to facilitate the sustainable economic development.

II. LITERATURE REVIEW

Research of innovations as a factor of the regional economy development has been well developed by scholars. The theoretical aspects of innovative development are presented in the works of both Russian and foreign authors.

J. Schumpeter [3], Ch. Freeman [4], D. North [5] researched the mechanism of innovations’ impact on the economic development: they introduced the conception of staging in the development and spreading of innovations both in the sectoral and regional aspects.

The issues of developing the elements of the national and regional innovation systems were studied in the works by I.S. Zimin [2], L.S. Valinurova, E.V. Evtushenko, O.B. Kazakova, N.A. Kuzminykh, and N.Z. Mazur [6], O.B. Kazakova [7], N.A. Kuzminykh [8], E.V. Koroleva [9] and others.

Various aspects of regional competitiveness were researched in the works by M. Porter [10], R.R. Sadyrtidinov (2016), Glebova I.S. [12], A.A. Gudkova and T.I. Turko [13], I.I. Rakhmeeva [14] and others.

Statistical calculations are based on scientific-methodological elaborations of the specialists of the Institute for Statistic Research and Knowledge Economy of the National Research University “Higher School of Economics” [15].

III. METHODS OF RESEARCH

The methodological basis of the research is the method elaborated by the Institute for Statistic Research and Knowledge Economy of the National Research University

“Higher School of Economics”. The key element of this model is calculation of the Russian Regional Innovation Index (RRII) [15]. The system comprises 37 indicators divided into four groups and making it possible to calculate the indices for each RF region:

1. Socio-economic conditions of innovative activity (SECIA);
2. Scientific-technical potential (STP);
3. Innovative activity (IA);
4. Quality of innovative policy (QIP).

Thus, the system of indicators is quite comprehensive; it comprises actually all spheres characterizing the level of economic development of a region.

Index method is used for calculations. Index in a block is calculated by a formula:

$$I_r = \frac{x_i - x_{min}}{x_{max} - x_{min}} \quad (1)$$

Then the index is calculated for the block. In this case, arithmetic mean I_r is used.

Within the method, the composite integral index is calculated by a formula:

$$\frac{3}{37} SECIA \mid \frac{11}{37} STP \mid \frac{9}{37} IA \mid \frac{5}{37} SECIA \mid \frac{11}{37} STP \mid \frac{9}{37} IA \mid \frac{9}{37} QIP \quad (2)$$

where SECIA – block 1, STP – block 2, IA – block 3, QIP – block 4 [15].

The informational basis for the research are the laws and Programs of innovative development of the Russian Federation and of its subjects, the data of the Federal Agency of State Statistics (Rosstat) and territorial divisions of the Federal Agency of State Statistics of the Russian Federation subjects [16], the data of the National center for monitoring of innovative infrastructure of scientific-technical activity and regional innovative systems [17] and web-sites of federal and regional state power bodies, as well as the data from scientific publications.

IV. RESULTS AND DISCUSSION

In accordance with the above methodology, we have estimated and analyzed the level of innovative development of the Volga federal district regions by four blocks: socio-economic conditions of innovative activity, scientific-technical potential, innovative activity and quality of innovative policy.

The ranking of the Russian Federation subjects by the block “Socio-economic conditions of innovative activity” (SECIA) is an aggregate evaluation of their economic, educational and informational potential, which displays the basic opportunities for its creation, adjustment, mastering and implementation of innovations. The ranking of the Volga federal district regions is shown in Tab. 1. The Russian Federation subjects are united into four groups with similar

composite characteristics of socio-economic conditions of innovative activity.

TABLE I. RANKING OF THE VOLGA FEDERAL DISTRICT REGIONS OF THE RUSSIAN FEDERATION BY THE VALUE OF INDEX “SOCIO-ECONOMIC CONDITIONS OF INNOVATIVE ACTIVITY”

Region	2015			2014	
	Group by SECIA	Ranking by SECIA	SECIA	Ranking by SECIA	Group by SECIA
Republic of Tatarstan	II	3	0.5568	3	II
Samara oblast	II	6	0.4900	6	II
Nizhniy Novgorod oblast	II	13	0.4649	10	II
Republic of Bashkortostan	II	16	0.4481	15	III
Russian Federation			0.4397		
Ulyanovsk oblast	II	19	0.4372	27	III
Perm krai	II	20	0.4371	20	III
Chuvash Republic	II	27	0.4126	49	III
Udmurt Republic	II	29	0.4090	22	III
Saratov oblast	III	41	0.3672	39	III
Orenburg oblast	III	47	0.3562	57	III
Penza oblast	III	49	0.3541	16	III
Mari El Republic	III	56	0.3418	54	III
Republic of Mordovia	IV	59	0.3239	39	IV
Kirov oblast	IV	82	0.2758	75	IV

^a. Rating of innovative development of the Russian subjects. Issue 5. Moscow: NIU VShE, 2017.

There are no subjects from the Volga federal district in the first group. The top position in the ranking of the second group is occupied by the Republic of Tatarstan: SECIA = 0.5568 (the index value is 27% higher than the average Russian index of 0.4397). Together with Tatarstan, the second group includes Samara and Nizhniy Novgorod oblasts, Republic of Bashkortostan, i.e., the regions whose index value is higher than the average Russian index. These regions have a well-developed system of higher education, high-technology and middle-technology sectors of industrial production, and by the share of population employed in science-consuming sectors of services Samara oblast and the Republic of Tatarstan are in the top ten in Russia. The third group includes 4 subjects – Saratov, Orenburg, Penza oblasts and Mari El Republic. SECIA values of these regions are lower than the average Russian index. The fourth group with the lowest values of SECIA is represented by the Republic of Mordovia and Kirov oblast.

Comparing the positions of regions in the ranking of 2014 and 2015 shows that the values of 2014 were repeated in 2015 only by the Republic of Tatarstan and Samara oblast. Intense dynamics was shown by Chuvash Republic, improving its indicators by 22 positions due to the renovation of capital

assets and increasing the share of population employed in science-consuming sectors of services. The second group of SECIA grew from 3 to 8 subjects of the district, the third group reduced from 10 to 4 subjects, which indicates the leveling of the socio-economic conditions of innovative activity. At the same time, Penza oblast (-33 positions) and the Republic of Mordovia (-27 positions) sharply descended in the ranking.

The ranking of the Russian Federation subjects by the value of index of scientific-technical potential (STP) is a comprehensive estimation of science and technology development in the region by such indicators as personnel and financial resources of scientific research, publication and patent activity, elaboration of advanced industrial technologies and export of services of technological character.

The ranking of the Volga federal district subjects by STP in 2015 is shown in Tab. 2. The subjects are divided into 4 groups. The first group comprises Nizhniy Novgorod and Ulyanovsk oblasts. Nizhniy Novgorod oblast is distinguished by the highest rates of the resource provision of science, and Ulyanovsk oblasts – by the high indicators of intensity of scientific-technical activity. The second group includes 3 subjects of the district (Republic of Bashkortostan, Republic of Tatarstan and Perm krai), in the first two of them the values of STP are higher than the average Russian index. The third, numerous, group includes 8 subjects of the district with the relatively modest values of the key indicators of scientific-technical potential. The fourth group is represented by 2 subjects of the district – Orenburg oblast and Udmurt Republic.

In accordance with this ranking, more than a half of the Volga federal district subjects (8 out of 14) belong to the category of stable regions, whose positions changed either way not more than by 3 ranks. The ranking positions by STP in 2015 were significantly increased by the Republic of Bashkortostan (+6) and Saratov oblast (+5), and decreased by Penza (-26), Orenburg (-19) oblasts and Chuvash Republic (-17), due to the decrease of all indicators of research and development efficiency.

TABLE II. RANKING OF THE VOLGA FEDERAL DISTRICT REGIONS OF THE RUSSIAN FEDERATION BY THE VALUE OF INDEX "SCIENTIFIC-TECHNICAL POTENTIAL"

Region	2015			2014	
	Group by STP	Ranking by STP	STP	Ranking by STP	Group by STP
Nizhniy Novgorod oblast	I	2	0.5312	3	I
Ulyanovsk oblast	I	3	0.5145	1	I
Republic of Bashkortostan	II	5	0.4643	11	I
Republic of Tatarstan	II	15	0.3846	17	II
Russian Federation			0.3826		
Perm krai	II	19	0.3781	16	II
Samara oblast	III	21	0.3499	20	II

Kirov oblast	III	39	0.3017	34	II
Saratov oblast	III	42	0.2941	46	II
Chuvash Republic	III	49	0.2827	32	II
Mari El Republic	III	56	0.2718	54	III
Penza oblast	III	57	0.2679	31	II
Republic of Mordovia	III	58	0.2652	59	III
Orenburg oblast	IV	60	0.2534	41	IV
Udmurt Republic	IV	69	0.2315	70	IV

b. Rating of innovative development of the Russian subjects. Issue 5. Moscow: NIU VShE, 2017.

The ranking of the regions by the parameters of innovative activity (see Tab. 3) is an aggregated estimation of the intensity of the processes of creation, launching and practical implementation of technological, organizational and marketing innovations in the Russian Federation subjects. The positions of the regions in the ranking are determined according to the index of innovative activity (IA). The index is calculated on the basis of indicators which provide a complex estimation of resources and results of innovative activity, performance of small, middle and large business in implementation of technological innovations.

TABLE III. RANKING OF THE VOLGA FEDERAL DISTRICT REGIONS OF THE RUSSIAN FEDERATION BY THE VALUE OF INDEX "INNOVATIVE ACTIVITY"

Region	2015			2014	
	Group by IA	Ranking by IA	IA	Ranking by IA	Group by IA
Republic of Mordovia	I	1	0.6773	1	I
Chuvash Republic	I	2	0.5917	3	I
Republic of Tatarstan	I	3	0.5895	2	I
Nizhniy Novgorod oblast	II	7	0.4296	12	I
Perm krai	II	11	0.3995	8	I
Penza oblast	II	17	0.3644	15	I
Mari El Republic	II	18	0.3611	23	II
Samara oblast	II	19	0.3583	33	II
Republic of Bashkortostan	III	25	0.3323	17	I
Udmurt Republic	III	26	0.3319	13	I
Russian Federation			0.3087		
Saratov oblast	III	36	0.2852	42	II
Orenburg oblast	III	37	0.2841	48	III
Kirov oblast	III	38	0.2760	35	II
Ulyanovsk oblast	III	53	0.2466	50	III

c. Rating of innovative development of the Russian subjects. Issue 5. Moscow: NIU VShE, 2017.

Just as in the first two blocks, the subjects in the ranking are divided into four groups. As can be seen from Tab. 3, the majority of regions of the Volga federal district belong to the groups which are characterized by middle values of indicators.

The leaders, both in the Volga federal district and in the Russian Federation as a whole, are three regions – Republics of Mordovia (IA – 0.6773), Chuvash (IA - 0.5917) and Tatarstan (IA - 0.5895), which in the IA ranking of the Russian Federation occupy the first, second and third places, respectively. The IA values of these regions are about two times larger than the corresponding average value of the Russian Federation (IA index of the Russian Federation is 0.3087). The leading positions of these regions in the ranking are explained by the high efficiency of innovative activity. Thus, for example, the Republic of Mordovia is characterized by the high level of novelty of its production: among the produced goods (works, services) 7.2% belong to the category of “new in the market” (compare to the average Russian value of less than 1%). The high positions of Chuvash Republic and the Republic of Tatarstan are determined, first of all, by the maximal level of activity of organizations in the sphere of technological innovations (28 and 23.3% respectively). These values are 2.5-3 times larger than the average Russian value.

The second group comprised 5 Russian subjects – one Republic, one krai and three oblasts. The level of innovative activity development in these regions, just as in the first group, is higher than the average in Russia. This is determined not only by the number of organizations implementing innovative activity, but also the high efficiency of innovations. By the level of innovative activity of the regions of the second group, Penza oblast is distinguished, where 14.2% of industrial production organizations were carrying out development and introduction of innovations of technological character. The value of non-technology innovations of organizational-managerial and marketing character in Perm krai was two times larger than the corresponding average value of the Russian Federation – 7.5%. The high efficiency of innovative activity is demonstrated by the indicators of Samara (19.7%), Nizhniy Novgorod (13.1 %) oblasts and Mari El Republic (9.5 %).

The third group of ranking by IA comprises six Volga federal regions. The key factors determining the place of the subjects in the ranking are the involvement of enterprises into innovative processes and the scale of investments into technological innovations. There are no regions belonging to the fourth group in the Volga federal district.

The dynamics of positions of the Russian subjects in the ranking of IA values indicates that since 2014 to 2015 only a half of all regions managed to keep their position in the groups. Only Samara oblast (+14) and Orenburg oblast (+11) significantly increased their ranking in 2015. 7 subjects lowered their ranking due to the decrease of the main indicators of innovative activity. A sharp decrease was demonstrated by the Republics of Udmurtia (-13) and Bashkortostan (-8).

Thus, the research results show that innovative activity is most successfully implemented in large, economically

developed centers of the Russian Federation, and the Volga federal district occupies the first place by the IA index among other Russian federal districts (maximal number (8) of the Volga federal district subjects belong to the first two leading groups).

Evaluation of the quality of innovative policy in the Russian subjects enables to obtain an integral view of their innovative development. The quality of innovative policy is evaluated by the following parameters: elaboration of normative-legal base; availability of a specialized body and institutions for development, which supervise the regional innovative policy; budget expenditures for science and innovations.

The ranking of the Volga federal regions by the index of “Quality of innovative policy” (QIP) is shown in Tab. 4.

TABLE IV. RANKING OF THE VOLGA FEDERAL DISTRICT REGIONS OF THE RUSSIAN FEDERATION BY THE VALUE OF INDEX “QUALITY OF INNOVATIVE POLICY”

Region	2015			2014	
	Group by QIP	Ranking by QIP	QIP	Ranking by QIP	Group by QIP
Republic of Tatarstan	I	1	0.8108	1	I
Republic of Bashkortostan	I	3	0.6969	34	II
Republic of Mordovia	I	4	0.6663	3	I
Chuvash Republic	I	5	0.6561	5	I
Penza oblast	I	7	0.6372	8	I
Nizhniy Novgorod oblast	II	15	0.5556	28	II
Kirov oblast	II	24	0.4842	29	II
Perm krai	II	30	0.4502	50	III
Samara oblast	III	39	0.4030	36	III
Saratov oblast	III	41	0.3827	37	III
Mari El Republic	III	49	0.3429	48	III
Orenburg oblast	III	49	0.3429	47	III
Ulyanovsk oblast	III	57	0.3333	39	III
Udmurt Republic	IV	73	0.1522	76	IV

d. Rating of innovative development of the Russian subjects. Issue 5. Moscow: NIU VShE, 2017.

As a result of calculation of the QIP values, the regions were divided into four groups by the method of cluster analysis. The positions in the first group of the ranking were kept by the Republics of Tatarstan, Mordovia, Chuvash Republic and Penza oblast. In 2015, the leading group started to include the Republic of Bashkortostan, its ranking grew by 31 positions. In Bashkortostan in 2015, the Council for Science was formed under the Republic Head, a new pattern of territorial planning was adopted, IT-park and technology park for energy-effective technologies were launched. Perm krai moved from the third to the second group, increasing its

index value by 20 positions. The third and fourth groups of ranking by the QIP value had no significant changes in 2014-2015.

The research of the key constituents of the regional innovative development (socio-economic conditions of innovative activity, scientific-technical potential, innovative activity and quality of innovative policy) served as the basis for compiling a composite rating of the Volga federal district regions of the Russian Federation by the value of the Russian Regional Innovation Index (RRII). Tab. 5 shows the rating of the innovative development of the regions in descending order of the RRII values in 2015 compared to the values in 2014. The regions of the district are distributed on the basis of cluster analysis into four groups, by the value of the integral indicator.

TABLE V. RATING OF THE VOLGA FEDERAL DISTRICT REGIONS OF THE RUSSIAN FEDERATION BY THE VALUE OF THE RUSSIAN REGIONAL INNOVATION INDEX

Region	2015			2014	
	Group by RRII	Ranking by RRII	RRII	Ranking by RRII	Group by RRII
Republic of Tatarstan	I	1	0.5753	1	I
Nizhniy Novgorod oblast	I	4	0.4981	6	II
Republic of Bashkortostan	I	5	0.4853	15	II
Chuvash Republic	I	7	0.4768	8	II
Republic of Mordovia	I	8	0.4757	4	II
Perm krai	II	13	0.4136	19	II
Penza oblast	II	19	0.3998	10	II
Samara oblast	II	20	0.3951	25	II
Ulyanovsk oblast	II	22	0.3836	16	II
Mari El Republic	III	35	0.3396	38	III
Kirov oblast	III	38	0.3343	34	III
Saratov oblast	III	41	0.3312	39	III
Orenburg oblast	III	51	0.3049	51	III
Udmurt Republic	III	62	0.2750	61	III

e. Rating of innovative development of the Russian subjects. Issue 5. Moscow: NIU VShE, 2017.

In 2015 the Volga federal district became the leader by the share of the first group (by the RRII) regions among other Russian federal districts. While in 2014 only the Republic of Tatarstan belonged to the first group, in 2015 it was joined by 4 more subjects – Nizhniy Novgorod oblast, Republic of Bashkortostan, Chuvash Republic and Republic of Mordovia (growth from 7 to 36%).

The number of members of the second group significantly reduced from 8 to 4, in the third group the number of subjects remained the same. Just as a year before, there are no regions

of the fourth group in the Volga federal district.

An unrivaled leader of the innovative development ranking, both in the Russian Federation as a whole and in the Volga federal district, is still the Republic of Tatarstan. The beneficial factors of innovative activity of enterprises are: highly developed innovative infrastructure in the region, adequate normative-legal base, broad specter of the measures supporting the innovative business, and informational provision working in the modes of direct communication and feedback, which provides the “right for communication” for the interested subjects [18], promoting the implementation of innovative ideas.

The most “breakthrough” region in 2015 was the Republic of Bashkortostan, which rose by 10 positions in the ranking – from the 15th position in 2014 to the 5th in 2015. The key to success is the increase of the quality of innovative policy.

The results of comparative analysis demonstrate the uneven development of different constituents of the innovative process. The even development of all four blocks composing RRII, compared to 2014, is characteristic of a single subject of the Volga federal district – Saratov oblast. In most cases, the high indicators in one block are combined with low indicators in others, or there are essential declinations in one or several sub-indices compared to RRII value. For instance, Penza (9 positions), Ulyanovsk (6 positions) and Kirov (4 positions) oblasts stated the decrease of their positions in the composite rating. The reasons are related to the development of scientific-technical potential of the regions, innovative activity and quality of innovative policy. We distinguish the following key problems of the regions:

The problem of insufficient incentives for scientific-research and innovative activity exists in all regions. Due to optimization, research establishments and universities are deprived of the incentive rates of estate tax, land tax, energy tariffs, etc. Customs duties for the import of raw materials and equipment are very high (in particular, a special customs center was created to solve this problem). That is why, one of the topical tasks is correction of the taxation policy in relation to scientific and higher educational establishment.

The next is personnel problem: university business incubators and innovative centers face the ageing of research personnel, especially professors, and higher educational establishments face the sharp decrease professional level of lecturers.

A strong barrier in the development of innovative processes in the regions is weak integration between science, education and business community. Unlike in the developed Western countries, the Russian science, education system and business are developing in isolation from each other. The mutual alienation leads to the erosion of competitive potential of each sphere. Thus, the topical task of the university science is to develop the integration processes with the use of innovative technologies.

The number of small innovative enterprises is not large in all regions. The consequence is the low share of innovative constituent in the total volume of goods produced in a region. Situation is aggravated by the deficit of specialists in

innovative sector, both highly qualified workers and managers capable of forming and implementing the innovative projects.

The projects implementation is connected with their commercialization, which is a separate socio-economic problem. This problem is determined by both subjective factors of management – inability to create conditions for scientific research and to bring an innovative idea to production and distribution, and objective economical-legal factors – protection of intellectual property rights, lack of financing of innovative projects, and lack of interest of business in innovations.

V. CONCLUSION

Competitiveness of a modern state is determined by its innovative policy. That is why the formation and successful development the Russian national innovative system requires an efficient economic mechanism of management in the following spheres:

- Upgrading of the social status of researchers and university professors;
- Elaborating the mechanism of commercialization: transfer of the scientific elaborations to the private sector;
 - Increasing the share of venture capital in the total volume of investments;
- Systematic monitoring of the efficiency of innovative infrastructure functioning, namely: technology parks, business incubators, and technology towns;
 - Support of innovative business at all stages of the life cycle of innovative process;
- Forming a favorable investment climate in the country.

The cumulative effect of implementation of the above directions of activity will increase with the large-scale, long-term investments into the higher education system and into training of highly qualified specialists working at innovation-oriented enterprises.

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