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VARIATIONS IN SOCIAL-ECONOMIC DEVELOPMENT BY REGION

Assessment of Russian Regions by Level of Innovative Development

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Abstract—Innovation activity of Russian regions is considered in two aspects, i.e., creation of innovations and use of innovations. A methodology for assessing the regional level of innovative development is presented. In order to identify the regions' specialization in different aspects of innovation activity, we constructed two indices of innovative development, i.e., the index of innovation creation and the index of innovation use. Each region receives a numerical estimate for its level of innovative development. Regions are ranked based on these values and assessed as developed or backward. We analyze regions appearing to be leaders in innovative development and assess the stability of their group and leadership position. It is shown that innovations are created in the same leading regions, the number of which (19 regions) remains almost the same over the entire considered period, but they are used in 41 regions, the set of which changes from year to year. Ranking of regions makes it possible to compare innovation levels and to determine strengths and weaknesses of particular innovation systems, which can be taken into account in designing state innovation policy.

Keywords: region, innovation activity, assessment, regional inequality, rating of regions, innovative development index

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INEQUALITY IN REGIONAL DEVELOPMENT

Inequality in the economic development of regions and territories is an objective reality. According to regional science, such inequality is a natural consequence of a concentration of benefits in some places and their absence in others (see, e.g., [1]). New economic geography divides territorial benefits into two types, i.e. "of the first nature" and "of the second nature" The benefits of the first nature exist independently of people (natural resources, geographical position), while the benefits of the second nature result from human and social activity (agglomeration effects, quality of human capital, institutions, and infrastructure) [1, 10].

On the one hand, spatial inequality in social and economic development is caused by the distribution of competitive advantages between territories; on the other hand, it is a stimulus for further development. However, not every type of inequality yields impetus towards development. On the contrary, too much inequality in development produces a depressive effect. The minimum level of inequality does not yield incentive toward development either. Indeed, why should anyone engage in development when things are good as they are? Here, as in sports race, there must be a gap, although finite, but such that catching up would seem achievable although requiring significant effort. Then, the existing inequality will stimulate accelerated development of territories.

This is particularly true of innovative development. Innovation in itself creates competitive advantages, and innovation activity at the regional level adds advantages resulting from spatial inequality. However, it is not enough just to recognize that inequality stimulates economic development. In order to trigger the relevant mechanism, the inequality must be assessed; regions in the peloton of the innovation race must be compared and ranked in order to provide stimulus for further development.

The proposed method for assessing the innovation level of Russian regions and their comparison is based on constructing an innovative development index using official statistical data. The array of statistical data includes information on 80 federal subjects (with the exception of autonomous okrugs within other federal subjects) over the period of 2000–2012. The analyzed time interval covers the period of high economic growth rates, the crisis, and postcrisis recovery. This excludes the influence of random factors on the assessment of innovative development.

This study is primarily focused on the leaders of innovative development. The proposed methodological approach enables us to identify regions taking leading positions in innovative development and to analyze the stability of the group of leaders and their leadership.

INNOVATIVE DEVELOPMENT INDEX

Innovative development indices are constructed and widely used both by researchers and regional associations. For instance, assessment of innovation activity in regions based on the ranking of federal subjects using a constructed general indicator is presented in publications of IEIE SB RAS researchers S.V. Kazantsev [3] and G.A. Untura [7]. A special rating of innovative development of Russian regions was worked out by researchers at the National Research University Higher School of Economics [5]. Ranking of Russian regions based on integral estimates is also carried out by the Independent Institute for Social Policy[1]. Russia's innovative regions for monitoring and management purposes are rated by the Association of Innovative Regions of Russia [2].

Unlike other existing techniques for assessing the development levels of regions, the proposed method involves analysis of two aspects of innovation activity: regions where innovations are created and regions where innovations are applied. This enables the identification of regions occupying a leading position in the creation of innovations and regions that are leaders in using them. In addition, our study covers a 12-year period, which enables us to identify innovatively developed regions occupying a stable leading position, because, as mentioned above, this excludes the influence of random factors on the final estimate.

Innovation activity[2] is a complex form of economic activity including a variety of elements. According to the concept suggested in [8], any functioning innovation system[3] consists of two subsystems: a subsystem using knowledge and a subsystem generating and disseminating it. The same approach is shared by the authors of [9], who apply it at the microlevel. There are industries producing machines and equipment where research and development processes are concentrated. At the same time, there are industries producing consumer goods using machinery purchased from its producers. Certainly, such a subdivision is largely a simplistic model, but it clearly illustrates the difference between the process of creating innovations and the process of their use, with emphasis that different aspects of innovation activity are governed by different internal laws and are described by different mathematical models.

Therefore, there are two aspects identifiable in innovation activity: *creation of innovations* and *use of innovations*. Creation of innovations is understood here as the part of innovation activity that includes research and development. By the use of innovations, we mean innovation activity aimed at disseminating implementing innovations that bring R&D results to a final innovation product. Despite the fact that the processes of innovation creation and innovation use are interrelated, we believe that a high level of one aspect of innovation activity in a region does not guarantee an equally high development level of the other aspect. Confining ourselves to a single integral index describing innovation activity, we can exclude from consideration regions with an imbalanced innovation system where only one aspect of the innovation process is developed.

Thus, in studying innovatively developed regions, we consider individually regions specializing in the creation of innovations and regions specializing in the use of innovations.

The construction of innovative development indices starts from the choice of indicators describing innovation activity. The basis for assessing innovation activity is largely determined by the innovation features or attributes that are considered relevant. The choice depends on what serves as the central focus of a researcher's attention. If he focuses on expenditures, the indicator will be research and development costs; if he is mainly interested in the results, the indicator will reflect the number of patents or products; if his attention is mostly concentrated on the process, the indicator will be the presence of networks, clusters, etc. [4]. Our consideration of the system of Russian regions in terms of their specialization in different aspects of innovation activity necessitates the choice of both the indicators of innovation creation and innovation use. The available government statistical data offer a broad set of indicators describing the state of various aspects of research and of innovation activity. From those, for each aspect of innovation activity we choose three indicators, which characterize the state of various elements of the innovation system and main input-output indicators of innovation activity[4]. On applying them, we pass to relative indicators to prevent the size of the region from affecting the obtained results.

As *indicators of innovation creation* we use:

[1] See Social Atlas of Russian Regions – URL: http://atlas.socpol.ru/indices/index_innov.shtml.

[2] According to Recommendations for Collection and Analysis of Data on Innovations (http://old.mon.gov.ru/files/materials/7766/ruk.oslo.pdf), "innovations are introduction into use of a new or a considerably improved product (commodity or service) or of a process, a new marketing method or a new organizational method in business practice, organization of workplaces or external relations." Then the innovation activity (or, otherwise, innovation performance) will be understood as actions, including research, technological, organizational, financial, and commercial aimed at the implementation of innovations.

[3] By innovative system, we mean the total set of organizations and institutions and the network of relationships between them. These organizations and institutions operating within the specified territorial boundaries collectively and individually create and use knowledge (innovations).

[4] By formal methods (factor analysis) from the indicators used in the section "Research and Innovation" of the official state statistics we selected sets of three indicators for each of the considered aspects of innovation activity (for details, see Khalimova, S.P., Evaluation of regional differences in innovative activity—URL: http://regconf.hse.ru/uploads/81e230c40931bf4c5e81208263c3a42a4fe18921.doc).

Table 1. Results of factor analysis (principal component analysis)*

Intermediate indices of innovative development	K1	K2
Share of internal research and development costs in GRP	**0.906**	0.171
Share of staff engaged in research and development in total number of employed	**0.894**	0.175
Share of organizations engaged in research and development in total number of enterprises and organizations	**0.595**	–0.234
Share of organizations implementing technological innovations	0.273	**0.540**
Share of innovative products in total output	0.143	**0.697**
Share of expenditures on technological innovations in the GRP	0.085	**0.779**

* Calculated using data from *Regions of Russia: Main Characteristics of Subjects of the Russian Federation for 2013: Statistical Yearbook*, Rosstat, Moscow, 2013.

Table 2. Shares of intermediate indices

Index of innovation creation	
Share of internal research and development costs in GRP	0.38
Share of staff engaged in research and development in total number of employed	0.25
Share of organizations engaged in research and development in total number of enterprises and organizations	0.37
Index of innovation use	
Share of innovative products in total output	0.35
Share of organizations implementing technological innovations	0.27
Share of expenditures on technological innovations in GRP	0.39

the share of internal research and development costs in GRP;

the share of organizations engaged in research and development in the total number of enterprises and organizations;

the share of staff engaged in research and development in the total number of employed.

As *indicators of innovation use* we employ:

the share of innovative products in total output;

the share of organizations implementing technological innovations;

the share of expenditures on technological innovations in the GRP.

The choice of the indicators is followed by the construction of intermediate indices for each considered indicator (here, we mostly use the methodology developed by the Independent Institute for Social Policy [6]), i.e.

$$I_{ij}^t = \frac{X_{ij}^t - X_{i\min}^t}{X_{i\max}^t - X_{i\min}^t},$$

where X_{ij}^t is the value of variable i for region j in year t; $X_{i\min}^t$ is the minimum value of variable i in year t; $X_{i\max}^t$ is the maximum value of variable i in year t.

Next, the obtained intermediate indices are integrated into a general indicator. The key point here is the choice of specific weights assigned to intermediate indices for inclusion into the integral index. When various indicators are combined into the general index, their relations must be taken into account to avoid the situation where the effect of one factor on the overall index is overestimated or underestimated because of the cross impact of factors. In order to determine the share of intermediate indices, we use the results of factor analysis. Table 1 presents the period-averaged values of factor loadings (at each interval of the considered period, the obtained values of factor loadings appeared similar; therefore, we take their average values).

By construction, the intermediate indices assume values from 0 to 1. For the integral indices to assume values from 0 to 1, the shares of intermediate indices are taken as factor loadings normalized so that their sum is 1. The obtained shares are presented in Table 2.

Taking the above-mentioned into account, the integral indices are constructed as follows:

$$I_{\text{creation}\,j}^t = 0.38 I_{1j}^t + 0.25 I_{2j}^t + 0.37 I_{3j}^t$$

where I_{ij}^t are intermediate indices: (1) is the share of internal research and development costs in GRP; (2) is the share of organizations engaged in research and development; (3) is the share of staff engaged in research and development in the total number of employed,

$$I_{\text{use}\,j}^t = 0.35 I_{4j}^t + 0.27 I_{5j}^t + 0.39 I_{6j}^t,$$

Table 3. Innovatively developed regions (process of "creation of innovations")

Region	Number of years	Years
Vladimir oblast	9	2000–2008
Voronezh oblast	12	2000–2011
City of Moscow	13	2000–2012
City of St. Petersburg	13	2000–2012
Kaluga oblast	13	2000–2012
Kamchatka krai	3	2003, 2006, 2008
Magadan oblast	4	2006–2008, 2011
Moscow oblast	13	2000–2012
Murmansk oblast	1	2003
Nizhny Novgorod oblast	13	2000–2012
Novosibirsk oblast	13	2000–2012
Penza oblast	11	2000–2007, 2010–2012
Samara oblast	10	2000–2002, 2004–2007, 2009–2010, 2012
Sverdlovsk oblast	5	2000–2004
Tver oblast	6	2000–2003, 2006–2007
Tomsk oblast	13	2000–2012
Tula oblast	1	2001
Ulyanovsk oblast	13	2000–2012
Yaroslavl oblast	4	2000–2001, 2007–2008

where I_{ij}^{t} is the intermediate indices; (4) is the share of innovative products in total output; (5) is the share of organizations implementing technological innovations; and (6) is the share of expenditures on technological innovations in the GRP.

Theoretically constructed integral indices can assume a value from 0 when there is absolutely no innovation activity in the region to 1 when a region is a leader in innovation activity with regard to all indicators.

Thus, the innovative development level of each region is numerically rated with regard to both aspects (ratings are the calculated values of indices). Using the calculated values, we rank regions by innovative development level. As a result, we can determine which regions are the most and least developed.

What regions can be considered innovatively active? How can we determine the boundary below which a regional economy is no longer innovatively developed? In the author's view, a rigidly defined variation range of integral indices is of little avail here. First, it is not clear how to set the limits of such a range. Second, the spread of indicators of innovation activity development varies in different periods, resulting in corresponding changes in the spread of the indices themselves, their maximum and minimum values; however, this does not always involve changes in differentiation in the innovation level of regions.

The author believes that innovatively active regions are those in which innovation activity is at a higher level of development than in most other regions of the country. Then, in order to identify innovatively developed regions, integral indices for the region must be compared with the average value of the corresponding index over this period. Thus, innovatively developed regions in the field of innovation creation (at any specific time) means those for which the value of the innovation creation index is higher than the national average. If such an excess is greater than 0.1, such regions will be referred to as regional leaders in the field of innovation creation. In the same way, we determine innovatively developed regions in the field of innovation use[5].

INNOVATIVELY DEVELOPED REGIONS

Here, we focus on the leaders in innovative development. Regions were selected that occupied the leading positions in each of the aspects of innovation activity at least once during the considered time. In the field of innovation creation, there are 19 such regions (Table 3), and in the field of innovation use, there are 41 regions (Table 4).

There regions occupying leading positions in the field of innovation creation are far fewer than those that are leaders in the field of their use, but the "region-creators" appear much more often in the sample of leaders, and practically none were estimated as a leader by accident. In the field of innovation use, on the contrary, there are many outliers when a region becomes a leader for a single year, and in the remaining periods, the value of the corresponding index for it is even below the national average. Out of 41 regions occupying leading positions in innovation use, there are 14 such "one-time" leaders[6]. Among the remaining regions, only ten were leaders in this sphere for longer than half the considered period (seven times or more), while in the sphere of innovation creation, there are 12 such regions. Leaders in innovation use change, while the sample of leaders in innovation creation is much more constant. Thus, innovations are created in the same regions and used in different ones.

With regard to the data on innovation activity taken into account by statistics, use of innovations can be

[5] See Khalimova, S., *Innovation Activities of Russian Regions: Analysis of Development of Regional Innovation Systems*. Saarbrucken: LAP Lambert Academic, 2011.

[6] These are Belgorod, Kostroma, Lipetsk, Arkhangelsk, Kaliningrad, Kirov, Irkutsk, Magadan, and Sakhalin oblasts, and the Komi, Adygea, Dagestan, Karachay-Cherkess, and Sakha (Yakutia) republics.

Table 4. Innovatively developed regions (process of "use of innovations")

Region	Number of years	Years	Region	Number of years	Years
Arkhangelsk oblast	2	2002–2003	Belgorod oblast	1	2001
Vladimir oblast	1	2006	Volgograd oblast	7	2000–2001, 2004–2005, 2007, 2009–2010
Vologda oblast	3	2001, 2003, 2007	Voronezh oblast	3	2005, 2007–2008
City of Moscow	2	2000, 2012	City of St. Petersburg	3	2001, 2011–2012
Irkutsk oblast	1	2002	Kaliningrad oblast	1	2006
Kaluga oblast	5	2000–2002, 2004–2005	Karachay–Cherkess Republic	1	2008
Kirov oblast	1	2008	Kostroma oblast	1	2004
Kurgan oblast	1	2007	Lipetsk oblast	4	2009–2012
Magadan oblast	5	2008–2012	Moscow oblast	3	2000, 2003–2004
Murmansk oblast	2	2001–2002	Nizhny Novgorod oblast	10	2000, 2002–2004, 2006–2007, 2009–2012
Novgorod oblast	8	2000–2001, 2003–2008	Oryol oblast	8	2000–2002, 2004–2008
Penza oblast	1	2001	Perm krai	12	2000–2010, 2012
Republic of Adygea	1	2006	Republic of Dagestan	1	2002
Republic of Komi	1	2000	Republic of Mordovia	8	2005–2013
Republic of Sakha (Yakutia)	1	2001	Republic of Tatarstan	13	2000–2012
Ryazan oblast	2	2001–2002	Samara oblast	13	2000–2012
Saratov oblast	2	2000, 2005	Sakhalin oblast	3	2009, 2011–2012
Sverdlovsk oblast	9	2000, 2002–2009	Tomsk oblast	1	2003
Tula oblast	5	2000–2002, 2006, 2012	Ulyanovsk oblast	3	2004, 2008, 2010
Chelyabinsk oblast	12	2000–2010, 2012	Republic of Chuvashia	6	2005, 2007–2010, 2012
Yaroslavl oblast	5	2007–2008, 2010–2012			

somewhat sporadic and nonsystemic in nature when companies in a region actively improve production processes or launch new products and services over a short time (thus occupying a leading position) and then abruptly stop all improvements. Thus, at an individual enterprise, the processes of modernization and technical re-equipage, which are reflected in statistics as a high level of expenditures on technological innovations, are usually cyclic; when purchasing new equipment, an enterprise assumes that it will be operating for more than one year. On the other hand, if a lot of enterprises in a region are engaged in innovation activity, when a single company temporarily reduces the scale of its activity, there are still others that, on the contrary, may become more active, thereby offsetting the drop in indicators of innovative development and making the reduction less significant. The fact that regions that are leaders in innovation use vary shows that in some years, innovation projects are launched in some regions and after their completion, they are not succeeded by other projects of similar scale that could be implemented by other companies.

Activity aimed at creation of innovations, on the contrary, is usually characterized by stability; from year to year, the same regions occupy the leading position in this field. In the same regions from year to year, innovations are created on a larger scale than the national average. Using aggregated statistical data, we are unable to determine with certainty whether the same organizations are engaged in research and development, but it is highly probable that these are the same agents. At the same time, we can say for sure that these are the same regional innovation systems.

The fact that innovations are created in the same regions and applied in different ones shows that the state and quality of regional external environment to a greater degree impacts the process of creating innovations than the process of their use. There are no accidental members of the group of creation leaders, while the use of innovations is less determined by specific regional innovation systems.

Now, let us consider regions that happened to be leaders in both creation and use of innovations. There are 15 such regions (Table 5), characterized by balanced development of innovation activity, in which

Table 5. Innovatively developed regions

Region	Aspect of innovative activity	Number of years	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Vladimir oblast	Creation	9	1	1	1	1	1	1	1	1	1				
	Use	1							1						
City of Moscow	Creation	13	1	1	1	1	1	1	1	1	1	1	1	1	1
	Use	2	1												1
City of St. Petersburg	Creation	13	1	1	1	1	1	1	1	1	1	1	1	1	1
	Use	3		1										1	1
Kaluga oblast	Creation	13	1	1	1	1	1	1	1	1	1	1	1	1	1
	Use	5	1	1	1		1	1							
Magadan oblast	Creation	4							1	1	1			1	
	Use	5								1	1	1	1	1	1
Moscow oblast	Creation	13	1	1	1	1	1	1	1	1	1	1	1	1	1
	Use	3	1		1	1									
Murmansk oblast	Creation	1				1									
	Use	2		1	1										
Nizhny Novgorod oblast	Creation	13	1	1	1	1	1	1	1	1	1	1	1	1	1
	Use	10	1		1	1	1		1	1		1	1	1	1
Penza oblast	Creation	11	1	1 1	1	1	1	1	1	1			1	1	1
	Use	1													
Samara oblast	Creation	10	1	1	1		1	1	1	1	1	1	1		1
	Use	13	1	1	1	1	1	1	1	1	1	1	1	1	1
Sverdlovsk oblast	Creation	5	1	1	1	1	1								
	Use	9	1	1	1	1	1	1	1	1	1	1			
Tomsk oblast	Creation	13	1	1	1	1	1	1	1	1	1	1	1	1	1
	Use	1				1									
Tula oblast	Creation	1		1											
	Use	5	1	1	1				1						1
Ulyanovsk oblast	Creation	13	1	1	1	1	1	1	1	1	1	1	1	1	1
	Use	3					1			1			1		
Yaroslavl oblast	Creation	4	1	1	1					1	1				
	Use	5								1	1		1	1	1

both aspects of innovation activity identified in this work are observed.

We can see that many creation leaders also occupied, at least once, a leading position in the use of innovations. It can be assumed that the regional environment that fosters leadership in the creation of innovation, is more balanced and also promotes intensive development of innovation activity in the use of innovations. As well, it is not especially important whether the innovative results being implemented have been developed in this region or elsewhere. What is important is the formation of an environment where subjects understand why it is necessary to be innovatively active.

For the identified regions, periods of occupying leading positions in different aspects of innovation activity are related as they either overlap or succeed each other. The author believes this testifies to the fact that in the best-balanced regions, different directions of innovation activity influence each other and mutu-

ally stimulate development. This suggests the systemic character of innovative development.

For the effective functioning of the Russian innovation system (as the total set of regional innovation systems) both the regional balance of innovative development and the stability of leadership are of great importance. It was mentioned above that leaders in the creation of innovations almost never change, unlike leaders in their use. Even more striking evidence of the stability of the leader group is that 8 out of 19 regions have become leaders throughout the entire period: the cities of Moscow and St. Petersburg and Kaluga, Moscow, Nizhny Novgorod, Ulyanovsk, Novosibirsk, and Tomsk oblasts. At the same time, there are only two such leaders in the use of innovations: the Republic of Tatarstan and Samara oblast.

In what regions is innovative development both stable and balanced? There are eight such regions: the cities of Moscow and St. Petersburg and Kaluga, Moscow, Nizhny Novgorod, Ulyanovsk, Samara, and Tomsk oblasts. Their regional innovation systems can be conditionally considered full-fledged, i.e., those in which we observe the stable presence of both abovementioned aspects of innovation activity. The term "conditionally" is used because although these regions constantly occupy the leading position in the creation of innovation, most of them were innovation-use leaders less than five times. Full-fledged innovation systems have only been developed in two regions: the oblasts of Nizhny Novgorod (13 times in a leading position in the creation of innovations and 10 in their use) and Samara (10 times in a leading position in the creation of innovations and 13 in their use).

What accounts for such a level of innovative development in Nizhny Novgorod and Samara oblasts? Now, let us pass from integral indices to the statistical indicators underlying them.

Nizhny Novgorod oblast is the absolute leader in the share of internal research and development costs in GRP, whereas the share of organizations engaged in research and development and the share of staff engaged in research and development in the total number of the employed here is significantly higher than Russia's national average. In Samara oblast, the indicators of the share of internal research and development costs in GRP and the share of staff engaged in research and development in the total number of employed exceed the average level, although in relative terms there are fewer organizations engaged in research and development in the region than in the country on average. However, the high values of other indicators are sufficient to secure the region's leading position in creation of innovations. As for innovation use, all the relevant indicators of Samara oblast are above the national average, and in some years, the oblast became the absolute leader in the share of the innovation products in the total output. In Nizhny Novgorod oblast, too, the indicators of the share of expenditures on technological innovations in GRP and the share of organizations implementing technological innovations are above average and the share of innovation products in the output varied: in some years, it was at an average level, and in others, it attained the regional maximum.

What is behind these indicators? What is the economic structure of these regions? On the one hand, in each of them, fundamental research and higher education are very well developed and represented by such institutions as the Nizhny Novgorod Scientific Center of the Russian Academy of Sciences and the Samara Scientific Center of the Russian Academy of Sciences, and universities (Nizhny Novgorod State University and Samara State Aerospace University received subsidies for entering world rankings). On the other hand, the economies of both oblasts are based on manufacturing, which in 2011 accounted for 29.9 and 25.5% GRP of Nizhny Novgorod and Samara oblasts, respectively. Manufacturing in these regions makes up 6.6% of total national production, although their total GRP is only 3.5% of the Russian economy. In addition, industries developed in these regions are mainly those characterized by a high level of innovation activity. In Nizhny Novgorod oblast, 56.5% of manufacturing is represented by production of petroleum products, transport vehicles and equipment, and chemicals, and in Samara oblast, 53.6% of manufacturing is represented by production of transport vehicles and equipment and chemicals[7].

Thus, both the creation and use of innovations are widely represented in Nizhny Novgorod and Samara oblasts, and this enables them to stably assert their leadership in both aspects of innovative development.

In addition to finding out when a region joined the group of leaders (i.e., when its value of the relevant index exceeds the national average by more than 0.1), we should consider changes in the indices of innovative development as such. Over the studied period, the following four regions ranked first in rating: the city of St. Petersburg (2000, 2002, 2003, 2007, and 2008), Nizhny Novgorod (2004–2006, 2010–2012), Kaluga (2009), and Moscow (2001) oblast. In different years, leadership in the rating of innovation use index was occupied by Samara (2000–2006), Lipetsk (2009, 2010), and Nizhny Novgorod (2012) oblasts, the Republic of Mordovia (2007, 2011), and Perm krai (2008).

Let us consider the dynamics of the innovative development indices (Fig. 1). In 2000–2012, the maximum value of the innovation creation index on average for the period was 0.785, and the minimum value was 0.001. The average value of the index for all regions was 0.211. At the same time, a trend toward a decline in the maximum value was observed. The gap between advanced and backward regions is narrowing

[7] See *Regions of Russia: Main Characteristics of Subjects of the Russian Federation for 2013*: Statistical Yearbook, Rosstat, Moscow, 2013.

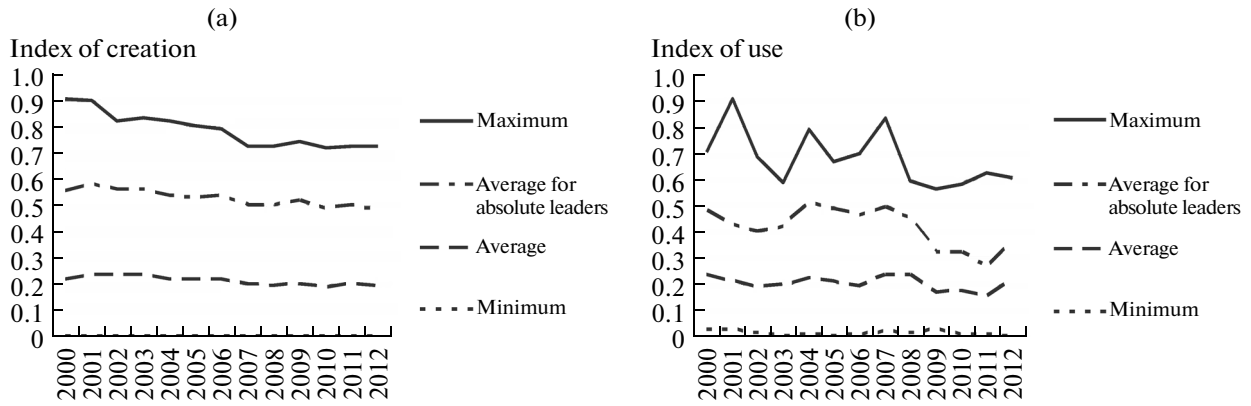

Fig. 1. Dynamics of indices of creation (a) and use (b) of innovations. Calculated from *Main Characteristics of Subjects of the Russian Federation for 2013: Statistical Collection*, Rosstat, Moscow, 2013.

mostly due to the decline in activity of leaders that have ceased to be leaders in everything; i.e., the values of indicators reflecting innovation creation activity in advanced regions are no longer so far ahead of the others. As for the innovation use index, its maximum value on average for the period was 0.680, the minimum was 0.010, and the average for all regions was 0.203. The innovation use index (its maximum value) varied more unstably, and its values demonstrated both significant drops and sharp rises.

Despite the fact that the dynamics of innovation use index seems more unstable (as both ups and downs are observed) as compared to the creation index, the resulting change in the index for 2012 turned out to be smaller (Fig. 1). The maximum value of the creation index dropped by 20%, while the maximum of the use index only decreased by 14%. The same is observed for their average values as the average index of creation decreased by 13% and the use index decreased by 8%. Despite the drop observed in both innovative development indices, a firm conclusion about a sustainable downward trend can only be made with regard to the innovation creation index, since there are no great bursts or fluctuations observed in its dynamics.

Let us consider individually the dynamics of the innovative development indices for the absolute leaders (i.e., regions occupying leading positions for more than half the period). The average value of the index for absolute leaders in creation of innovations is closer to its maximum value, while for the absolute leaders in the use of innovations, it is closer to the average value for all regions. This pattern further confirms the greater stability of the group of leaders in creation of innovations and the regular character of this part of innovation activity in such regions.

It should also be noted that the distribution of regions over the development level of innovation activity both in the sphere of innovation creation and in the field of innovation use is not uniform as the average values of the indices are closer to minimal. That is to say, that a significant part of the country's regions fall far behind the leaders of innovative development.

GEOGRAPHY OF THE INNOVATIVE DEVELOPMENT LEADERS

There is another point, which is worth our attention, and it is the geography of innovative development leaders. Consider the location of the leading regions on the map; Figures 2 and 3 show the regions selected in 2000–2012 and give the values of the respective indices of innovative development average for the period. As can be seen from Fig. 2, regions occupying the leading positions in creation of innovations seldom border on each other. An exception is the belt of eight regions around the city of Moscow. In the rest of territory, the innovations are created in scattered centers. Regions leading in the use of innovations, on the contrary, in most cases are geographical neighbors. We can refer to these areas as a single innovative space, which includes almost the entire European part of Russia and South Urals. Certainly, the assumption of the impact made on the level of innovation activity of a particular region by the level of innovative development in neighboring regions must be further tested by formal methods. However, it is qualitatively evident that the innovative development of neighboring territories is more important for the process of innovation use than for innovation creation.

In fact, use of innovations is the output of innovative products. Companies that either launch the production of a new product or improve the production processes are sure to tighten their requirements on their partners inducing them to develop further. No matter how technically complex and unique the process of innovation use in an individual company may be, some of its suppliers and contractors are with high probability in geographical proximity, which contributes to the launch of a chain leading to an increase in the innovation activity level in the territory and in neighboring regions. Thus, leaders in innovation use

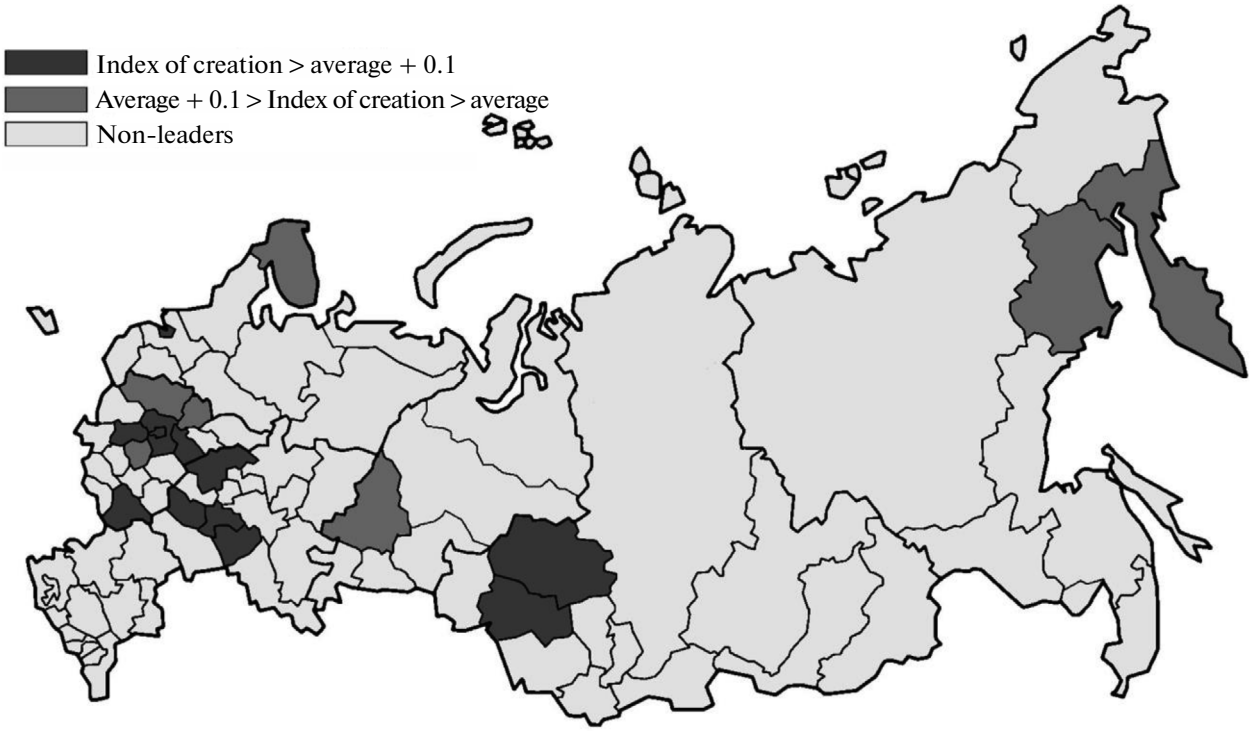

Fig. 2. Leaders in creation of innovations, 2000–2012 .

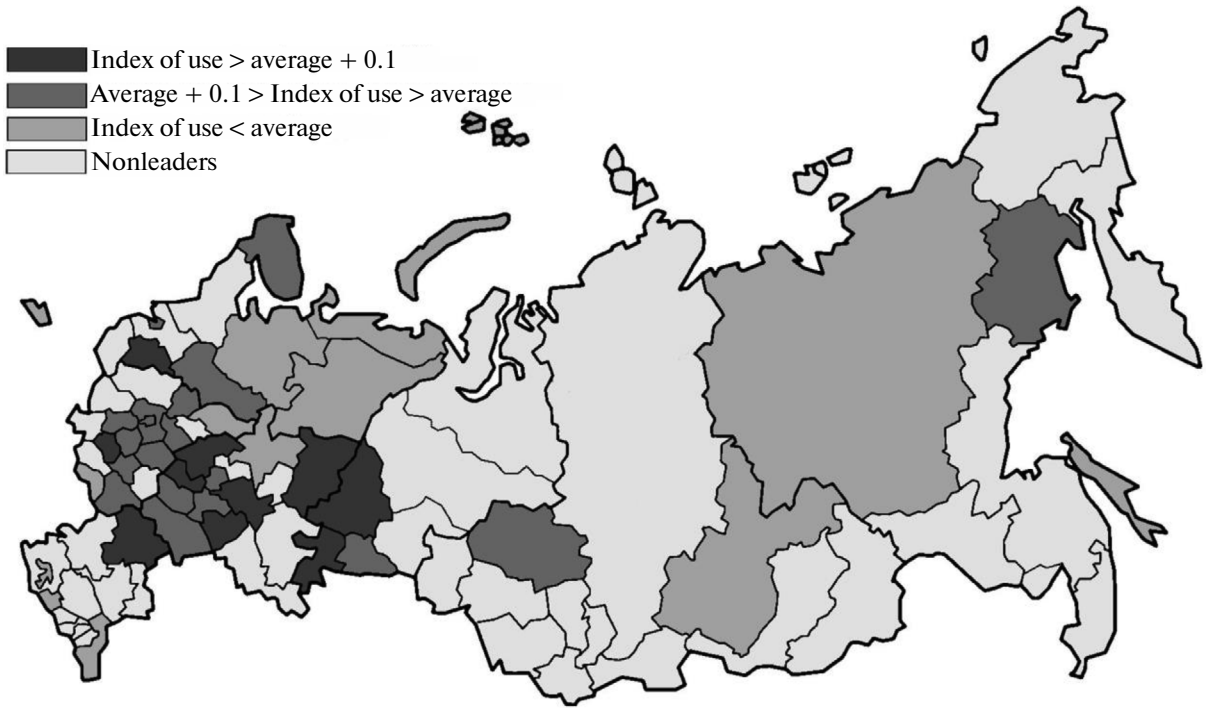

Fig. 3. Leaders in use of innovations, 2000–2012.

stimulate the innovative development of neighboring territories.

ESTIMATION OF DIFFERENCES IN INNOVATIVE DEVELOPMENT AS A TOOL FOR DESIGNING INNOVATION POLICY

The proposed method made it possible to rank Russian regions by level of innovation activity for different aspects of innovation activity and to single out regions occupying the leading positions in creation of innovations and in their use. We found out that innovations were created in the same group of regions but were used in different ones, since the sample of leaders in creation of innovations includes 19 regions and this changes only slightly over the entire period 2000–2012, whereas 41 regions at one or another time were leaders in the use of innovations and their group varied from year to year. In addition, it should be noted that a regional environment that promotes leadership in creation of innovations is more balanced and stimulates the active development of innovation activity in terms of innovation use.

Ranking regions makes it possible to compare levels of innovative development in territories, revealing strengths and weaknesses of particular innovation systems. In this sense, the rating system itself constitutes the stimulating function of inequality, because when inequality is estimated and measured, each specific region can see where it is superior or inferior to other regions. This outlines the guidelines for further development.

From the practical viewpoint, ratings of innovative development can be used to elaborate government innovation policies. In this case, rating is used not to show what regions must be supported, but to demonstrate that regions are at different development levels of innovation activity. In the author's opinion, different regions require different means of support, and in this case, regional inequality may perform a stimulating function instead of hampering further advancement. The ranking in this study has shown that it is easier to become a leader in the use of innovations (taking into account that a large number of different regions have managed to occupy leading positions in the rating). It can be assumed that comparatively moderate support of activity aimed at the use of innovations can produce a noticeable result. If systemic development of innovation activity is the goal, the author believes that an incentive should be offered to regions both creating and using innovations, then support given to a single aspect of this activity will be beneficial for the entire regional innovation system. However, it should be borne in mind that support given only to the strong makes them even stronger, so the innovation policy should provide for separate measures aimed at supporting regions that are far behind in the field of innovative development.

Specific measures of regional innovation policy are determined by long-term objectives and economic development priorities. The proposed method for measuring inequality in innovative development of Russian regions is only one possible instrument that could prove helpful in determining the government policy directions.

REFERENCES

1. Zubarevich, N.V., *Regiony Rossii: neravenstvo, krizis, modernizatsiya* (Russian Regions: Disparity, Crisis, and Modernization), Moscow: Nezav. Inst. Sots. Polit., 2010.

2. Ivanova, O. and Sorokina, A., Rating of innovative Russian regions for monitoring and control: version 2013-2.0. http://www.i-regions.org/upload/nasait.pdf. Cited September 5, 2014.

3. Kazantsev, S.V., Assessment of the scales of innovative activities in Russian federal subjects, *Reg.: Ekon. Sotsiol.,* 2012, no. 4 (76), pp. 111–138.

4. Kravchenko, N.A., The problem of measuring and analysis of national innovative systems, *EKO,* 2010, no. 1, pp. 61–75.

5. *Reiting innovatsionnogo razvitiya sub"ektov Rossiiskoi Federatsii: analiticheskii doklad* (Rating of Innovative Development of the Russian Federal Subjects: Analytical Report), Gokhberg, L.M., Ed., Moscow: Vyssh. Shkola Ekon., 2012.

6. *Rossiya regionov: v kakom sotsial'nom prostranstve my zhivem?* (Russia of Regions: What is the Social Space Where Do We Live?), Zubarevich, N.V., Ed., Moscow: Pomatur, 2005.

7. Untura, G.A., Strategic support of the Russian regions: problems of the assessment of the status of innovative territories, *Reg. Res. Russ.,* 2013, vol. 3, no. 2, pp. 153–161.

8. Cooke, P., Boekholt, P., and Todtling, F., *The Governance of Innovation in Europe: Regional Perspectives on Global Competitiveness,* London: Pinter, 1999.

9. Dosi, G., Fagiolo, G., and Roventini, A., Schumpeter meeting Keynes: a policy-friendly model of endogenous growth and business cycles, *J. Econ. Dyn. Control,* 2010, vol. 34, no. 9, pp. 1748–1767.

10. Krugman, P.R., *Geography and Trade,* Cambridge, MA: MIT Press, 1991.

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