# INNOVATION DEVELOPMENT

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# Identification of directions and ways to transform the scientific and innovation space in different regions

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**Abstract.** The article proposes an approach to the definition of the directions of transformation of scientific and innovation space, and ways of its development from the viewpoint of improving the interaction between different regions, expansion of the involvement of regions in the research and innovation process for ensuring greater dissemination of research findings and innovation. The research is conducted in the context of the necessity to expand the role of science in the post-industrial era. This approach is based on the author's methodology of selecting different regions by assessing their innovation development. The methodology consists in making the statistical distribution of Russian regions by selected indicators, identifying groups of regions that are close to each other by the degree of innovation development, on the basis of the standard deviation, and establishing the link between the identified groups of regions that reflects the possibility of interaction between the groups of regions on creating scientific results and their promotion in the spatial dimension. The author analyzes directions and ways of implementation of polarization of scientific and innovation space, development of scientific-innovation activity in the regions, also in the regions with similar competitive advantages, ways of participation of a larger number of medium-sized and small towns in the scientific and innovation activities, integration of the regions' activities seeking to increase the degree of innovation development and so on. The author identified a number of opportunities for the improvement of organization of scientific and innovation space by specifying the possible links of the groups of regions between the stages of the research and innovation process, comparison of the regions, included into one group, which gives a real opportunity to shape the innovation strategy in the regions.

**Key words:** transformation, research and innovation space, extent and ways of innovation development, regions.

The problem to boost innovation development of the country and its regions is aggravating due to the increased role of science in the post-industrial era. The economy has begun to transfer to a new type of economic growth – an innovation type of development.

However, in this country in the last 10 years the inertial scenario to develop science and technology was implemented but has not brought any fundamental changes in the dynamics of technological and innovation development [13, p. 110, 150-151; 18, pp. 38-39, 76-77].

In our opinion, implementation of all types of innovation strategies (a breakthrough by a number of principally new technology, technological borrowing (a catch-up), re-industrialization) is hindered by weak – not wide and slow – spread of research results and innovations. Moreover, the role of regions with small innovative entrepreneurship can become significant, as one of their key tasks is the adaptation of innovation to a wide range of consumers and local markets. The results are distributed vertically – from academic to small innovative organizations and corporate science, as well as horizontally – in the spatial dimension.

Thus, one of the main possibilities to increase regional innovation development in the post-industrial era is spread of research results, their transfer, adaptation to them, thus, *involvement of the maximum number of regions in innovation, expanding the space of innovation development as a form of its transformation, research and innovation space (RIS).*

Research and innovation space is a territory perceived as an arena of actions, where entities of the scientific-innovation sphere are distributed, they interact within the existing ties in conditions of world economy globalization, organizational and institutional environment to conduct the research and innovation process. The space extension becomes more effective when the regions are encouraged to implement innovations, the institutional environment is changed more intensively, socio-economic development is changed positively (economic diversification, clustering, entrepreneurship growth), inequalities in the development of regions are addressed and the scale of the country's economy is extended.

Thus, the development of scientific research potential and promotion of its results can be influenced by a spatial factor, a factor forming research and innovation space that differs a lot in the regions. There are such basic trends in RIS development as significant inequality in spatial distribution of innovation potential [20, p. 82-85, 106-111, 174-175], a low degree of connection of research and innovation space of the country and its regions [3], formation of the territories of innovation development [9]. Besides, many regions do not implement innovation.

This curvature of research and innovation space, a heterogeneous structure, disparity in the elements of regional innovation systems lead to the weakening of interaction between regions while generating and developing new technology and adapting innovation create serious

obstacles for the spread of results of science and innovation, i.e. prevent an increase in the degree of innovation development, especially in non-innovation regions.

Transformation of RIS includes both intensive and extensive changes, i.e. both bettering the research-innovation process (research-innovation activities) and increasing the scale of this process (amount of research-innovation activity). So, one can speak about development or expansion of research and innovation space, respectively. As there is no development or expansion in pure form that is why these terms can be accepted as synonyms.

One of the major problems of RIS transformation is to establish cooperation between regions different in the degree of innovation development. This statement corresponds with theoretical foundations of Academician P.A. Minakir claiming "...that the national economic space is fundamentally heterogeneous, but consists of a set of economic agents, homogeneous in institutional and economic aspects" [12]. Academician A.I. Tatarkin draws attention to the possibility of innovation development not only of large cities, but also of agglomerations – outskirts of border areas, deep-laid areas and small towns as participants of cluster projects, rural areas on the basis of the economy diversification [21].

**The significant regional diversity sets a task to develop a methodological tool that identifies the space for innovation development of regions of different types and the approach to determine the ways of implementing the directions of RIS transformation.**

*The proposed approach to assess the capabilities of territorial development of the potential of science and innovation presupposes identification of the thresholds that reflect the current degree of the regional innovation development. Besides, it establishes interaction between the relevant groups of regions, reflecting the possibility of their cooperation in science and innovation.* A set of thresholds characterizes a consistently different, increasing degree of innovation development [6] *(fig. 1)*.

Groups of regions differ according to the degree of innovation development. At the same time, the author applies a diverse approach to the selection of groups of regions with significantly different competitive advantages to produce new products. They can create, transfer, adapt, distribute and use them.

This method to select regions on the basis of regional competitive advantages is crucial in determining the extent of innovation development. In our opinion, in a broader sense there is no competition between regions with different competitive advantages; the regions compete in the framework of a certain type regions. It is incorrect to apply the same criteria to all groups of regions.

Identification of directions and ways of RIS transformation is based on the author's significantly improved methods to assess innovation development of the regions[1,2].

[1] Approbation of methodological approaches by a different algorithm and other indicators are given in [8].

[2] The research –method development, indicators justification, calculations, results interpretation, was carried out with the help of postgraduate of IPRE RAS O.A. Burkatskaya.

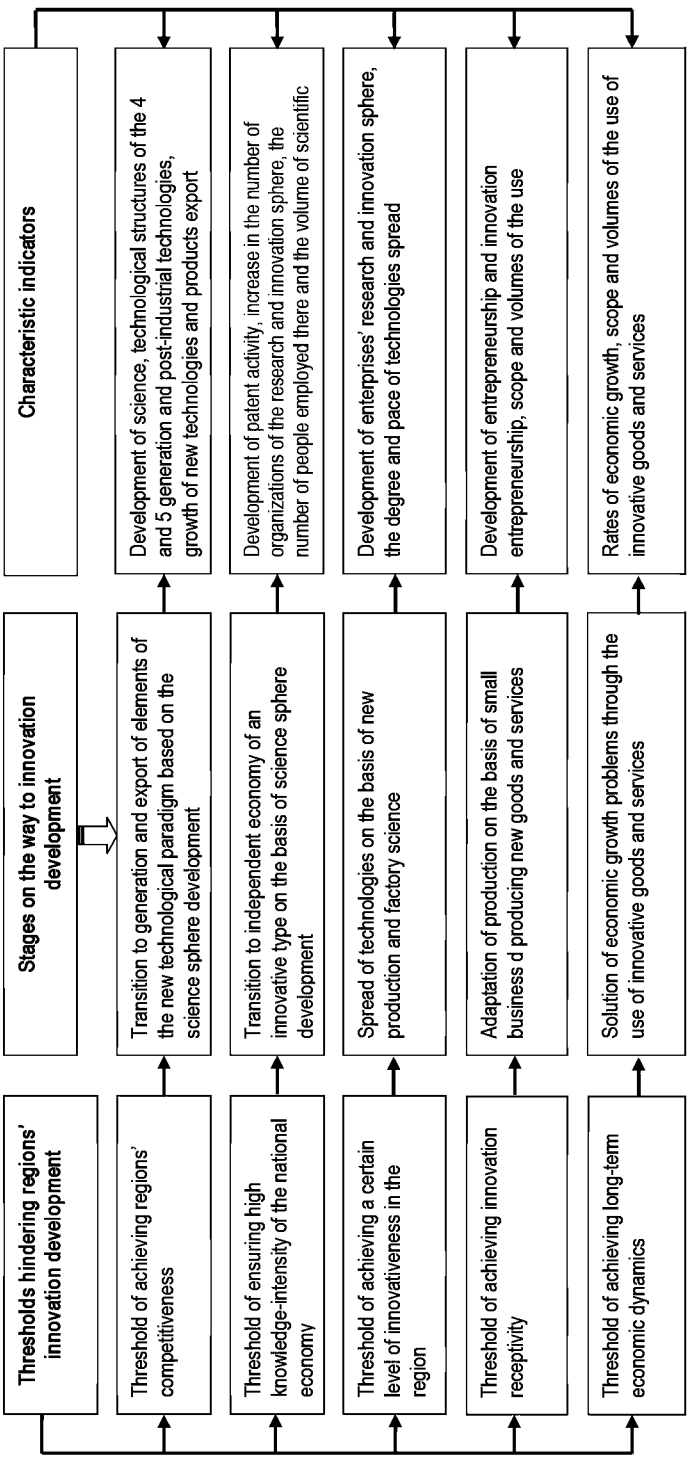


Figure 1. Thresholds hindering regions' innovation development, stages and characteristic indicators

The method is to reveal the statistical distribution of Russian regions (83 regions) by selected indicators (the fragment of initial data is provided in *table*), to single out the group of regions, similar in the degree of innovation development, on the basis of the standard deviation indicator and the link between identified groups of regions, reflecting their interaction in the scientific sphere.

Taking into account the diverse approach, the calculation is carried out on the basis of indicators, different for each threshold. We also apply the indicator characterizing the most innovatively developed regions, and distinguish regions by the maximum value that exceeds the standard deviation ("sigma" σ). Then we use the indicator disclosing the next threshold of innovation development, etc.

The "soft" variant of the algorithm is applied. It proposes to exclude the regions of a higher degree of innovation development from each subsequent group of regions, belonging to different thresholds of innovation development, only after calculations when the groups of regions are being selected. Calculations on the basis of a more "hard" algorithm (with the exclusion of groups of regions in the first stage, conducting further calculation without this group of regions) do not take into account the presence of the aggregate functions sequence (stages), characteristic of regions with a higher degree of innovation development.

The calculated statistical distribution is presented in *figure 2* (selected by one indicator from each of the threshold).

Distribution confirms the probabilistic nature of the indicators values by regions of the Russian Federation.

The proposed approach requires further study of algorithms to single out groups of regions and to select indicators because different statistical indicators often take into account different groups of regional industries (manufacturing, mining, high-tech), not comparable by the type of innovation activity and innovation products that significantly affects the extent of their innovation development within the same group of regions. For example, the coefficient of production renewal in the extractive industries due to change in equipment reflects the stage of renovation and technological expansion and is less than in machine-building branches, and hence in the respective regions.

Then we identify the link between the selected groups of regions, reflecting the possibility of their interaction in the scientific sphere *(fig. 3)*. It should be noted that the identified groups of regions do not differ significantly from the typology, justified by other methodological approaches.

The study of RIS management issues, domestic and foreign experience of regional innovation development, spread of fundamental science (both by the stages of the research and innovation process and from the Federal to regional level) gives an opportunity to single out summarized directions of RIS transformation.

Taking into account the analysis of the extent and potential of regional innovative development, we define the directions

Table 1. Statistics data on the thresholds hindering innovative development of Russian regions (fragment)

| Federal district, region | Indicators | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Threshold of achieving long-term economic dynamics | | Threshold of achieving innovation receptivity | | Threshold of achieving a certain level of innovativeness in the region | | Threshold of ensuring high knowledge-intensity of the national economy | | Threshold of achieving regions' competitiveness in the context of globalization | |
| | 2010 | | 2011 | | 2010 | | 2010 | | 2010 | |
| | GRP per one employed in the regional economy, thousand rubles per person | Ratio of GRP to the cost of fixed assets, % | Share of small enterprises, implementing technological innovations, %* | Share of innovative products, works, services in the total volume of shipped goods, performed works and services of small enterprises, %* | Efficiency of R&D results commer-cialization, % | Average specific output of innovative enterprises,% | Number of enterprises carrying out scientific researches, units* | Number of patents issued by Rospatent per 1 million people, units*** | Export of technologies and services of a technological nature, number of agreements, units** | Export of innovative products, works, services, %**** |
| *Central* | 722.07 | 0.44 | 5.00 | 1.46 | 1.01 | 0.50 | 1358 | 285.7 | 659 | 3.9 |
| Belgorod Oblast | 574.42 | 0.59 | 5.36 | 0.98 | 10.53 | 0.24 | 16 | 60.7 | - | 0.7 |
| .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| *Northwestern* | 582.90 | 0.43 | 5.93 | 0.88 | 1.70 | 0.44 | 502 | 121.5 | 489 | 2.4 |
| Republic of Karelia | 357.92 | 0.31 | 5.50 | 0.48 | 1.86 | 0.19 | 16 | 23.3 | 1 | 2.4 |
| .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| *Southern* | 382.42 | 0.41 | 4.04 | 0.96 | 6.64 | 0.87 | 231 | 97.6 | 78 | 1.8 |
| Republic of Adygea.... | 309.68 | 0.43 | 8.59 | 0.09 | 17.81 | 0.90 | 6 | 15.9 | - | 15.3 |
| .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| *North Caucasian* | 269.06 | 0.38 | 3.45 | 0.74 | 10.49 | 1.38 | 92 | 63.6 | 3 | 35.4 |
| Republic of Dagestan | 289.10 | 0.39 | - | - | 2.29 | 0.88 | 29 | 81.3 | - | 0.3 |

Sources: *Ofitsial'naya statistika: Natsional'nye scheta. Nauka, innovatsii i informatsionnoe obshchestvo. Nauka i innovatsii [Official Statistics: National Accounts. Science, Innovation and Information Society. Science and Innovations]. Rosstat. Available at: http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/science_and_innovations/science/#

** Regiony Rossii. Sotsial'no-ekonomicheskie pokazateli 2011: stat. sb. [Russian Regions. The 2011 Socio-Economic Indicators: Statistics Digest]. Rosstat, Moscow, 2011, pp.220-222.

*** Monitoring razvitiya informatsionnogo obshchestva v Rossiiskoi Federatsii. Tabl. 1.2.20. Chislo patentov na izobreteniya, vydannykh Rospatentom rossiiskim zayavitelyam, v raschete na 1 mln. chelovek naseleniya [Monitoring of Information Society Development in the Russian Federation. Table 1.2.20. Number of Patents Issued by the Rospatent to the Russian Applicants per 1 Million People]. Rosstat. Available at: http://www.gks.ru/free_doc/new_site/business/it/monitor_rf.xls

**** Indikatory innovatsionnoi deyatel'nosti: 2012: stat. sb. Tabl. 6.4. Eksport tovarov, rabot, uslug [Indicators of Innovation Activity: 2012: Statistics Digest. Table. 6.4. Export of Goods, Works, Services]. Pp. 353-360. Available at: http://www.hse.ru/primarydata/ii2012

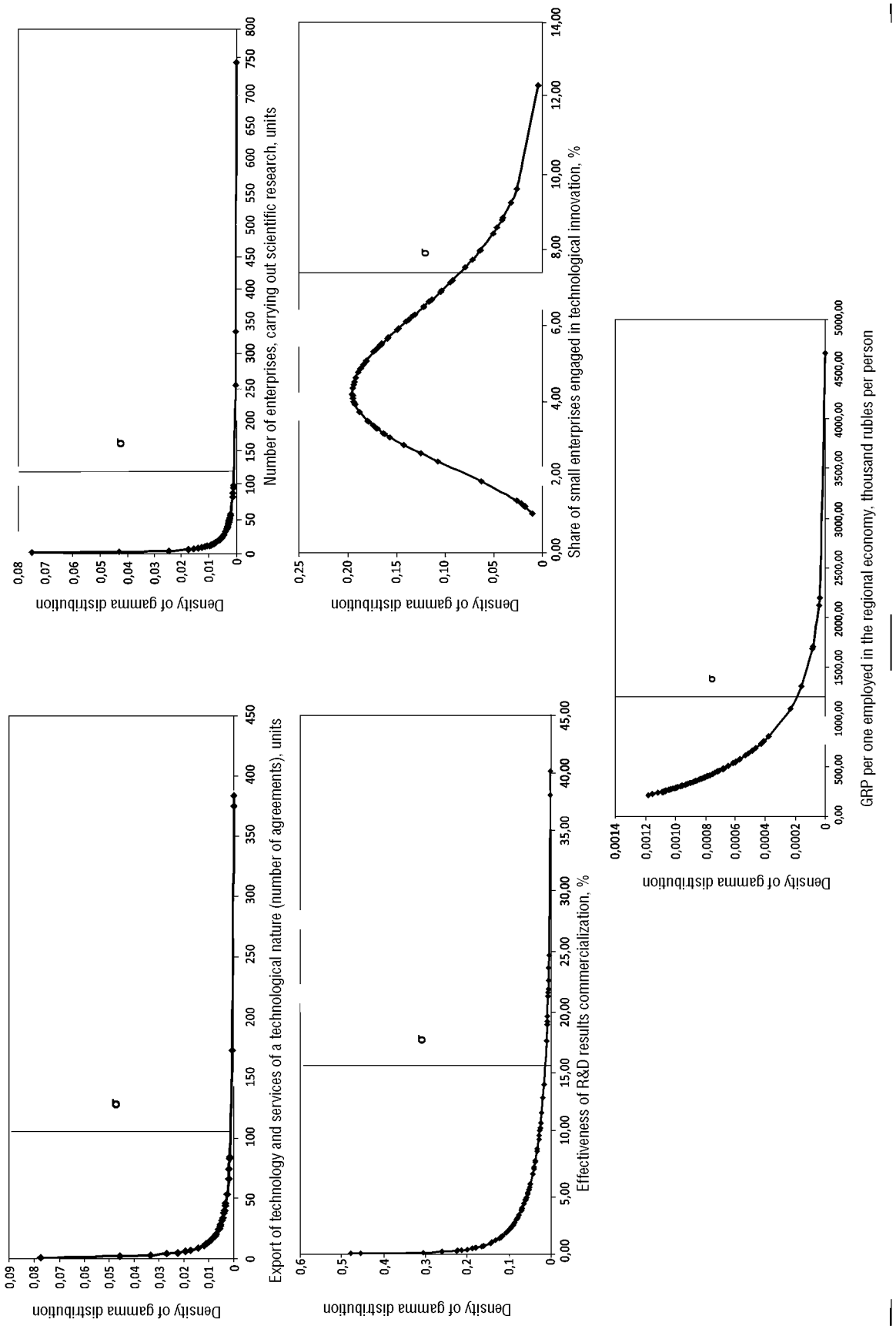


Figure 2. Statistical distribution of regions by the thresholds hindering innovation development

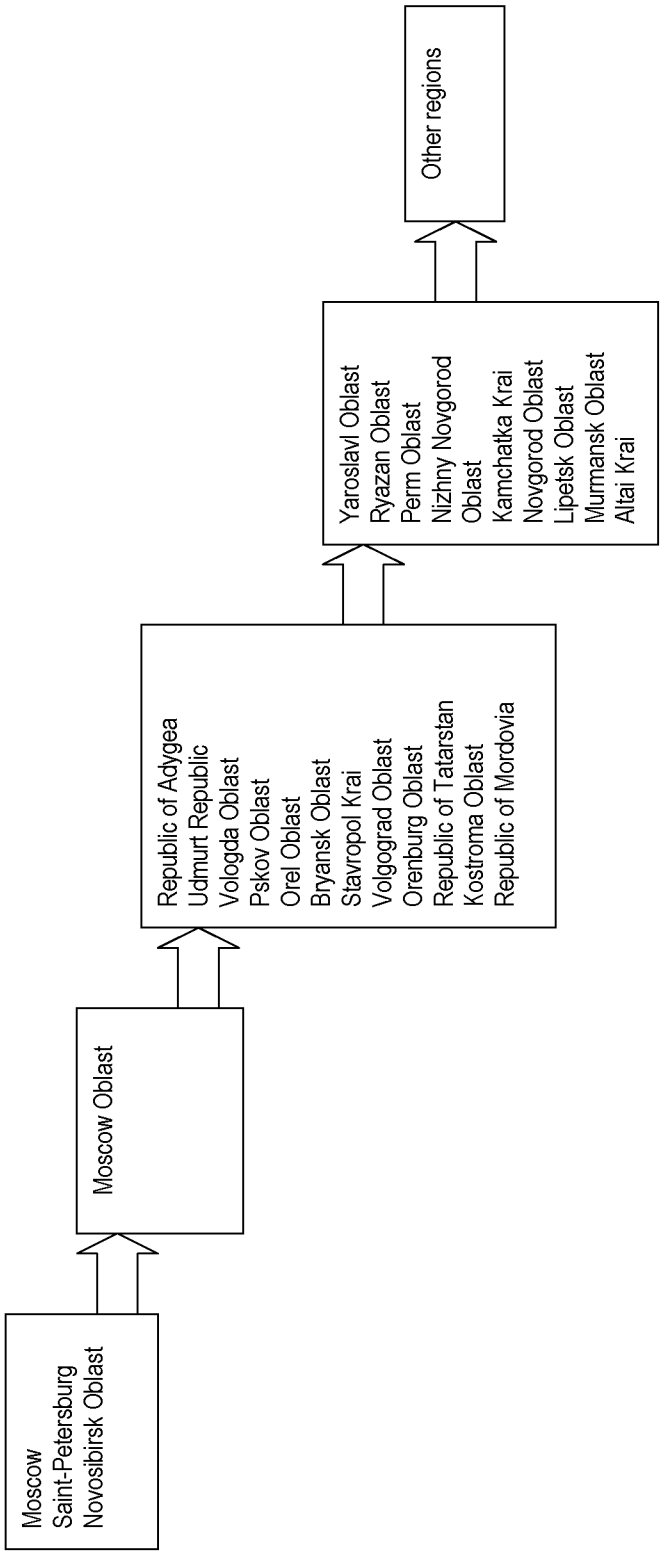


Figure 3. Interaction of groups of regions to create potential of scientific results and promote them in the spatial dimension

(forms, methods, tools) to implement RIS transformation within the identified areas.

While calculating we use a number of indicators. As a result we choose a five of indicators out of the three fives for five thresholds. The selection of indicators is carried out on the basis of a more objective threshold and a stage of the research and innovation process: fundamental research – applied research work – development of new production – innovation and spread of technology – application of innovation. The calculations reveal that the number of statistical indicators does not meet their direct and unambiguous purpose. For example, the indicator "innovation activity of enterprises" (the share of enterprises implementing technological, management and marketing innovation)" is, in fact, eclectic, reflecting, on the one hand, innovations and their spread, and on the other, application and spread of new products (marketing). The latter prevails in reporting, thus greatly distorting the essence and uniqueness of innovation activity and does not reflect a real state of innovation activity of the region.

What is more, the use of indicators of the enterprises' innovation level distort the assessment of the degree of regional innovation development, as the calculations depend on the number of enterprises in the region (a small number of enterprises presupposes a higher threshold) and the size (a great number, a small size and substantial research intensity also presuppose a higher threshold). At the same time, in some regions there is no correspondence between the share of innovation-active enterprises and the share of innovation products due to different innovation output. For example, you can mark a reduced return in regions of the Northwestern Federal District such as the Arkhangelsk, Leningrad, Murmansk and Pskov oblasts and the Republic of Karelia. There are other distortions. For instance, the indicator "effectiveness of R&D results commercialization" in the Lipetsk Oblast amounts to 473%, in Yamalo-Nenets Autonomous Okrug – 1201%. This indicator is calculated as the ratio of "the amount of shipped innovation products, works, services" to "internal costs of research and development". The "incorrect" indicator value is caused due to a small size of domestic expenditure on R&D compared to the relatively high value of the numerator of the given ratio.

Therefore, such regions were separated from the group.

The groups of regions, identified by the degree of innovation development, confirm the above mentioned trends of the research and innovation space configuration, primarily, of its polarization.

The directions and ways to realize the polarization are quite obvious and marked in literature:

– **increased knowledge-intensity of the territories** and the share of high-tech innovation of post-industrial economy in the regions on the basis of development and creation of new centers of innovation economy, including those on the basis of large federal research centers and research universities, science cities, research centers corporations, construction of major city objects on the basis of mega-projects;

– **formation of the "poles" of research and innovation potential in the country**, growth of the territories' more close location to the centers of science and technology and activation of the RIS "curvature", including on the basis of development of agglomerations and large cities and the synergy process.

The comparison of the regions belonging to the same group of the highest degree of innovation development shows that some regions are observed in other groups as they solve tasks of other stages on the way to innovation type of development. Thus, the cities of Moscow and Saint Petersburg are still in the group with the high level of indicator "a number of enterprises carrying out scientific research". It is a threshold ensuring high research intensity of the national economy. Moreover, Moscow has a high rate of the indicator "GRP per one employed in the economy of the region", related to the characteristics of the threshold to achieve long-term economic dynamics, while Saint Petersburg has a "high share of small enterprises engaged in technological innovation", an indicator relevant to the characteristics of the threshold of achieving innovativeness. As practice shows [16], for such regions it can be considered as perceived reserves, which can be implemented to expand interregional cooperation between traditional research centers and regions-R&D consumers, to create programs to support small and medium business, to organize educational programs and to back small enterprises affiliated with universities and enterprises affiliated with business incubators.

The analysis shows that such reserves are characteristic of a number of regions.

Another direction of transformation can be **development of research and innovation activity in the regions through involvement of a greater number of regions** in it that are not so actively promoted and developed. Meanwhile, the RIS potential expansion is significant, as there are several such regions.

Firstly, a greater number of regions can be involved in research and innovation activity on the basis of their innovation modernization, including on the basis of new regions [15, p. 17-24], by means of updating industry of regions and cities that have raw-material orientation.

The study also reveals similar reserves, taking into account regions of new development that are differentiated in several groups (till their exclusion): the Vologda and Kostroma oblasts belong to a group of regions characterized by the indicator "efficiency of commercialization of R&D results"; Kamchatka Krai and the Murmansk Oblast are in a group of regions characterized by the indicator "a share of small enterprises engaged in technological innovation"; the Sakhalin Oblast and Yamalo-Nenets Autonomous Okrug – by the indicator " GRP per one employed in the economy of the region".

The graphs of calculation of the degree of regional innovation development show that the RIS expansion in this direction can be based on the regions with prevalence of engineering industries (e.g., the Novosibirsk Oblast), chemical-technological industries (the Perm Oblast),

agricultural regions with dense rural population (the Volga Oblast), single-industry and old-industry regions, because, apparently, the transformation processes are more actively manifested in commodity regions where corporations' innovation potential is growing intensively [4, p. 19-21].

There are two ways to encourage research and innovation activity. One way is based on the region's systemic action to implement the innovation development strategy and involve key players in the innovation development of the territory. Krasnoyarsk Krai, Kaluga and Chelyabinsk oblasts, making comprehensive efforts, are included in the innovation top ten in the ranking [16, 17].

Another way is to form the poles of innovation development in a city and region – clusters, universities and research and education centers, and to manage and promote innovation activity – to develop maps of distribution of creative human capital, to project an intelligent city on the basis of wide use of breakthrough information technology in the sphere of services and management [22].

Brighter possibilities are revealed when the regions are singled out by the multi-structural indicator.

Therefore, to achieve more comprehensive results it is necessary to unite the regions in groups by more or less similar competitive advantages, expanding the economic profile and range of production specialization in the group of regions: science-intensive (old and new research, educational and innovation centers); old- industry (centers of mechanical engineering, chemical industries, etc., agricultural); regions of new development (raw materials, a fuel and energy complex); border (including Northern, port).

This analysis takes into account sectoral differences of groups of regions, differences in the nature of scientific research (fundamental or applied, having different return) and therefore differentiates groups of regions by the innovation development type more objectively.

The border regions that differ significantly are analyzed in the article. The Novosibirsk Oblast has the highest value of the indicator "export of technology and services of a technological nature" and, accordingly, is referred to the group of regions with the highest level of innovation development. Having approximately equal scientific potential, the Pskov, Bryansk, Volgograd and Orenburg oblasts belong to the group with a high value of the indicator "efficiency of commercialization of R&D results"; the Murmansk Oblast and Altai Krai refer to the group "a share of small enterprises engaged in technological innovation". Such variations are due to dominating indicators that refer regions to one or another level by the degree of their innovation development. Besides, as practice shows [16, 17], certain regions do not have other components of potential, affecting the degree of innovation development, such as education, management, spatial development (in the sense of a lack of integration with other regions). This gives some reserves for innovation development and ways for its realization.

Secondly, more regions can be involved in research and innovation activity on the basis of territorial development of medium and small towns that have certain abilities for innovation development or potential for their formation, such as national scientific and cultural phenomena, in particular, phenomena of innovation development, including those in the field of social sciences. In this case the potential of regional development can be based primarily on self-management and entrepreneurship. What is more, research and innovation space in the aspect of post-industrial production can have a new vector in the development of intellectual services based on cognitive technologies. The creative process is important as it is a factor of potential development to create a regional innovation system in the regions where "...there is no innovation activity yet" [19, p. 56].

Middle and small cities, located primarily around agglomerations, can support innovation development of high levels. We consider transformation of provincial "megapolises" from "centers of industry" into "centers of trade and services" (the feature of innovation development is the foundation of 50 new cities and towns) [2]. Besides, the potential of innovation entrepreneurship can be used to produce various kinds of services – from science-based resource service and scientific entrepreneurship at universities and science cities to agro-industrial and single-industry provincial regions [19, p. 56-59].

The development of specific museums, traditional interesting crafts, and intellectual services for different social strata segments of the population leads to different management of urban space [5]. The examples are the following: Kasli in the Chelyabinsk Oblast, Myshkin in the Yaroslavl Oblast, Plyos in the Ivanovo Oblast, Kolomna in the Moscow Oblast, etc. For instance, Kolomna had become economically insufficient, but entrepreneurs organized a museum factory "Kolomna Pastila Museum" and then opened a travel agency, hotels, which created work places for the population [14].

One of the directions of research and innovation policy to involve small and medium cities in the innovation activity could be the inclusion of less innovative regions in the activity of more innovative ones on the basis of economy clustering [21, p. 102-107]. More innovative region "absorbs" non-innovative or less innovative, one thus encouraging entrepre-neurship.

The RIS curvature also stems from distortion of its structure – incompleteness of regional innovation systems and a lack of connection between them. Hence, it is necessary to develop a direction of transformation, such as the **interconnection of regions' activity in order to increase the degree of innovation development** due to integration of research and innovation activity of regions and construction of the national innovation system structure in the country and its regions in all phases of the research and innovation process.

Practice shows that the regions' greater interaction in the research and innovation sphere is based on the development of horizontal, radial and vertical relations of its

subjects in different regions, establishment of different forms of cooperation, combining elements of scientific-innovative potential and components of regional innovation systems, concentration of research and innovation resources, creating common structures and industries, especially in the sphere of high technology, organization of innovation development poles in the region and the city and activation of key subjects of innovative development.

The interregional project "Caucasian Silicon Valley" is a positive vivid example of interconnecting. It is aimed to create a series of industries associated with alternative energy (it is planned to spend more than 32 billion rubles) [16], such as production of polycrystalline silicon (Stavropol Krai), monocrystalline silicon (the Kabardino-Balkar Republic), multicrystalline silicon (the Karachay–Cherkess Republic), photoelectric converter (the Republic of North Ossetia), solar modules (Dagestan).

The forms of interactions that are actively used are the following: research and innovation clusters, technology platforms, federal and regional scientific and technological programs. However, for example, regions and cities that have enterprises, forming the core of the network structures of the development of critical technologies "Biomedicine" (one of the consortiums of scientific-technological platform "Living systems"), mainly belong to the high-tech group of regions, and only 10% of enterprises operate in the regions of the moderate degree of innovation development [10, p. 58-61].

Opportunities to consolidate the regions' efforts under the programs are also limited, because the profile of regional industry differs essentially, so they participate in various programs.

Apparently, technology platforms and scientific-innovative programs have not become an active factor to form research and innovation space of the regions yet; the spatial factor is based on the existing structure, does it not transform it and not realize the network principle to manage the research and innovation process.

Along with comprehensive directions of RIS transformation we can formulate the following directions, characterizing the separate sides of the development of research and innovation space, separate components and structures of the scientific and technical potential, stages of the research and innovation process.

**1. Purposeful and active use of competitive advantages of the region** – a developed base of energy; highly qualified personnel – scientists, designers, planners, engineers, workers; high investment potential; a powerful and comprehensive infrastructure in the industrial production (energy, transport, information, financial infrastructure); a high level of concentration of scientific and technological potential (academic, industry, university, factory sciences); the presence of a significant number of high-tech industries.

For example, the Chechen Republic is a region with the excess working population; its territory can be used for various types of business. Tourism can become a competitive advantage of the republic. By the way,

the term "excess working" population seems to be wrong in principle. They are people who are temporarily unemployed. Another example is the availability of local natural competitive advantages of raw export-oriented regions (the Tyumen and Kemerovo oblasts).

**2. Improving the quality of human potential** as the main factor promoting innovation development in the regions with low scientific and technological potential, primarily due to the improvement of the education system [1].

**3. Integration of scientific and educational organizations in the country in order to form the system of their competitive cooperation** – universities and institutes of higher education affiliated with science cities and academic institutes affiliated with universities [7].

A number of science cities have educational institutions, for example, Dubna in the Moscow Oblast, Michurinsk in the Tambov Oblast, Obninsk in the Kaluga Oblast, Peterhof in Saint-Petersburg, and many cities preparing highly-qualified personnel in close contact with the leading universities of the Russian Federation [11, p. 22, 33, 35, 38].

Thus, directions and ways of transformation of research and innovation space in relation to different regions are identified on the basis of selection of thresholds of the territorial development of potential of science and innovation and a new justified methodological approach and methodological tools to analyze and measure the degree of regional innovation development.

Among the proposed directions of transformation we have analyzed those that are not actively being developed and promoted. These include:

- involving a larger number of regions in scientific-innovation activity; it is shown that the potential expansion of research and innovation space is significant, as a significant number of such regions have carried out innovative modernization; including those that have upgraded industry;

- development of the territories of medium and small towns that have certain abilities of innovation development or potential for their formation, such as national scientific and cultural phenomena, in particular phenomena of innovation development, including those in the field of social sciences, based on self-management and entrepreneurship;

– more innovative region's "absorption" of non-innovative or less innovative ones on the basis of economy clustering;

– purposeful and active use of competitive advantages of the region;

– integration of scientific and educational organizations in order to form the system of their competitive cooperation.

The developed methodological tool to analyze the degree of innovation development of different regions has revealed a number of new reserves for transformation of research and innovation space, such as:

• specification of possible links of groups of regions between stages of the research and innovation process, comparison of the regions included in one group,

but with different potentials for innovative development by any characteristic – generation of innovations, technologies transfer, etc.;

• some regions of a higher degree of innovation development have high rates related to the subsequent thresholds;

• some regions that have similar competitive advantages have different potentials – generation of innovations, transformation, adaptation, etc., thus belonging to different groups of regions by the level of innovation development;

• some regions that have similar competitive advantages and the same scientific potential belong to different groups of regions by the level of innovation development.

Identification of the reserves of transformation of research and innovation space helps find concrete ways to implement the directions of transformation in relation to different regions, to develop strategies and scientific-innovative policy of the regions, taking into account regions with different competitive advantages.

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