Evaluation of the Innovation Code of Economic Development of Russia and Its Partner Countries

Myslyakova Yu.
Ural State University of Economics, 620144, 8 Marta street,
62, Yekaterinburg, Russia,
IE UB RAS, 620014, Moscow street, 29,
Yekaterinburg, Russia
e-mail: jul_jul@inbox.ru

Zakharova V.
IE UB RAS, 620014, Moscow street, 29,
Yekaterinburg, Russia

Abstract—**The transition to a new level of the country's innovative development cannot be achieved without singling out its "invariant core", which determines the code "genotype", the predisposition of the territory to innovative processes of a certain level of complexity and type. The scientific result of the presented research is the development of a new code approach to the interpretation of existing knowledge about the innovation development of Russia and its partner countries, synthesizing elements of classical and evolutionary approaches for ensuring innovative growth of the country's economy, as well as elements of genetic engineering. The result of applying this methodology is the definition of the innovation code of Russia's economic development in a comparative aspect through rating. After the analysis of the each indicator, it can be possible to understand what measures can be found to improve the innovation development of Russia and to help partner countries to improve their innovation development.**

Keywords—innovative code of development, code approach, scientific and technological partnership.

I. ACTUALITY AND BASIC ISSUE

It is generally accepted that the positioning of the state in the world economic system is largely determined by the development of new knowledge and innovative products, efficiency of research and innovation activities. The globalization processes based on the innovation processes acceleration have increased the share of innovation in the global gross domestic product and increased the importance in the global technological development. A knowledge-based economy, which growth key factor based on the high-level of science and technology, becomes the source of national welfare.

Numerous works have been devoted to the issue of ensuring regional innovative development. It is possible to identify various theoretical and methodological approaches. The most well-known in the scientific literature approaches can be listed as follows: approaches to the formation of growth poles; approaches to ensuring structural and innovative regional development and approaches to identifying hidden sources of "new" growth. Despite the substantial differences, the general approach is to study the static and dynamic processes occurring in the particular territory at particular time. At the same time, previous studies have not formed a universal effective scheme of solutions the issues of innovative development of the economy. Therefore, we make a hypothesis that when examine the issue of innovative development of regions, first of all it is

necessary to start from the analyze of the business and economic past of the territories; their specifics and traditions of doing business; culture and values of civil society. Without this data it is impossible to design and model a "new" future. Akso it is impossible to make the transition to the new level of innovative development without identification the "invariant core" [2], representing the socio-economic context of the studied territory, and which determines its "genotype" [3] as a predisposition to innovation processes of certain type and level of complexity. In this work, we sought to develop the identification of innovative codes of Russia and its partner countries, which allows us making the comparative analysis for future improvement of the positions in terms of scientific and technological integration with other partner countries.

II. ANALYSIS AND APPLICATION OF METHODS FOR ASSESSING THE INNOVATIVE DEVELOPMENT OF THE COUNTRY'S ECONOMY

The relevance to develop a new methodology for assessing Russia's innovative development is supported by the fact that the Strategy for Scientific and Technological Development of the Russian Federation, approved in December 2016 by Presidential Decree and establishes the principles, priorities, main directions and measures for implementation of the state policy in this area, among the necessary measures mentioned transition to modern models of statistical observation, analysis and evaluation of economic and social efficiency of research and innovation activities.

A. Analysis of Existing Methods for Assessing the Innovative Development of the Economies of Different Countries

This section provides a brief overview of analytical annual reports, where the analysis is based on composite indices and consists a number of indicators selected depending on goals and objectives of the study. The key indices of innovative development can be listed as follows: Global Innovation Index (GII), Networked Readiness Index (NRI), Knowledge Economy Index (KEI), and Global Competitiveness Index (GCI). Moreover, we should mention Rating of Innovative Development of the Subjects of the Russian Federation, made by Institute for Statistical Studies and Economics of Knowledge National Research University Higher School of Economics (Russia).

One major drawback of foreign analytical reports is the usage of indicators that are not always present in Russian sta-

tistics, which reduces the information transparency of calculations and forces researchers to use other indicators, often changing the semantic logic of calculations. As a result, all foreign methods need to be competently adapted to the Russian research conditions. Whereas the obvious advantages of the Russian methodology is the complexity of the indicators that characterize the socio-economic conditions of innovation, the scientific and technical potential, the level of innovation activity, the quality of the regional innovation policy, but only at the level of the subjects of the Russian Federation.

B. Statement of Need to Develop an Evaluation Methodology Based on the Global Innovation Index 2017-2018

To develop an author's methodology for evaluating the innovation code of Russia's economic development, Russian place in the global innovation system was found out (see Table 1).

TABLE I.   DYNAMICS OF RUSSIAN RATINGS IN TERMS OF ITS INNOVATIVE DEVELOPMENT 2007-2018

Year	2007	2009	2010	2011	2012
Total	107	130	132	125	141
Russia	54	68	64	56	51
2013	2014	2015	2016	2017	2018
142	143	141	128	127	126
62	49	49	43	45	46

Also before employing an author's methodology, it is necessary to check using the regression analysis the assumption that country's positioning in the rating is in a linear positive dependence just on the volume of investment in research and development.

In the regression analysis of dependence the Global Innovation Index, calculated in 2017 for 127 countries, from the gross expenditure on R&D (% GDP), the resulting regression equation is as follows:

$$y = 10.36x + 28{,}77 \qquad (1)$$

The coefficient 10.36 shows that if the gross expenditure on R&D is increased in one country by one unit (one percent of GDP), the value of Global Innovation Index of this country grows by 10.36 units. However, from the graph below, see Fig. 1, it can be seen that the linear dependence is characteristic only for R&D expenditures in the range from zero to one percent. Out of this range, the dependence is non-linear, indicating that the change in the level of innovation development in the country has tendency to proportional grow only until the level of investment in R&D is below one percent of GDP. It appears that the gross expenditure R&D (% GDP) is not the only causative factor of innovative development.

The dashed line indicates the regression line calculated for countries whose R&D expenditures are less than one percent of GDP and further extrapolated to 5% of GDP (the highest R&D expenditures in the Republic of Korea reached 4.3 in 2017 %).

The above graph clearly demonstrates the effect of "saturation", in which the increment value of the global innovation index at the level of R&D expenditure of more than 2% of GDP is far behind the line.

The application of the method of calculation of the Global Innovation Index-2018 made it possible to actualize the need to develop an authoritative evaluation technique that excludes subjectivism due to the expert's personal context and ensures the operative reproducibility of indexing results.
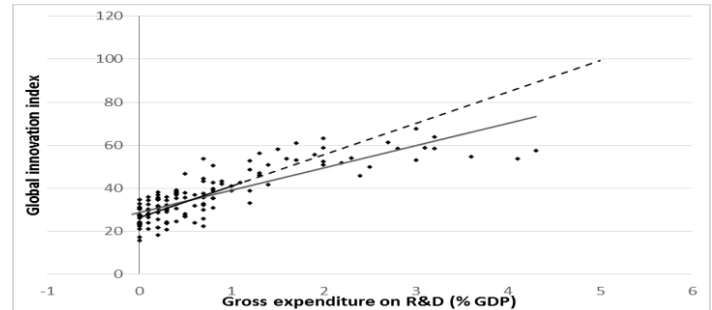

Fig. 1. Dependence the value of Global Innovation Index from the gross expenditure R&D (% GDP).

III. METHODOLOGICAL APPROACH TO THE EVALUATION OF THE INNOVATION CODE OF ECONOMIC DEVELOPMENT OF RUSSIA AND ITS PARTNER COUNTRIES

Our methodology is based on the innovative code of economic development of the territory. The index of the innovative code of economic development (IICED) is calculated on the basis of eleven selected indicators GII 2018, which have analogues among the target indicators in the Strategy for Innovative Development of the Russian Federation for the period up to 2020:

I1 Expenditure on education (%GDP),

I2 Tertiary enrolment (% gross),

I3 Gross expenditure on R&D (%GDP),

I4 QS university ranking (average score top 3),

I5 ICT access,

I6 Patent families 2+ offices/bn PPP$ GDP,

I7 High-tech net imports (% total trade),

I8 Patents by origin/bn PPP$ GDP,

I9 Scientific & technical articles/bn PPP$ GDP,

I10 Citable documents H index

I11 High-tech net exports (% total trade).

The use of the selected indicators is caused by the need to discuss innovations at the international level in order to identify the world's best practices, and IICED allows for an ongoing assessment of the factors affecting innovation. IICED was calculated for countries of The Eurasian Economic Union (EEU) and potential partners (China, India, Pakistan, Iran) as the sum of the values of the indicators for each country, translated into a ten-point scale. The result of applying this methodology is the definition of the innovation code of Russia's economic devel-

opment in a comparative aspect through rating. This technique allows identifying the limitations of Russia's innovative development and adjusting the possibilities for Russia's intercountry scientific and technological cooperation with partner countries.

IV. THE RESULTS OF THE EVALUATION OF THE INNOVATION CODE OF ECONOMIC DEVELOPMENT OF RUSSIA AND ITS PARTNER COUNTRIES

The initial data are presented in Table 2.

TABLE II.   THE INITIAL DATA FOR CALCULATION IICED

	Armenia	Belarus	China	India	Iran	Ka-zakhstan	Kyr-gyzstan	Pakistan	Russia
I1	2,8	5	4	3,8	3,4	3	6	2,8	3,8
I2	51,1	87	48,4	26,9	68,8	49,6	45,9	9,7	81,8
I3	0,2	0,5	2,1	0,6	0,3	0,1	0,1	0,2	1,1
I4	0	16,9	82,3	49,8	24,6	35,9	0	21,9	49,6
I5	65,2	78,7	55,8	36	67,4	75,5	45,4	33,4	72,3
I6	0,1	0,1	0,8	0,2	0	0,2	0,1	0	0,1
I7	5,5	5,7	24,3	9,1	4	7	8,1	11	8,1
I8	5	3,3	56,6	1,5	9,6	2,3	4,2	0,2	7
I9	25,7	5,3	11,7	5,6	17,2	1,8	3,5	8,1	7,2
I10	9,8	9,5	52,7	37,7	17	3,5	1,4	13,8	36,7
I11	0,5	2,1	28,7	3,2	0,5	5	1,9	0,8	2,3

The Ranked Results of calculating IICED are the follows:

1. China-93,87

2. Russia-52,57

3. Belarus-41,54

4. Iran-39,99

5. India-39,86

6. Armenia-36,21

7. Kazakhstan-34,03

8. Kyrgyzstan-29,14

9. Pakistan-24,25

As we can see Russia shows quite good results among the other countries, only China has better results in innovation development. After the analysis of the each indicator, it can be possible to understand how to improve the innovation development of Russia and to help countries – members of EUU and partners to improve their innovation development.

V. CONCLUSION

The scientific result is the development of a new code approach to the interpretation of existing knowledge about the innovation development of Russia and its partner countries, synthesizing elements of classical and evolutionary approaches, as well as elements of genetic engineering. The practical result is a higher degree of reliability to index estimates and the appearance of the additional capabilities of multiple calculations of possible structural innovation and economic shifts of integration interaction of a given country with other countries. The identification of innovative codes cannot be based only on estimates. It is necessary to create a macro model based on a huge amount of experimental and historical material and a careful analysis of historical trends, and the dynamics of modernization transformations, which will serve as a further direction of this research.

ACKNOWLEDGMENT

REFERENCES

[1] Zakharova V.V. Organization of innovation systems in accordance with the challenges of the global economy // Journal of Economic Theory. 2016. № 2. P. 185-189.

[2] Arthur W. B. 1988. Self-reinforcing mechanisms in economics. In: Arrow K. J., Anderson P. (eds.). The Economy As an Evolving Complex System. Santa Fe Institute Studies in the Science of Complexity. Addison-Wesley: Redwood City, CA. P.120-134.

[3] Nelson R. R., Winter S. G. 1982. An Evolutionary Theory of Economic Change. Harvard University Press: Cambridge. P.75-80.

[4] Romer P. Endogeneous Technological Change // Journal of Political Economy. – 1990. - October. - P. 71 – 102.

[5] Becker M. C. 2005b. The concept of routines: Some clarifications. Cambridge Journal of Economics 29 (2): 249–262.

[6] Coleman J.S. Social Capital in the Creation of Human Capital // American Journal of Sociology.Vol. 94 (1988). P. 95–121.

[7] David P. 1985. Clio and the economics of QWERTY. American Economic Review 75 (2): 332–337.

[8] Feldman M. S., Pentland B. T. 2003. Reconceptualizing organizational routines as a source of flexibility and change. Administrative Science Quarterly 48 (1): 94–118.

[9] Hodgson G. M., Knudsen T. 2004. The firm as an interactor: Firms as vehicles for habits and routines. Journal of Evolutionary Economics 14 (3): 281–307.

[10] Maiminas E. Socio-economic genotype of society // Bulletin of Moscow University. Ser. 6. The economy. 2016. № 4. P. 186 - 204.

[11] Kleiner G.B. System economy: in search of a common platform for economic management, management organization, development of economic theory / / Economics and management: problems, solutions, 2017, Vol. 3, No. 6, P. 6-14.

[12] Tambovtsev V.L. The concept of socio-economic genotype and modern research in the sphere of management//Russian Journal of Management. Volume 12. №2. 2014. 117-132.

[13] Orekhova E.A. Influence of characteristics and properties of economic space on territory development // Regional economy: theory and practice. 2008. №10 (67). Pp. 19-23.

[14] Auzan A.A. Sociocultural codes in economic analysis //Journal NEA, № 1 (17), 2013, p. 173-176.

[15] Inglehart R., Welzel K. Modernization, Cultural Change and Democracy: The Sequence of Human Development M.: New Publishers, 2011. - 464 p.