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Regional aspects of implementing innovations as a lever for economic growth and sustainable development in Russia

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***Abstract*—The essential condition for innovation effectiveness ensuring economic growth, increased national competitiveness and other positive changes is innovation implementation in the economic activities of particular enterprises. An innovation policy has to take into account regional aspects because regions play an increasingly important role as sources of innovation changes. The present paper considers the regional aspects of innovation implementation in the Russian federation. The authors have built and analyzed a 2015-2017 ranking of Russian federal constituent entities (regions) on the basis of two indicators: a share of organizations which carried out innovations of all types, and a share of those which implemented technological innovations as a key type of innovation enabling increased labor efficiency, improved product quality and overall economic growth. Range and relative range, variance, standard deviation, and coefficient of variation were calculated as indicators of the level of regional differentiation. The results show a high level of unevenness in innovation activities of organizations across Russian regions; for the three-year period, divergence in the enterprise-level innovation implementation across the regions grew, with a slight decrease in some of the estimated indicators occurring in 2017. Based on the findings, the authors suggest new directions for future research sheet.**

Keywords—innovation, region, Russia

I. INTRODUCTION

Innovation has been widely seen as a key driver of economic growth, particularly since the landmark studies of J.A. Schumpeter, and a crucial factor influencing contemporary economies of countries and regions. Innovation has a multi-dimensional impact on the economy encompassing economic growth, global competitiveness, sustainable development, financial systems, quality of life, infrastructural development, employment, openness to trade, and economic security. The positive relationship between innovation and economic growth, both directly and indirectly, has been confirmed by an array of studies. Only countries succeeding in innovation support and implementation are occupying top positions in the world rank lists of various competitive indexes [1-10, etc.].

The Russian economy remains heavily dependent on natural resources. Any change in the state of world affairs can jeopardize the stability of either economic or social development of the country. The resource-oriented model of the national economy is, a priori, contradictory to the paradigm of sustainable development as it leads to fast depletion of natural resources and environmental degradation and is unable to ensure decent employment for the population or stimulate the development of education, science and high technologies. For this reason, the current Russian economic model based on natural resource exports has become increasingly obsolete.

A policy shift towards innovation should improve the situation. Today, to achieve its economic growth targets, Russia must move away from redistribution of mineral resources and intensify its innovation activity, develop technology-intensive products. It is innovative development that must become a crucial factor driving economic growth of the country and its constituent entities (regions) [2, 8, 9].

In recent years, innovation promotion issues have been placed at the center of the Russian Government agenda. A few concept documents determining avenues for the nation's progress towards building an innovation-based economy have been developed and adopted such as the Concept of the Long-Term Socio-Economic Development of the Russian Federation for the Period up to 2020, the Strategy of Innovative Development of the Russian Federation for the Period up to 2020, etc.

To date, some positive results have been achieved in research and development funding, innovation infrastructure creation, regulatory and legal support provision for innovation. However, Russia is still significantly lagging behind the global largest economies on key innovative development indicators. The Global Innovation Index study [11] showed that, by the sum of indicators estimated in 2018, Russia ranks 46th out of 126 participating countries (as of 2017, Russia ranked 45th).

The development and implementation of an innovation policy necessarily has to take into consideration regional aspects, particularly in view of the fact that the regions and cities are playing an increasingly important role as sources of innovation changes [12]. Inequality in innovative development across different regions of one country has been noted in a number of countries, even small ones [1, 13, etc.].

The disparities among Russian regions in achieving intended innovation indicators are quite significant [2, 7, 9, 14, 15, 16], which is explained by the unevenness in the population distribution, industrial structure, and socio-economic development of different constituent entities of the

Russian Federation, each having its historical, geographical and ethnic composition particularities.

Research that has been conducted into the regional aspects of innovation in Russia mainly considers innovation potential indicators (expenditures, characteristics of the educational system, number and quality of researchers and organizations engaged in R&D, number of patents received, etc.). However, the essential condition for innovation effectiveness ensuring economic growth, increased national competitiveness and other positive changes is implementation of innovations in the economic activities of particular enterprises. Consequently, this aspect of innovation development is in focus of the present paper.

II. METHODS

The term innovation is of Latin origin ("inovatis") which could mean 'renewal', 'novelty', 'change'. The meaning may encompass relative, radical, and revolutionary changes in thinking, products, processes, or organizations.

As 'innovation' appears to be a concept with a wide range of meanings and applications, researchers and organizations have suggested a number of definitions characterizing as both a process and an outcome [4, 5, 6, 17]: an action providing resources that give new strength and the ability to create wealth [18]; using a new product or the significant improvement of a new product (or service) or process, a new marketing, organizational or business method, a different way of organizing workplace or external relations [19]; the renewal and extension of scale of products and services and related markets, creating new methods of production, supply and distribution, introduction of changes in management, work organization, working conditions and changes in workforce skills [17]; the search for, discovery, development, improvement, adoption, commercialisation of new processes, new products, and new organisational structures and procedures and it is a process that involves uncertainty, risk taking, probing, reprobing, experimenting, and testing; acumulative activity that involves building on what went before, whether it is inside the organisation or outside the organisation, whether the organisation is private or public, whether the knowledge is proprietary or in the public domain [3]; the creative process by which new products, services or production processes are developed for a business unit [6] etc.

The existing innovation-related knowledge base distinguishes a few basic types of innovation: product, process, organizational, marketing, and others [10, 17].

Our research involves analysis of innovation statistics presented in the statistical compendium 'Regions of Russia. Socio-Economic Indicators' [20]. The methodology for the national statistical monitoring of innovation activities in Russia is based on the Oslo Manual (3rd ed.) framework, an effective document prepared jointly by the Organization for Economic Cooperation and Development and Eurostat, which contains internationally agreed methodological guidelines for collecting and reporting innovation data in countries.

According to this document, innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organization, or external relations [19].

Currently, the Federal State Statistics Service of the Russian Federation provides statistical data on the implementing innovations of three types.

- Technological innovation: an eventual outcome of innovation activities, which has been implemented as a new or improved product or service introduced on the market, a new or improved process or mode of service production (delivery) used in practice.
- Organizational innovation: implementation of a new method in business management practices, workplace organization, or external relations.
- Marketing innovation: implementation of new or significantly improved marketing methods involving significant changes in the design and packaging of goods, works, and services; the use of new methods of sales and presentation of goods, works, services, their placement and promotion into markets; formation of new pricing strategies.

This paper considers regional statistics on implementing all types of innovations and, in particular, technological innovations as a key type of innovation enabling increased labor efficiency, improved product quality and overall economic growth.

III. RESULTS

Table 1 presents the ranking of Russian regions with regard to the share of organizations carrying out innovations of all types. Table 2 contains the regional ranking regarding the share of organizations that implementing technological innovations. In view of space limitations, only the first ten positions and last ten positions of the ranking are given. For the Arkhangelsk Region and Tyumen Region, the indicators were analyzed taking into account the autonomous districts within these entities, while none of the autonomous districts in isolation was represented in the ranking. In 2015, there were no statistical data available on the estimated indicators for the city of Sevastopol, while in 2016 that was the case with the Republic of Ingushetia; consequently, the rankings for 2015-2016 and the ranking for 2017 included 81 and 82 regions of the Russian Federation, respectively.

Range and relative range, variance, standard deviation, and coefficient of variation were calculated as indicators of the level of regional differentiation..

IV. DISCUSSION

The data contained in the tables indicate a decrease in the innovation activities of organizations in the Russian Federation over the past three years, with a slight improvement of the situation in 2017. During the time period under analysis, only 25 regions demonstrated an increase in the share of organizations implementing innovations.

It should be noted that the Strategy for Innovative Development of the Russian Federation for the Period up to 2020 implies an increase in the share of innovation implementing companies up to 15% by 2016 and 25% by 2020. However, the feasibility of the intended outcome levels

is highly questionable as the actual value of the indicator was 7.3% in 2016 and 7.5% in 2017.

The unevenness in the innovation activities of organizations across Russian regions is high (coefficient of variation > 0.33), and over the three years, the divergence in the enterprise-level innovation implementation across the regions has increased, with a slight decrease in some of the estimated indicators occurring in 2017.

The majority of Russian regions leading on the estimated indicators are concentrated in the Volga Federal District (VFD), with the Chuvash Republic, the Republic of Tatarstan and the Penza Region being significantly ahead of the other regions with regards to the innovative activity of organizations. For another 24 regions, the share of innovation implementing organizations is higher that the national average. The extremely low level of organizations' innovation activity is characteristic of the republics of the North Caucasus Federal District (NCFD).

Based on the findings obtained, the authors suggest the following directions for future research:

TABLE I. SHARE OF ORGANIZATIONS IMPLEMENTING TECHNOLOGICAL, MARKETING, AND ORGANIZATIONAL INNOVATIONS IN THE TOTAL NUMBER OFORGANIZATIONS UNDER STUDY

Region/Indicator	2015, %	Region/Indicator	2016, %	Region/Indicator	2016, %
Ranking of the regions					
1. Chuvash Republic (Volga Federal District (VFD))	24.0	1. Chuvash Republic (VFD)	24.5	1. Chuvash Republic (VFD)	24.7
2.The Republic of Tatarstan (VFD)	20.5	2. The Republic of Tatarstan (VFD)	21.3	2. The Republic of Tatarstan (VFD)	22.2
3. Lipetsk Region (Central Federal District (CFD))	20.0	3. Penza Region (VFD)	20.1	3. PenzaRegion (VFD)	20.7
4. Moscow (CFD)	19.7	4. Lipetsk Region (CFD)	19.2	4. Lipetsk Region (CFD)	18.5
5. Chukotka Autonomous Region (Far-Eastern Federal District (FEFD))	17.8	5. Moscow (CFD)	16.1	5. St. Petersburg (NWFD)	16.1
6. St. Petersburg (North-West Federal District (NWFD)	17.2	6. St. Petersburg (NWFD)	14.8	6. Belgorod Region (CFD)	14.8
7. Republic of Mordovia (VFD)	16.6	7. Belgorod Region (CFD)	14.1	7. Moscow (CFD)	14.3
8. Penza Region (VFD)	14.7	8. Republic of Mordovia (VFD)	13.4	8. Tomsk Region (SFO)	14.0
9. Magadan Region (FEFD)	14.3	9. Nizhny Novgorod Region (VFD)	12.8	9. Altai Territory (SFO)	12.6
10. Nizhny Novgorod Region(VFD)	13.5	10. Kamchatka Krai (FEFD)	12.7	10. Republic of Mordovia (VFD)	12.5
…		…		…	
72. Kurgan Region (Ural Federal District (UFO))	4.2	72. Ivanovo Region (CFD)	3.2	73. Kabardino-Balkaria Republic (NCFD)	3.8
73. Kaliningrad Region (NWFD)	4.1	73. Kemerovo Region (SFO)	3.2	74. Republic of Crimea (SFD)	3.8
74. Kemerovo Region (Siberian Federal District (SFO))	3.9	74. Republic of Crimea (SFD)	2.8	75. Komi Republic (NWFD)	3.5
75. Republic of North Ossetia-Alania (North Caucasus Federal District (NCFD))	3.8	75. Republic of Dagestan (NCFD)	2.5	76. Ulyanovsk Region (VFD)	3.4
76. Karachay-Cherkess Republic (NCFD)	3.1	76. Republic of Tyva(SFO)	2.4	77. Sevastopol (SFD)	3.2
77. Republic of Khakassia (SFO)	3.0	77. Kabardino-Balkaria Republic (NCFD)	2.4	78. Republic of Dagestan (NCFD)	2.8
78. Sakhalin Region (FEFD)	2.6	78. Republic of Khakassia (SFO)	2.1	79. Kostroma Region (CFD)	2.8
79. Kabardino-Balkaria Republic (NCFD)	2.5	79. The Republic of Kalmykia (SFD)	2.0	80. Republic of Kalmykia (SFD)	2.5
80. The Republic of Kalmykia (Southern Federal District (SFD))	2.4	80. Karachay-Cherkess Republic (NCFD)	0.8	81. Karachay-Cherkess Republic (NCFD)	1.8
81. Chechen Republic (NCFD)	1.6	81. Chechen Republic (NCFD)	0.3	82. Chechen Republic (NCFD)	0.2
Average across Russia	9.3	*Average across Russia*	8.4	*Average across Russia*	8.5
Indicators					
Range	22.4	Range	24.2	Range	24.5
Relative range	2.41	Relative range	2.88	Relative range	2.88
Variance	19.86	Variance	20.94	Variance	20.82
Standard deviation	4.46	Standard deviation	4.58	Standard deviation	4.56
Coefficient of variation	0.48	Coefficient of variation	0.55	Coefficient of variation	0.54

TABLE II. SHARE OF ORGANIZATIONS IMPLEMENTING TECHNOLOGICAL INNOVATIONS IN THE TOTAL NUMBER OF ORGANIZATIONS UNDER STUDY

Region/Indicator	2015, %	Region/Indicator	2016, %	Region/Indicator	2016, %
Ranking of the regions					
1. Chuvash Republic (VFD)	22.7	1. Chuvash Republic (VFD)	23.1	1. Chuvash Republic (VFD)	22.2
2. The Republic of Tatarstan (VFD)	19.5	2. The Republic of Tatarstan (VFD)	20.0	2. The Republic of Tatarstan (VFD)	20.3
3. Lipetsk Region (CFD)	18.,8	3. Lipetsk Region (CFD)	18.0	3. Penza Region (VFD)	18.6
4. Moscow (CFD)	18.5	4. Penza Region (VFD)	17.5	4. Lipetsk Region (CFD)	17.6
5. Chukotka Autonomous Region (FEFD)	17.8	5. Moscow (CFD)	14.9	5. St. Petersburg (NWFD)	14.5
6. Republic of Mordovia (VFD)	14.9	6. St. Petersburg (NWFD)	13.8	6. Moscow (CFD)	13.6
7. St. Petersburg (NWFD)	14.8	7. Belgorod Region (CFD)	13.0	7. Belgorod Region (CFD)	13.3
8. Penza Region (VFD)	12.1	8. Republic of Mordovia (VFD)	12.4	8. Republic of Mordovia (VFD)	12.3

Region/Indicator	2015, %	Region/Indicator	2016, %	Region/Indicator	2016, %
9. Tula Region (CFD)	11.8	9. Altai Territory (SFO)	11.8	9. Tomsk Region (SFD)	12.2
10. Astrakhan Region (SFD)	11.8	10. Nizhny Novgorod Region (VFD)	11.3	10. Altai Territory (SFO)	11.5
11. Altai Territory (SFD)	11.8	…		…	
…		…		72. Sevastopol (SFD)	3.2
72. Ivanovo Region (CFD)	3.5	72. Ivanovo Region (CFD)	2.4	73. Republic of North Ossetia-Alania (NCFD)	3.2
73. Kaliningrad Region (NWFD)	3.4	73. Kabardino-Balkaria Republic (NCFD)	2.4	74. Komi Republic (NWFD)	2.9
74. Kemerovo Region (SFO)	3.3	74. Republic of Crimea (SFD)	2.3	75. Trans-Baikal Territory (SFO)	2.9
75. Republic of Buryatia (SFO)	3.3	75. Sevastopol (SFD)	2.2	76. Kostroma Region (CFD)	2.8
76. Republic of Khakassia (SFO)	3.0	76. The Republic of Kalmykia (SFD)	2.0	77. Republic of Adygea (SFD)	2.8
77. Sakhalin Region (FEFD)	2.6	77. Republic of Dagestan (NCFD)	1.9	78. The Republic of Kalmykia (SFD)	2.5
78. Kabardino-Balkaria Republic (NCFD)	2.5	78. Republic of Khakassia (SFO)	1.6	79. Karachay-Cherkess Republic (NCFD)	1.8
79. The Republic of Kalmykia (SFD)	2.4	79. Republic of Tyva (SFO)	1.2	80. Republic of Tyva (SFO)	1.8
80. Karachay-Cherkess Republic (NCFD)	2.0	80. Karachay-Cherkess Republic (NCFD)	0.8	81. Republic of Dagestan (NCFD)	1.1
81. Chechen Republic (NCFD)	1.6	81. Chechen Republic (NCFD)	0.3	82. Chechen Republic (NCFD)	0.2
Average across Russia	8.3	*Average across Russia*	7.3	*Average across Russia*	7.5
Indicators					
Range	21.1	Range	22.8	Range	22.0
Relative range	2.54	Relative range	3.12	Relative range	2.93
Variance	18.83	Variance	19.11	Variance	17.45
Standard deviation	4.34	Standard deviation	4.37	Standard deviation	4.18
Coefficient of variation	0.52	Coefficient of variation	0.60	Coefficient of variation	0.56

- Analyzing other indicators of the regional innovative development, with regard to both creation and implementation of innovations
- Searching for a relationship between the level of the innovation potential of a particular region and the innovation activity of its enterprises.
- Detecting the causes of insufficient innovation activity in most of the constituent entities of the Russian Federation; determining the reasons for low innovation activity levels in the outsider regions, as well as defining the need for intensifying the innovation activity.
- Studying the typology of regions according to their production-technological and socio-economic characteristics in order to set forth strategies for innovative development of territories of different types; the strategies are expected to enable the transfer of innovations and a reasonable level of innovation.

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