



Impact of Government Funding of R&D Development in Industrial Sector of Russia

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Abstract. Specific features of the national R&D sector are “regional”, cluster location of research and design work, its transfer and low level of integration at the federal level. According to the survey on the implementation of R&D results in innovative projects in Russia’s regions more than 90% of intellectual property objects are addressed to regional industry. This is due to the spatial development of production forces and relations in Russia, historical and current trends. The purpose of the article is to determine the impact of government funding on the development of the entire R&D sector in industrial projects. Despite its weak position in the global comparison, it is possible to notice the preservation of “growth points” in the national research and development sector. When analyzing this problem, one can state a general progressive dynamics of technology exports, as well as growth in certain areas, in particular, manufacturing industry. The study assesses the effectiveness of the development of the industrial sector of R&D in the Russian Federation.

Keywords: Industrial sector · Innovation development · Government funding · R&D · R&D budget

1 Introduction

When comparing the competitiveness of world economies [8], the development of the national innovation system is determined primarily by R&D sector indicators, and secondly by institutional indicators. Over the period from 2012 to 2017 there was a slight positive dynamics in the sector (changes below one point on the rating scale), which can be defined as stagnation. Several constraints can be analyzed, the main of which is the low level of industry investment in technological innovation (3.3 out of 7) and the lack of government mechanisms for the procurement of innovative goods and services (3.3) [10].

The intensive path of development of the sector, due to the implementation of a relatively high (but reducing) intellectual potential, is not closed as an opportunity, but requires [4] changes in the organizational model of the innovation process, R&D cycle integrated into it, and the institutional development of the national intellectual property market. Moreover, it requires not only a change in the organizational mechanisms of R&D, but also the activation of the “transfer” of intellectual property rights into industrial production practice. For the last decade there has been an objective trend of a decline in the volume of transfer of intellectual property into the national economy,

expressed by a decrease in the turnover of license rights in absolute terms. In 2017 Russia accounted for 1.41% of the world intellectual property turnover [10] against the background of a breakthrough growth in the number of intellectual property objects in the world, due to the dominance of the “information” and “digital” economy in the structure of social production in economically developed countries. Moreover, technology transfer is not only a key mechanism for the innovative growth of industrial production, but also the basis for integrating the achievements of economically advanced countries into international infrastructure.

In the “Forecast of scientific and technological development of Russia” the Russian Academy of Sciences identified areas where technologies are at the world (or higher) level of development [6]. In particular, global parity - leadership remains in software production; the creation of biocompatible materials, membranes and catalytic systems; bioengineering, bio catalytic, biosynthetic and biosensor solutions; monitoring the state of the atmosphere, hydrosphere, lithosphere and biosphere; energy and energy conservation. These areas are identified by Decree of the president “On the strategy of scientific and technological development of the Russian Federation” as priority areas for R&D investment [1].

2 Methodology

The author analyzes the development trends of the research and development sector of the national industry. The study presents economic characteristics of the national research and development sector, medium-term development trends and comparison with global trends. The process of research, development, experimental and technological work, intellectual property objects created in it are the “core” of added value of technological innovations.

The main research questions are:

- factors of R&D development in the Russian Federation,
- assessment of the development of the industrial sector of the Russian Federation,
- changes in the structure of subjects, interaction processes and the economics of R&D processes,
- allocation of resources for R&D development in most industrial enterprises of the Russian Federation.

The level of R&D costs in the added value of innovative production determines its knowledge intensity, the level of technological efficiency of industries.

3 Results

A key institutional factor in the development of the national research sector is the preservation of a significant amount of basic science funding [4]. The increase in the rate of transfer of fundamental discoveries into applied developments over the period of 10 years (from 2007 to 2017), observed by economists, allows to consider the academic science sector as a resource for innovative activity, a source of breakthrough scientific

and technical development [9]. In particular, the President of the Russian Academy of Sciences in 2016 Fortov highlighted number of breakthrough Russian fundamental developments of world level: proton therapy, femtosecond laser, ultrahigh pressure systems, photon computers based on diamonds with germanium defect centers, etc. Moreover, Fortov designated both the horizon for transferring discoveries to applied development and the markets for innovative products [6]. Thus, in the period from 2000 to 2015, R&D cost in the Russian Federation increased from 100 million rubles to 750 million rubles per year; the cost of basic research to 500 million rubles; and the cost of experimental development from 80 million rubles to 190 million rubles per year.

4 Discussion

Based on the development of the R&D sector as a whole, the author analyzed and highlighted a counter positive trend in the growth of applied research funding (Table 1), which creates the potential for innovative developments, both on the basis of fundamental breakthroughs and on global platforms of “open innovation”, acquired franchises on intellectual property. The distribution structure of the R&D budget, funded by state programs of the Russian Federation is given in Table 1.

Table 1. R&D budget, funded by state programs of the Russian Federation in 2014–2016 and vertical analysis (VA) for 2016

State programs	2014, bln. rubles	2015, bln. rubles	2016, bln. rubles	VA, %
Development of science and technology	102.73	111.82	119.61	71
Aviation industry development	28.62	27.87	35.22	20
Development of industry and increasing its competitiveness	7.27	8.55	12.80	7
Development of the nuclear power	0.89	0.20	0.01	0
Energy efficiency and energy development	1.49	1.37	0.92	1
Reproduction and use of natural resources	1.50	1.20	1.19	1
Agricultural development	0.04	0.01	0.00	0
Total	142.54	151.03	169.75	100

Source: author based on [3]

Let’s consider sectoral distribution of state R&D funding. After analyzing a number of data, we can conclude about cross-sectoral nature of the funding, 71% of which is concentrated in multidisciplinary research and development. The strategy of state R&D financing is not based on breakthroughs in individual industries, typical for the EU countries, [10] but on the creation of a common innovative scientific and technological platform, that provides the potential for technological breakthroughs in priority sectors

of industry and infrastructure. It is on these principles that the national program “National technological initiative” was created, which replicates general R&D solutions (“Technet”) in industry projections (“AeroNet”, “MariNet”, etc.).

The formed funding program is based on the promising institutional structure of R&D entities. Over the past 20 years, the global innovation system has undergone significant changes: from clusters led by manufacturing corporations to global networks based on an open technology solutions platform. The new and changing functions of traditional R&D institutions appear, and a new organizational model of research and development is being formed. The research on innovation leadership factors of the United States (and other countries) has identified a key factor in creating new operational models for internal R&D organization and cooperation mechanisms [5]. The Russian sector of research and development, the institutional transformation of which is inseparable from global trends, has undergone significant changes (Table 2). The adoption of the “triple helix” concept at the turn of the 2010s led to a change in the role of Universities in innovation processes. Since 2015 the volume of research and development of scientific and educational organizations in Russia has increased by 15% [2].

Table 2. Dynamics and vertical distribution (VD) of the number of organizations performing R&D by sectors of activity and types of organizations in the Russian Federation in 2000 and 2015

Indicators	2000	VD, %	2015	VD, %
Total number of organizations	4099	100%	4175	100%
<i>Distribution by sectors</i>				
State organizations	1247	30%	1560	37%
Entrepreneurial organizations	2278	56%	1400	34%
Universities	526	13%	1124	27%
Nonprofit organizations	48	1%	91	2%
<i>Distribution by types of organizations</i>				
Research organizations	2686	66%	1708	41%
Design organizations	318	8%	322	8%
Design and survey organizations	85	2%	29	1%
Pilot plants	33	1%	61	1%
Universities	390	10%	1040	25%
Industry divisions	284	7%	371	9%
Others	303	7%	644	15%

Source: author based on [7]

The transfer of applied research to universities reduces the role of specialized research institutes (−25%) in innovative industry programs. Educational centers demonstrate clear leadership; due to their activity in innovative R&D processes [5]. The role of the state and its institutions in the implementation of R&D projects (+7%) is increasing, which is in line with world practice. On the one hand, state funding makes up for the deficit of investments in R&D, smooths out the investment gap in R&D

expenses and profits from the introduction of technological innovations, on the other hand, the government financial initiative is holding back R&D investments in the private capital sector (−22%). The increase in the participation of internal scientific divisions of the industry in applied research and development (+2%) is largely due to the state financing programs, rather than an investment initiative of private entrepreneurship. In other words, there is a change in the structure of subjects, interaction processes, and the economics of R&D processes.

5 Conclusion

Thus, the development prospects of the national R&D sector are determined by the following key medium-term trends:

1. Lagging in R&D funding from world parity.
2. Reduction of intellectual resources in scientific and technical sphere.
3. Insufficient implementation of R&D potential.
4. Institutional transformation.

Summing up the analysis, we can confidently conclude that the key direction of intensification of the national sector is the improvement of managerial approaches to the organization of research and development work in innovative industrial projects. One can also speak with confidence about the clear potential for intensifying the R&D sector of industry in terms of the objectivity of “growth points” and institutional prerequisites.

Huge changes in the share of R&D financing in industry can be observed in dynamics over the past 10 years, and this is due to the enormous demand for the development of this particular national sector. Most Russian and Western economists agree with this view. This development allows further progress of the industrial sector in Russia, which will bring additional revenues to the state budget. In this regard, the current trend of active government funding is more than justified.

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