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## Peculiarities of Financial Provision for the Implementation of State Programs with Scientific and Technical Components

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**Abstract:**

*Based on the analysis of the powers of the Russian Federation and its subjects in the scientific and technical sphere, the article shows that despite the constitutional consolidation of the sphere of science as joint powers of the regions and the federal center, in fact, in most cases, the development of science is exclusively the task of the Russian Federation.*

*Therefore, the expenditures of the federal budget determine the direction of financing and development of science. The paper analyzes both the dynamics of the main parameters of financing within the program budget and the first major results obtained under the new conditions in 2013-2016. It is shown that the efficiency of expenditures on science has significantly increased.*

*However, a separate analysis is required both for the quality of the obtained scientific results and the results of institutional reforms in the sector of research and development.*

**Keywords:** *Development of science, Research and development, Competency, Expenditure, Federal budget, State programs, Salary of scientific employees, Publication activity.*

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## 1. Introduction

The transition to the program budget launched a new stage in the financing of science, which is related to an increase in the concentration and transparency of the sources of its resource provision (Thalassinos and Dafnos, 2015). While preserving a significant distribution of expenditures on research and development among state programs and budget funds managers, research in Russia is financed, mainly, from the federal budget, which is determined by the practice of delineating the powers between the federation and the regions in the field of science.

The adoption of the Strategy for Scientific and Technological Development of the Russian Federation (Decree of the President of the Russian Federation No. 642, 2016) determines the need for changes in both the management system and the mechanisms for financing the development of science. In this regard, of particular interest is the analysis of both the dynamics and the structure of expenditures on science in 2013-2016 as well as the first changes in the general indicators of the development of science in the new financing environment (Shekhovtsov and Shchemlev, 2017; Vovchenko *et al.*, 2017; Rupeika-Apoga and Nedovis, 2016).

## 2. Materials and Methods

### 2.1 The powers in the management of science and determination of research priorities

The distribution of powers between the center and the regions in the sphere of science in the current Russian legislation is consolidated at the highest – constitutional level: Article 72 of the RF Constitution (*The Constitution of the Russian Federation*, 1993) states that science (clause "e") is in the joint jurisdiction of the Russian Federation and the subjects of the Russian Federation.

A further specification of the scope of possibilities and tasks of the federal and regional levels of power takes place in the Federal Law No. 127-FZ (1996) (hereinafter – the Law "On Science"), which consolidates the powers of state authorities in the relevant sphere as the main aspects of management of scientific activity. It is also stated that within their powers the bodies of the state authorities of the Federation, its subjects and state academies of sciences determine the relevant priority areas for the development of science and technology, ensure the formation of a system of scientific organizations, implementation of inter-industry coordination of scientific and (or) scientific and technical activities, development and implementation of scientific and technical programs and projects, development of forms of integration of science and production, realization of the achievements of science and technology (Dmitrishina and Uskov, 2015; Ivanova *et al.*, 2017; Gubin *et al.*, 2017).

The powers of the authorities of the Federation and the regions in the field of formation and implementation of the state scientific and technical policy are also

enshrined in the Law "On Science" (Article 12). It is the Government of the Russian Federation that determines the powers of federal executive bodies in the field of formation and implementation of a unified state scientific and technical policy, approves the federal scientific and scientific and technical programs and projects on the priority areas for the development of science and technology, which is caused by its constitutional status (see article 114 of the Constitution). The Ministry of Education and Science of the Russian Federation jointly with the Russian Academy of Sciences, sector academies of sciences and federal executive bodies ensure the formation and practical implementation of the state scientific and technical policy of civil nature.

The Law "On Science" also establishes the procedure for financing the scientific, technical and innovative activities (Article 15). In accordance with this norm, the financial provision of all three areas is based on its targeted focusing and multiplicity of funding sources and can be implemented by the Federation, its subjects, municipalities as well as individuals and (or) legal entities in ways that do not contradict the law. Therefore, the law establishes the diversification of sources of funding for scientific activity – both from the budgets and private individuals. At the same time, it is stipulated that the main source of financing of fundamental scientific research and exploratory research are federal budgetary funds as well as the funds for the support of scientific, technical and innovative activities.

Article 15.1 of the Law "On Science" regulates such area as the creation of funds to support scientific, technical and innovative activities in order to ensure the financial provision of such activities including co-financing from various sources not prohibited by law. Although this Law specifies that such funds may be created by the Russian Federation, its subjects, individuals and (or) legal entities in the organizational and legal form of a foundation, the main foundations that determine the financing of science have so far been created only by the Russian Federation.

Some of the tasks in the sphere of development of science are realized by other legal entities, for example, by state corporations or joint-stock companies with state participation, although they are mainly focused on the development of individual, specialized areas of science aimed at achieving the goals for which such legal entities are created. The most striking example is the state corporation "Rosatom". The Federal Law No. 317-FZ (2007) establishes that this corporation is created and operates for the purposes, which include the development of atomic science, technology and vocational education, the implementation of international cooperation in this field. State corporations, which are related to the sphere of science in the framework of their main activities, include "Rostek" and "Rusnano". It is obvious that state corporations and joint-stock companies with state participation have a significant potential for receiving extrabudgetary resources, which they should use to achieve the goals for which they are created. In addition to budgetary funds, foundations have a possibility of obtaining other resources (for example, the Russian Science Foundation).

Such subject of relations in the field of science as the Russian Academy of Sciences

(hereinafter - RAS) has a very specific status. Unlike other academies of sciences, the RAS is the state academy of sciences, the peculiarities of the legal status of which are determined by a special Federal Law No. 253-FZ (2013). Article 4 of this law stipulates that all expenses related to the financial provision for the activities of the RAS, including financial support for the activities of its regional branches and monthly cash payments to members of the RAS, are provided separately by the federal budget for the corresponding year and for the planning period. At the same time, the RAS is a chief administrator of the federal budget funds intended for financial support of activities of its regional branches. Therefore, it is obvious that all issues related to the functioning of the state academies of sciences, including their branches in the regions, are the powers of the federal level.

By analogy with the status of the RAS, some significant state institutions that carry out scientific activity (for example, the National Research Center "Kurchatov Institute" (Federal Law No. 220-FZ, 2010), Lomonosov Moscow State University and St. Petersburg State University (Federal Law No. 259-FZ, 2009), The National Research Center "Zhukovsky Institute" (Federal Law No. 326-FZ, 2014)) are also directly funded from the federal budget because of their importance and uniqueness.

Therefore, despite the constitutional consolidation of the sphere of science as joint powers of the regions and the federal center, in fact, in most cases, the development of science is a task exclusively of the Russian Federation, which, in turn, determines the insignificant volume of regional budgets' expenditures for the development of science, attraction of extrabudgetary sources of research funding at the level of many regions. The main powers in the field of science are realized by the Federation. The priorities of the development of science are also set by the Federation. Therefore, the expenditures of the federal budget determine the directions of financing and development of science.

### **3. Results and Discussion**

#### **3.1. The peculiarities of science funding in the period of implementation of the program of the Russian Federation "Development of Science and Technologies"**

The transition to the program budget launched a new stage in the financing of science, which is related to an increase in the concentration and transparency of the sources of its resource provision. The state program of the Russian Federation "Development of Science and Technologies" for the period of 2013-2020 became the main instrument of the state policy in the sphere of science and technological development, which helps realize more than 85% of fundamental research and a significant part of applied research.

The analysis of managerial problems of the current stage of implementation of the state programs in Russia using the example of the program "Development of Science and Technologies" (Dmitrishina and Uskov, 2016) has shown that at present

practically all possible instruments for regulating the sphere of research and development are used and their mutual coordination is carried out, although not efficiently. In this regard, of particular interest is the analysis of both the dynamics and the structure of expenditures on science in 2013-2016 as well as the first changes in the general indicators of the development of science in the new financing environment.

Earlier it was noted (Mikhailova and Uskov, 2017) that scientific research in Russia is financed mainly by the federal budget. At the same time, the resources are distributed not only among a significant number of state programs, but also among a multitude of major managers of budgetary funds (hereinafter – MMBF) that ensure their implementation. Almost  $\frac{3}{4}$  of the state programs make provisions for scientific research mainly of an applied nature (Table 1). It seems that consolidation of resources within one or several state programs aimed at achieving the results consistent with the main areas and objectives of scientific and technological development will make it possible to increase both the efficiency of use of budgetary funds and coordination of activities to achieve the planned results.

**Table 1:** *The dynamics of the number of state programs and major managers of budgetary funds receiving federal budgetary appropriations for research and development.*

Indicator	2013	2014	2015	2016	2017
Number of state programs *	42	42	42	43	44
Number of state programs that make provisions for the expenditures on scientific research	29	29	31	31	31
Number of major managers of budgetary funds	110	106	104	102	93
Number of major managers of budgetary funds receiving federal budgetary appropriations for research and development	65	66	64	66	60

\* at the beginning of year, in accordance with the order of the Government of the Russian Federation of November 11, 2010 No. 1950-r.

**Source:** compiled by the authors according to the data of the federal laws on the federal budget for the relevant years.

In the recent years the tendency has been to consolidate the expenditures on research. If in 2014 79% of the budgetary expenditures on science fell for 5 state programs, including 68% – for only 3 state programs, in 2016 these indicators increased to 86% and 74%, respectively (Table 2). The growth is expressed not only in relative indicators, but also in absolute values. At the same time, the total amount of appropriations of the federal budget for scientific research is reduced annually both in the program and non-program part of the budget.

**Table 2:** *The expenditures of the federal budget on scientific research in the context of state programs (billion rubles, in accordance with the consolidated budget at the end of year).*

Indicator	2013	2014	2015	2016
Appropriations of the federal budget for scientific research – the total, including:	378,2	375,2	371,4	370,1
expenditures in the program part of the budget	-	373,1	370,0	368,9
expenditures in the non-program part of the budget	-	2,1	1,4	1,2
Expenditures on scientific research in five most knowledge-intensive state programs	-	297,3	305,4	316,4
The share of 5 most knowledge-intensive state programs in the total volume of the federal budgetary expenditures on scientific research	-	79,3%	82,2%	85,5%
The expenditures on scientific research in three most knowledge-intensive state programs	-	254,9	263,6	275,1
The share of three most knowledge-intensive state programs in the total volume of the federal budget expenditures on scientific research	-	67,9%	71,0%	74,3%

**Source:** *compiled by the authors according to the data of the federal laws on the federal budget for the relevant years.*

The tendency to reduce the volume of funding for scientific research from the federal budget can also be traced to the results of the budget execution.

Against the background of reduced appropriations for research in the federal budget, the internal expenditures on research and development, according to Rosstat, are growing (Table 3), which indicates an increase in the amount of extra-budgetary sources attracted to research and development.

**Table 3:** *Domestic expenditures on research and development in the Russian Federation.*

Indicator	2013	2014	2015	2016
Internal expenditures on research and development in actual prices, billion rubles	749,8	847,5	914,7	943,8
in percentage to the gross domestic product	1,03	1,07	1,10	1,10

**Source:** *Rosstat.*

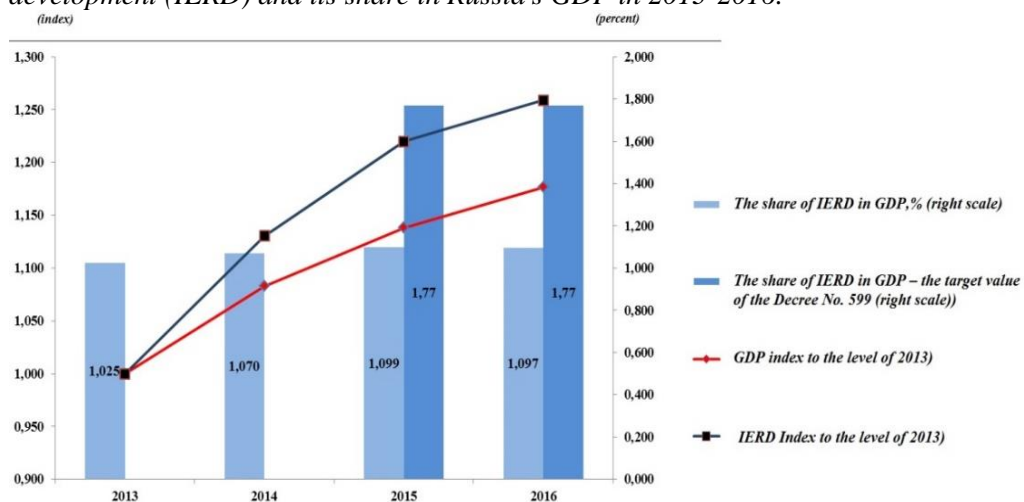
In the period of 2013-2016 the GDP of the Russian Federation and the volume of internal expenditures on research and development (IERD) increased, while the volume of IERD was growing at a faster rate (Figure 1). Nevertheless, one of the key targets for the development of the Russian science set in the Decree No. 599 of the President of the Russian Federation of May 7, 2012 (Decree of the President of the Russian Federation No. 599, 2012), – the ratio of the volume of IERD to GDP at the level of 1,77% – was not achieved. In the period of 2013-2016 an increase in the value of this indicator was only 7% (with an increase in nominal GDP by 18% and the volume of IERD by 26%). A failure to achieve the target value of the indicator is

largely explained by the inadequate attraction of extrabudgetary co-financing and the continuing non-alternative dominance of the federal budget allocations in the financing of the domestic science.

The salaries of scientific employees were growing faster than GDP. In the period 2013-2016 an average salary of the personnel engaged in research and development increased by 30%. The salary fund of scientific workers was increased by the same amount. At the same time, the total number of scientific workers, including researchers, was growing continuously until 2015, and in 2016 it was reduced to the level of 2013.

Therefore, an increase in salaries in 2013-2015 was due to an increase in labor costs, and in 2016 the reduction in the number of personnel contributed to the growth of salaries (Table 4). Presumably, under the conditions of reduced expenditures on science this trend will continue in the future.

**Figure 1:** Dynamics of the volume of internal expenditures on research and development (IERD) and its share in Russia's GDP in 2013-2016.



**Table 4:** Dynamics of salaries of the personnel engaged in scientific research and development.

Indicator	2013	2014	2015	2016
The number of personnel engaged in research and development, people.	727	732	738	722
including researchers, people.	029	274	857	291
	369	373	379	370
	015	905	411	379
Average monthly salary of the personnel engaged in research and development, rubles	41 623	48 212	51 780	53 836
Estimated annual salary, bln. Rub.	363,1	423,6	459,1	466,6

*Source:* Rosstat, calculations of the authors.

### 3.2 Effectiveness and efficiency: the first results of the development of science in the new conditions

Has the change in the organization of financing and the growth of salaries led to the corresponding increase in the effectiveness of scientific workers? At the present time, one of the key parameters of scientific effectiveness, first of all, in the fundamental science, is the number of articles in scientific publications, citation indexes and other indicators related to publication activity. From 2013 to 2016 the number of Russian scientific articles indexed in the international database WEB of Science increased by 39% (Table 5). At the same time, the labor productivity of Russian scientists also increased if we estimate the number of articles per 1000 scientific workers or, in particular, 1000 researchers.

**Table 5:** Dynamics of the publication activity of Russian authors in the world scientific journals, indexed in the database WEB of Science.

Indicator	2013	2014	2015	2016
Number of articles indexed in the database WEB of Science – total, including:	29 043	30 155	37 190	40 363
in Russian publications	14 396	14 569	17 663	18 614
in foreign publications	14 647	15 586	19 527	21 749
Growth to the previous year	4,7%	3,8%	23,3%	8,5%
Estimated number of articles per 1000 researchers	78,7	80,6	98,0	109,0
Estimated number of articles per 1000 scientific workers	39,9	41,2	50,3	55,9
Federal budget expenditures on research, billion rubles	378,2	375,2	371,4	370,1
Estimated expenditures of the federal budget per one article, million rubles	13,0	12,4	10,0	9,2
IERD in actual prices, billion rubles	749,8	847,5	914,7	943,8
	25,8	28,1	24,6	23,4

**Source:** Rosstat data, federal laws on the federal budget for the relevant years, authors' calculations.

In addition to the growth of publication activity and the growth of labor efficiency of Russian scientists, the economic efficiency also increased, that is, unit costs for the preparation of one publication decreased (Table 5). This statement is valid both for the budgetary funding of scientific research and the total internal expenditures on research and development.

It is necessary to note the sharp growth of indicators related to the effectiveness of scientific development compared with the indicators of financing for the period 2013-2016 (Table 6).



**Table 6:** *Dynamics of the main indicators of scientific development. The cost of one article for the economy (VZIR per article), thousand rubles.*

Indicator	2013	2016	Growth, %
GDP of the Russian Federation, billion rubles	73 133,9	86 043,6	17,7%
IERD in actual prices, billion rubles	749,8	943,8	25,9%
Federal budget expenditures on research, billion rubles	378,2	370,1	-2,1%
Number of personnel engaged in research and development, people.	727 029	722 291	-0,7%
Number of researchers, people	369 015	370 379	0,4%
Number of articles indexed in the WEB of Science database	29 043	40 363	39,0%
Average monthly salary of personnel engaged in research and development, rubles	41 623	53 836	29,3%
Estimated number of articles per 1000 researchers	78,7	109,0	38,5%
Estimated number of articles per 1000 scientific workers	39,9	55,9	39,9%
Estimated expenditures of the federal budget per one article, million rubles	13,0	9,2	-29,6%
The cost of one article for the economy (IERD per article), thousand rubles	25,8	23,4	-9,4%

*Source:* Rosstat data, federal laws on the federal budget for the relevant years, authors' calculations.

Calculations show that in the period 2013-2016 an increase in domestic expenditures on research and development is higher than an increase in GDP growth. The number of personnel engaged in research and development fell, but the number of researchers increased. The salaries of scientific workers increased by one third while publication activity grew by 40%. The "price of an article" for the budget and for the economy in general has significantly decreased by higher value than the growth of labor remuneration while the federal budget expenditures on science declined.

#### 4. Conclusion

It should be noted that the results of the study show that the effectiveness of expenditures on science assessed as the ratio of the results to the costs, has increased significantly, it is necessary to conduct a separate analysis of both the quality of the obtained scientific results and the results of institutional reforms in the sector of research and development. A significant number of the accumulated problems that have not been resolved do not make it possible not only to conclude about the system of functioning of science coming out of the crisis, but demonstrate that the system is working at the limit of its capacities and needs changes in its development paradigm.

#### Acknowledgments

The publication is prepared on the basis of the results of the applied research (unique identifier – RFMEFI60315X0012), conducted with financial support from the

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