



Expenditures on research and development work (R&D) of state-owned companies

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Abstract. The article discusses the costs of R&D of state corporations and joint-stock companies with state participation. Based on the results of statistical and comparative analysis, carried out based on form No. 2-science and innovative development programs, conclusions are drawn about the contribution of the expenses of various state corporations and joint-stock companies with state participation in the total expenditures on R&D in Russia, as well as on the contribution of extra-budgetary expenses to the total R&D costs. Based on the results of the study, the main problems that exist in the used method of accounting for R&D expenses are identified.

Keywords: R&D, state corporations, joint stock companies with state participation or state-owned, research funding, extra-budgetary funds

I. INTRODUCTION

The main document that defines the concept of research and development in Russia is Federal Law No. 127-FZ of 23 August 1996 'Science and State Scientific and Technical Policy', according to which research and development (R&D) activities include research work (RW) and development work (DW).

Funding for research and development is carried out at the expense of budgetary and non-budgetary funds. Funding sources are determined based on the fact of direct transfer of funds from the contracting organization to the executing organization. State corporations and joint-stock companies with state participation play an important role in financing R&D in Russia. According to our calculations based on the data of the Federal State Statistics Service and based on the Programs for the Innovative Development of Joint Stock Companies with State Participation, in 2017 their contribution to the total R&D expenses amounted to 28%, and the share of extra-budgetary funds for R&D in Russia as a whole is 36% of all funds spent on R&D.

For statistical collection and processing of data in the field of research and development, including on expenditures on research and development, special forms of statistical accounting were created and approved in Russia, the main of which is form No. 2 science 'Information on the implementation of scientific research and developments', which was put into effect in 2009 by the Federal State Statistics Service.

In 2010, the Ministry of Economic Development of Russia initiated a project to stimulate innovation activities of companies with state participation through the development and implementation of medium-term innovation development programs (IDPs), the structure of which reflects, among other things, the development and implementation of innovative projects, improvement of innovation management mechanisms in companies, as well as development of an ecosystem of 'open innovations' based on the interaction between different groups of organizations. Such programs are long-term documents and provide for annual reporting on their implementation.

The above form No. 2-science and innovative development programs are the main sources of data for determining the volume of R&D expenditures of state corporations and joint-stock companies with state participation.

In this study, the following tasks were set and successfully solved: to assess the contribution of off-budget expenditures to the aggregate volume of R&D expenditures of state corporations and joint-stock companies with state participation; to carry out a comparative analysis of the volume of expenditures on R&D of state corporations and joint-stock companies with state participation and to identify the problems of statistical accounting arising in connection with the conduct of relevant assessments.

II. LITERATURE REVIEW

Much attention is paid to the problems of financing research and development work in the literature. Several researchers carry out a comparative analysis of R&D financing in different countries, including the Russian Federation (Yurchenko, 2013; Chechenkina and Kucherenko, 2016; Mikhailova and Uskov, 2017). Particular attention is paid to how R&D is funded by the public sector (Fonotov, 2013; OECD, 2015). Among the researchers of this topic, individual authors study issues related to budgetary financing of science and the achievement of indicators of scientific and technological development of states (Dmitrishina et al., 2018; Filatov and Dorzhieva, 2018; Dmitrishina et al., 2020).

The scientific literature also discusses the issue of the role of off-budget funds in financing the innovation sphere (Pashchenko and Chelpanova, 2018; Lukhmanova, 2019).

Also, concerning Russian practice, the scientific literature examines the problem of regional distribution of scientific potential based on data on the costs of research and development from budgetary and extra-budgetary sources (Gusev and Yurevich, 2017).

In this article, we will consider a problem area that has not yet found sufficient sanctification in the literature, namely, we will assess the contribution of state corporations and joint-stock companies with state participation to R&D costs.

III. METHODS

The study analyzed information on budgetary and off-budget expenditures on R&D of state corporations and companies with state participation in Russia.

Budgetary funds are funds paid from the budgetary system of the Russian Federation.

To date, the concept of off-budget funds is not enshrined in federal laws and regulations of the Russian Federation. However, there is a methodology for accounting for extra-budgetary sources of funding for research and development, determined by the Federal State Statistics Service, which allows us to conclude that extra-budgetary sources of funding are own funds of organizations, funds of state extra-budgetary funds, funds of organizations in the higher education sector, funds private non-profit organizations, funds from the business sector, funds from foreign sources.

For the analysis, we used the publicly available data of Form No. 2-Science for 2017, as well as open data from state corporations and joint-stock companies with state participation for the period from 2015 to 2017. This is the most relevant data posted in open sources as of August 2020. We have considered the costs of research and development exclusively for civil purposes.

The list of joint-stock companies with state participation to analyze the costs of research and development was determined based on the order of the Government of the Russian Federation dated August 30, 2017 No. 1870-r on the approval of the lists of joint-stock companies specified in subparagraph 'a' of paragraph 5 of the Decree of the Government of the Russian Federation dated December 3, 2004 No. 738 'On the Management of Federally Owned Shares of Open Joint Stock Companies and the Use of the Special Right to Participate of the Russian Federation in the Management of Joint Stock Companies ('Golden Share')'.

We monitored official documents of joint-stock companies to identify research work (RW) in the public domain, or statements confirming their existence. During the monitoring, it was revealed that out of 58 joint-stock companies with state participation from the List, only 28 have research work (RW), while 26 of them have published research work (RW) in the public domain. Based on the publicly available research work (RW), further analysis was carried out.

Analysis of R&D expenditures in public corporations' development programs

As of September 2020, there are three state corporations in the Russian Federation that, in addition to their main activities, are also engaged in research and development of Rostekh, Roscosmos and Rosatom. Each public corporation includes several other organizations that directly carry out research and development.

It is worth emphasizing that the data published in the official documents of corporations in the public domain does not fully correspond to the consolidated data in the form No. 2-science. This may be due to different approaches to accounting for research and development costs applied in corporate and government accounting.

According to the data presented in the annual reports of the Corporation 'Rostekh' from 2015 to 2017, on average, the share of budgetary funds in R&D funding is 64%, and non-budgetary funds are 36%.

The results of the analysis indicate that the state corporation 'Rostekh' is following the path of a gradual increase in the share of extra-budgetary funds in the total amount of R&D expenditures while maintaining

the volume of R&D expenditures at the same level, which indicates an increase in the efficiency of spending budget funds, since by 1 budget the ruble attracts more extra-budgetary funds.

According to the annual reports of the state corporation on space activities Roskosmos, a total of 305.6 million rubles of budgetary and extra-budgetary funds were allocated to finance research and development of the state corporation Roskosmos for the period from 2015 to 2017. The average growth rate of the volume of R&D financing for the period under review was 14.4%. However, it should be noted that in 2016 compared to 2015, the volume of R&D expenditures increased by 49.3%, and in 2017 decreased by 12.3% compared to 2016 (and increased by 30.8% compared to 2015). Information on R&D financing at the expense of extra-budgetary funds, namely, at the expense of own and borrowed funds, in open sources (official documents of the Corporation) was published in 2017 alone, the share of budget funds for 2017 amounted to 87%, off-budget 13%.

Based on the results of the analysis of open data, it can be assumed that the state corporation Roskosmos considers R&D as one of its strategic imperatives, as evidenced by the positive average growth rate of R&D funding for the period from 2015 to 2017. The efficiency of budget spending could not be assessed, since data on sources of funding for the R&D state corporation Roskosmos was published in the public domain only for 2017.

According to information published in the annual reports of the state corporation Rosatom, the costs of research and development in the corporation for the period from 2015 to 2017 amounted to 4.5% of revenue, namely 119.9 billion rubles.

The average growth rate of R&D funding for the period from 2015 to 2017 amounted to 8.5%, which indicates that the corporation is moving towards an increase in funding. So, in 2016 compared to 2015, the volume of expenses on R&D increased by 6.9%, in 2017 it also shows an increase of 10.2% compared to 2016 (and 17.8% compared to 2015).

Indicators of the volume of sources of R&D financing are presented in the documentation of ROSATOM only for 2017. In monetary terms, 25.6 and 18 billion rubles, respectively.

Thus, according to the corporation's annual reports, the share of funds from budgetary sources amounted to 59%, off-budget 41%.

The analysis of Rosatom's R&D financing activities revealed a tendency to increase the volume of financing to increase its competitiveness by developing more innovative products and services, which confirms the positive average growth rate of R&D financing for the period from 2015 to 2017. Efficiency of budget spending funds could not be estimated, since data on sources of funding for the R&D state corporation 'Rosatom' was published in the public domain only for 2017.

It can be noted that according to the analysis of officially published reports for the period from 2015 to 2017, among state corporations, the state corporation Rostekh is the leader in the volume of R&D financing (the share of R&D expenses in the total expenditures of all state corporations was 43%), which also mastered the largest amount of own and borrowed funds for R&D.

The state corporation Roskosmos ranks second in terms of R&D funding, its share of R&D expenses in total expenditures is 41%, which is 2% less than the share of the state corporation Rostekh.

Thus, we can say that the state corporation 'Rostekh' and the state corporation 'Roskosmos' contribute approximately equally to the financing of R&D relative to the state corporation 'Rosatom', where the share of R&D expenses in the total expenses of all state corporations was only 16%.

The average growth rate of R&D funding for all state corporations is 7.1%. The growth in R&D funding is most likely associated with an increase in the importance of R&D in the development strategies of public corporations (since R&D can serve as a driver for the creation of innovative products and services), as well as the need to implement measures of government programs in which corporations are involved (Table 1).

Table 1. R&D funding in public corporations

	Amount of R&D financing in state corporation, billion rubles				Expenses of the state corporation in total expenses, %		
	Rosatom	Rostekh	Roskosmos	Allstatecorporations	Rosatom	Rostekh	Roskosmos
2015	36.9	105.3	80.4	222.7	17%	47%	36%
2016	39.5	111.9	120.0	271.4	15%	41%	44%
2017	43.5	106.8	105.2	255.5	17%	42%	41%
Total R&D costs	120.0	324.0	305.6	749.6	16%	43%	41%

Average growth rate 8.5% 0.7% 14.4% 7.1%

Source: compiled by the authors based on sources. Rostekh. (2016, June 15), Roscosmos. (2017, June 26), Roscosmos. (2018, October 26), Ministry of Education and Science. (2020, June 15), Rosatom. (2018, August 13), Pershukov, V. (2016, April 13).

Analysis of R&D costs in development programs for companies with state participation

RW analysis of joint stock companies with state participation for the period from 2015 to 2017 showed that research and development, indicating the amount of funding, is reflected in only 19 such companies. JSC 'Inter Russian JSC Russian energy company' with a budget of 36.6 billion rubles, JSC 'Russian Railways' with a budget of 23.1 billion rubles, JSC 'Gazprom' with a budget of 15.6 billion rubles are the leaders in the volume of extra-budgetary R&D funding (excluding data for 2015). A complete list of companies is presented in Table 2.

Table 2. Amount of R&D financing in joint-stock companies with state participation at the expense of their own funds, billion rubles

State-owned JSCs	2015	2016	2017	2015-2017	Average growth rate, %
Public JSC 'Inter Russian JSC Russian energy company'	11.6	12.2	12.8	36.6	5.0 %
JSC 'Russian Railways'	7.3	7.6	8.3	23.1	7.1 %
Gazprom	-	7.7	7.95	15.6	3.7 %
Public JSC 'Russiannetworks'	0.3	1.8	1.90	4.0	175.7 %
Public JSC 'ALROSA'	0.7	2.0	0.94	3.6	13.5 %
Trust 'United Shipbuilding Corporation'	1.2	1.71	-	2.9	40.2 %
Public JSC 'Aeroflot - Russian Airlines'	0.5	0.9	1.0	2.4	36.5 %
JSC 'Center for Shipbuilding and Ship Repair Technology'		1.10	1.18	2.28	7.3 %
Public JSC 'Federal Grid Company of the Unified Energy System'	0.5	0.64	0.61	1.77	7.5 %
JSC 'Concern 'Scientific and Production Association' AURORA'	-	-	0.15	0.15	-
Public JSC 'Federal Hydro-generating Company - RusHydro'	-	0.49	0.63	1.12	28.8 %
JSC 'Zarubezhneft'	0.3	0.30	0.35	0.98	3.0 %
JSC 'System operator of the Unified Energy System'	0.1	0.08	0.08	0.27	-14.2 %
JSC 'Trust 'Granite-Electron'	0.1	0.1	0.1	0.1	0.0 %
Open JSC 'Corporation 'Roskhimzashchita'	-	-	-	0.0	-
JSC 'Trust 'Morinformsystem - Agat'	-	-	-	0.0	-
JSC 'Trust 'Central Research Institute 'Electropribor'	-	-	-	0.0	-
Public JSC 'Modern commercial fleet'	0.2	-	-	0.2	-
Public JSC 'Rostelecom'	-	-	-	0.0	-
Total 19 JSCs	22.7	36.4	35.9	95.2	28.1 %

Source: compiled by the author on the basis of the programs of innovative development of joint-stock companies with state participation.

Public JSC 'Inter Russian JSC Russian energy company' explains such high R&D costs by the implementation of the innovative development and R&D program, which is aimed at creating strategic partnerships with world leaders in the energy sector to use the best world experience and technological solutions, as well as to create their innovative developments in partnership with leading Russian enterprises and research centers.

The large volume of R&D financing in Open JSC 'Russian Railways' in comparison with other joint-stock companies with state participation is conditioned by the existing production base of the R&D holding 'Russian Railways', characterized by the presence of scientific traditions and schools, its industry

implementation centers, unique test centers, testing, examination and certification of practically all new railway equipment.

Public JSC 'Gazprom' pays priority attention to the development of advanced technical solutions for use, first of all, during the implementation of major investment projects and at the production facilities of subsidiaries, in connection with which the company allocates large budgets for R&D.

The average growth rate of the volume of off-budget financing of all analyzed joint-stock companies with state participation from 2015 to 2017 was 28.1%, which may indicate that companies are interested in developing R&D to increase their competitiveness both in the domestic and foreign markets.

Extra-budgetary R&D funding volume comparison

After analyzing the data of the statistical Form No. 2-Science 'Information on the performance of research and development' and investment development programs of state corporations and companies with state participation for 2017, a comparison was made of the values of their R&D financing volumes, which is presented in Table 3.

Table 3. R&D funding volumes in 2017

Company	Extra-budgetary funds, Report, billion rubles	Extra-budgetary funds, Form No. 2-science, billion rubles	Deviation of the report data from the data of Form No. 2-science, %	Budgetary funds, Form No. 2-science, billion rubles	The share of extra-budgetary funds in R&D expenses, Form No. 2-science, %
Open JSC 'Russian railways'	8.3	5.2	61	0.4	94
Public JSC Gazprom	8.0	3.1	159	0.0	100
State corporation 'Rosatom'	25.6	19.3	32	83.1	19
State corporation 'Rostekh'	40.0	12.2	229	31.9	28
State corporation 'Riskosmos'	13.6	0.7	1826	30.0	2

Source: compiled by the authors.

For Open JSC 'Russian Railways', the report presents projected R&D costs, as no actual figures were found in the company's official documents. Accordingly, we can assume that Open JSC 'Russian Railways' really spent 5.2 billion rubles, which is reflected in the submitted form No. 2-science, therefore, in table 3 there is a deviation of 61%.

For Public JSC 'Gazprom', the report provides estimated R&D costs based on the projected share of revenues directed to R&D. The target share of revenues directed to R&D, according to the Company's Innovative Development Program, was in the range of 0.1% from 0.2%. The data presented in Form No. 2-Science is in line with the target revenue of 0.057%. Thus, the actual value of R&D costs does not meet the target, as evidenced by the discrepancy of 159% in the comparison table.

For public corporations, the report presents the actual values of the volumes of extra-budgetary R&D funding, which are published in the official documents of corporations in the public domain, but these values do not correspond to the data from Form No. 2-Science. As noted earlier, this may be due to different methods of accounting for R&D costs for official documents of corporations and forms of federal statistical observation. Besides, the discrepancies are since data for some organizations in the report are presented only as forecast values.

The efficiency of spending budget funds for 2017 in the field of R&D can be estimated based on table 3, which shows the amount of extra-budgetary funds raised per 1 ruble of budget funds by groups of all-Russian classifier of public authorities and administration. Accordingly, the larger this volume, the more efficiently the group uses budget funds.

IV. RESULTS

Based on the results of the analysis, the following conclusions can be drawn.

The total expenditures of companies with state participation in R&D in Russia account for about 14% of similar expenditures of state corporations.

Among state corporations, the largest volume of R&D expenditures, according to Form No. 2-Science, in 2017 falls on 'Rosatom', however, according to the companies' reports, the state corporation 'Rostekh' is the leader, with about a fifth of the expenditures in both companies accounted for extra-budgetary funds. According to the analysis of the Innovative Development Programs of joint-stock companies with state participation from 2015 to 2017, the leaders in terms of the volume of off-budget R&D funding are JSC 'Inter Russian JSC Russian energy company', Open Joint Stock Company 'Russian Railways', Public JSC 'Gazprom'.

Joint-stock companies owned by the Russian Federation, when conducting R&D, are guided to a greater extent by off-budget sources, in particular, their funds.

Among state corporations, the state corporation 'Rostekh' is the most efficient in terms of attracting budget funds.

The discrepancy in the data presented in the annual reports of companies and the form No. 2-science can be explained by the different methodology according to which expenses are classified for corporate and statistical purposes.

V. CONCLUSIONS

The main problems existing in the methodology used for accounting for research and development work, in particular off-budget, are the lack of transparency of companies that are not interested in the timely publication of their reports in the public domain, as well as the likelihood of differences in the classification of expenses, which creates a situation when different companies use different logic when deciding whether funds spent for specific purposes are included in research and development (R&D) work expenses.

In connection with the above, it is necessary, firstly, to develop and implement a unified methodology for accounting for research and development work costs, stimulate companies to increase the degree of transparency, and create an infrastructure within which it will be possible to introduce a mechanism for attracting extra-budgetary funds for R&D work.

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