Methodical approaches to assessment of scientific results effectiveness in Russia

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Abstract: In order to solve these problems, we should develop brand-new approaches to analysis and assessment of R&D cost-effectiveness in scientific and production activities as well as innovation activities. In Russia these problems are not attended to properly. There are no more or less significant practical development or theoretical justifications which allow using value approach in management, so tackling the afore-mentioned issues, one the one hand, requires their systematic development due to the specifics of scientific and technological progress characterized by systematic innovation with broad use of information technology and commercialization of intellectual property as R&D result which is formed during innovation activities.
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Introduction

This article presents the analysis results of R&D investment effectiveness on micro and macro levels and studies matters, related with grants funding and taxing:

- Methodical approaches to assessment of scientific results effectiveness
- The effectiveness of governmental measures for supporting Russian science with the existing system of grant taxation
- Science is supported all over the world. This support extends to definite researchers and takes the form of grants. There are specific features of grant support in Russia. What are they?

The problems of R&D cost-effectiveness and forms of R&D funding and taxing have been researched in different times by famous scientists, such as: A. Akayev, A. Andrianov, A. Asaul, E. Balatsky (2009), V. Barancheev (2007), I. Blank, F. Boyer, Y. Bychaev, D. Demidenko, G. Goldstein, V. Glukhov, A. Gryaznova, E. Egereva, I. Eliseeva, I. Ivashkovskaya, A. Karlik, V. Kovalev, E. Kozlovskaya, V. Kelle, M. Limitovsky, V. Livshits, G. Malinetsky, L. Mindeli, N. Komkov, A. Novozhilov, A.Ostashkov, O. Shcherbakova., S. Valdaitsev, A. Viktorov, P. Vilensky, V. Volkova, V. Zherebina.

Estimation of research subvention losses due to taxation of legal entities

Let us look into the leakage of money researchers experience as a result of the current taxation system. So, as a result of work done by a team of researchers [1, 2] «Thin-film multilayer coatings beat cracks» by V. Tabakov, M. Smirnov, A. Cirkin , there has been found a solution to increase cutting tools durability with the use of the new three-layer coating TiZrFeTiZrFeNTiZrN. This technology has been applied by a machine-building company OAO "Klimov" [3], the leading Russian developer of gas turbine engines (http://en.klimov.ru/about/general) []. Let us calculate the amount of grant subsidies for the researchers and losses resulting from the current taxation system. We assume that the Russian Fund of Fundamental Research (RFFR, www.rfbr.ru) has supported the scientific research project and paid at the first stage (state of fundamental research development) 200 000 rubles to one of the scientists and the next year, at the second stage, paid 1,500,000 rubles to a team of 3 researchers as subsidies to put the technology into practice. According to the legislation, the team can receive the grant only through a legal entity. However, this is a direct deduction from the grantees' income. Furthermore, in case the money is transferred to the account of a legal entity and takes the form of salary, it is subject to the same taxation as salary payments (mandatory payments to insurance funds before 2011 were 26%, in 2011 – 34% and after 2012 – 30%.) [3, 5]. This is one more serious deduction from the grantees' income. This deduction appears automatically when converting an individual (researcher) into a legal entity (organization). Therefore, such a conversion influences destructively on the researchers' work motivation. The income charged to the researchers is automatically liable for income tax (13%). This form of deduction cannot be controlled by researchers either and comes in force automatically. If we represent the initial amount of the research grant as GR, and the amount of money paid to the researcher as net income as NCF , the dependence between them with the current taxation system can be shown in the following way (in the

general view):

$$NCF = \frac{(1-\alpha)(1-\beta)(1-\gamma)}{(1+\omega)} * GR \quad (1)$$

And, in case some equipment should be purchased (R&D):

$$NCF = \frac{((1-\alpha)(1-\beta)GR - R\,\&\,D)(1-\gamma)}{(1+\omega)} \quad (2)$$

where α is the share of overheads, related with registration of scientific research work in RFSTIC (Russian Federal Scientific Technical Information Centre), bank commission for salary transfer into plastic cards, etc.; ω - salary payments quota in percentage (Mandatory payments to insurance funds, 30%); β - the percentage of grant amount paid for finance monitoring and technical maintenance of the project (15%); γ - income tax rate (13%);R&D – expenses related with equipment purchase in rubles.

Let us calculate the amount of grant paid after taxes to the project participants: the percentage of overheads α includes expenses on registration of the scientific research work in RFSTIC, bank commission for salary transfer to plastic cards and deductions for increased value of company's material assets. As a rule, this amount is not big and for average grants is α =3-4%. The amount of grant β, paid for finance monitoring and technical maintenance of the project is β =15% for RFFR. Although the regulatory documents stipulate the figure of 15% as a maximum (formally it can be equal to zero), in practice it is the one used when dealing with grant subventions. According to the R&D conditions some equipment should be bought in the amount of 500,000 rubles.

Table 1. Calculation of tax burden

Key figures:	1 year		2 year		Total
	Rate	Amount, RUR	*Rate*	Amount, RUR	Amount, RUR
Amount of grant on R&D in machine-building (GR)		200 000		1 500 000	**1 700 000**
Overheads (a)	*3%*	6 000		45 000	51 000
Finance monitoring of the legal entity (b)	*15%*	29 100	*15%*	218 250	247 350
Purchase of equipment and test samples (R&D)				500 000	**500 000**
Mandatory payments to insurance funds (w, MPIF=30%)	*30%*	38 054	*30%*	170 019	208 073
Net income of the researchers excluding personal income tax (as labor compensation fund)		126 846		566 731	693 577
Calculation of the personal income tax (13%)	*13%*	16 490		73 675	90 165
Net income of the researchers including personal income tax (NCF_1)		110 356		493 056	**603 412**
or in % of the grant amount		*55,2%*		*32,9%*	*35,5%*
Net R&D costs (NCF_2), RUR.		**110 356**		**993 056**	**1 103 412**
or in % of the grant amount		*55,2%*		*66,2%*	*64,9%*
Financial and tax burden, RUR.		89 644		506 944	**596 588**
or in % of the grant amount		*44,8%*		*33,8%*	*35,1%*

As one can see, at the second stage, instead of 1.5 million rubles, the researchers received 493,056 rubles after taxes, which is equal to 32,9% of the initial amount. By now, the federal law "On amendment to article 217, part two of the Tax Code of the Russian Federation" has been passed. In accordance with the new version of the Tax Code [6] (www.garant.ru, www.nalog.ru), taxes are not imposed on the incomes of individuals received by taxpayers in the form of grants (gratuitous aid) which have been given to support science, education, culture and arts in the Russian Federation by international, foreign and (or) Russian organizations included in the list of such organizations which has been approved by the Government of the Russian Federation. This list, according to decree No. 602 of 15 July 2009, includes Russian State Scientific Fund and Russian Fund of Fundamental Research.

We recalculate this figure without the income tax and receive the amount equal to 566,731 rubles. Anyway, the tax amounts are too high for individuals and the tax burden on grant subventions does not comply with any international or Russian standards. If we bear in mind the fact that grants themselves are a specific form of charity (in this case, state charity), this tax system seems to be absolutely absurd [5]. Thus, the current Russian tax system is built in such a way that about a half of the given grants returns to the state treasury. Such a size of the tax burden is considered to be unacceptably high even for legal entities involved in commercial activities.

Methodical approaches to assessment of scientific results effectiveness

One of the major conditions for science management optimization is development of methodical approaches to the assessment of scientific results. In order to ensure comparability of different R&D types [7, 8, 9, 10, 11]– from fundamental research to development and demo programs – the most general critiria which reflect three fundamental aspects inherent in any R&D program should be defined: relevance – justification of importance, possibility and necessity for federal investment in a program; quality – justification of the way how the invested budget funds can provide the best quality of R&D; performance – justification of the effective use of investment. To assess the effectiveness of technology during the operational stage, cost, profitability, elasticity and other factors are primarily used [12]. Shareholder value of the company is often used to measure its financial performance. For the management of the company, the proportion of the expected free cash flow and weighted average cost of capital is the shareholder value of the company. Thus, economic assessment of R&D should arise from the system influence on this proportion. As a result, the following factors should be analyzed: cash flow, related with the commercialization of R&D results; capital investment for introduction of the new

system (problem of financing); effect of the new system on the monetary evaluation of the risk for all company's activities; institutional constraints (taxes, duties, direct constraints …)

We go back to our example and calculate the direct savings on cost for a machine-building enterprise OAO Klimov when using a new three-layer coating TiZrFeTiZrFeNTiZrN 1 «Thin-film multilayer coatings» [1] (Tabakov V. (2008)). The financial statements of the company say that the annual prime costs of OAO Klimov*'s* products were 2 558 750 000 rubles in 2009. A considerable proportion of machine components and mechanisms are manufactured with the use of cutting. As the abstract of the scientific research says, the share of tooling costs can be 3-10% of the products' prime cost, and the doubled life period of the tools, all other things being equal, can result in decrease prime cost up to 5% [3].

Let us assume that the share of tools' purchase for a science absorbing industry in the overall costs of the products sold (prime cost) is 3% (the lowest limit of the range from 3 to10% is taken) and the saving on costs is 5% (maximum value). Then the value of the first component of R&D implementation effect is 3 838 125 rubles (=2 558 750 000*0,03*0,05). We shall call the value identified as the direct effect of the innovation. Let us calculate one more index of R&D direct effect multiplication as a relation of the direct effect on the actual investments (modification of R&D multiplier by formula [11]) as:

$$\text{R \& D multiplier} = \frac{\text{Costs of new product development}}{\text{Capital investment for production and sales of this product}} \quad (3)$$

Table 2. Multiplication index of R&D direct effect

Factors	Overall R&D costs (RUR) (from table 1)	Relation «direct effect / investments», (shares)
Amount of grants	GR=1 700 000	2,26
Net research costs	NCF_2=1 103 412	3,48

With the use of the "direct effect/investments" multiplier equal to 3.48, it is possible to evaluate the institutional losses in the RF taxation system as the product of overall financial and tax load (596 588 rub. in Table 1) multiplied by the value of the multiplier. This amount is equal to 2 075 181 = 596 588 *3.48. With the application of the well-known principle of the time value of money, one can prove that, when removing part of the cash from the economic system, the state loses future profits from R&D commercialization [8]. Using financial statements data and direct R&D effect, the total value of the R&D result or effect can be formed:

Table 3. Calculation of the overall effect of R&D implementation

Factors	Amount, RUR
1. Profits from R&D (according to the accounting records)	472 667 000
2. Effect (savings on direct costs)	3 838 125
=Total overall effect of R&D implementation=1+2	**476 505 125**

Total overall effect of R&D implementation in the amount of 476 505 125 RUR will be used to identify the relative effectiveness of R&D result which the company obtained. In order to use the new technology OAO Klimov has to buy it from the researchers. The price of the new technology or its marginal cost must be calculated. According to the expert data, the "R&D costs/IPO cost" multiplier has a value from 15 to 28 (shares). The reason for the IPO price identification is the amount of finance used for IPO creation [13]. Let us consider two options for R&D financing: including losses in the taxation systems and excluding them. Let us use the data of Table 1.

Table 4. Identification of R&D cost at the stage of commercialization in terms of R&D costs/IPO costs multiplier

Factors	Option 1 (including losses in the taxation system)	Option 2 (excluding losses in the taxation system)
R&D costs/IPO cost multiplier (times)	20	20
Net research costs (NCF_2), RUR.	1 103 412	----
Amount of grants (GR), RUR.	----	1 700 000
Identification of IPO cost range for the company from and to, RUR.	**22 068 238**	**34 000 000**

So, the value of the new technology can be identified from 22 to 34 million rubles, i.e. we review the process when the intellectual property object is being commercialized. Now we can estimate the effects of the new technology purchase (IPO) for the end-user, OAO Klimov. We will do this both including and excluding the taxation (institutional) limitations. With the use of the data from the company's financial statements, we can calculate the index of the relative effectiveness of the investment

costs on the basis of the elasticity principle. Traditional factors of the investment effectiveness (NPV, IRR) cannot be used here, since there are no capital forming investment costs, in the proper sense of the word, i.e. in this particular case we talk about purchase of an intellectual property object for the end-use by a manufacturer [10].

According to the accountancy requirements [6], the value added tax is not applicable for this transaction and the costs are written off in the current period with the reduction of the taxable profits. Further on, let us estimate costs of IPO introduction in the company. We know OAO Klimov production costs on high-technology products with account of direct savings when applying IPO (R&D results) and they are going to amount for 451 770 000*0,97= 438 216 900 RUR.

Table 5. The factor of the relative effect from R&D introduction (elasticity of costs connected with IPO introduction)

Factors	Option 1 (including losses in the taxation system)	Option 2 (excluding losses in the taxation system)
IPO price, RUR.	22 068 238	34 000 000
Prime costs, including direct effect, RUR.	438 216 900	438 216 900
= New prime costs of R&D, RUR.	460 285 138	472 216 900
Overall annual costs of the company prior to IPO introduction, RUR.	528 532 500	528 532 500
Total overall effect of R&D introduction	476 505 125	476 505 125
Relative effect of R&D introduction (by formula 3)	**1,158**	**1,128**

Innovation company value growth

Appraisal of the value growth and effectiveness of an innovation company based on R&D multiplier [7, 8, 14]:

$$Eff_{Value} = V' - V = 0{,}5\left(\frac{V}{\varphi} \times \varphi' - \frac{V}{1-\varphi} \times (1-\varphi')\right) - V \quad (*) \quad (4)$$

where V is a market value of the company (RUR); V' is a market value of the company after having new R&D costs (RUR); φ - share of R&D costs; φ' – share of R&D costs on a new product; Eff_{Value} – multiplication effect in rubles.

$EEff_{R\&D} > 1$ - Innovation cost-effectiveness grows, and it is going to be higher for option 1, since IPO price is lower. I.e. at the micro level (researcher-manufacturer), the stipulated innovation activity is effective. In order to identify the effectiveness at the macro level, for the whole economic system: state – researcher and manufacturer- manufacture, the relevant cash flows should be identified. To do so, the value of OAO Klimov should be calculated prior and after IPO commercialization. The value of OAO Klimov prior to IPO commercialization can be calculated via the method of direct capitalization of profit as equal to 4 274 480 000 rubles at the recapitalization rate of 15%. At the same time, its balance value is equal to 3 837 437 000 whereas the value of the owned capital is 1 171 371 000 rubles. To identify the market value of the company after the IPO has been commercialized, by formula (*), the share of R&D costs should be defined (34.7% before the IPO was purchased and 35.98% after it) in the total amount of the company's expenses (2 663 971 000 RUR). The financial statements show R&D costs as 924 437 000 RUR and the IPO cost as 34 000 000 RUR, which are included into the said expenses. Then the value growth by formula (*) is 36 832 506 or 0.86% to the value of the company prior to R&D commercialization. Let us calculate the relevant cash flows for the economic system (state-researcher-manufacturer).

Table 6. Projection of the relevant cash flows for the economic system (state-researcher-manufacturer)

Factors, RUR.	1 year	2 year	3 year	4 year
1. Efflux of grant subsidies, RUR.	- 200 000	- 1 500 000		
2. Money repayment through taxes, RUR.	89 644	506 944		
3. Direct R&D effect, RUR.			3 838 125	
4. Losses in obtaining direct effect because of the taxation system and substitution of relations			- 2 075 181	
5. Growth in the company's value				36 832 506
6. Overall CF in the economic system	- 110 356	- 993 056	1 762 944	36 832 506
7.NPV	22 936 505			

If the same cash flows are calculated, but without losses in the tax system, the amount of the current net value will increase and NPV= 23 898 367 RUR with the discount rate of 13%. I.e. the system effectiveness would grow by 4.2%. The obtained amount is rather modest, but for the economic system as a whole it is quite significant, therefore the above-mentioned approach helps to tackle the problem of use of the company's intellectual activity results, estimate the effects of the introduced R&D results both at the micro and macro levels [15].

Conclusion

Cost-effectiveness is defined by many parameters. However, the innovative nature of the way the social and economic relations develop, according to the post-crises economic changes, causes shift in approaches, analysis, and assessment and management methods of social and economic systems management. The market economy development in our country has a number of specific

features, the major of which is a broad attraction of investment resources. It requires a considerable increase in the motivation factors, which, in their turn, dictate the use of cost-oriented (value) approach.

To summarize, we should emphasize the necessity to introduce three simple principles for grant system formation: maximum trust for individual researchers from the state; rejection of the authorities from the savings on science with the help of "concealed" fiscal instruments; active introduction of modern financial technologies for the budget to work with individuals. Otherwise, constant "removal" of half of allocated money (grants) can seriously demotivate national researchers, who play an important part in building up modern national economy of innovation type.

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