

Assessing the impact of public funding and tax incentives in Russia: recipient analysis and additionality effects evaluation

Yuri Simachev*,
Mikhail Kuzyk**,
Nikolay Zudin**.

*Russian Science Foundation (Moscow, Russia, 109992, 14/3, Solyanka str.)

**Interdepartmental Analytical Center (Moscow, Russia, 121069, 31/29, Povarskaya str.)

Corresponding author:

Nikolay Zudin,
tel.: +79165715843
N_zud@mail.ru

Abstract

So far a considerable number of studies with the use of the basic evaluation approach called additionality concept has taken place but none of them paid attention to the Russian innovation policy additionality. In this study we performed a microeconomic evaluation of the industrial firms' public innovation support in Russia focusing on its two key toolbox elements: direct funding and tax incentives. Based on the data from a questionnaire survey of top executives of Russian manufacturing firms held in 2015 we identified and evaluated the profiles and the performance correspondingly of direct funding and tax incentives recipients. We also assessed the "relative" additionality - the additionality of a concrete instrument for a particular firm relative to all other used instruments - with propensity score matching. The results show that generally Russian industrial innovation policy tends to target sufficiently large and long-operating companies. In terms of effects we have confirmed not only the importance of the fiscal support in providing all main kinds of additionality but also its significance in the private investment crowding-out. Tax incentives as our results suggest almost do not contribute to additionality of any kind which is especially unusual regarding input additionality. One should also point out a relatively small impact of public support on science-business cooperation which is quite unexpected considering Russian government substantial effort in enhancing its development.

Introduction

In recent years the attention to innovation policy evaluation, particularly as a means of learning and also as a search for the best practice, has intensified in many foreign countries. What has been successful in one country may be counterproductive in the other, so the problem identification should be combined with certain "experiments" over solution methods combined with learning processes development (Rodrik 2008; Chaminade et al. 2009). By now an extensive experience in assessing the impact of public policies on fostering companies' innovation activities has been accumulated. There's also a significant progress in the development of methodology concerning the assessment of science-technology and innovation policies that should be mentioned (Crespi et al. 2011). Objectives of the innovation policy evaluation have become more complex due to the recording need of a substantial amount of different factors and effects, including non-economic. The evolution of evaluation techniques goes in several directions (OECD 2012):

(1) establishment of frameworks and conditions, formation of the evaluation culture, sometimes - the development of assessment legislation;

(2) expansion of the assessment institutions and their coordination, distribution and improvement of assessment practices;

(3) formation of the base and infrastructure for the evaluation - determination of standards and methodologies, combining assessment with the KPI, accumulation of policy implementation data, support of the evaluation expert community.

The following features of the modern innovative instruments evaluation practice can be distinguished:

(1) regular assessment, cross-country comparison of the results;

(2) long observation periods (over 10 years), maintenance of extensive detailed statistical databases urgent for performing evaluation; openness of assessment procedures to capture new effects.

(3) the complexity and ambiguity of the estimates (e.g. considering substitution effect), presence of significant time lags over output effects (4-6 years), high heterogeneity of the incentive mechanisms impact; substantial econometric problems; preparation and submission of guidelines on principles and problems of evaluation;

(4) openness, publicity of assessment results; practical use of the assessment results for decision-making at government level – the spread of best practices; drawing lessons: in particular, making decisions to stop, clarify or expand various programs, mechanisms and instruments aimed at fostering innovation activity

It must be admitted that Russian public innovation policy evaluation system in comparison with the best foreign examples turns out to be quite imperfect and unbalanced – due to the excessive emphasis on the direct results of support and lack of attention to drawing lessons process.

Concept of additionality: main points

In recent years the basic evaluation approach of the innovation policy toolbox has become the concept of additionality. Conceptually, in the context of government intervention the notion of additionality involves comparison of the real situation of receiving government support with a hypothetical scenario of what would have happened if no support had been provided.

The central element of the additionality concept is the change in specific indicators and company characteristics achieved thanks to government support. For this reason additionality is often classified by the type of considered indicators and so is divided into input, output and behavioral additionality. It must be added that among recognized in economic literature a significant portion of innovative development problems lies in the features of economic agents innovative behavior: lack of responsiveness to new knowledge, low level of cooperative activities etc. (Gok, Edler 2011). Thus, behavioral additionality should be considered more closely. There's also a more detailed subclasses of each type of additionality which are briefly represented in figure 1. To save time we will not dig into them but instead would highlight some important points concerning basic concept of additionality.

In general, along with the main and obvious advantage of the additionality concept which lies in operating with “clean” results of the public support not being achieved in the absence of the latter, one can identify a number of other important arguments in favor of this approach:

- a wide range of considered effects, including hardly formalized “quality” results of the support, such as development of partnerships and competences;
- consideration of not only the direct influence of the public support on a recipient, but also of the indirect impact on his partners in science-industrial cooperation;
- consideration of government support effects not only in the period of its provision but also after its termination is essential, firstly, to test the robustness of the results and, secondly, due to the fact that these effects often occur with a significant time lag, sometimes even a few years after provision of government support (Lopez-Acevedo, Tan 2010; Crespi et al. 2011a).

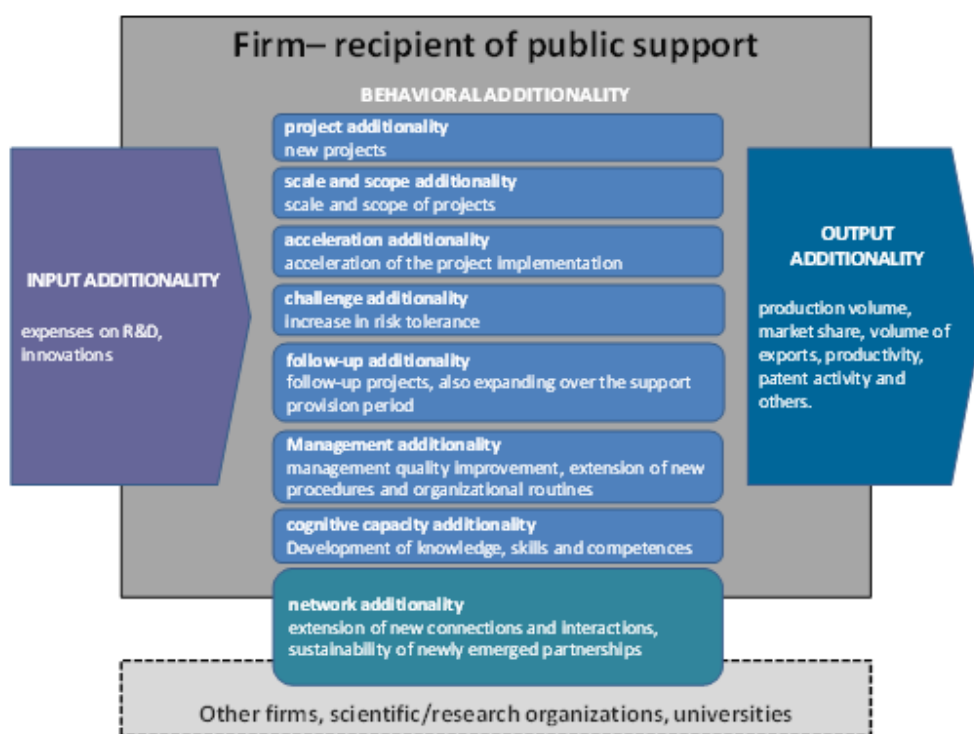


Figure 1 – Main types of additionality

Sources: based on Buisseret et al. (1995); Georghiou (1997, 2002); Bach, Matt (2002); Georghiou et al. (2002); Rye (2002); Falk (2004); Georghiou, Clarysse (2006); Idea Consult (2006); Hsu et al. (2009); Gok (2010); Roper, Hewitt-Dundas (2012); Viljamaa et al. (2013); Wanzenbock et al. (2013); Lohmann (2014); Neicu et al. (2014)

Thus, the use of the additionality concept as the basis for the analysis of the public support effectiveness enables to minimize the risks of overvaluation (due to the orientation on a net effect) and of undervaluation (what is even more important from the standpoint of identifying and disseminating of best practices).

Contemporary empirical evidence on the public support additionality: brief overview

So far a considerable number of studies assessing the effects of innovation policy on firms' activity with the use of the concept of additionality has taken place. However, none of the known studies paid attention to the Russian innovation policy additionality. In most of them the object of analysis were various instruments of government funding or - more rarely - general financial support for innovation as the direction of the public innovation policy. Making no claim to cover all the existent empirical evidence on additionality, we, nevertheless, on the basis of the results of about thirty studies can identify some common features and patterns of the financial support in terms of additionality concept.

Most often, the subject of analysis became input and output effects of the public support as well as network additionality (figure 2). Three other types of behavioral additionality – acceleration, follow-up and challenge - in contrast, relatively rare have attracted the attention of researchers. Finally, despite the fact that cognitive capacity additionality is often considered in theoretical works, in practice it is usually either not included in the scope of the empirical analysis or considered as a part of the follow-up or management additionality.

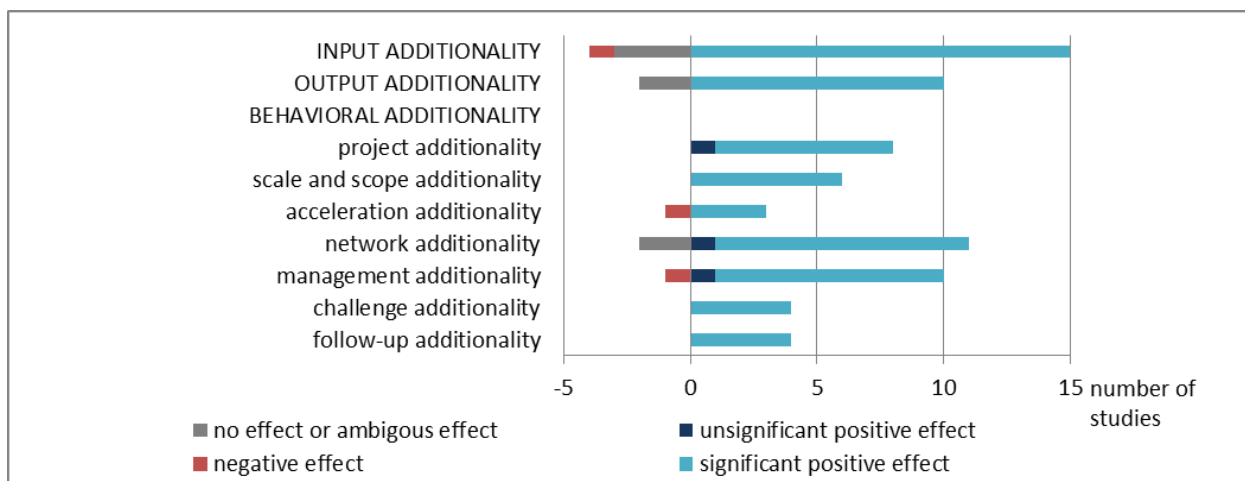


Figure 2 – Financial support additionality of the innovation activities of the companies - generalization of empirical evidence

Sources: based on Callejón, Quevedo (2005), Pegler (2005), Georghiou et al. (2005), OECD (2006), González et al. (2005), Czarnitzki, Licht (2006), Fier et al. (2006), Falk (2007), Busom, Ribas (2008), Hsu et al. (2009), Gelabert et al. (2009), Clausen (2009), Knockaert, Spithoven (2009), Idea Consult (2009), Baghana (2010), Wanzenbock et al. (2011), Catozzella, Vivarelli (2011), Marzucchi, Montresor (2012), Antonioli et al. (2012), Lucena, Afcha (2013), Lohmann (2014), Hud, Hussinger (2014), Montmartin, Herrera (2015), Cantner, Kösters (2015), Montmartin et al. (2015).

In most cases results obtained by the researchers confirmed the presence of different additionality effects. However, there are important single reverse examples.

Thus, the study of Marzucchi, Montresor (2013) dedicated to the analysis of the results of financial support provided at regional and national levels for companies' innovation activities in manufacturing sector of two European countries - Italy and Spain - revealed in both countries the absence of input additionality for regional innovation funding in contrast to its presence at the national level. With regard to Italy the authors along with a significant positive impact of the government support (both at regional and national levels) on process innovations have discovered a meaningful negative impact on the product innovation financing at the regional level. Researchers believe that obtained results can be explained by the fact that regional support stimulates more the “deepening” of the innovation activity rather than its "reversal" to the

producing of new products. In addition, the negative relationship between regional funding and employees' qualification improvement activities has been identified for the Italian companies. Also the same consistent pattern was found for the networking with other companies aimed at obtaining information, while in the case of information networking with the scientific organizations the effect of regional funding has been, in contrast, positive.

In the study of Montmartin, Herrera (2015) devoted to the analysis of the public financial support and tax incentives on the scale of private funding of R&D on the basis of data for 25 OECD countries over a twenty-year period (1990-2009) the authors came to the conclusion that at the country level tax incentives increase the intensity of business expenditure on R&D, while direct government funding leads rather to the opposite result. In a more "local" study (Montmartin et al. 2015) on the basis of data from 94 regions of mainland France for 2001-11 authors analyze the direct and indirect impact of the financial support provided at the regional, national and supranational (EU) level on the private R&D spending. The results suggest that a significant input additionality was revealed only for the national government subsidies, while the corresponding additionality was statistically insignificant for EU financing and regional subsidies.

Quite interesting and unexpected results have been received by Lohmann (2014) through in-depth interviews with project managers in the airline industry: government participation in financing of projects, contrary to expectations, did not lead to the reduction of terms of their implementation, but on the contrary - to their prolongation, meaning that that acceleration additionality is negative. This determined by the long period of subsidies' provision which significantly exceeded the typical duration of the supported projects. At the same time, however, a number of respondents described the increase in the duration as a result of public support for projects as a positive effect, which allowed carrying out a more detailed study of projects and thus increasing the chances of their successful implementation.

As for the tax incentives they have become the object of the additionality studies to a considerably less extent. As a rule, researchers only considered the input additionality and obtained an empirical evidence of its presence (Figure 3). At the same time, in the above mentioned research (Montmartin et al. 2015), the authors came to the conclusion that the direct positive effect of tax incentives for a particular region is offset approximately equal in magnitude to the indirect negative effect for the other regions.

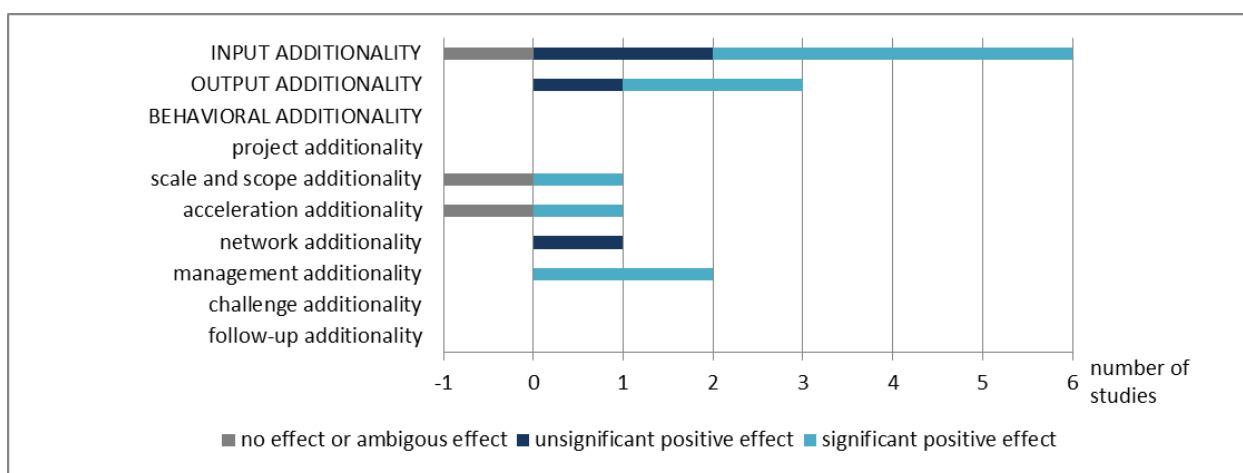


Figure 3 – Additionality of tax incentives for the innovation activities of the companies - generalization of empirical evidence

Sources: based on Poot et al. (2003), Hægeland, Møen (2007), Catozzella, Vivarelli (2011), Lokshin, Mohnen (2012), Zoran, Botrić (2013), Neicu et al. (2014), Montmartin, Herrera (2015), Freitas et al. (2015), Montmartin et al. (2015).

Objectives, method and data

The aim of our study is to perform a microeconomic evaluation of the industrial firms’ support implementation in Russia focusing on its two main instruments: direct funding and tax incentives. The usage of these two instruments for the analysis is quite straightforward as they are traditionally viewed as the key elements of the national innovation policy toolbox (e.g. David et al. (2000); OECD (2015)) and are well ahead of the other instruments in their “coverage” – the number of the firms supported (Kuzyk, Simachev 2013).

The objectives of this study are as follows:

firstly, to identify the “typical profile” of the firms-beneficiaries of the government support policy as a whole and direct funding and tax incentives in particular;

secondly, to consider the basic input, output and behavioral additionality effects;

thirdly, to analyze the “relative” additionality of fiscal support and tax incentives.

Data was collected from a questionnaire survey of top executives of Russian manufacturing firms which was held in September-October 2015.

The organizer of the survey was the Interdepartmental Analytical Center and field operation was carried out by the publishing and information center "Statistics of Russia". While constructing the sample to meet the research objectives we targeted the public support recipients. Thereby we’ve tried to capture in our sample, on the one hand, mostly high technology industries which are relatively more often supported by the government in Russia than low-tech and medium-tech industries (Zudin 2015) and, on the other, large companies because (as the results

of several studies prove) they become the beneficiaries of government support more often in comparison with SMEs (Fier, Heneric 2005; Aschhoff 2010; Simachev et al. 2014a). As a result, the final sample consists of 658 firms, $\frac{3}{4}$ of which belong to high-tech industries – first of all, chemical and machine-building complex, and is characterized by an equal share of small companies and relatively large enterprises (while the general population is dominated by small firms) (Table. 1). Additionally, it should be noted that in the sample as in the whole of Russian industry prevail companies with private ownership, but at the same time public companies are also widely presented, what is very important from the standpoints of the public support distribution analysis and its results evaluation. Finally, a major part of the surveyed firms are in a relatively healthy financial condition, but companies experiencing financial problems are also significantly represented in the sample.

Table 1. Sample structure

	Characteristic	Share in the sample
Industry	Manufacturing textiles, clothing and footwear	7,45%
	Wood processing, manufacturing of wood products, pulp, paper and paperboard	5,32%
	Chemical production (excluding pharmaceuticals)	6,23%
	Manufacturing of pharmaceutical products	4,71%
	Metallurgy, manufacturing of finished metal products	9,73%
	Manufacturing of machinery and equipment (except for machine-tools)	18,84%
	Manufacturing of machine-tools	3,95%
	Manufacturing of electrical machinery and electrical equipment	8,36%
	Manufacturing of computer technology, equipment for processing information, radio, TV and telecommunication	9,42%
	Manufacturing of medical equipment	4,86%
	Manufacturing of control and measuring devices	3,65%
	Automobile production	4,56%
	Shipbuilding	4,10%
	Manufacturing of railway rolling stock	4,86%
Manufacturing of aircraft	3,95%	
Operation period	less than 5 years	8,81%
	5-10 years	16,26%
	10-20 years	26,90%
	more than 20 years	48,02%
Ownership	state and municipal (including the ownership of state-owned corporations)	9,27%
	mixed	5,78%
	private	84,95%
Number of employees	less than 100 emp.	24,77%
	101-200 emp..	22,95%
	201-500 emp..	24,32%
	more than 500 emp..	27,96%
Financial condition	poor	17,93%
	satisfactory	69,91%
	good	12,16%

Sources: prepared by the authors

To determine the composition of the companies that are "consumers" of the government support we used a questionnaire in which respondents were suggested to mark if they had received budget financing, used tax incentives or other public support instruments and measures in 2013-2015. Actually the analysis of the public support results and additionality is based on the responses from CEOs for the objective questions covering a wide range of corresponding effects related to all the "classical" types of additionality with the exception of management and follow-up additionality (Table 2). Important to note that one of the main restrictions of the survey was the opportunity to interview only one person in a company and CEOs were chosen as they are actually better informed compared to any company's single specialist of the firm's profile, its position on the market and most importantly the impact of public support of different kinds on its activities and organizational routines.

Table 2. Comparison of the public support effects and different types of additionality

Effect	Additionality
volume of company's investment in new equipment based on its own or borrowed funds has increased	input
volume of company's spending on innovation based on its own or borrowed funds has increased	
volume of company's spending on R&D based on its own or borrowed funds has increased	
company's revenue has increased	output
company's market share on the domestic market has increased	
company's market share on the external market has increased	
production volume of new (improved) products has increased	
profitability of core company's activities has improved	
company's general competitiveness has increased	
import dependence of the company has been reduced	<i>import substitution</i>
a promising new project (projects) was launched	project
public support has allowed to implement a larger project (projects)	scale and scope
public support has allowed to implement (projects) with a longer payback period	
public support accelerated implementation of the project	acceleration
public support enabled to reduce risks of project implementation	challenge
development (strengthening) of the company's linkages within the scientific and industrial cooperation has occurred	network
public support has allowed to redistribute part of company's funds towards the other areas not related to the subject of support	—

Sources: prepared by the authors

Reducing the risks of innovation activities as a result of the public support we associate with the challenge additionality since this effect contributes to the risk "tolerance" of companies and thus to the initiation and implementation of more risky projects. Reducing import dependence of the companies (was included in the scope of the analysis due to the active implementation of the ISI policy in the Russian industry) directly does not correspond to any of the "classic" types of additionality and for this reason we regard it as a separate category. Finally, the redistribution of existing funds towards the other areas not related to the subject of public

support is nothing more than a well-known and frequently observed in national and foreign studies "crowding out" effect inherently completely opposite to the input additionality (David et al. 2000; Lach 2002; Chudnovsky et al. 2006; Benavente et al. 2007; Simachev et al. 2015).

In order to identify the specifics of public support recipients and the achieved results frequency and regression analysis are used. Moreover, for a more precise definition of "relative" additionality effects of direct funding and tax incentives we use a propensity score matching (PSM) which is currently one of the main techniques for the analysis of the additionality at firm level (e.g. Fier et al. (2006); Baghana (2010); Marzucchi, Montresor (2013); Cantner, Kösters (2015)). An important distinguishing feature of our approach is that we analyze the additionality of a concrete instrument for a particular firm relative to all other used instruments and therefore consider the "relative" additionality. This enables us to highlight additionality effects inherent precisely to tax and financial instruments distinguishing them from the "background" of all other elements of the innovation policy toolbox.

It is necessary to pay attention to two important limitations of our study. Firstly, we analyze the generalized directions of the public support: direct budget funding and tax incentives. This approach leaves out of account the specifics of selected support instruments and measures, but in general it seems to us quite rational and justifiable as tax and financial support are fundamentally different and also because in practice companies often tend to use only one of the generalized support directions due to relative proximity of measures (generated effects, problems etc.) of the same type (Ivanov et al. 2012). Note also that this "generalized" approach is widely used in modern empirical studies (e.g. Gelabert et al. (2009); Lokshin, Mohnen (2012); Marzucchi, Montresor (2012); Hud, Hussinger (2014); Bodas Freitas et al. (2015)).

Secondly, we do not distinguish between federal and regional support. Meanwhile, as noted above, the effects of such support can vary considerably (Marzucchi, Montresor 2013). However, such differences most clearly manifest themselves in the case of financial support. In Russia the innovation activities financing from the federal budget significantly exceeds the volume of the relevant funding at the regional and local levels (Gorodnikova et al. 2016).

Results

Public support beneficiaries - the typical profile

Before analyzing additionality results provided by tax and financial instruments we will briefly turn to the formation of the typical profile of the beneficiaries of public support. On the whole one third of the sample companies used some public support instruments in 2013-15; while 20 per cent of companies have received government funding, about the same – 21 per cent have enjoyed different tax incentives.

Large and long operating (over 20 years) companies have more frequently become the recipients of public support than relatively newly established and small (100-200 employees) companies. Note that such a "failure" of the public support application in relation to for small firms was observed by us earlier (Simachev et al. 2014a).

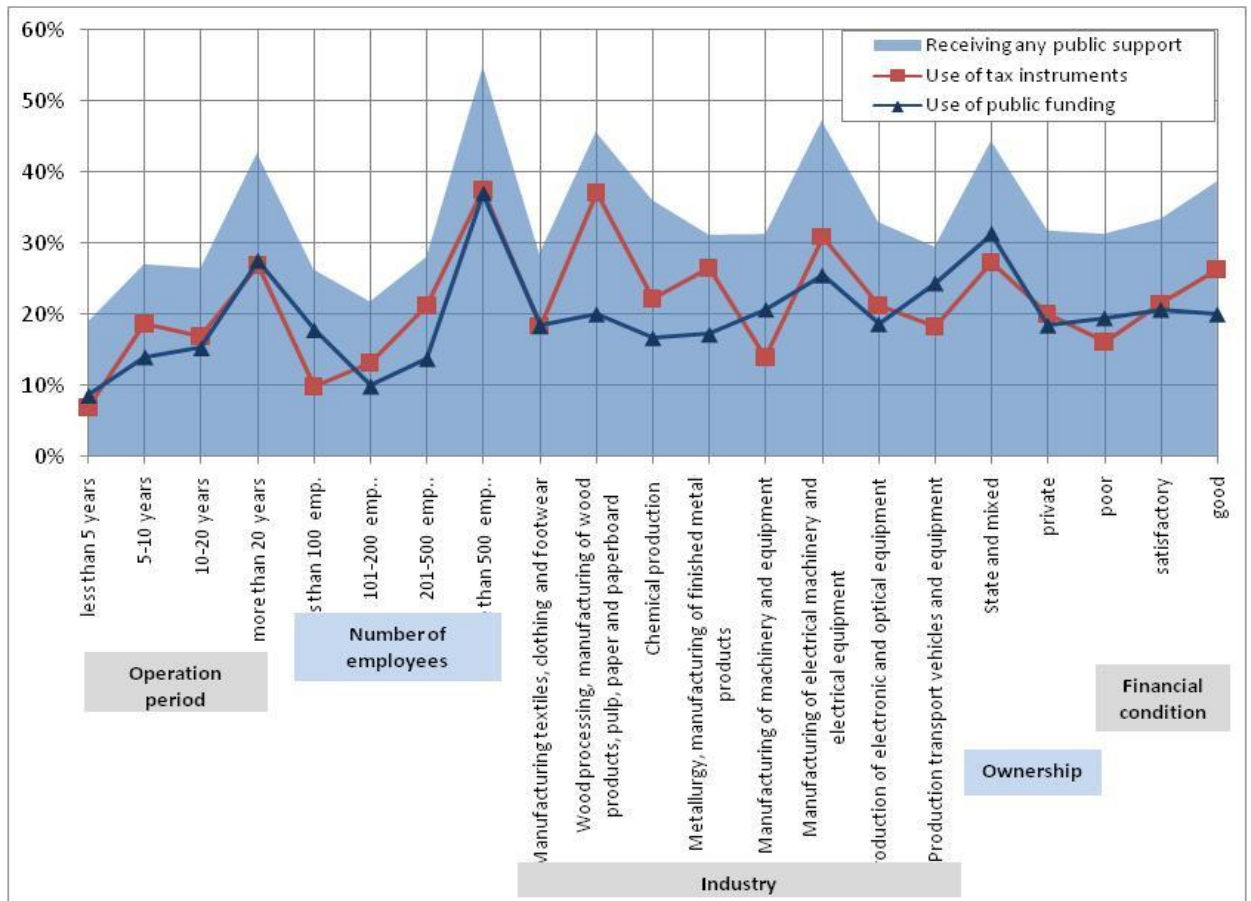


Figure 4 - Receiving state support in 2013-2015 by companies of different categories - percentage of the total company sample by category

Sources: prepared by the authors

Considering industries one can note "concentration" of both public support dimensions in the field of electrical equipment production and also a relatively frequent use of tax incentives by wood processing in a line with pulp and paper industry companies. Finally, the beneficiaries of financial support and tax incentives all else being equal more frequently become companies with government participation in capital.

Regression analysis which the explanatory variables reflecting all presented in Figure 4 categories of companies allows us to define more clearly the profile of beneficiaries using different tax and financial support instruments (Table 3.) The use of tax incentives in the review period was the most typical for large companies and unusual for SMEs (not more than 200

employees). Large and long-operating companies had the greatest chance to receive government financial support; at the same time, however, small firms also often became the recipients of budget funds.

Table 3. Receiving state support for companies in 2013-15 - calculation results for the binary logistic regression model

Independent variables (dummy)		Dependent variables (dummy)		
		Receiving any public support	Use of tax instruments	Use of public funding
Industry	Manufacturing textiles, clothing and footwear	<i>control</i>		
	Wood processing, manufacturing of wood products, pulp, paper and paperboard	+	+	
	Chemical production			
	Metallurgy, manufacturing of finished metal products			
	Manufacturing of machinery and equipment			
	Manufacturing of electrical machinery and electrical equipment	+		
	Production of electronic and optical equipment			
	Production transport vehicles and equipment			
Operation period	less than 5 years			
	5-10 years			
	10-20 years	<i>control</i>		
	more than 20 years	+		+
Ownership	State and mixed			
	private	<i>control</i>		
Number of employees	less than 100 emp.		-	+
	101-200 emp..		-	
	201-500 emp..	<i>control</i>		
	more than 500 emp..	+	+	+
Financial condition	poor			
	satisfactory	<i>control</i>		
	good			
Chi-square		78,39***	66,98***	65,44***
N		658		

Notes:

Maximum VIF value – 3,20.

* – significant a 10% level;

** – significant a 5% level;

*** – significant a 1% level.

Sources: prepared by the authors

Interestingly, that the regression analysis revealed no statistically significant relationship between receiving by industrial companies of the public support and fully public or mixed ownership, which is consistent with previous empirical results (Simachev et al. 2014a).

Main effects of public support

Talking about input additionality the most widely observed effect is the increase in investment in new equipment based on its own or borrowed funds. Interestingly, almost as often respondents mentioned the crowding out effect (see Table 4.).

The most common output effects of public support are the increase of new and improved products production and revenue, as well as growth of profitability and general company competitiveness. In contrast, least likely public support led to the increase companies' market share on the external markets. Moreover, public incentive policies contributed (but not very significantly) to companies' import dependence decrease. Among key behavioral effects of public support are the decrease in project timing and encouragement of new projects' launches. At the same time government support relatively rare led to the development of scientific-industrial cooperation, which seems very surprising in view of the impressive scale of the public policy in recent years aimed at encouraging network between science and industry (Simachev, Kuzyk 2015).

Input and output, and behavioral effects are inherent to a significantly greater extent in financial instruments than in general public policy and tax incentives dimension (Table 4). Wherein financial support significantly stood out from the other instruments in terms of such effects as growth of investment in new equipment, increase in production volumes of new and improved products, acceleration of project implementation and risk decrease. At the same time, the budget funding recipients are much more likely than other companies who received public support experienced crowding-out of own private funds by the government ones.

Table 4. Major results of public support – frequency statistics

	All the recipients of government support	Companies using tax incentives	Companies enjoying public funding
INPUT ADDITIONALITY	35,6%	36,7%	42,5%*
- volume of company's investment in new equipment based on its own or borrowed funds has increased	28,4%	25,9%	34,3%**
- volume of company's spending on innovation based on its own or borrowed funds has increased	15,3%	17,3%	17,2%
- volume of company's spending on R&D based on its own or borrowed funds has increased	15,8%	17,3%	18,7%
OUTPUT ADDITIONALITY	47,3%	48,2%	56,0%***
- company's revenue has increased	18,9%	16,5%	20,9%
- company's market share on the domestic market has increased	13,5%	10,1%*	16,4%
- company's market share on the external market has increased	2,7%	2,9%	2,2%
- production volume of new (improved) products has increased	21,2%	19,4%	27,6%***
- profitability of core company's activities has improved	18,0%	18,0%	17,9%
- company's general competitiveness has increased	18,9%	16,5%	22,4%
IMPORT SUBSTITUTION ADDITIONALITY	4,1%	4,3%	4,5%

- import dependence of the company has been reduced			
BEHAVIORAL ADDITIONALITY	44,6%	46,0%	55,2%***
- a promising new project (projects) was launched	19,8%	21,6%	24,6%**
- public support has allowed to implement a larger project (projects)	11,7%	12,9%	14,2%
- public support has allowed to implement (projects) with a longer payback period	12,6%	15,1%	14,2%
- public support accelerated implementation of the project	21,6%	20,9%	26,9%**
- public support enabled to reduce risks of project implementation	13,5%	15,1%	17,2%*
- development (strengthening) of the company's linkages within the scientific and industrial cooperation has occurred	8,1%	8,6%	9,7%
CROWDING-OUT EFFECT			
- public support has allowed to redistribute part of company's funds towards the other areas not related to the subject of support	29,3%	27,3%	37,3%***
N	222	139	134

Notes:

The significance of differences, the Chi-square test

* – significant a 10% level;

** – significant a 5% level;

*** – significant a 1% level.

Sources: prepared by the authors

Relative additionality of tax incentives and public funding

In this section we would like to address the “relative” additionality, i.e. the additionality of a concrete instrument for a particular firm relative to all other used instruments, to capture “net” additionality effects.

For a more precise identification and comparison of the effects generated by tax and financial support, we use the following typical algorithm¹:

1) The first step involves the assessment of the two sets of expected probabilities (propensity scores) of using tax incentives or obtaining budget funding consequently for sample companies by building bivariate logistic regressions with the "standard" set of control variables (see Table 3). At the same time, since the questionnaire about the public support effects were addressed only to recipients, evaluation was carried out under the sub-sample of companies with the experience of obtaining government support of any form in 2012-15.

2) At the second step for two dimensions of public policy (tax incentives and budget funding) pairs of most similar recipients and non-recipients are defined. Pairs are formed by nearest neighbor matching on the basis of propensity score variables created at the first step.

3) At the third step the average treatment effects on the treated (ATTs) for tax and financial support are estimated (for more details see Newey (2009)). It is important to note that initially this effect is described by the following functional dependence:

¹ A similar approach is used, for instance, in studies Fier et al. (2006); Baghana (2010); Marzucchi, Montresor (2013); Cantner, Kusters (2015).

$$ATT_{i,j} = E(Y_{ij}^1 - Y_{ij}^0 | S_i = 1) = E(Y_{ij}^1 | S_i = 1) - E(Y_{ij}^0 | S_i = 1), \quad (1)$$

где i – considered dimension of support (tax or financial); j – specific effect of the support; Y_{ij}^1 - indicator of presence or absence of the effect in case of receiving support of j type i ; Y_{ij}^0 - the corresponding indicator in the hypothetical situation, if this type of support has not been received; S_i – indicator of obtaining support of a specific type i (1 – presence, 0 – absence).

The main problem here is that the indicator Y_{ij}^0 is unobservable, so it is necessary for the calculation to find its approximation. Steps 1 and 2 enables one to do it by using the observed values of this indicator obtained for the "most similar" companies, not being a recipient of a specific support type. As a result, the functional dependence takes the following form:

$$ATT_{i,j} = E(Y_{ij}^1 | S_i = 1) - E(Y_{ij}^0 | S_i = 0). \quad (2)$$

Note that since the variables Y^1 and Y^0 are binary, the mean of ATTs are located in the range from - 1 to 1. Wherein the ATT's zero value corresponds to the case where the average values of indicators $Y_{ij}^1 | S_i = 1$ and $Y_{ij}^0 | S_i = 0$ (or the value of effect for recipient and non-recipient consequently) are identical. That means that the use of the specific instrument does not increase or reduce the emergence likelihood of a certain effect compared with the total set of public incentive mechanisms. Thus, the ATT indicator in this case reflects the "relative" additionality, provided by a certain dimension (tax or financial) on the background of general public support policy.

Evaluation results indicate that across almost all considered effects the impact of financial measures exceed the tax incentives with the exception of only two output indicators (the market share on the external market and profitability) and scale and scope additionality effects (Figure 5).

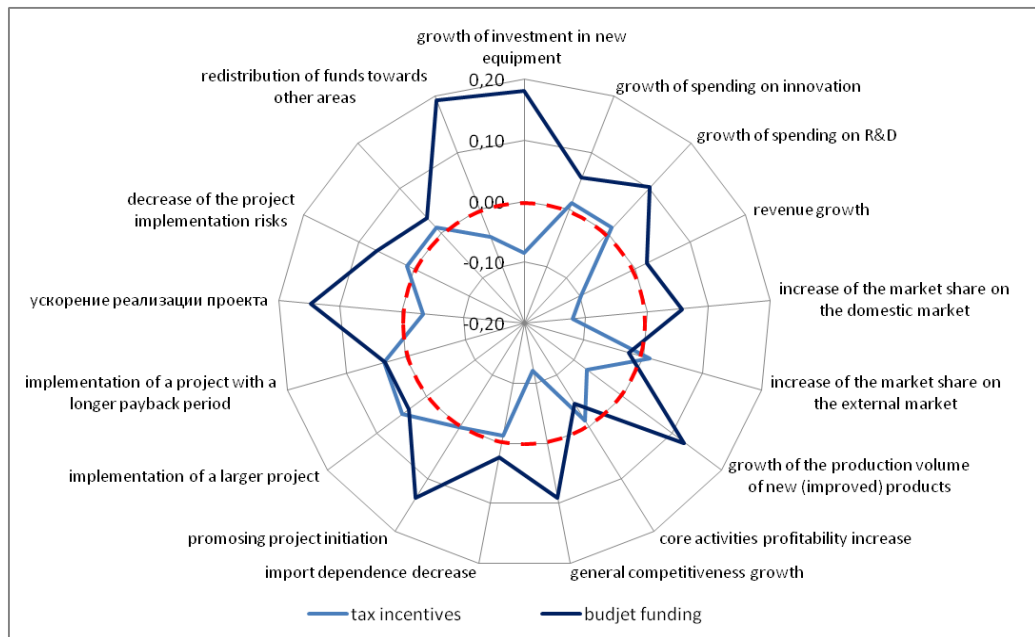


Figure 5 – Relative additionality of tax and financial support – average treatment effects on the treated (ATT) for sub-sample of companies-recipients of government support in 2013-15

Sources: prepared by the authors

The most significant “failure” of the tax instruments’ impact is observed in respect of the investments in new equipment, the market share on the domestic market and the general competitiveness of the company. At the same time it is important to note that the crowding out effect is inherent to a much greater extent to financial instruments than to tax measures.

Aggregation of ATT values for input, output and behavioral additionality revealed that financial support most strongly affects the input company characteristics with a noticeable positive impact also on its output and behavioral parameters (Figure 6). As for the tax measures, they are "in the rear" of public police in terms of all additionality effects, especially output.

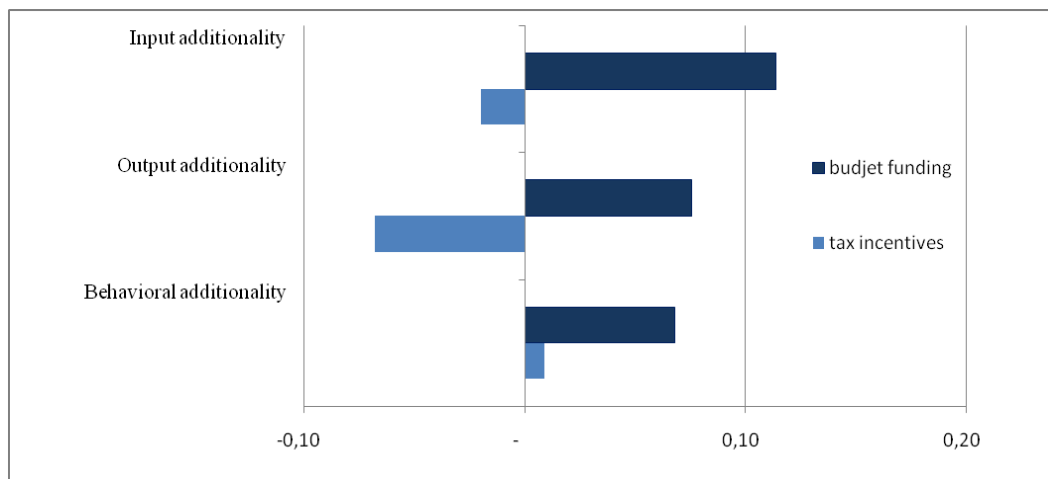


Figure 6 – Relative input, output and behavioral additionality of tax and financial support – average treatment effects on the treated (ATT) for sub-sample of companies-recipients of government support in 2013-15

Sources: prepared by the authors

In conclusion, we will take a brief look at the question of how company characteristics relate to specific effects. We calculated the parameters of ordinal regression models in which the dependent variables were the individual treatment effects on the treated² - the differences between the effects (with values 1 or 0) in the "recipient non-recipient" pairs: $Y_{ij}^1 - Y_{ij}^0$. Explanatory variables reflect all the above "standard" characteristics of companies (Table 3), except for the industry sector as in sub-sample formed by pairs of recipients and non-recipients of tax and financial support the relevant company group were not sufficiently representative. For this reason the industries have been aggregated according to their technology level³. If the recipient and non-recipient control parameters vary then in the models were used values corresponding to the recipients (treated). Below only results for the meaningful models are presented (Table 5).

The results though should be interpreted with great caution due to the relatively small number of observations (pairs of "recipient non-recipient"). Nevertheless, we believe it is important to note two consistent patterns (at least as a hypothesis for further empirical testing on larger samples): first, the effects of tax support more often occur in the companies with government participation in the capital, second, the positive impact tax incentives is less typical for small businesses than for larger firms.

² This approach is used, in particular, in Hottenrott, Lopes-Bento (2013).

³ In our sample the low-tech industries include textiles, clothing and footwear, wood processing and pulp and paper industry, medium-tech - metals and fabricated metal products, high-tech - chemical industry and mechanical engineering (for more details see Zudin (2015)).

Table 5. Individual treatment effect on the treated for tax and funding instruments - calculation results for the binary logistic regression model

		Effects of tax incentives						Effects of public funding					
		increase in investment in new equipment	increase in volume of spending on innovation	growth of revenue	increase in general competitiveness	launch of a new project	implementation acceleration of the project	project implementation risks decline	increase in investment in new equipment	increase in volume of spending on innovation	network development	project implementation risks decline	
Technology level of sector	low			+ *				+ *		- **			
	medium	<i>control</i>											
	high		+ **		- *	- **							
Operation period	less than 5 years				- ***				+ **				
	5-10 years				- *			- *		- **			
	10-20 years	<i>control</i>											
	more than 20 years	+ *			- *					- **			
Ownership	State and mixed		+ ***		+ **		+ **	- ***	+ ***	+ ***		+ *	
	private	<i>control</i>											
Number of employees	less than 100 emp.				- ***	- ***			- *				
	101-200 emp..						+ *						
	201-500 emp..	<i>control</i>											
	more than 500 emp..	+ ***	+ *										
Financial condition	poor							+ **					
	satisfactory	<i>control</i>											
	good		+ **								- *	- *	
Chi-square		18,05*	19,36*	17,60*	24,46**	19,92**	18,63*	20,74**	32,05***	28,43***	18,84*	21,11**	
N		83						88					
Maximum VIF value		2,55						5,13					

Notes:

* – significant a 10% level;

** – significant a 5% level;

*** – significant a 1% level.

Sources: prepared by the authors

Discussion and policy implications

1. The ongoing public policy to stimulate firms' development with a substantial variety of instruments and measures applied, conditions for granting support and, consequently, the potential recipients (e.g. Kuzyk, Simachev (2013))⁴ is characterized by a strong emphasis on the development of sufficiently large and long-operating companies. Such a result is not surprising, especially for the Russian economy. Positive relationship between the size of the firms and the likelihood of receiving government support has been identified in a number of empirical studies (e.g. Fier, Heneric (2005); Aschhoff (2010); Simachev et al. (2014a)).

The focus shift of the public support towards large and long operating companies occurs due to a number of factors. Firstly, these companies are more "visible" for the state and objectively are better able to lobby their interests in the government. Secondly, a large established business has a strong and highly diversified system of connections with the public authorities and a lot of experience in attracting and using government support. The latter is particularly important because, as has been shown in several studies, the company which has previously received the support are more likely to receive it in the future⁵ (e.g. Falk (2006); Aschhoff (2009)). Thirdly, as it is noted in the study of Garcia, Monhen (2010), a greater proportion of large companies in the set of public support recipients may indicate a risk aversion of the government: indeed, support of a relatively small number of large companies in comparison with a lot of smaller firms is associated with lower transactional costs of support allocation and its administration. Moreover, by virtue of a "formally" higher innovation activity of large companies' support for their innovation activities provides pseudo-positive result important for reporting (Simachev et al. 2014a). Finally, precisely in crisis periods, the government is most inclined to support large companies significant across particular industries, regions or/and the national economy as a whole⁶ (Simachev et al. 2010).

The question considering the relative efficiency of the government support of small and large firms is rather controversial. Today there exists empirical evidence of both significant influence of government support on SMEs, including behavioral changes (Loof, Heshmati 2005; Wanzenbock et al. 2013), and substantial corresponding changes in the large firms (Falk 2006). Obtained results confirm, rather, the second point of view. However, due to the relatively small number of relevant observations, we can only hypothesize that in Russia instruments of

⁴Despite the fact that Russian industrial innovation policy toolbox is rather diversified

⁵In literature this effect is commonly called the Matthew effect: this term is used in the broader context with respect to scientific recognition (Merton 1968) and in a narrow sense in relation to public support for innovation (e.g. Crespi, Antonelli (2011)).

⁶It is appropriate to mention the renewal in 2015 of the practice of public guarantee support provided for strategic organizations - the largest entities that have a significant influence on the formation of GDP, employment and social stability. Previously the government has resorted to such measures in the most acute phase of the previous crisis - in 2009 (Simachev, Kuzyk 2010).

government support (especially tax incentives) provide positive changes mainly for middle and large sized firms.

Our view is that of the largest significance in the implementation of the instruments of government support are not the formal characteristics of the beneficiaries (such as size, age etc.) but their “quality”. The recipients of government support should have big potential for further successful development and, what is more important, demonstrate the abilities to implement it. However, in Russian realities that principle is not always followed. In periods of relative economic stability the government mostly support successfully developing firms (e.g. Simachev et al. (2014a)), whereas crises force the government to shift the support focus towards troubled companies, especially if these are of a great importance in the context of providing socio-economic stability in the region or/and in the whole country (Higher School of Economics, Interdepartmental Analytical Center 2009; Mau 2010).

2. Tax and financial instruments of the government support de facto have differential target audiences: the use of tax incentives is not likely for small firms, whereas medium-sized companies relatively rare appear to be the recipients of the financial support. The former can be the reflection of both the imperfect parameters of the tax instruments (their rate, base, etc.) for small businesses and the existence of significant implementation and administration problems, which are acceptable for large companies but excessive for small firms. As for the fact of a relatively rare financial support of the medium firms, it can be considered as another empirical evidence of a lack of instruments aimed at funding medium-sized projects and companies. (see also Simachev et al. (2012)).

3. The relatively small impact of government support on science-business cooperation seems to us quite unexpected (abroad, this effect is among most frequently observed, especially in the case of financial support – e.g. Pegler (2005); Busom, Fernandez Ribas (2008); Idea Consult (2009); Marzucchi, Montresor (2013)). Also this fact is rather discouraging, as the Russian government make considerable effort to enhance linkages and interactions between the R&D sector and industry. In the last few years, the government initiated a number of policies fully or to a large extent focused on the development of cooperation: financial support for projects to develop high-tech industries, executed by companies in cooperation with universities and research institutions; creation of a technological platform network; approval and implementation by the largest public sector companies of the medium-term innovative development programs which include cooperation activities with universities and research institutions; promotion of support programs for the development of innovative territorial clusters etc. The absence of an explicit result of these efforts, to our mind, can be explained by the fact that government support often does not lead to the creation of new linkages and partnerships but

only contributes to the “capitalization” of long-established ones (Simachev et al. 2014c). Note that a significant contribution of the government support to the improvement of existing science-business linkages and partnerships has been widely observed abroad (e.g. Georghiou et al. (2005); Lohmann (2014)).

4. Our empirical analysis as well as a significant number of earlier studies has confirmed the importance of the fiscal support in providing all main kinds of additionality. Based on our results, we can say that in Russia the application effects of the financial instruments cover all three main types of additionality. The main input effect is the increase of investment in new equipment; output - the increase of production of new and improved products, behavioral – the initiation of new perspective projects and an acceleration of project implementation. It should be noted that project additionality (government contribution to firms’ launching new projects) is one of the most frequently observed behavioral changes (e.g. Falk (2007); OECD (2006); Idea Consult (2009)), what cannot be said about acceleration additionality (when government support speeds up the course of the project) which was analyzed by researchers to a considerably smaller extent (Figure 2).

Unlike financial instruments, tax incentives almost do not provide significant results in terms of additionality concept. The most considerable “failure” is observed in relation to such effects as the increase in the firms’ competitiveness, the growth the domestic market share and the increase of investment in new equipment. Negative results concerning the last indicator seem quite surprising to us as a large set of tax incentives in Russia are principally intended to stimulate firms’ investment activity. At the same time in contrast to a number of foreign studies, which examined a significant impact of tax incentives on input characteristics of innovation activity, first of all R&D expenses (e.g. Lokshin, Mohnen (2012); Bodas Freitas et al. (2015)), in Russia we can see no tangible input additionality of such measures. Slightly noticeable additionality effect of tax instruments relate to scale and scope additionality (the growth of investment in ongoing projects and the increase of the acceptable payback period). Note that the positive impact of tax support on scale and scope of ongoing projects in contrast to initiation of the new ones rather often was identified in economic literature (Guellec, Van Pottelsberghe 2003; Jaumotte, Pain 2005; Simachev et al. 2014b).

A detected clear dominance of financial instruments over tax incentives in most additionality effects, in our opinion, should not be considered as an exhaustive evidence of the inefficiency of tax measures and even more as a convincing argument in favor of abandonment of this element of the innovation policy. Indeed, the set of tax instruments obtains a number of important advantages. Actually, they are potentially available for a wider range of recipients than direct funding instruments, other things being equal they are associated with lower

implementation and administration costs (Simachev et al. 2014b), do not involve government intervention in market mechanisms and, what is important, are not directly linked to the budget allocation process (Gokhberg et al. 2014). It is also important that tax measures and public funding instruments have substantially different beneficiaries. Finally, tax incentives in a noticeably less degree produce a crowding out effect (replacement of private funds by public ones - e.g. David et al. (2000); Jaumotte, Pain (2005)) which is confirmed by the results of our study.

This situation, in our opinion, is explained by the fact that the expected benefits from the tax breaks are taken into account by firms initially - when making decision on the initiation of projects and defining their parameters. Financial support, on the contrary, is often only possible, but not a guaranteed option, so in the case of its obtaining companies prefer not to increase the project funding but to use the redistributed funds for their own needs. In addition, budget funds are often invested in obviously successful projects that would have been carried out without public support on the grounds of the above-noted tendency of public authorities risk aversion motivated by the need to demonstrate high efficiency in their programs (David et al. 2000; Klette et al. 2000; Wallsten 2000; Lach 2002).

Arguments given above do not mean that tax incentives do not need improvement. On the contrary, the revealed significant "gap" in the effectiveness of financial and tax support, in our opinion, shows just that the latter is more in need of "setting up" - at least from the standpoint of providing companies' input and output effects, which are often observed abroad (Hægeland, Møen 2007; Lokshin, Mohnen 2012; Bodas Freitas et al 2015;. Montmartin, Herrera 2015), but almost cannot be traced in Russia.

However, tax incentives productivity should not be improved through its "enrichment" with features and attributes of financial mechanisms as it eliminates the key benefits of tax incentives: the availability for a wide range of companies and low costs of use and administration. Thus, the relatively recent "improvement" of a certain tax benefit (the ability to write off a given amount of R&D expenditure) resulted in the requirement for the companies to submit to tax authorities the full research reports, which increased the application costs of this tax break and, as a consequence, led to a sharp reduction in its popularity among firms (Simachev, Kuzyk 2015).

Finally, we would like to note that our evaluation results of tax and financial policies influence on companies need to be interpreted with caution. Strictly speaking, no study of this kind can claim to be a universal truth. Indeed, as evidenced by the results of numerous foreign empirical studies, even very similar mechanisms of public support lead to significantly different results in different countries and over different periods of time, and this is due not only to the

differences in the "design" of support tools, but also because of their high impact heterogeneity over sectors, companies' parameters and their market functioning characteristics. The observed effects vary considerably over time, some - appear only with considerable lags.

Against the background of an objectively limited value of any single empirical research it is particularly important that abroad at present there is a huge number of studies devoted to the evaluation of the public support impact on companies, a great portion of which for the last fifteen years has been based on the concept of additionality. Such studies are regular, are carried out on the basis of statistical data for long observation periods, often include cross-country comparisons of the results. Finally, and most important - they are in demand by the government and are implemented in the decision-making system. For Russia, surprisingly, our attempt to estimate the additionality of the tax and financial support is perhaps the first.

At the very end we would like to emphasize the urgent need in Russia of introducing the practice of a regular independent assessment of the public policies effectiveness. At the same time, in our opinion, one should focus on the public support additionality effects, which would not have occurred in its absence. It is essential along with an estimation of the input and output effects take into account the behavioral changes that determine to a large extent the stability of the public support impact on the companies. This will create the required information basis for decision making regarding public incentive policies (both existing and initiated), will create conditions for the learning expansion and scaling of the best practices.

References

- Antonioli, D., Marzucchi A., Montresor, S. (2012) 'Regional innovation policy and innovative behaviours. A propensity score matching evaluation', Ingenio Working Paper, № 5.
- Aralicaa, Z., Botrić, V. (2013) 'Evaluation of research and development tax incentives scheme in Croatia', *Ekonomika Istrazivanja, Economic Research*, 26(3), pp. 63-80.
- Aschhoff, B. (2009) 'The effect of subsidies on R&D investment and success: do subsidy history and size matter?' ZEW Discussion Paper , 09-032, Mannheim.
- Aschhoff, B. (2010) 'Who gets the money? The dynamics of R&D project subsidies in Germany', *Journal of Economics and Statistics*, vol. 230(5), pp. 522-46.
- Bach, L., Matt, M. (2002) 'Rationale for Science and Technology Policy'. In: Georghiou, L., Rigby, J., (Eds.) *Assessing the Socio-Economic Impacts of the Framework Programme*, Report to DG Research.
- Baghana, R. (2010) 'Public R&D Subsidies and Productivity: Evidence from firm level data in Quebec', United Nations University - Maastricht Economic and social Research and training centre on Innovation and Technology, Working paper, August 2010.

- Benavente, J., Crespi, G., Maffioly, A. (2007) 'Public Support to Firm-Level Innovation: The Evaluation of the FONTEC Program', OVE Working Paper, 0507, Inter-American Development Bank, Office of Evaluation and Oversight (OVE).
- Bodas Freitas, I., Castellacci, F., Fontana, R., Malerba, F., Vezzulli, A. (2015) 'The additionality effects of R&D tax credits across sectors: A cross-country microeconomic analysis', Centre for Technology, Innovation and Culture, University of Oslo, Working paper, March 2015
- Buisseret, T., Cameron, H., Georghiou, L. (1995) 'What Difference Does It Make - Additionality in The Public Support Of R&D In Large Firms', *International Journal of Technology Management*, № 10.
- Busom, I, Fernandez Ribas, A. (2008) 'The impact of firm participation in R&D programmes on R&D partnerships', *Research Policy*, vol. 37(2), pp. 240–57.
- Callejón, M., García-Quevedo, J. (2005) 'Public subsidies to business R&D: Do they stimulate private expenditures?', *Environment and Planning C: Government and Policy*, 23, pp. 279-93.
- Cantner, U., Kösters, S. (2015) 'Public R&D support for newly founded firms – effects on patent activity and employment growth', *Journal of Innovation Economics & Management*, vol. 1(16), pp. 7-37.
- Catozzella. A., Vivarelli. M. (2011) 'Beyond Additionality: Are Innovation Subsidies Counterproductive?', Discussion Paper, № 5746.
- Chudnovsky, D., Lopez, A., Pupato, G. (2006) 'Innovation and productivity in developing countries: a study of Argentine manufacturing firms' behavior (1992-2001)', *Research Policy*, 35(2), pp. 266-88.
- Clausen, T. (2009) 'Do subsidies have positive impacts on R&D and innovation activities at the firm level?', *Structural Change and Economic Dynamics*, 20, pp. 239-53.
- Crespi, F., Antonelli, C. (2011) 'Matthew effects and R&D subsidies: knowledge cumulability in high-tech and low-tech industries', Departmental Working Papers of Economics, University Roma Tre.
- Crespi, G., Maffioli A., Mohnen, P., Vazquez, G. (2011) 'Evaluating the Impact of Science, Technology and Innovation Programs: a Methodological Toolkit', SPD Working Papers, 1104, Inter-American Development Bank, Office of Strategic Planning and Development Effectiveness.
- Czarnitzki, D., Licht, G. (2006) 'Additionality of public R&D grants in a transition economy: The case of Eastern Germany', *Economics of Transition*, 14, pp. 101-31.

- David, P., Hall, B., Toole, A. (2000) 'Is Public R&D a Compliment or a Substitute for Private R&D? A Review of Econometric Evidence', *Research Policy*, vol. 29 (4), pp. 497-529.
- Falk, R. (2004) 'Behavioural Additionality Effects of R&D Subsidies: Empirical Evidence from Austria', WIFO Working Paper. Available at:
http://www.fep.up.pt/conferences/earie2005/cd_rom/Session%20IV/IV.B/Falk.pdf
- Falk, R. (2006) 'Behavioural additionality in Austria's industrial research promotion fund (FFF)'. Chapter 3 in: *Government R&D Funding and Company Behaviour: Measuring behavioural additionality*, Paris, OECD, pp. 59-74.
- Falk, R. (2007) 'Measuring the effects of public support schemes on Firms innovation activities', *Research Policy*, vol. 36(5), pp. 665-79.
- Fier, A., Heneric, O. (2005) 'Public R&D Policy: The Right Turns of the Wrong Screw? The Case of the German Biotechnology Industry', *ZEW Discussion Papers*, № 05-60.
- Fier, A., Aschhoff, B., Löhlein, H. (2006) 'Detecting Behavioural Additionality: An Empirical Study on the Impact of Public R&D Funding on Firms' Cooperative Behaviour in Germany', *ZEW Discussion Papers*, № 06-037.
- Garcia, A., Mohnen, P. (2010) 'Impact of Government Support on R&D and innovation', UNU-MERIT Working Paper Series, № 2010-034, United Nations University - Maastricht Economic and Social Research Institute on Innovation and Technology.
- Georghiou, L. (1997) 'Issues in the evaluation of innovation and technology policy'. Chapter 3 in: *Policy evaluation in innovation and technology: towards best practice*, OECD.
- Georghiou, L. (2002) 'Impact and additionality of innovation policy', *IWT-Studies*, №. 40, pp. 57-67. Available at: http://www.iwt.be/sites/default/files/english/files/iwt_studie40.pdf
- Georghiou, L., Clarysse, B. (2006) 'Introduction and Synthesis'. Chapter 1 in: *Government R&D Funding and Company Behaviour: Measuring behavioural additionality*, OECD Publishing, Paris.
- Georghiou, L., Malik, K., Cameron, H. (2005). 'DTI Exploratory study on behavioural additionality', PREST, Manchester Business School and University of Manchester, Working paper.
- Georghiou, L., Rigby, J., Cameron, H. (eds.) (2002) 'Assessing the Socio-Economic Impacts of the Framework Programme. Report to European Commission DG Research'. Available at: http://ec.europa.eu/research/evaluations/pdf/archive/other_reports_studies_and_documents/assessing_the_socio_economic_impacts_of_the_framework_programme_2002.pdf
- Gelabert, L., Fosfuri, A., Tribó, J.A. (2009) 'Does the effect of public support for r & d depend on the degree of appropriability?', *Journal of Industrial Economics*, № 57, pp. 736-67.

- Gokhberg, L., Kitova, G., Roud, V. (2014) 'Tax Incentives for R&D and Innovation: Demand versus Effects', *Foresight-Russia*, vol. 8(3), pp. 18-41.
- Gok, A. (2010) 'An Evolutionary Approach to Innovation Policy Evaluation: Behavioural Additionality and Organisational Routines', PhD Thesis, Manchester Institute of Innovation Research, The University of Manchester. Available at: <http://www.innovation-policy.org.uk/compendium/reference/Default.aspx?referenceid=1026>
- Gok, A., Edler J. (2011) 'The Use of Behavioural Additionality in Innovation Policy-Making', MBS/MIoIR Working Paper, № 627, The University of Manchester.
- González, X., Jaumandreu, J., Pazó, C. (2005) 'Barriers to innovation and subsidy effectiveness', *RAND Journal of Economics*, №36, pp. 930-50.
- Guellec D., Van Pottlesberghe, B. (2003) 'The impact of public R&D expenditure on business R&D', *Economics of Innovation and New Technologies*, vol. 12(3), pp. 225-44.
- Hægeland, T., Møen, J. (2007) 'Input additionality in the Norwegian R&D tax credit scheme', *Statistics Norway Reports*, № 2007/47. Available at: http://www.ssb.no/a/publikasjoner/pdf/rapp_200747/rapp_200747.pdf
- Higher School of Economics, Interdepartmental Analytical Center. (2009) 'Evaluation of Anti-crisis Measures Supporting the Real Sector of the Russian Economy', *Voprosy Ekonomiki*, vol. 5, pp. 21-46.
- Hsu, F.M., Horng, D.J., Hsueh, C.C. (2009) 'The effect of government-sponsored R&D programmes on additionality in recipient firms in Taiwan', *Technovation*, №29, pp. 204-17.
- Hottenrott, H., Lopes-Bento, C. (2013) '(International) R&D collaboration and SMEs: The effectiveness of targeted public R&D support schemes', *DICE Discussion Paper*, № 121.
- Hud, M., Hussinger, K. (2014) 'The Impact of R&D Subsidies During the Crisis', *ZEW Discussion Paper*, № 14-024.
- Idea Consult (2006) 'Study and Evaluation of the Behavioral Additionality of R&D subsidies'. Available at: http://www.iwt.be/sites/default/files/english/files/final_report_BA_IWT-subsidies_10_11_2006.pdf
- Idea Consult (2009) 'Does Europe change R&D-behaviour? Assessing the behavioural additionality of the Sixth Framework Programme'. Available at: https://ec.europa.eu/research/evaluations/pdf/archive/fp6-evidence-base/evaluation_studies_and_reports/evaluation_studies_and_reports_2009/assessing_the_behavioural_additionality_of_the_sixth_framework_programme.pdf
- Jaumotte, F., Pain, N. (2005) 'An Overview of Public Policies to Support Innovation', *OECD Economic Department, Working paper*, № 456.

- Klette, T., Moen, J., Griliches, Z. (2000) 'Do Subsidies to Commercial R&D Reduce Market Failures? Micro Econometric Evaluation Studies', *Research Policy*, 29, pp. 471-95.
- Knockaert, M., Spithoven, A. (2009) 'When do firm-technology intermediary interactions result in cognitive capacity additionality?', Working Paper, D/2009/7012/61.
- Kuzyk, M., Simachev, Yu. (2013) 'Russia's Innovation Promotion Policies: Their Evolution, Achievements, Problems and Lessons'. Chapter 6.4 in: *Russian Economy in 2012. Trends and Outlooks (Issue 34)* (eds. Sinelnikov-Murylev, S. G.), Moscow: Gaidar Institute Publishers, pp. 435-79.
- Lach, S. (2002) 'Do R&D Subsidies Stimulate or Displace Private R&D? Evidence from Israel', *Journal of Industrial Economics*, L (4), pp. 369-90.
- Lohmann, F. (2014) 'The Additionality Effects of Government Subsidies on R&D and Innovation Activities in the Aviation Industry. A Project Level Analysis', Master's thesis. Available at: http://essay.utwente.nl/64836/1/Lohmann_MA_MB.pdf
- Lokshin, B., Mohnen, P. (2012) 'How effective are level-based R&D tax credits? Evidence from the Netherlands', *Applied Economics*, vol. 44(12), pp. 1527-38.
- Loof, H., Heshmati, A. (2005) 'The Impact of Public Funding on Private R&D Investment: New Evidence from a Firm Level Innovation Study', MTT Discussion papers, № 3.2005.
- Lucena, A., Afcha, S. (2014) 'Public Support for R&D, Knowledge Sourcing and Firm Innovation: Examining a Mediated Model with Evidence from the Manufacturing Industries', CENTRUM Católica's Working Paper Series, № 2014-06-0002.
- Marzucchi, A., Montresor, S. (2013) 'The Multi-Dimensional Additionality of Innovation Policies: A Multi-Level Application to Italy and Spain', SPRU Working Paper Series, № 2013-04.
- Mau, V. (2010) 'Economic Policy in 2009: Between the Crisis and Modernization', *Voprosy Ekonomiki*, vol. 2, pp. 4-25.
- Merton, R.K. (1968) 'The Matthew effect in science', *Science*, № 159 (3810).
- Montmartin, B., Herrera, M. (2015) 'Internal and external effects of R&D subsidies and fiscal incentives: Empirical evidence using spatial dynamic panel models', *Research Policy*, 44(5). pp. 1065–79.
- Montmartin, B., Herrera, M., Massard. N. (2015) 'R&D policies in France: New evidence from a NUTS3 spatial analysis', Working Paper GAEL, № 2015-11.
- Neicu, D., Teirlinck, P., Kelchtermans, S. (2015) 'Dipping in the policy mix: do R&D subsidies foster behavioral additionality effects of R&D tax credits?', *Economics of Innovation and New Technology*, pp. 1-22. Available at: https://lirias.kuleuven.be/bitstream/123456789/445812/1/MSI_1409.pdf

- Newey, Whitney K. (2009) 'Treatment effects', *Quantile*, №. 6, pp. 15-23.
- OECD (2006) 'Government R&D Funding and Company Behaviour, Measuring Behavioural Additionality'. Available at:
<http://browse.oecdbookshop.org/oecd/pdfs/product/9206041e.pdf>
- OECD (2015) 'OECD Science, Technology and Industry Scoreboard 2015: Innovation for growth and society', OECD Publishing, Paris.
- Pegler, B. (2005) 'Behavioural Additionality in Australian Business R&D Grant Programs: A Pilot Study', Department of Industry, Tourism and Resources, Working paper.
- Polt, W., Streicher, G. (2005) 'Trying to capture additionality in Framework Programme 5 - main findings', *Science and Public Policy*, 32(5), pp. 367-73.
- Poot, T., Hertog, P., Grosfeld, T., Brouwer, E. (2003) 'Evaluation of a major Dutch Tax Credit Scheme (WBSO) aimed at promoting R&D', Discussion Paper. Available at:
<http://ftp.zew.de/pub/zew-docs/evaluationR%26D/EBrouwer.pdf>
- Rodrik, D. (2008) 'The New Development Economics: We Shall Experiment, but How Shall We Learn?', Harvard University, John F. Kennedy School of Government, Working Paper Series, № rwp08-055.
- Roper, S., Hewitt-Dundas, N. (2012) 'Does additionality persist? A panel data investigation of the legacy effects of public support for innovation', Available at:
http://druid8.sit.aau.dk/acc_papers/u7flocbh7rlj5s6uof3gkgquivxo.pdf
- Rye, M. (2002) 'Evaluating the Impact of Public Support on Commercial Research and Development Projects: Are Verbal Reports of Additionality Reliable?', *Evaluation*, №8(2), pp. 227-48.
- Simachev, Yu, Kuzyk, M. (2010) 'State guarantee support of strategic companies as Russian anti-crisis policy tool: specifics, problems and lessons for the future', *Jekonomicheskaja politika*, №3, pp. 64-89.
- Simachev, Yu, Kuzyk, M. (2015) 'State policy to promote scientific and industrial cooperation'. Chapter 6.4 in: *Russian economy in 2014. Trends and outlooks. (Issue 36)* (eds. Sinelnikov-Murylev, S. G.), Moscow: Gaidar Institute Publishers, 2015, pp.m465-511.
- Simachev, Yu., Kuzyk, M., Feygina, V. (2014a) 'Fostering firms' innovation activities in Russia. Empirical analysis of beneficiaries and effects'. In Yasin, Ev.G (Ed) (2014) *XIV April International Academic Conference on Economic and Social Development*, vol. 3, pp. 369-88.
- Simachev, Yu., Kuzyk, M., Feygina, V. (2014b) 'Public Support for Innovation in Russia: What Can We Say about Tax Incentives and Public Funding?', *Russian Management Journal*, vol. 12(1), pp. 7-38.

- Simachev, Yu., Kuzyk, M., Feygina, V. (2014c) 'R&D Cooperation between Russian Firms and Research Organizations: Is There a Need for State Assistance?', *Voprosy Ekonomiki*, vol. 5, pp. 4-34.
- Simachev, Yu., Kuzyk, M., Feygina V. (2015) 'Public Support for Innovation in Russian Firms: Looking for Improvements in Corporate Performance Quality', *International Advances in Economic Research*, № 21(1), pp. 13-31.
- Simachev, Yu., Kuzyk, M., Ivanov, D. (2012) 'Instruments of government support for innovative companies in Russia: beneficiaries and issues'. In: *Znaczenie innowacji dla konkurencyjności międzynarodowej gospodarki*. (eds. Rynarzewski, T., Mińska-Struzik, E.), Poznan: Wydawnictwo Uniwersytetu Ekonomicznego w Poznaniu, pp. 183-201.
- Simachev, Yu., Kuzyk, M., Ivanov D. (2012) 'Russian Financial Development Institutions: Are We on the Right Way?', *Voprosy Ekonomiki*, vol. 7, pp. 4-29.
- Simachev, Yu, Kuzyk, M., Kuznetsov, B. (2010) 'Assessing the impact of various anti-crisis measures on the firms in manufacturing industries', *Jekonomicheskaja politika*, №1, pp. 122-134.
- Viljamaa, K., Piirainen, K., Kotiranta, A., Karhunen, H., Huovari, J. (2013) 'Impact of Tekes activities on productivity and renewal'. Available at:
<http://www.tekes.fi/globalassets/global/nyt/uutiset/productivity-and-renewal-2013.pdf>
- Wallsten, S. (2000) 'The Effects of Government-Industry R&D Programs on Private R&D: The Case of the Small Business Innovation Research Program', *RAND Journal of Economics*, 31, pp. 82-100.
- Wanzenbock, I., Scherngell T., Fischer, M. (2013) 'How do firm characteristics affect behavioural additionalities of public R&D subsidies?', *Technovation*, vol. 33 (2-3), pp. 66-77.
- Zudin, N. (2015) 'Relationship of the technology level of sector with company characteristics and public support', *Innovations*, №6, pp. 61-70.