Fostering innovation in Russian companies in the post-crisis period: Opportunities and constraints

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In recent years the Russian innovation policy has made a significant progress that manifests in developing its 'tool kit', increasing resource base, etc. However it has not yet succeeded in improving business innovation activities that remain local thus not giving prerequisites to transform the general macroeconomic context.

Basing on a survey of more than 600 Russian industrial enterprises the authors analyze key features of innovation in Russian companies under economic recovery, as well as stimuli and obstacles for innovation activities. In particular, the paper shows that lack of competition is the key factor discouraging innovation and that the most limiting constraints to business innovation activities are instable economic environment and intra-corporate bureaucratization.

Significant attention is paid to the analysis of the use of various instruments of state support for innovation and their beneficiaries. One of the findings is that Russian innovation policy is "neutral" to the size of companies, but there is a lack of instruments engaging new companies in innovation activities. The authors also discuss two possible models of government support for innovation: the former relies on international innovation spillover and the latter on domestic innovation and import-substitution.

Keywords: *industrial innovation, research and development, innovation policy.*

JEL classification:*, O31, O38*

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Introduction

Over the past five years, Russian innovative policy has developed significantly. The substantial role of innovations for economic growth was realized at the highest political level. Attitude to innovations has changed radically; promoting innovations has become one of the government policy priorities since 2006. This priority can't be considered declarative – government make a lot of efforts to discuss ways of stimulating innovations, "tool kit" to promote innovations is intensively developed, resources' provision increases. Decision-makers have become more than ever susceptible to the variety of ideas and new mechanisms for stimulating innovations, and the very period of new ideas "digestion" to their practical implementation has declined significantly – up to about six to twelve months.

However any noticeable positive changes in innovation at macroeconomic level are not available yet: they did not exist in pre-crisis period (until the autumn of 2008), they don't now, at the stage of recovery (2010-2011 years). At microeconomic level, significant positive changes in the behavior of companies have not been observed too. It should be noted that experts regularly highlight individual examples of medium-sized companies' dynamic development, a substantial increase in outlays on innovation of several major companies, raising the interest of business to the results of research and development (R&D) and to expanding cooperation with domestic academia. However, it is unclear how all of these positive samples "disappear" at macroeconomic level.

In the post-crisis period Russian government pays considerable attention to the issues of innovation policy's outcomes, but there is no answer yet, and the answer can be no picnic. In particular, innovative development can be significantly limited by the actions of government outside the innovation policy itself. Thus, the assessment of government measures' impact should be combined with the analysis of major factors affecting companies' innovation commitment as well as incentives for innovation at the firm-level.

The effectiveness of incentive mechanisms should not be viewed only on the basis of "gross" indicators of innovation – it is important to determine the orientation of these mechanisms, sensitivity of different business groups to them and related behavioral effects. Firm-level analysis can provide a basis required for such findings.

Over the past decade, a series of foreign papers has been published, containing substantiations of government intervention in the innovation activities, as well as analysis of the associated negative practices[1]. However, as applied to Russia, there is a certain lack of empirical studies of different incentives impact on innovation activities of Russian companies. In research papers, authors have increasingly focused on the analysis of companies' innovation activities' parameters, barriers and incentives for innovation. There are quite a few studies relating to the firms' innovative behavior models, to the estimation of connection between innovations and competitiveness, productivity of companies [Kozlov et al, 2004; Zasimova, Kuznetsov et al, 2008; Gokhberg, Kuznetsova, 2009; Simachev, Kuznetsov, 2009; Gokhberg et al, 2010]. And there is a very limited number of works that provide microeconomic analysis and assessment of the impact of various government incentive measures on behavior of companies[2]. More often expert judgements are used for assessment of the quality of innovation policy and making suggestions for its improvement. However, in such cases outcome depends heavily on the selection of experts.

The main purpose of this paper is *to analyze the impact of different innovation support instruments on innovation activities of companies, as well as to estimate business' "request" to the public policies* on basis of microeconomic analysis of empirical data on the behavior of firms.

1. Initial hypotheses

The competition of domestic enterprises with foreign producers promotes product innovation and stimulates research and development. Competition with Russian producers is more conducive to process innovation aimed to reduce the price of products.

This phenomenon is attributed to the fact that domestic producers compete with each other primarily in price, and with foreign ones – in quality. This statement may be clarified: in industries with a high share of imports from countries with lower labor costs

[1] See, for example, theoretical works [Freeman, 1982], [Loury, 1979], [Martin, Scott, 2000], World Bank report, which includes a number of findings and recommendations of expert groups to build in-country innovation policies [Goldberg et al., 2011], as well as work of [van Pottelsberghe et al., 2003], which, in particular, includes generalization of the results of a number of empirical studies, dedicated to the impact of government innovations stimulating measures on companies to conduct R&D. Detailed study of the effectiveness of state innovation policy's concrete instruments: for example, tax incentives for innovation [Hall, van Reenen, 2000], subsidizing corporate R&D expenditure [Busom, 2000], [Klette et al., 2000], the problem of substitution of private expenditure on R&D by public funds [Lach, 2002].

[2] In fact, in Russian literature there are only isolated examples of this kind of analysis [Zasimova et al, 2008], to a lesser extent - [Upravlenie Issledovaniyami…, 2011].

and "gray" imports Russian producers also tend to mainly price competition which stimulates process, not product innovation.

Previously, similar results were obtained in [Zasimova et al., 2008]. Foreign competition stands out as one of the main incentives for corporate innovation in post-socialist countries in [Gorodnichenko et al., 2010].

In addition, we should consider the question of how and how much are different the effects of competition with imports in the country and competition with foreign producers that occurs when exporting from Russia. The relationship between exports and innovation activities, especially outside developed countries, is a well known phenomenon (see, eg, [Roper, Love, 2002], [Salomon, Shaver, 2005], [Golikov et al., 2012]). In [Almeida, Fernandes, 2008] they show on the material from developing countries that the import can also act as a channel of innovation transmission.

In vertically organized sectors that define innovation activeness in the economy (for example, mechanical engineering), the innovative development of the head producers is constrained by the risk of technological gap with its partners in the supply chain.

The interaction between the partners in the production chain has a significant potential of generation of innovations and their distribution. Thus, in [Goknberg et al., 2010] they show that in Russia the greatest impact on the probability of selection of more "advanced" innovation modes by the enterprise is provided by collaboration with consumers in the development of innovation.

However, this dependence is, in our view, "double-edged": if there exist rigid (i. e. not adjusted to the rapid reorientation to other counterparties) industrial relations between the supplier and the consumer, then the innovation inertia of the first holds back the development of the second.

Barriers to innovation are divided into two types: (1) those that impede the innovation and (2) those that are detected during innovation activity, but do not make companies give up the innovation. The obstacles of the first type include, for example, the instability of the external environment (macro-economic, socio-political) which makes unacceptable risk associated with innovation which is high already. As an example of barriers of the second type one can name the institutional problems; the companies with an experience of work in the existing business environment can adapt to those.

With this hypothesis, we develop the insights made in [D'Este et al., 2012], where they show the distinction between the two types of barriers to the innovative development of companies: the barriers of the first type have a negative impact on the success of the already started innovation activity of the firm, and barriers of the second type discourage the company from innovation as such.

We proceed from the fact that the barriers of the second type influence not only non-innovators but also innovators, preventing the expansion of their innovative activities. In turn, among the barriers of the first type there can be identified barriers immanent in the innovation and barriers associated with the business climate in the country.

The beneficiaries of government support for innovation are more likely to be large companies, as well as companies where the government is a shareholder, while the performance of companies does not affect their chances to get support.

One of the features characterizing innovative policies of any state is the so-called picking winners practice, which means allocation of resources to support the most efficient companies. The paper [Cantner, Kösters, 2009] states that the concentration of governmental support in a relatively small cluster of the most promising companies instead of "slicing up the funds" helps to avoid the replacement of private financing by public funding. The paper [Shane, 2009] shows that the policy of picking winners minimally distorts the market stimuli for the enterprises. The paper [Antonelli, Crespi, 2011] provides examples of Italian manufacturing and demonstrates that in the highly developed technological sector even the practice of appointing winners through R&D subsidies persistence does not lead to the distortion of corporate stimuli and crowding out private assets by state funds (though the sectors with lower levels of technology development show opposite results). This phenomenon can be explained by results in [Ortega-Argilles et al., 2009]. The later tells that R&D leads to increase in productivity primarily in high-tech sector.

Nevertheless, government and quasi-government organizations try to avoid high risk levels. Taking into consideration the risky nature of innovative activities, this leads to the corruption of the logics on which the policy of picking winners is based, and engenders a specific government failure. This is a burning issue even in the developed states. For instance the paper [Fier, Heneric, 2005] uses the example of German

biotechnological industry to show that state subsidies for R&D are received more frequently and in bigger quantities by the companies that have already high credit rating and so are able to raise funds from the market. The presence of investors external to the biotechnological industry among the shareholders of the company also increases the expected value of the scope of state subsidies. This issue leads to the opinion (see for example [Cantner, Kösters, 2009]) that the best solution could have been the policy of selecting winners taking the level of innovations into consideration.

The list of possible distortions in the course of implementation of an innovative policy is not limited to risk aversion. Government officials may also misuse available instruments of state policy and allocate the funds aimed at the stimulation of innovations on the basis of their political motive, family and friendly relations, as well as following their ideas of social stability.

One of the most obvious consequences of government failures in the course of implementation of an innovative policy is a superfluous support of major companies. The government trusts them because of their stability and better lobby possibilities, and subsidies to a small number of large companies are easier to manage. A positive correlation between the scope of business and the receiving state subsidies has been repeatedly proven by foreign researchers (see [Fier, Heneric, 2005], [Aschhoff, 2010] for the examples found out in Germany)

Another possible distortion in the course of implementation of public innovative policy is excessive support of state companies. For the persons that make decisions regarding the allocation of state funds collaboration with state companies reduces uncertainty and increases the level of trust. Moreover state companies can be more experienced in the order of receiving state support and may have better skills of collaboration with governmental authorities.

The support of state companies is also preferable in terms of political loyalty, and this tendency is of high importance for modern Russia (the combination of rent-seeking behavior and political concerns of Russian bureaucracy is described for example in [Yasin, 2005]).

Russian companies are interested in government promotion of their export and support for technology import, rather than in import substitution policy and domestic development of new technologies.

It is recognized that combination of technology import and domestic research and development is a key to successful innovation policy for a country, lagging in development of the research base (see, eg, [Pack, Saggi, 1997]). Without proper R&D the absorption of complex new manufacturing technologies by companies is problematic, as reflected in the fundamental concept of "absorptive capacity" [Cohen, Levinthal, 1990]. Thus, the promotion of technology imports only is not a realistic option for a policy-maker.

At the same time, relying on rapid creation of proper breakthrough innovations, although it looks attractive from a political point of view, may be unrealistic and wasteful. As shown theoretically in [Acemoglu, Aghion, Zilibotti, 2006] and empirically confirmed in [Polterovich, Popov, 2006], the cumulative effect of domestic R&D and technology import shows the stronger, the higher is the current level of GDP per capita. In other words, the lower is the level of economic and, in particular, the innovative development of the country, the more attention should be paid to technology import, except that government should not encourage firms to imitation of too advanced technology, because there is no national research base for its absorption.

According to the views expressed in [Polterovich, 2009], inside the current Russian environment the cutting edge industries in near-by decade will not be the engines of country's economic development, and the capabilities for catching-up modernization in traditional sectors remain important.

Export promotion plays an important role in the technology import, as active exporters have to adjust to global technology standards. The relationship between export and innovative activity, especially outside of developed countries, is a well-known phenomenon (see, e.g., [Roper, Love, 2002], [Salomon, Shaver, 2005], [Golikova et al, 2012]). In the paper [Almeida, Fernandes, 2008] on the material of developing countries it is shown that import can also act as a channel of innovations exchange. Thus, an important role for innovation is the inclusion in the global production chains.

In Russia, in our opinion, the system of state support for export is prohibitively weak and to some extent even discourage companies to work in external markets (for

example, the problem is created by complicated and time-wasting procedures of VAT refund on goods exported). Without reforming this system innovative development can not be successful even on the way of technology import.

2. The empirical base for the study and the main parameters of surveyed companies innovation activities

The paper is based on the data obtained by the questionnaire survey of top managers of 602 Russian industrial enterprises carried out in autumn 2011[3] (Table 1)

Table 1. The main characteristics of the sample

	Amount of companies, %		**Amount of companies**, %
Age of company		**Number of employees**	
less than 5 years	9,0	up to 250 people	35,8
5-10 years	18,6	251-500 people	28,1
10-20 years	24,6	501-1000 people	18,8
over 20 years	47,8	over 1000 people	17,3
Industry		**Revenue in 2010**	
extraction of crude petroleum and natural gas	6,5	up to 100 mln rubles (USD 3,3 mln)	19,4
manufacture of food products, including beverages	16,7	100-500 mln rubles (USD 3,3-16,5 mln)	29,1
manufacture of textiles and textile products	13,1	500 mln – 1 bln rubles (USD 16,5-32,9 mln)	20,6
manufacture of wood, wood products, pulp, paper and paper products	13,3	1-5 bln rubles (USD 32,9-164,6 mln)	22,6
manufacture of chemicals and chemical products	11,0	over 5 bln rubles (USD 164,6 mln)	8,0
manufacture of rubber and plastic products	7,6	**Exporting**	
manufacture of basic metals	8,1	to the former Soviet Union (FSU) countries	49,8
manufacture of machinery and equipment	9,1	to other countries	29,5
manufacture of electrical machinery and equipment	6,6	**Financial condition**	
manufacture of transport equipment	8,0	poor	14,5
Ownership		satisfactory	65,7
participation of foreign owners	21,4	good	19,8
of wich more than 10%	15,3		
participation of government and/or municipalities	11,1		

[3] The survey was carried out by the Interdepartmental Analytical Center (Moscow, Russia) in cooperation with the Center or Market Research of Institute for Statistical Studies and Economics of Knowledge (National Research University Higher School of Economics, Moscow, Russia).

In general, the sample is sufficiently balanced in all parameters, critically important for the further analysis. The sample contains a substantial number of relatively old companies, which started operating during the Soviet period; at the same time, there is enough weighty representation of relatively new companies. Manufacturing firms form the general body of the sample, but there is a statistically significant "control group" of oil and gas enterprises. A relatively small firms, as well as large and extra-large companies are well represented in the sample; there are a significant number of enterprises with foreign investors; and finally, a substantial part of surveyed companies exporting to the former Soviet Union (FSU) and/or other countries.

Now, we should consider some basic parameters of the innovation activities of surveyed enterprises. About a third of the sample had no expenditures on technological innovation in 2010. The proportion of companies that do not innovate is the most sizeable (about 40%) in manufacture of textiles, rubber and plastic products. As for the "depth" of innovation activities, the expenditures on technological innovation of three-quarters of the sample were less than 5% of their revenues in 2010. Only 7% of the companies spent on technology innovations more than 10% of revenue. For this indicator, the better stands manufacture of basic metals, as well as manufacture of transport equipment.

A very important characteristic of innovation activities (describing companies' ability to perceive innovation from external sources[4]) is the amount of expenditure on R&D. About 60% of companies in the sample did not finance research and development in 2010, and only 15% of the companies made expenses on R&D that exceeded 1% of revenue. The greatest proportion of companies without spending on R&D is in such sectors as manufacture of wood, wood products, pulp, paper and paper products, manufacture of food products, manufacture of textiles and textile products. At the same time, knowledge-intensive production is traditionally concentrated primarily in mechanical engineering (except manufacture of transport equipment) and metallurgy.

[4] See the classic article [Cohen, Levinthal, 1990].

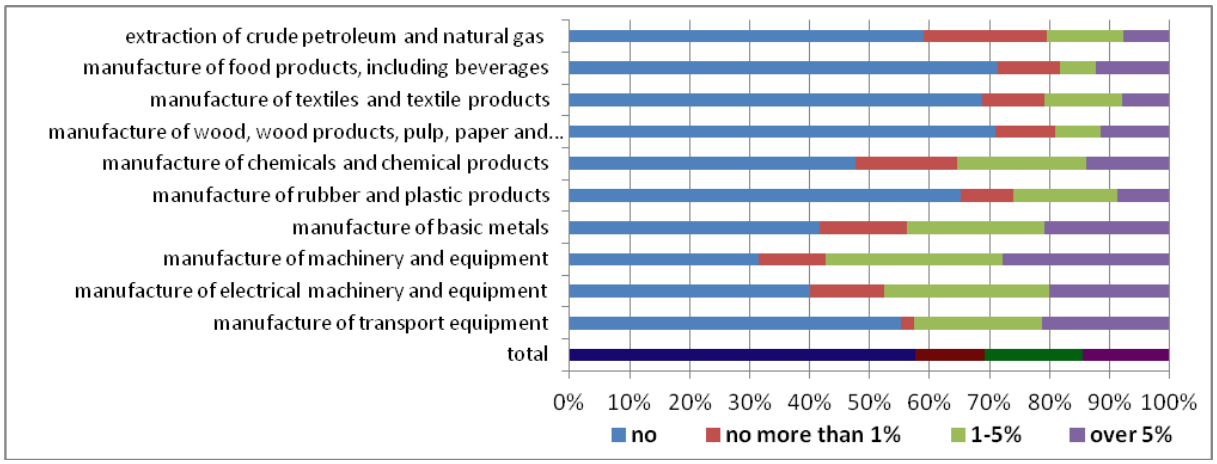

Figure 1. The ratio of companies' expenditures on R&D to their revenue in 2010, %

It should be noted a very low level of innovative (new and enhanced) products of the companies surveyed. Almost half of companies manufactured no such products in 2010, and only 14% of firms sold new and enhanced products for more than more than 10% of their output. According to this indicator, mechanical engineering and metallurgy are in better position again, while oil and gas sector is the worst.

Only a very small portion of companies in the sample produce innovative products that are new across the globe (Fig. 2); only 15% of the firms have products that are new on the national scale.

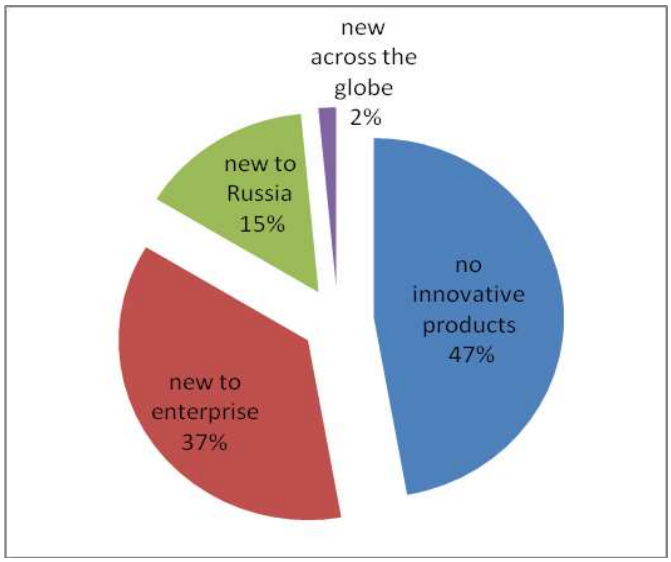

Figure 2. The level of novelty of innovative products manufactured by companies in the sample, %

Thus, we have written a rather unfavorable profile of innovation activities of Russian companies, which suggests the presence of serious problems of the long-term competitiveness of the Russian economy in the context of globalization. It should be

noted, that our estimates are largely coincide with pessimistic assessments of innovation activities in Russia, which are typical of most Russian and foreign experts.

However, we believe it is important to pay attention to some of the features of innovation processes in Russia, which require separate consideration, in particular:

(1) Although the average level of most parameters of innovative activities is very low, some companies are quite active in their technological modernization, and there are shown the signs of a sizeable divergence of companies. In this regard, there is a significant "polarization" of companies in terms of their technological level, scope and impact of innovations. This effect is most evident in such sectors as manufacture of textiles and textile products and mechanical engineering. Thus, there is increasing heterogeneity of certain sectors;

(2) The emergence of *technologically advanced modern companies is linked to the creation of new firms and the expansion of foreign investors' activities*. Regression analysis showed that the group of companies with a technology level fulfilling global standards more often (compared to a group of technologically backward companies companies) include: (1) firms established in the last 10 years, (2) firms with foreign shareholders;

(3) We should note *a positive trend to an increase in companies' expenditure on technological innovations*: about 42% of innovation-active companies increased their innovative spending in 2011 compared to 2010, and only 13% reduced it. Manufacture of basic metals, chemical industry and manufacture of transport equipment make the greatest progress.

(4) *The demand for corporate innovative products tends to increase:* 39% of enterprises surveyed reported its growth in 2011 as compared to 2010 and only 13% of the companies experienced a decrease in the demand.

3. Innovation drivers and factors

As a rule, one of the basic factors influencing corporate innovation activities include the size of business, financial condition, industry, level of competition in product markets. Along with these kind of typical factors, we also use for analysis a number of additional characteristics associated with "age" of companies, ownership structure

(foreign or government stake), the presence of the companies' export to foreign countries. On the basis of the models we have evaluated the effect of these factors on the innovation activity of companies in three aspects:

(1) the sheer fact of technological innovation, the availability of funding for research and development (Table 2);

(2) the level (relative to revenue) of outlays on technological innovation and R&D (Table 2);

(3) the change in companies' outlays for technological innovation in 2011 compared to 2010 (Table 3).

The size of business has traditionally been one of the most important factors in the innovation activity of Russian companies[5]. There were no surprises – small companies (annual revenues of up to 100 million rubles) significantly[6] less likely to innovate and fund research and development. The influence of *the financial condition* was also quite predictable – innovation, as well as funding R&D is significantly more carried out by companies with good financial condition. The influence of *industry* on the innovation performance and R&D activity is significant enough (especially in regard to R&D). The list of industries in which companies are most active in research and development, includes machinery, metallurgy and chemical industry.

The presence of competition has a significant impact on innovation activities of enterprises. In this research, we have found that *the technological innovation in companies per se is more sensitive to competition from Russian producers, and funding for research and development – with the foreign competition.*

Positive effect on corporate innovation has the exports outside of ex-USSR – it increases the likelihood that the company not only carries out technological innovation but funds R&D, so there is a learning-by-exporting effect for the enterprises. The stimulating effects of foreign competition and exports, as well as work as suppliers of multinational corporations, to corporate innovation in the post-socialist countries has been pointed out in [Gorodnichenko et al., 2010]. At the same time in the developed markets the relationship between innovation and export activity of enterprises is to some extent ambiguous, including evidence of negative relationship between exports and some

[5] See, for example, [Kozlov et al., 2004; Zasimova et al, 2008; Gokhberg, Kuznetsova, 2009;Gokhberg et al. 2010].
[6] We have chosen 10-% p-value threshold of t-statistics.

measures of corporate innovative activity (see, e.g., [Roper, Love, 2002], [Wakelin, 1998]).

Ownership structure of companies has much more complex and ambiguous impact on the firms' innovative behavior. Our statistical analysis did not reveal significantly greater or lesser propensity of companies *with foreign investors* for the implementation of innovation and R&D funding. *Enterprises with state and local government participation*, too, have no significantly greater or lesser propensity to implement technological innovations and R&D[7], but if they carry out innovation activities, the level of their spending is usually higher compared to other companies.

Table 2. Factors influencing technological innovation and R&D activity in Russian companies (based on estimates of logistic and ordinal regressions; p-value 10% threshold is used)

Variable	**Expenditures on technological innovation**	**Expenditures on R&D**
	presence	**presence**
	size	**size**
Annual revenue	Small less (up to 100 million rubles)	Small and middle-sized less (up to 500 million rubles)
	Small and middle-sized less (up to 500 million rubles)	Small less (up to 100 million rubles)
Financial condition	Good financial condition more	Good financial condition more
Age	Not significant	Not significant
Foreign stake	Not significant	Not significant
Government stake	Not significant	Not significant
	Public sector enterprises more	
Industry	Machinery production more	Chemical industry, metallurgy, machinery production more
	Not significant	
Presence of domestic competition	Not significant	Not significant
	Firms not competing with Russian rivals less	
High intensity of domestic competition	Not significant	Not significant
Presence of foreign competition	Not significant	Firms not competing with foreign rivals less
High intensity of foreign competition	Not significant	Not significant
Export outside ex-USSR	Not significant	Exporters more
	Exporters more	

As for the *dynamics of the technological innovations' outlays*, the growth of such funds, according to the results of regression analysis (Table 3) is more common: (1) for super companies, (2) for companies that have already sent for this purpose quite a

[7] We should keep in mind heterogeneity of these class of companies in Russia: as shown in [Gokhberg, et al., 2010], enterprises under full government control appear to be non-innovators more often but firms under shared public and private control do not.

substantial amount (more than 1% of revenue). We believe that this is due to the fact that the attitude towards innovation as a real factor in the company's development is possible with a fairly substantial level of funding for innovation, and the seriousness of treatment to innovation in the future determines the future growth of expenditures.

Table 3. Factors influencing on the fact of positive dynamics of innovative expenditures of Russian companies (based on estimates of logistic regression; p-value 10% threshold is used, subsample of companies-innovators)

Variable	**Influence on dynamics of innovative costs**
Annual revenue	Middle-sized less (revenue 100-500 mln rubles), extra large more (more than 5 bln rubles).
Financial condition	Bad financial condition less
Age	Companies 10-20 years old less
Foreign stake	Not significant
Government stake	Not significant
Industry	Oil & gas industry more
Presence of domestic competition	Companies not competing with Russian rivals more
High intensity of domestic competition	Not significant
Presence of foreign competition	Companies not competing with foreign rivals less
High intensity of foreign competition	Not significant
Export outside ex-USSR	Not significant
Level of technology compared to Russian rivals	Not significant
Level of technology compared to foreign rivals	Not significant
Current innovative expenditures	Companies with high current innovative expenditures more

Once again, *speaking now on to the dynamics of corporate innovative expenditures*, *we can note a fundamentally different effect of competition with Russian and foreign rivals*: to step up spending on technological innovations are more "situated" in the first place, the companies which are not competing with Russian producers, and, secondly, companies that are in competition with foreign enterprises.

4. Incentives for innovative activities of the companies: specifics of industries and markets organization

For a long period the experts have been discussing the peculiarities of innovations in different industries (markets) and considering the necessity of taking into consideration different possible models of innovative activities in the course of implementation of innovative policies (see papers [Gokhberg et al., 2010; Gokhberg, Kuznetsova, 2011]).

Therefore we attempted to analyze the influence of different incentives for innovation in the companies taking into account the organization of industries — vertical or horizontal orientation, peculiarities of corporate demography, role and motives of different owners (including government and foreign investors), demand trends, customers' profile, nature and intensity of competition in relevant markets.

Potential impact of increased competition on the innovative activities of the companies

The dependence of innovative activities on the intensity of competition is of complex nature. It has been theoretically proven that in case the level of competition is too high it hinders the implementation of innovations [Schumpeter, 1942], [Loury, 1979]. As shown in [Scherer, 1967], [Kamien, Schwarz, 1972], [Aghion et al., 2005], relationship between competition and corporate commitment to innovation can be visualized as a reverse U-shaped curve. It means that both in case of very low and very high level of competition the companies are not interested in innovative activities. In case the level of competition is low, a company lacks stimuli, and in case it is high, corporate resources are limited due to prices opposition.

However in Russia the level of competition is far from the upper part of the curve. Empiric research specified in [Kozlov et al., 2004; Zasimova et al., 2008] led us to conclude that the main part of industries (at least as of early and middle 2000th) the level of competition was not so high as to play a negative role. In [Gorodnichenko et al., 2010] it also has been found no evidence of emerging U-shaped dependence between the level of competition and innovative activities of the companies and in general for post-Soviet states.

Unexpectedly, in 2011 the majority (55%) of top managers representing the surveyed companies stated that the increase of competition will encourage innovative activities of their enterprises, and only 6%[8] of managers assumed that the impact could be negative. Along with this it should be noted that the responses differed materially between industries. The most ambiguous situation has formed in the textile industry and garment manufacture (the only sector that includes more responses showing ambiguous influence of the increased competition than positive evaluations).

The results of regression analysis show that the potential influence of increased competition on the innovative activities of the companies is positively evaluated by the heads of the companies with the participation of foreign investors (with the share in the authorized capital exceeding 10%) and with good financial standing. It is clear that the companies that feel considerable pressure and competition from foreign manufacturers would less likely rate the increase of the competition as positive (however no effect of this nature is detected in case of the high level of competition with Russian manufacturers).

Demand for new improved products and its main drivers

The most important characteristic of industries is the typology of the main consumers of their products. It is obvious that the specifics of innovative activities will be to a great extent predetermined by the nature of the demand for the products of the companies (whether such demand is public or private, foreign or domestic, corporate of households-driven). Moreover depending on the nature of the main consumers industry-specific possibilities of encouragement of the demand for the innovative products differ considerably.

The increase of the demand for new innovative products is one of the most important preconditions for the development of innovative activities of the companies. In case the stagnation of demand for traditional goods takes place, it finally leads to the "creative destruction" in the course of which less innovative companies are replaced in the market by more innovative and successful.

[8] We perceived these empiric results as unexpected and even intriguing due to the fact that the results of a poll held in 2005 among the manufacturing top managers found very similar proportion of positive and negative assessments of potential impact of the increased competition on the innovative activities of the companies that have been shown recently.

In the framework of our empiric research we have detected a considerable shift of demand from traditional to new products (on the corporate level) that occurred in the end of 2009 [Simachev, Kuznetsov, 2009]. We believed that this effect was connected with the influence the crisis had on the Russian economy. However the post-crisis growth stage featured the same tendencies of demand transformation in the market (based on the results of the recent poll held in late 2011): in 7% of enterprises the demand shifted to traditional products, but for 18% — to new and improved ones.

About one third of the enterprises in the sample are focused on households' consumption. For about 12% of the enterprises present in the selection foreign customers are significant, and this proportion appear to be quite high. Naturally the named group mainly features export-oriented industries of oil and gas sector, timber processing sector, metal and chemical industries. A considerable share in the selection (about 13%) is formed by the companies in which the government is the main customer. In certain industries (machinery and equipment manufacture, including electrical machinery) it has specific impact on demand.

It would be natural to assume that the change of the demand for new products is determined by the institutional content of the main consumers of a company's products. Regression analysis has shown that *the drivers of demand for new improved products are the following (1)households, (2) middle-sized businesses, (3) small businesses and individual entrepreneurs.* Indeed households are usually open for new technology and are less limited in their choice especially when the income and the life standards are at their increase.

It should be specifically mentioned that in case the main consumer of a company's products is the government, no positive relationship with the increase of the demand is founf. These results can prove the *weakness of innovative signals engendered by the government by public procurement.* No significant connection between the increase of the demand for new products and the focus on foreign consumers has been detected, too[9].

Vertical and horizontal channels of influence of corporate innovation stimuli

In the course of analysis of the innovative stimuli we assumed that such stimuli (prerequisites) can be:

[9] It can be assumed that a certain part of companies including those from processing industries export "simple" products to the markets with less sophisticated customers. However this issue requires special studies.

"vertical", connected to technological changes in the main supplier and(or) consumers of a company's products. Such stimuli will be of importance for vertically organized sectors;

"horizontal", determined by the examples of other companies. These stimuli will be detected on horizontally organized sectors that are open for competition with foreign companies;

"forcing", implemented directly by the government by broadening the innovative segment in public procurement, by means of the influence of government officials on the implementation of tightened technical regulations in companies (in particular public-owned companies);

those connected with the "external supply" of technological solutions by research institutions and universities, as well as experts.

On the ground of responses provided by the managers of the companies that actively innovate (Fig. 3) one can conclude that vertical stimuli are widely spread among enterprises (the transfer of the main corporate consumers to new technologies and tightening of technological demands) (42% of active companies), as well as horizontal stimuli, especially among the leading foreign companies (38%). The actions of the government aimed at motivating the companies to implement innovations is today obvious only in the part of improvement of technical regulations. Only 5% of the companies that carried out innovative activities stated that procurement played a stimulating role for them[10]. Only 21% of the companies that carry out innovative activities and the products of which are mainly consumed by the government named public procurement as an encouragement factor.

We should also underline very limited practical influence of "innovative demand" generated by research organizations on the companies[11].

[10] Speaking about public procurement, its importance for the formation of demand for innovative products was challenged before. For example, as a result of expert poll provided in the report "Barometer "Innoprom"-2011" federal and regional authorities were listed among the consumers with the lowest innovative demand potential.

[11] The problem of limited efficiency of the model of innovative demand stimulation is interesting but is not covered by the scope of this article. Generally, it can be connected with low innovative absorptive capacity of the companies (for example, due to the bureaucratization of business processes), non-conformity between the demand and supply, as well as underdevelopment of modern channels and mechanisms of cooperation between companies and scientific, educational and engineering organizations.

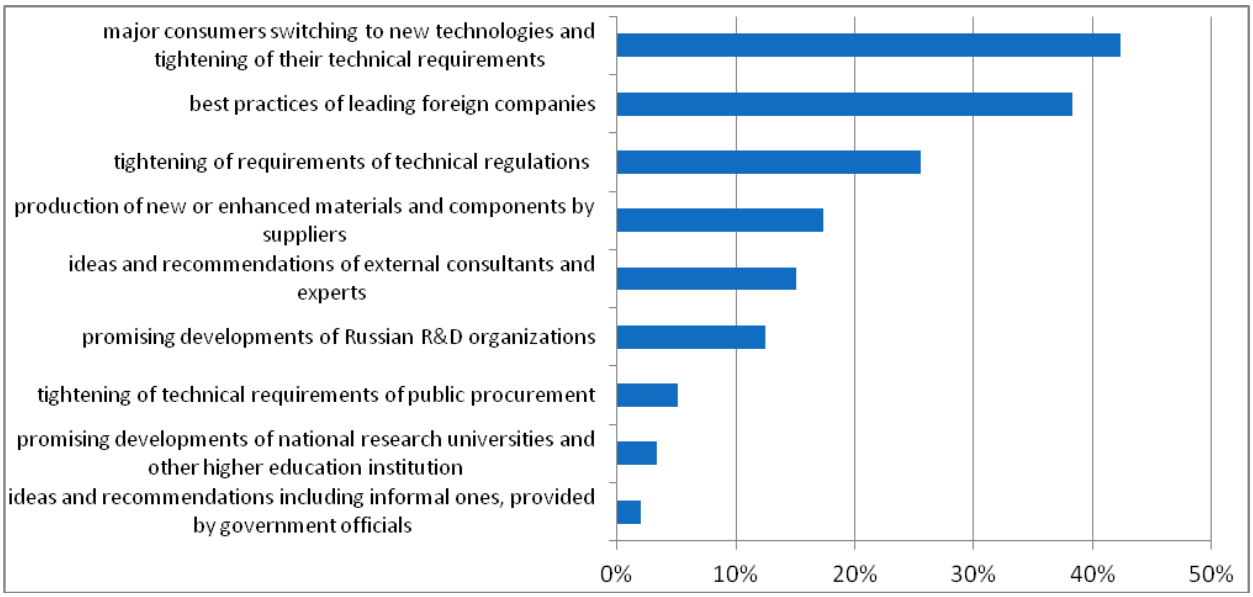

Figure 3. Important incentives for the implementation of technological innovations in the last three years — frequency of mentioning, percentage of the total number of the companies that implement innovations

Factor analysis (Table 4) enabled us to detect four well-interpretable main factors that in total provide explanation for more than a half of dispersion of the responses of corporate management regarding the stimuli of innovative activities. These factors have almost coincided with our initial "model" views of the main groups of stimuli.

First — stimuli connected with external innovative environment (promising developments of national research institutes and other educational establishments, ideas and recommendations of external consultants and experts);

Second — stimuli connected with the structure of value added chains and the processes of technological update of production cooperation;

Third — elements of active state influence on innovative processes (tightening of technical demands in the framework of public procurement, ideas and recommendations provided by government officials);

Forth — examples of foreign companies and tightening of technical regulations (the tightening of technical regulations often leads to their bringing into compliance with the standards of developed states, and therefore the combination of these two measures seems logical to me).

Table 4. Results of factor analysis of the incentives for innovative activities* (on the basis of responses of the managers)

Stimuli of innovative activities on the corporate level	**Factor value of the components**			
	1	**2**	**3**	**4**
Major consumers switching to new technologies and tightening of their technical requirements	-0.095	**0.729**	0.162	0.055
Best practices of leading foreign companies	0.140	-0.079	-0.266	**0.754**
Tightening of requirements of technical regulations	-0.180	0.181	0.324	**0.638**
Production of new or enhanced materials and components by suppliers	0.176	**0.708**	-0.188	-0.024
Ideas and recommendations of external consultants and experts	**0.614**	-0.245	0.084	0.344
Promising developments of Russian R & D organizations	**0.740**	0.009	0.129	-0.069
Tightening technical requirements of public procurement	0.229	0.078	**0.529**	-0.002
Promising developments of national research universities and other higher education institutions	**0.627**	0.165	-0.041	-0.049
Ideas and recommendations including informal ones, provided by the government officials	-0.058	-0.096	**0.726**	-0.017

* factors obtained by principal components method with varimax rotation

The aforementioned factors have distinct relationship with the objective characteristics of enterprises. The first factor ("innovations supply") is particularly clearly explains the incentives for innovative activities in major companies (with the annual income amounting to more than 15 billion rubles); the enterprises of such industries as oil and gas, electrical machinery and devices building, as well as the companies that are focused on the demand from the state and major businesses.

The second factor ("vertical cooperation") has a material impact on major, but not the biggest enterprises (with the annual income amounting from 1 to 15 billion rubles). The industries in focus include metallurgy (that could have been expected from an industry that manufactures intermediate consumption commodities with considerable quality differentiation), as well as the manufacture of electrical machinery and equipment.

The third factor ("active government participation") is connected with the share of the government in the capital of the companies and their orientation on public demand; besides, one can mark out the sector of machinery and equipment manufacture.

The forth factor ("foreign best practice") as well as the first one has a material impact on major companies (with the annual income amounting to more than 15 billion rubles). The same factor influences the enterprises with foreign share and the companies

that face increased competition with both national and foreign manufacturers. The equipment and machinery building industry is again the most sensitive here.

The sensitivity of companies to certain stimuli depends not only on objective characteristics, but also on individual peculiarities of innovative activities of certain companies. Therefore we have additionally considered a connection with the emphasis on two characteristics of innovative activities that we believe to be important: (1) persistent innovation in the framework of the strategy of competitiveness development, (2) positive expectations of potential influence of increased competition on the innovative activities of the company[12].

Innovation persistence showed a highly important positive connection only with the forth factor that includes the use of the experience of foreign companies and their being orientation points for innovative development. The connection with three other factors remained insignificant.

The optimistic view of the increased competition appeared to be negatively connected with the third factor that includes direct government encouragement of innovation. Positive connection of this feature with the first factor (based on the development of research organizations and educational establishments, as well as recommendations of external experts and consultants) was also proven to be significant on a rather high level (though not 10%). The absence of significant connection with the forth factor can be explained by the fact that this factor is positively connected with high competition with foreign manufacturers, and this feature in its turn dies not lead to the optimistic evaluation of the influence of increased competition.

Therefore the measures connected with public procurement and "hands-on management" trigger sensitivity mainly in those companies that to a great extent depend on the government and are not ready for the increase of competition. On the other hand the measures aimed at reaching the level of foreign competitors enable one to influence the companies that are operating in the markets with high competition and have already entered the phase of innovation.

Generally we can see that innovations are mainly spread in accordance with two models: vertical through corporate connections, and horizontal, based on the example of foreign companies in the atmosphere of developed competition. Along with this the

[12] The companies that implement no innovative activities or those that have selected no stimuli for it were excluded from the selection; all other standard characteristics of the companies were controlled.

model of “innovation supply” can prove to be valuable in the terms of technological modernization of major companies at the end of vertically organized industries and therefore can lead to the increased efficiency of innovational stimuli in corporate networks.

5. Barriers for innovation in Russian companies

Innovation activity of Russian companies: profile of barriers

Most companies of the sample used to adopt technological innovations with some intensity. About a third adopt innovations permanently as part of a competitiveness strategy, another third do that occasionally, when sufficient funds are available, and only a third does not adopt technological innovations at all.

However, the intensity of innovation in Russian companies remains inadequate, funding scarce. Innovative costs of most companies in 2010 did not exceed 5% of revenue, and only 7% of the surveyed companies spent on technological innovation more than 10% of revenue. R&D are not funded by most companies surveyed (58%), while companies that spend on R&D more than 1% of revenue count only 15% of total enterprises surveyed. As a result, only 14% of enterprises get more than 10% of revenue from new and improved products, while almost half of companies do not have new and improved products at all.

The vast majority (about 80%) of respondents reported the presence of various barriers to innovation both internal and external to the company. Companies in the "ideal" situation, carrying out technological innovation and perceiving no significant obstacles to it, constitute only 10% of the sample. Almost the same number of companies have neither internal nor external obstacles to innovation but still do not innovate.

Respondents generally believe the sources of obstacles to innovation activities external to their enterprises: 48,3% of respondents reported of no internal obstacles, and only 26,1% of the absence of external (Fig. 4).

Figure 4. Internal and external obstacles to companies' innovative activities — frequency of mentioning

There are specific obstacles: problems of macroeconomic nature (access to funding, payback period of technological innovation), lack of personnel, institutional problems (inadequate tax system, unstable business environment, administrative barriers). Some percentage of respondents also pointed a problem of owners and shareholders disinterest in innovation.

Among the institutional barriers dominate those ones that are not related to the state-driven fostering innovation, or do not involve government intervention in company activities (imperfect tax incentives, unstable business environment, high administrative barriers, low predictability of government innovation policy, complexity of customs

control procedures). Limited measures to support innovation through direct capital injections from the government (budget co-funding of projects, procurement, investment in physical infrastructure for innovation), is a problem for a relatively small part of companies. These data do not match with findings in [Gokhberg et al., 2010], which were based on an earlier survey results and according to them there where lack of state financial support ranked as the third problem in all innovation regimes. The reasons for this discrepancy may lie in facilitating access to government funding of innovation and changing requests for state support to companies. This issue requires more scrutiny.

Growth of innovative costs of Russian manufacturing companies and barriers to innovation: the comparative height of the barriers

Our insight is that the prevalence of a problem does not mean in itself that it is actually "restraining" the expansion of innovation activity. Therefore, we used regression analysis to test for dependency between the identified barriers to innovation and companies' propensity to increase innovative costs in 2011 in comparison to 2010.

Some proposed answers on the obstacles to innovation require implicitly the presence of such activities or similar experiences. If the company does not innovate, its head faces difficulties when judging about the problems associated with high-order innovation; in addition, some problems can be in positive relation with the intenseness and riskiness of innovation. Therefore, while estimating regression with innovation problems treated as independent variables and the case of innovation costs growth as the binary dependent variable, we have ignored the companies which reported no innovation expenses. In addition, the technological level of enterprises has been added to the set of control variables, because it determines, at least in theory, the motivation of the company to spend more on technological innovation under the strategy of "catching up development".

Due to the large number of variables and possible multicollinearity, we have conducted preliminary analysis adding the problems to the regression equation one by one.

Estimation of these regressions resulted in selecting three variables which alone exhibited statistically significant relation to probability of rising innovation costs. Obstacles corresponding to these variables are unstable business environment, excessive

bureaucratization of business processes related to innovation, technological gap within value-added chain. Estimated coefficients of regression with these variables treated as dependent are presented in Table 5.

Table 5. Factors affecting the probability of rising innovation costs (coefficients in logistic regression equation)

Variable		**Coefficient**
Unstable business environment		*-0,7598* *
Excessive bureaucratization of business processes related to innovation		*-0,6396* **
Technological gap within value-added chain		*1,9525* *
Revenue	less than 100 million rubles	-0,4077
	100-500 million rubles	*-0,5831* *
	500 million – 1 billion rubles	-0,0688
	more than 1 billion	0,5139
Financial condition	bad	*-0,8539* *
	good	0,4222
Participation of foreign capital	less than 10%	0,6081
	more than 10%	0,0822
Part of the state and municipalities		-0,0750
Age	less than 10 years	0,0134
	10-20 years	*-0,8178* ***
Sectors	oil and gas	-0,6020
	textile	0,6506
	wood, pulp and paper	*-0,8594* *
	chemicals	0,6248
	rubber and plastics	0,1506
	metallurgy	0,5675
	machinery and equipment	0,3508
	transport equipment	-0,0649
	electrical equipment and electronic products	0,1721
High competition	with Russian producers	-0,3668
	with foreign producers	*1,3166* *
The government among main consumers		*1,7838* ***
Export to non-ex-USSR countries (more than 2% of revenue)		0,0277
Level of technology	lower than that of the Russian competitors	*-1,9226* **
	higher than that of the Russian competitors	*0,6649* **
	higher than or equal to that of the foreign competitors	-0,5297

* Significance of t-statistics at 10% level
** Significance of t-statistics at 5% level
*** Significance of t-statistics at 1% level

Unstable business environment and the bureaucratization of business processes within corporation show a significantly negative impact on the dynamics of the corporate innovative costs. In addition, it seems apparently paradoxical that the concern about possible technological gap between the contractors in the supply chain showed a positive association with the dynamics of the innovative costs.

However, we must remember that these results are obtained for only one year; we plan to test the proposed technique on longer time series.

6. Instruments for fostering business innovations and their impact on companies

A characteristic feature of present public innovation policy in Russia is an excessive scope of measures and mechanisms, which are counted by dozens and include almost all the tools conceivable – from the simple co-funding of innovative projects to the organization of communication platforms for all stakeholders. Because trying to cover in the study the full variety of instruments of the state stimulation of innovation would be apparently futile, we had preliminarily selected them on the basis of the following considerations:

- The instruments in question should represent *all the major trends of today's public innovation policy*;
- The scope of the analysis should include measures and instruments that *are recognized at the national level* (in official documents or public statements of competent persons) *as most significant and/or priority*.

The sample of instruments selected for further analysis (Table 6) is somewhat "shifted" towards tax incentives and innovative infrastructure elements (primarily financial ones). This peculiarity, in our view, is objective due to the modern accents of government innovation policy[13]. In general, all the selected measures seem to be quite noticeable (at least in terms of their active discussion in the expert community). They are different in terms of their nature and expected effects and have no evident sectoral focus. It should be noted also that even within a small sample of selected instruments there can be distinctively seen the trends of recent years outlined above: strengthening of public innovation policy and diversification of its tools.

Table 6. Characteristics of the considered instruments of government support for companies' innovative activities

	Category	In use since
Public funding of innovative projects within federal targeted programs	Direct funding	1990s
Funding for innovative projects by venture capital funds[14]	"Quasi-public" funding	2006
Special economic innovation zones	Innovation infrastructure	2006
Development of technical regulations, establishment of new regulations and standards	Regulation	2006

13 See e.g.[Simachev, Kuzyk, 2010] and [Simachev, Kuzyk, 2012].

[14] This refers to funds established with government support, such as venture capital funds capitalized by the Russian Venture Company.

Funding for innovative projects by state development institutes (VEB, RUSNANO)	"Quasi-public" funding	2007
The possibility of accelerated depreciation of fixed assets that are used only for scientific and technical activities	Tax incentives	2008
Depreciation bonus - the possibility of a one-time write-off of 30% of investment in fixed assets with a useful life of 3 to 20 years	Tax incentives	2009
Tax exemption of employers' costs for employees' training	Tax incentives	2009
VAT exemption on imports of technological equipment with no domestic analogues based on a list approved by the government	Tax incentives	2009
Write-offs in the amount of one and a half of R&D expenditures on a list established by the government	Tax incentives	2009
Public funding of projects selected by the Presidential Commission for Modernization and Technological Development of the Economy	Direct funding	2009
Public funding of corporate innovative projects in cooperation with universities	Direct funding / networking	2010
Skolkovo innovation center	Innovation infrastructure / "quasi-public" funding	2010
Approval and implementation of innovative development programs of the largest state-owned companies	Regulation	2011
Technology platforms	Networking	2011

Sources: laws on the federal budget, tax reporting summary, annual reports and materials of official sites of Vnesheconombank, JSC "RUSNANO", JSC "Russian Venture Company", JSC "Special Economic Zones".

Selective support instruments prevail within the considered sample as well as within the government innovation policy as a whole. These are focused on a previously specified ("namely") list of companies or require their special screening. Only tax measures and the development of technical regulations are not included in this list. However, the use of non-selective support measures may de facto be selective, too: for example, if there is a special list which exhaustively defines a set of their "points of application"[15].

The use of innovation policy instruments: scope, focus, main beneficiaries

Heterogeneity of the selected innovation stimulation measures led us to assume *a priori* significant differentiation in the extent of their use: for example, non-selective measures must "in average" affect a wider range of enterprises, than selective ones, while the support of cooperative projects of companies and universities should scarcely provide as many direct beneficiaries as government programs, just because these tools have fundamentally different amounts of budget support.

Responses of the surveyed executives to the question about positive impact of the considered measures on the innovation activities of the company (including R&D) in

[15] Among the instruments considered there are two such ones: write-offs in the amount of one and a half of R&D expenditures and VAT exemption on imports of technological equipment into Russia. In the first case, the government approves the list of subjects of works, in the second the list of the equipment with no domestic analogues.

general confirmed this assumption (Fig. 5). Most popular in the sample were tax incentives and among which depreciation bonus was significantly more often mentioned. It is quite logical, as in order to apply this mechanism companies should just invest in equipment with a useful life of 3 to 20 years.

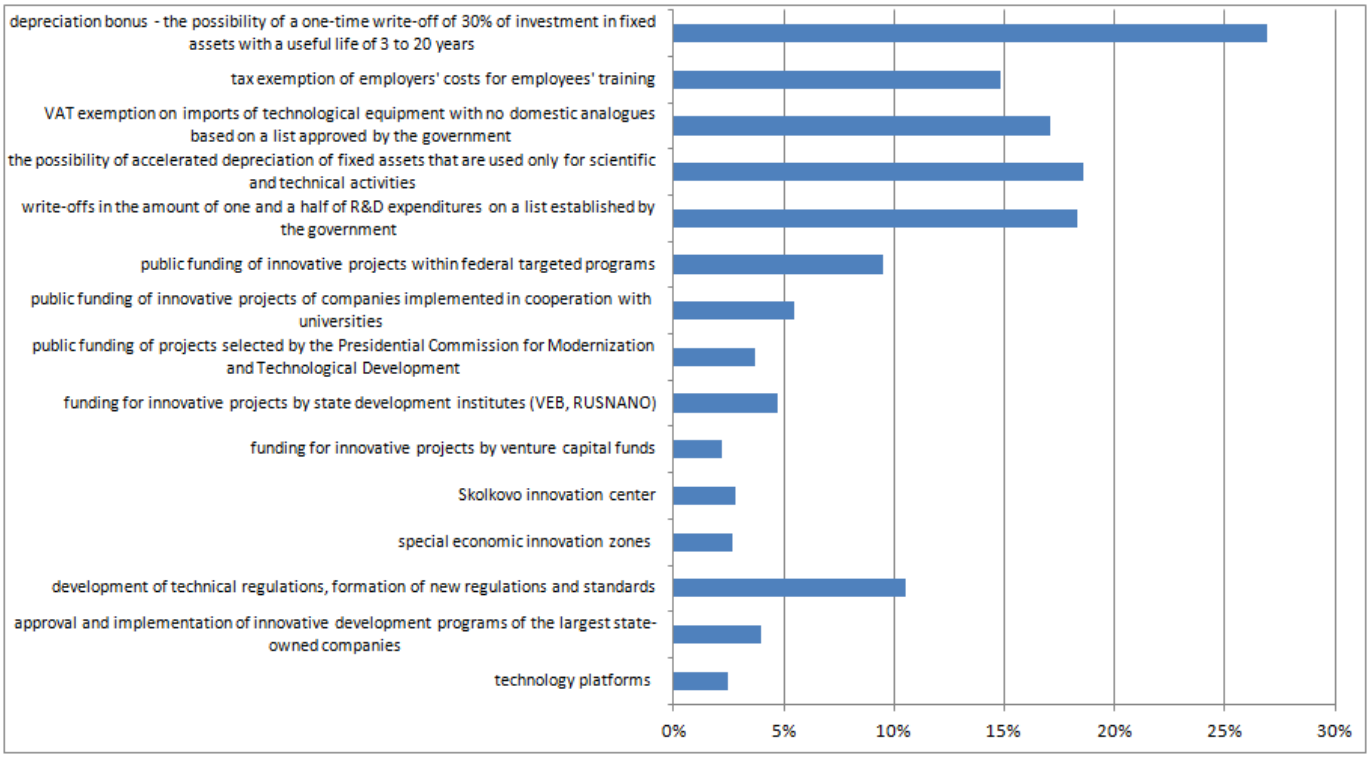

Figure 5. The scope of impact of the considered innovation policy instruments on the innovation activity of companies (including R&D) – frequency of mention

Among the non-tax instruments a nonselective measure was mentioned most frequently, too, i.e. *the development of technical regulation and establishment of new regulations and standards*. However almost as often the surveyed companies were affected by today's most mature and widespread selective tool, *the support of innovative projects within federal targeted programs (FTP)*. In turn, the scope of the latter was not so very different from other two instruments of public funding as one might had expected looking at difference in budget expenses (see Table 2). Note also *the activity of development institutes (VEB, RUSNANO) to support innovation*: given the "piece" nature of this support, the extent of their impact on the companies in the sample (probably both direct and indirect) should be recognized as a very high.

To write a profile of companies which are typical beneficiaries of government support we used regression analysis of the impact of each instrument on the companies

on a number of most important their characteristics such as industry, size, financial condition, and some others (Table 7)[16].

Table 7. The influence of various characteristics of companies on the presence of the positive impact of innovation policy instruments for innovation activities (including R&D)

Instrument	Characteristics of companies
Depreciation bonus - the possibility of a one-time write-off of 30% of investment in fixed assets with a useful life of 3 to 20 years	Age: -- * more than 20 years Financial condition: ++ good -- bad Exporting: +++ to the countries of former USSR +++ to far-abroad countries
Tax exemption of employers' costs for employees' training	Age: -- more than 20 years Ownership: - government stake Financial condition: +++ good
VAT exemption on imports of technological equipment with no domestic analogues based on a list approved by the government	Age: + less than 10 years -- more than 20 years Financial condition: +++ good - bad Exporting: + to the countries of former USSR ++ to far-abroad countries
The possibility of accelerated depreciation of fixed assets that are used only for scientific and technical activities	Number of employees: ++ more than 1,000 -- less than 250 Age: --- more than 20 years Financial condition: - bad Exporting: +++ to the countries of former USSR +++ to far-abroad countries
Write-offs in the amount of one and a half of R&D expenditures on a list established by the government	Industry: ++ manufacture of machinery and equipment + manufacture of chemicals and chemical products + manufacture of rubber and plastic products Age: -- more than 20 years Exporting: ++ to far-abroad countries

[16] The estimation was performed by binary logistic model in the subsample of 409 innovation-active companies. As the dependent variable were successively taken characteristics that reflect the positive impact of each of the considered measures on the innovation and/or research activities of the enterprise. As the independent variables binary characteristics were used, reflecting the industrial , age (the period of existence – less than 10 years or over 20 years), the number of employees (up to 250 people or more than 1,000 people), financial condition (good or bad), the presence of the state and/or municipalities among the owners, the presence of foreign shareholders, exporting to countries of the former USSR (only) or to far-abroad countries.

Instrument	Characteristics of companies
Public funding of innovative projects within federal targeted programs	Industry: +++ manufacture of transport equipment Financial condition: +++ good
Public funding of innovative projects of companies implemented in cooperation with universities	
Public funding of projects selected by the Presidential Commission for Modernization and Technological Development of the Economy	Age: - less than 10 years
Funding for innovative projects by state development institutes (VEB, RUSNANO)	Financial condition: ++ good
Funding for innovative projects by venture capital funds	Number of employees: ++ up to 250 Financial condition: ++ good
Skolkovo innovation center	Age: - less than 10 years Financial condition: +++ good
Special economic innovation zones	Age: - less than 10 years
Development of technical regulations, formation of new regulations and standards	Industry: +++ extraction of crude petroleum and natural gas + manufacture of electrical machinery and equipment Export: - to far-abroad countries
Approval and implementation of innovative development programs of the largest state-owned companies	Industry: ++ extraction of crude petroleum and natural gas Ownership: + government stake Financial status: - good
Technology platforms	
None of the instruments has influenced the company	*Industry:* *- manufacture of transport equipment* *Financial condition:* *+ bad* *- good* *Exporting:* *--- to far-abroad countries* *--- to the countries of former USSR*

+/- significant at 0.1 level;
++/-- significant at 0.05 level;
+++/--- significant at 0.01 level.

Most of the considered measures of public policy are *"neutral" to the size of companies, as well as to government of foreign stake in companies*. The exception, as a rule, is the measures originally aimed at companies of particular size groups or forms of ownership. For example, support from venture capital funds is addressed primarily to small businesses; the requirement to adopt and implement special innovative development programs concerns only the state-owned companies; the list of technological equipment, the import of which should be exempted from VAT, most

likely was developed by authorities with regard to the interests of major Russian companies.

The use of tax incentives is substantially less typical of companies established during the Soviet era. At the same time, it seems there is a lack of mechanisms that support innovative activities of relatively new firms (operating less than 10 years). Moreover, such instruments as special economic innovation zones and Skolkovo innovation center that ideologically should support start-ups are focused more on supporting "aged" companies in practice.

The use of two instruments has quite clear *sectoral priorities*: public funding of innovative projects under federal targeted programs was significantly more often mentioned by manufacturers of transport equipment (25% versus 10% of the whole sample) and the development of technical regulation by the oil and gas companies (31% versus 11%)[17].

The influence of most of the considered tools is connected to positive financial status and/or export orientation of companies. At the same time a company that has experienced no influence of the measures is significantly less likely to be an exporter and wealthy firm. Thus it can be concluded that *in general government innovation stimulation measures target successful companies rather than poorly performing ones.*

It is important to note that *some of the considered government innovation stimulation policies are connected in one way or another with the above discussed external barriers to innovation.* Thus, top-managers of companies that felt the impact of tax incentives are less inclined to mention the poor prevalence of budget co-financing for innovations and difficulties with raising funds for innovative projects. The latter problem is also less relevant for the companies that have experienced positive effects from Special economic innovation zones and Skolkovo innovation center. For the companies that benefit from the instruments of direct public funding, as well from the implementation of innovative development programs by major state companies, more common is concern about insufficient amounts of public procurement of innovative products.

[17] The first is most likely due to the implementation of a major federal program "Development of Transport System of Russia (2010-2015)", and the second – to the formation in recent years of a number of new standards in the field of oil and gas extraction.

Problems and constraints of state innovation policy instruments

Let us consider the problem of the application and administration of two categories of tools – tax incentives and instruments of direct financial support for innovation.

The key disadvantages of tax instruments are *increased attention of the tax authorities and risk of their additional audits,* as well as *insufficient clearness of tax regulation* and, consequently, the risk of conflicts with tax authorities (Figure 6), whereas the disadvantages associated with specific regulatory parameters of tax credits (i. e. their rates or the base for calculation) were mentioned much less frequently.

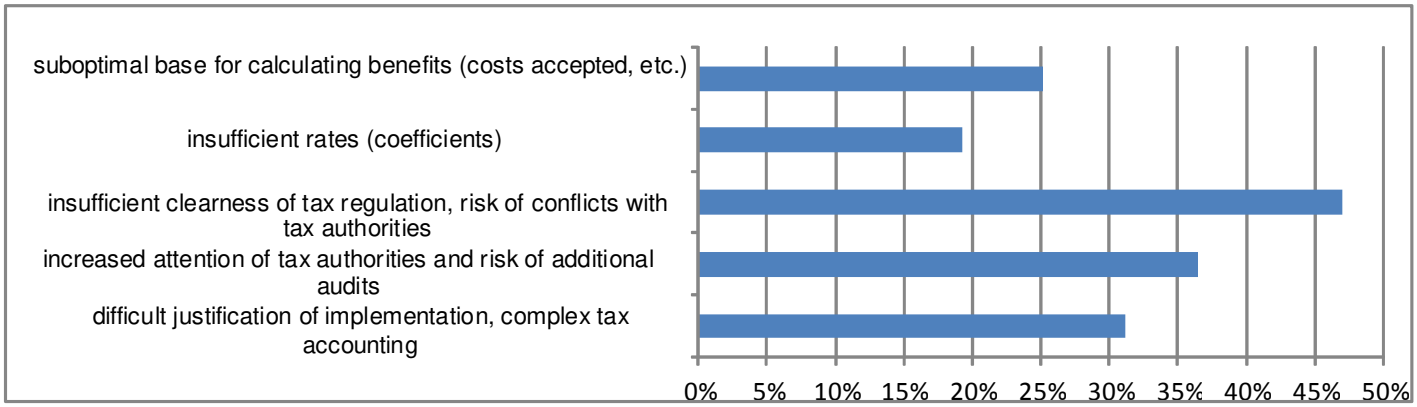

Figure 6. The main disadvantages of tax instruments – frequency of mention

Comparing the assessments of the problems given by the heads of the companies that have an experience of implementing tax instruments and by those who did not use these options, we can note that the former more frequently mentioned insufficient rates and coefficients, while the latter – difficulties of justification and the risk of conflicts with tax authorities.

The most significant disadvantages of application and administration of public funding are *the lack of information about existing instruments and conditions of their application,* as well as *excessive bureaucratization of support authorization procedures* (Figure 7).

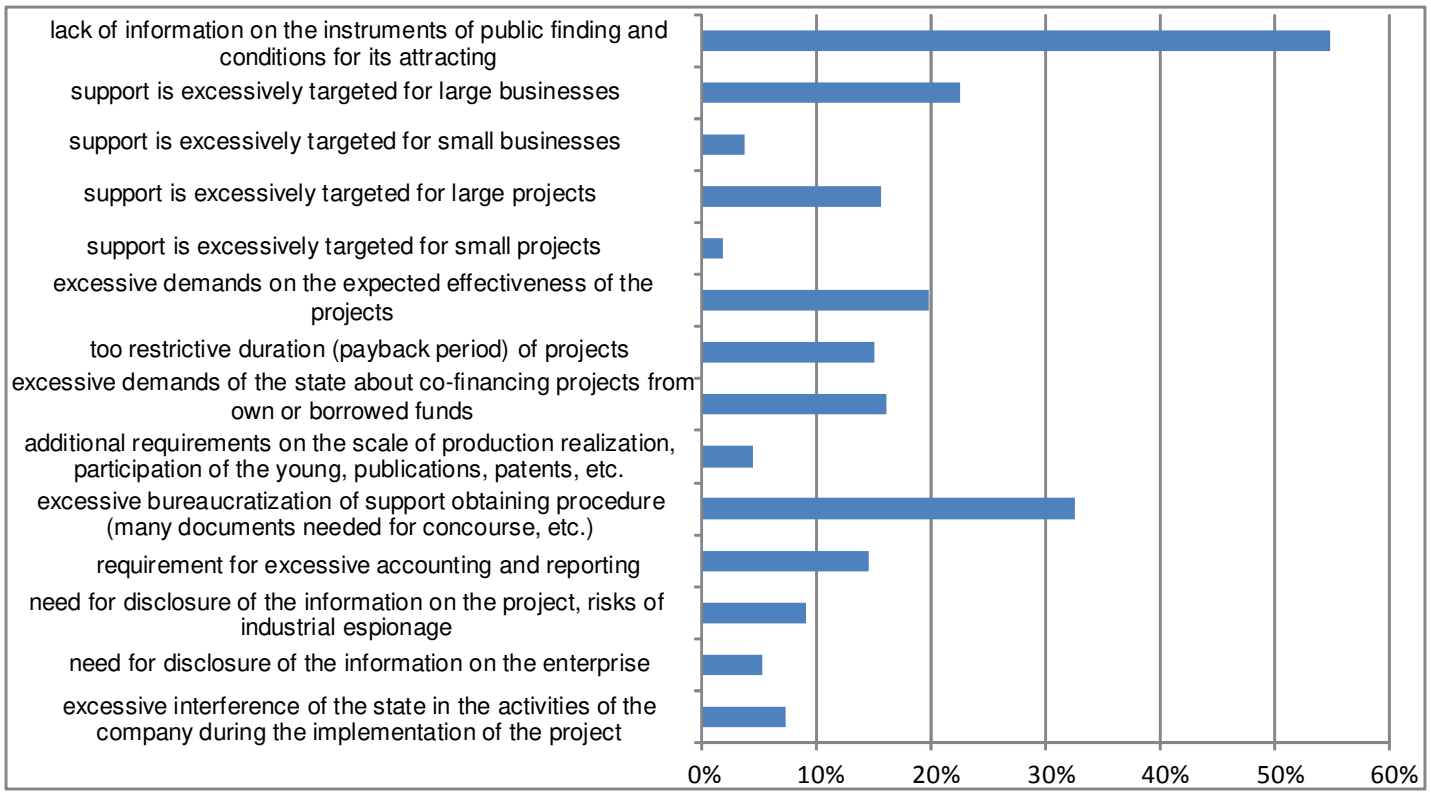

Figure 7. The main disadvantages and problems of public funding instruments – frequency of mention

Considering the differences in assessments of disadvantages by heads of companies non affected by the public financing instruments (76% of the sample) and of those that have felt the positive effects of at least one of these tools (13%), it is important to note that the problem of lack of information on the support mechanisms is much more relevant for companies which have used none of the considered financial instruments (it was reported by 60% of the managers of these companies and only by 29% of leaders of companies that are beneficiaries of state financial support). On the other hand, for companies that are recipients of support much more significant are excessive official requirements of co-financing projects (respectively 15% and 25%).

Thus, despite the undoubted relevance of issues related to tax administration, insufficient clearness of tax regulation, etc., it is important to note that their importance is somewhat overestimated by companies that have no experience with the considered tax incentives. This may to some extent prevent these companies from using tax breaks.

An important feature (and a certain disadvantage) of instruments of direct financial support for innovation is their "binding" to the rules and procedures established by the budget legislation, the legislation on public procurement, etc., while some of the existing

rules are very inconvenient in terms of support for innovative projects. Partly for that reason, and also because of insufficient media coverage, the financial mechanisms are characterized by rather narrow and year-to-year persistence range of companies, which have adapted to the specificity of these measures and particular requirements.

7. Features and characteristics of the "demand" from business to public policy in the interests of companies

Evaluation of policies implemented by the government is essential, above all, to identify practical ways to improve innovation policy in the short term. However, *it is also important to assess the strategic choice of companies on the basic principles (accents) of public policy*. Note that we have tried to formulate the questions proposed for the evaluation of the issues in a fairly neutral way, in relation to the overall objectives of the business and to ensuring its competitiveness (Figure 8).

Of course, the choice of a principle of policy by the majority is no reason for its restructuring. At the same time, the analysis of the preferences of businesses provides a more accurate representation of groups of companies "sensitive" to different components of public policy and therefore can contribute to a more integrated, harmonious and balanced policy to promote innovation.

According to most enterprise heads, the following emphases in public policy are necessary to ensure the competitiveness of business: the stability of regulation of economic activity, support for the demand for innovation from business, import-substitution-oriented policy, support for domestic development of new technologies.

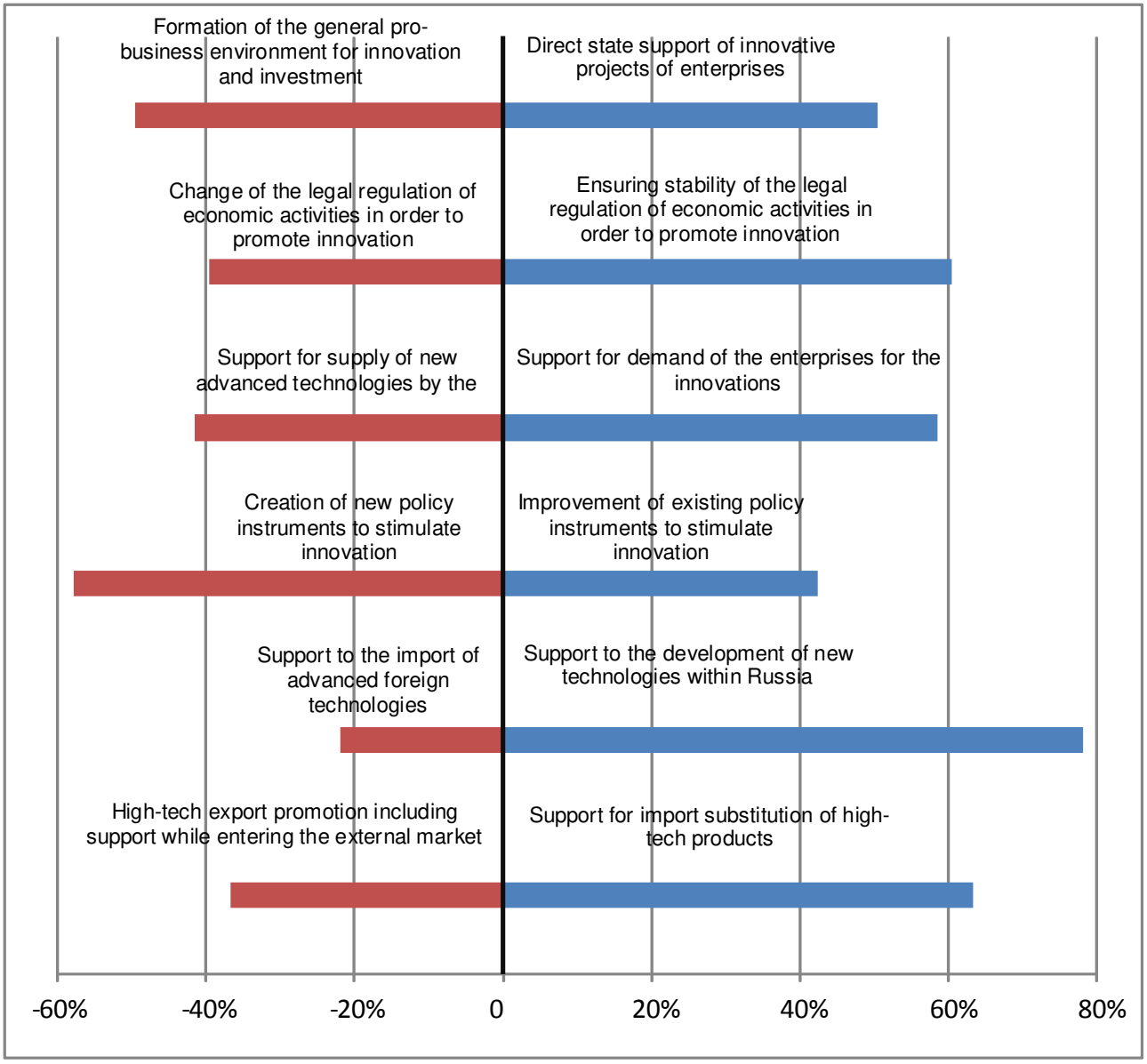

Figure 8. The choice of respondents from the six alternative conventional ways of the state action in terms of competitiveness and business development – the proportion of responses *

*Within each of the alternatives the positive values correspond to one variant and the negative – to another

Quite surprisingly the result shows that the majority of managers (almost 80%) chose the support for domestic development of advanced technologies and only about 20% – facilitating import of technologies. In our opinion, this result stems from the fact that almost half of the sample companies (48%) did not focus on any model of integration into the global economy (which is due, primarily, to a lower level of internal competition). At the same time, we found that *support for the import of advanced foreign technologies is more important for companies that focus on integration into the global*

economy (especially when they focus on the integration of such models as the attraction of foreign investors to shareholding, as well as the establishment of a joint enterprise). Along with this, we can also assume that the companies, as they grow, begin to deal with restrictions on imports of better technologies (see, for example, [Upravlenie Issledovaniyami…,2011]). Perhaps, the higher the role of innovation in competition the larger the significance of not-for-sale technologies. This may expand demand of Russian companies for domestic developments, too.

In addition, we consider to be noticeable the proportion of companies (40%) preferring the government support for *supply* of new technologies by the developers and not the *demand* of enterprises for innovation. This can be explained by the fact that a substantial portion of the sample companies (every third enterprise) is focused on the development (formation) of its in-house science. In this regard, managers are likely to consider such companies as potential "recipients" of state support for the proposal of new technologies.

Basing on regression analysis, we can mention the following *variables associated with a particular choice from the proposed alternative conventional public policies.*

1. *The support of import substitution more often is of interest for final consumer goods producers.* In the face of increasing competition, such companies increasingly focus on opening joint ventures with foreign producers in order to strengthen their position in local markets.

2. As we already noted, the choice in *favor of facilitating domestic development of new technologies* is prevalent in the responses of enterprise heads. However, we note that the "supporters" of this variant are more likely to include representatives of two fundamentally different groups of companies: (1) companies that do not manufacture innovative products, (2) companies that manufacture innovative products which are new in Russia.

3. *Private sector firms are more interested in stable regulation of economic activity,* while the companies with a government stake tend to welcome regulatory changes to promote innovation. It seems important that the need for stable control is more widely seen at the part of *firms that are under conditions of strong competition with foreign producers.*

4. *Medium-sized companies* (where the number of employees does not exceed 1,00) *are significantly more interested in the formation of general pro-business environment*, as well as companies in good financial condition. Direct financial support for innovative projects is much more preferable for large companies, for relatively young firms (of age up to 10 years), and for firms funding R&D.

According to the results of factor analysis, *there are two conventional models of public policy*[18] *that are "unanimously requested" by innovation-active companies*:

(1) The *first model* is aimed at promoting international division of labor and is to some extent shifted to *the support for the import of advanced technology and export of products.* In this model, more emphasis can be put to support the demand for innovation and ensure the stability in regulation rules. At the same time, in this model direct government intervention in supporting the project is more substantial and improving the environment for innovation is of less importance.

(2) The *second model* is associated with the stimulation of domestic supply and demand and *is more aimed at supporting the development of new technologies within Russia together with import substitution for tradable goods*. This model is most strongly associated with reconsideration of the "rules of the game" (by changing the regulation of economic activity in order to promote innovation). Also, this model assumes a greater emphasis on support for new technologies supply.

In the group of companies which require "open-doors policy" (first model), there are more "older" companies in good financial condition, with higher levels of R&D expenditures. This group rarely includes companies that export only to countries of the former Soviet Union, as well as the companies of textile and garment industry and manufacturers of transport equipment. In contrast, the group of companies focused on the "self-reliance policy" (second model) includes more often "young" companies, as well as companies involved in exporting to far-abroad countries. Thus, *the "open-doors policy" is more needed by high-tech companies looking to diversify their markets and expand exports.*

[18] This "combination" of preferences for public policy seems very interesting and needs further study. In fact, initially it was possible to assume that import substitution should be based on the adaptation of advanced foreign technologies and increasing exports – primarily through the development and introduction of new Russian technologies.

Conclusion

The low commitment to innovation in Russian companies is largely due not only to problems in their implementation, but also to the lack of motivation for companies. There remains a strong positive potential of the impact of increased competition on the innovation activities of companies. In addition, the government now insufficiently uses the opportunities associated with the expansion of public procurement of innovative goods. A significant potential in motivating companies to innovate is also associated with increased requirements in technical regulations.

The most significant barriers to the expansion of innovation are unstable business environment and internal bureaucratization of business processes in companies, which greatly limit their innovation susceptibility. Thus, to establish the stability of control is the major problem, as even a positive change in the regulation gives rise to uncertainty and increases the risks, especially for long-term innovation projects. In those markets where changes are much needed, appropriate adjustments in the regulation should be as predictable for the business community as possible.

A characteristic feature of the public innovation policy in Russia is the excessive scope of active instruments, but among them only a small part really fosters companies' growth. Also the implemented tools are in general rather poorly focused on start-up fostering. The effectiveness of innovation support tools is largely constrained by the quality of their administration.

Much of the existing tools provided with resources are aimed more at traditional sectors. Progressing corporate plans of technology modernization (we believe that this process will expand) increases the urgency of developing new, "smart" mechanisms to encourage innovation which tune in advance to the new and growing technology demand of companies.

The choice of most companies in favor of supporting import substitution is reasonable, as most companies still do not have substantial capability to expand high-tech products export. However, it is important to seek for such design of import-substitution policy that does not relies heavily on import duties and restrictions. Otherwise, the incentives for innovation reduce sharply and conditions for technological imitation get worse.

To broaden the population of innovation-active firms, the most important task is to improve the economic environment for innovation and investment. At the same time, it is useful to combine environment-improving policies with the support of innovative projects, but with a focus on demonstration effects, on support of relatively young companies that need to share risks.

References

1. Acemoglu D., Aghion P., Zilibotti F. Distance to Frontier, Selection and Economic Growth. // Journal of the European Economic Association. 2006. Vol. 4, No. 1. P. 37-74.
2. Aghion P., Bloom L., Blundell R., Griffith R., Howitt P. Competition and Innovation: An Inverted U Relationship. // Quarterly Journal of Economics. 2005. Vol. 120, No. 2. P. 701-728.
3. Almeida R., Fernandes A. Openness and Technological Innovations in Developing Countries: Evidence from From-Level Analysis. // Journal of Development Studies. 2008. Vol. 44, No. 5. P. 701-727.
4. Antonelli C., Crespi F. Matthew Effects and R&D Subsidies: Knowledge Cumulability in High-Tech and Low-Tech Industries. // Department of Economics "S. Cognetti de Martiis" Working Paper Series. No. 11/2011.
5. Aschhoff B. Who Gets the Money? The Dynamics of R&D Project Subsidies in Germany. // Journal of Economics and Statistics (Jahrbücher für Nationalökonomie und Statistik). 2010. Vol. 230, No. 5. P. 522-546.
6. Barometr "Innoprom" 2011 (Barometer "Innoprom" 2011). Materials of the Urals International Exhibition and Forum of Industry and Innovation. 2011.
7. Bloom N., Griffith R., van Reenen J. Do R&D Tax Credits Works? Evidence from a Panel of Countries 1979-1997. // Journal of Public Economics. 2002. Vol. 85. P. 1-31.
8. Busom I. An Empirical Evaluation of the Effects of R&D Subsidies. // Economics of Innovation and New Technology. 2000. Vol. 9. No. 2. P. 111-148.
9. Cantner U., Kösters S. Picking the Winner? – Empirical Evidence on the Targeting of R&D Subsidies to Start-Ups. // Jena Economic Research Papers. No. 2009-093. 2009.
10. Cohen W., Levinthal D. Absorptive Capacity: A New Perspective on Learning and Innovation. // Administrative Science Quarterly. 1990. Vol. 35, No. 1. P. 128-152.
11. Czarnitzki D., Hanel P., Rosa M. Evaluating the Impact of R&D Tax Credits on Innovation: A Microeconometric Study on Canadian Firms. // ZEW Discussion Paper No. 04-77. 2004.

12. D'Este P., Iammarino S., Savona M., von Tunzelmann N. What Hampers Innovation? Revealed Barriers Versus Deterring Barriers. // Research Policy. 2012, vol. 41. No. 2. P. 482-488.
13. Fier A., Heneric O. Public R&D Policy: The Right Turns of the Wrong Screw? The Case of the German Biotechnology Industry. // ZEW Discussion Papers. No. 05-60. 2005.
14. Freeman C. Economics of Industrial Innovation. Cambridge MA: MIT Press, 1982.
15. Golikova V., Gonchar V., Kuznetsov B. Vliyanie Globalizatsii na Povedenie Rossiyskikih Promyshlennykh Predpriyatiy. (Globalization's Impact on Behavior of Russian Industrial Enterprises). // XII International Scientific on Social and Economic Development Problems. 2012. Vol. 4. P. 21-30.
16. Gokhberg L., Kuznetsova I. Innovatsii v Rossiyskoy Ekonomike: Stagnatsiya v Preddverii Krizisa? (Innovation in Russian Economy: Stagnation in Anticipation of Crisis?) // Forsayt. 2009. Vol. 3, No. 3. P. 28-46.
17. Gokhberg L., Kuznetsova T. Strategiya-2020: Novye Kontury Innovatsionnoy Politiki (Strategy 2020: New Outline of Innovation Policy). // Forsayt. 2011. Vol. 5., No. 4. P. 8-29.
18. Gokhberg L., Kuznetsova T., Rud' V. Analiz Innovatsionnykh Rezhimov v Rossiyskoy Ekonomike. // Forsayt. 2010. Vol. 4, No. 3. P. 3-18.
19. Goldberg I., Goddard J., Kuriakose S., Racine J.-L. Igniting Innovation: Rethinking the Role of Government in Emerging Europe and Central Asia. Washington DC: World Bank, 2011.
20. Gonchar K. Innovatsionnoe Povedenie Promyshlennosti: Razrabatyvat' Nel'zya Zaimstvovat' (Industry's Innovative Behavior: To Invent or to Imitate?) // Voprosy Ekonomiki. 2009. No. 12. P. 125-141.
21. Gorodnichenko Yu., Svejnar J., Terell K. Globalization and Innovation in Emerging Markets. // American Economic Journal: Macroeconomics. 2010. Vol. 2, No. 2. P. 194-226.
22. Hall B., van Reenen J. How Effective Are Fiscal Incentives for R&D? A Review for the Evidence. // Research Policy. 2000. Vol. 29, No. 4-5. P. 449-469.
23. Indicators of Innovation in the Russian Federation. – Moscow: Higher School of Economy, 2012. – 472 p.

24. Innovatsionnya Aktivnost' Krupnogo Biznesa v Rossii. Mekhanizmy, Bar'ery, Perspektivy (Innovative Activities of Russian Big Business. Mechanisms, Barriers, Perspectives). – Moscow: Rosnano, Russian Venture Company, New Economic School, PricewaterhouseCoopers, 2010.
25. Jaumoutte F., Pain N. An Overview of Public Policies to Support Innovation. // OECD Economics Department Working Paper No. 456. 2005a.
26. Jaumoutte F., Pain N. From Development to Implementation: Evidence on Innovation Determinants from the Community Innovation Survey. // OECD Economics Department Working Paper No. 458. 2005b.
27. Kamien M., Schwarz N. Market Structure, Rival's Response and the Firms's Rate of Product Improvement. // The Journal of Industrial Economics. 1972. Vol. 20, No. 2. P. 159-172.
28. Klette T., Moen J., Grilliches Z. Do Subsidies to Commercial R&D Reduce Market Failures? // Research Policy. 2000. Vol. 29, No. 4-5. P. 471-495.
29. Kozlov K., Sokolov D., Yudaeva K. Innovatsionnya Aktivnost' Rossiyskikh Firm. // Ekonomicheskiy Zhurnal VShE. 2004. No. 3. P. 399-419.
30. Lach S. Do R&D Subsidies Stimulate Or Displace Private R&D? Evidence from Israel. // Journal of Industrial Economics. 2002. Vol. 50, No. 4. P. 369-390.
31. Loury G. Market Structure and Innovation. // The Quarterly Journal of Economics. 1979. Vol. 93. No. 3, P. 395-410.
32. Martin S., Scott J. (2000) The Nature of Innovation Market Failure and The Design of Public Support for Private Innovation. // Research Policy. 2000. Vol. 29, No. 4-5. P. 437-447.
33. Mau V. Ekonomicheskaya Politika 2009 Goda: Mezhdu Krizisom i Modernizatsiey (Economic Policy of Year 2009: Between Crisis and Modernization). // Voprosy Ekonomiki. 2010. No. 2. P. 4-25.
34. Ortega-Argilles R., Piva M.-C., Potters L., Vivarelli M. Is Corporate R&D Investment in High-Tech Sectors more Efficient? Some Guidelinnes for European Research Policy. // Institute for Prospective and technologival Studies Working Paper No. 2009-09. 2009.
35. Pack H., Saggi K. Inflows of Foreign Technology and Indigenous Technological Development. // Review of Development Economics. 1997. Vol. 1, No. 1. P. 81-98.

36. Polterovich V. Problema Formirovaniya Natsional'noy Innovatsionnoy Sistemy. (Problem of Shaping National Innovation System). // Ekonomika i Matematicheskie Metody. 2009. No. 2. P. 3-18.
37. Polterovich V., Popov V. Evolyutsionnaya Teoriya Ekonomicheskoy Politiki. Chast' II. Neobkhodimost' Svoevremennogo Pereklyucheniya. (Evolutionary Theory of Economic Policy. Part II. Necessity for Well-Timed Switching). // Voprosy Ekonomiki. 2006. No. 8. P. 46-64.
38. Roper S., Love J. Innovation and Export Performance: Evidence from the UK and German Manufacturing Firms. // Research Policy. 2002. Vol. 31, No. 7. P. 1087-1102.
39. Salomon R., Shaver J. Learning by Exporting: New Insights from Examining Firm Innovation. // Journal of Economic & Management Strategy. 2005. Vol. 14, No. 2. P. 431-460.
40. Scherer F. Market Structure and the Employment if Scientists and Engineers. // American Economic Review. 1967. Vol. 57, No. 3. P. 524-531.
41. Schumpeter J. Capitalism, Socialism and Democracy. NY: Harper & Brothers Publishers, 1942.
42. Simachev Yu., Kuznetsov B. Konets Sveta Otkladyvaetsya (Doomsday Is Suspended). // Expert. 2009. No. 49-50. P. 58-61.
43. Simachev Yu., Kuzyk M. Instituty v Razvitii (Institutes in Developments). // Pryamye Investitsii. 2010. No. 4. P. 16-21.
44. Simachev Yu., Kuzyk M. Priuchit' Biznes k Innovatsiyam (Training Business to Innovate). // Moskovskie Novosti. 2012. No. 61 (253).
45. Shane S. Why Encouraging More People to Become Entrepreneurs Is Bad Public Policy. // Small Business Economics. 2009. Vol. 33, No. 2. P. 141-149.
46. STI Report: tax incentives for research and development – trends and issues. – Paris: OECD, 2002.
47. Van Pottelsberghe B., Nysten S., Megally E. Evaluation of Current Fiscal Incentives for Business R&D in Belgium. – Brussels: Solvay Business School, 2003. – 62 p.
48. Wakelin K. Innovation and Export Behavior at the Firm Level. // Research Policy. 1998. Vol. 26, No. 7-8. P. 829-841.

49. Upravlenie Issledovaniyami i Razrabotkami v Rossiyskikh Kompaniyakh: Natsional'nyy Doklad (Research & Development Management in Russian Companies: National Report). Moscow: Assotsiatsiya Menedzherov, 2011.
50. Yasin Ye. Prizhivyotsya li Demokratiya v Rossii? (Will Democracy Survive in Russia?) – Moscow: Novoe Izdatel'stvo, 2005. – 384 p.
51. Zasimova L., Kuznetsov B., Kuzyk M., Simachev Yu., Chulok A. Problemy Perekhoda Promyshlennosti na Put' Innovatsionnogo Razvitiya (Problems of Switching Industry to Innovation-Driven Path). // "Scientific Reports: Independent Economic Analysis" Series, Paper No. 201. – Moscow: Moskovskiy Obshchestvennyy Nauchnyy Fond, 2008. – 264 p.