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Creating Linkages: Government Policy to Stimulate R&D through University-Industry Cooperation in Russia

The article analyzes new government measures aimed at the creation of linkages between universities and companies in Russia to strengthen R&D and make them more effective in terms of practical applications. Three measures are assessed — programs of innovation development of large government-controlled companies, technology platforms, and cooperative R&D projects. It is shown that all measures are important and interconnected though there are some flaws in their implementation. At the same time application of these measures caused a number of positive side effects for Russian R&D complex.

Keywords: R&D, universities, companies, financing, workforce, technology platforms, programs of innovative development, joint R&D projects

State of R&D in Russia

The R&D complex inherited to a large extent Soviet traditions and organization. It is still highly hierarchical, and centralized. The federal government dominates both in terms of financing and control over organizations involved in R&D. Federal budget is the major source of support for R&D in Russia and the share of federal budget among the sources of support is increasing while business plays an insufficient role in financing R&D. Moreover, government in a way substitutes private funds creating in this way disincentives for business. All these characteristics are especially noticeable from international perspective (tables 1 and 2).

Table 1

Gross Domestic Expenditures on R&D Financed by Government and Industry, in % of Total Gross Expenditure on R&D

Country	Business enterprises		Government	
	2005	2010	2005	2010
United States (1)	64.3	61.8	30.2	27.3
Japan (2)	76.1	78.2	16.8	15.6
Germany	67.6	66.1	28.4	29.7
France	51.9	52.4	38.6	38.6
United Kingdom	42.1	44.5	32.7	32.6
European Area (17 countries)	56.1	55.7	35.4	35.4
Russia	22.4	18.3	60.1	68.8

(1) Data for 2009
(2) Data for 2008
Sources: (EUROSTAT, 2011); (Science and Engineering Indicators, 2012: 254); (Nauka, technologii i innovatsii Rossii: 2009: 25); (Nauka, technologii i innovatsii Rossii: 2011: 31)

As it may be seen from the data presented in table 1, the share of business in financing R&D in most of the developed countries is high — over 50 % average — and was growing over years. In Russia, in opposite, the share of federal government is excessively high and has grown by 9 % for the last 5-year period, reaching almost 70 % of the total intramural expenditures on R&D.

Government participation in financing R&D in the business sector in Russia is also unprecedented — it is close to 60 % while the average for OECD countries is about 7 % (table 2).

Table 2

Percentage of Business Enterprise Expenditure on R&D Financed by Government

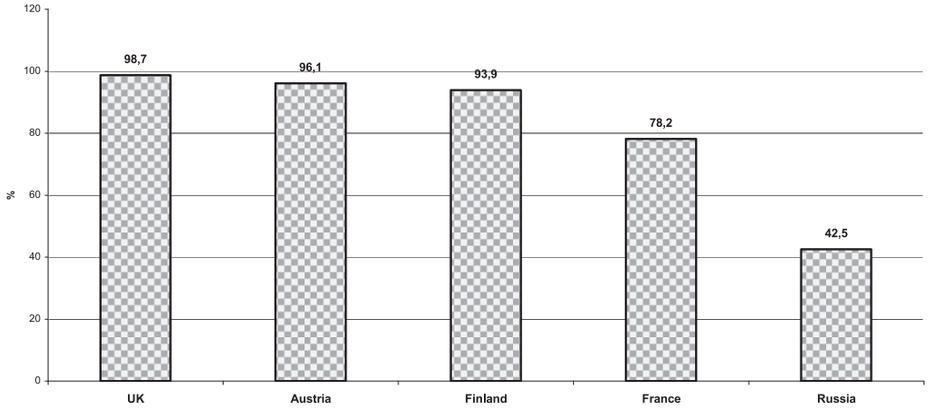
Country	2005	2006	2007	2008	2009
United States	9.7	9.8	9.9	8.9	14.0
Japan	1.2	1.0	1.1	0.9	—
Germany	4.5	4.5	4.5	4.5	4.5
France	10.1	11.3	9.8	11.4	—
United Kingdom	8.3	7.6	6.8	6.6	6.6
Total OECD countries	6.8	6.8	6.8	6.5	—
Russia	53.6	52.0	55.3	56.0	57.4

Sources: (OECD,2010: 59); (Science and Engineering Indicators, 2012: 238)

Another specific feature of the Russian R&D complex is low and decreasing support for R&D from abroad. The share of financing from abroad in the total expenditures on R&D is 8.4 % for OECD countries in average (data for 2009), with variations from 3.8 % in Germany to 16.6 % in UK (EUROSTAT, 2011). In Russia it is 3.5 % (data for 2010) (Nauka, technologii i innovatsii Rossii: 2011: 31). This indicates that foreign financing in the form

of charitable aid has decreased for Russia dramatically — at the end of 90-s foreign support reached almost 17 % and the main foreign source were charitable foundations and technical assistance programs (Graham, Dezhina, 2008: 113). At the same time Russian science did not become attractive for foreign investments that may be directed for applied research and developments. This is confirmed by a small share of financing for R&D provided by foreign business, as compared to developed countries of the world (graph 1).

Graph 1. R&D Expenditures Funded from Abroad by Foreign Business Enterprises, % in Total Expenditures from Abroad

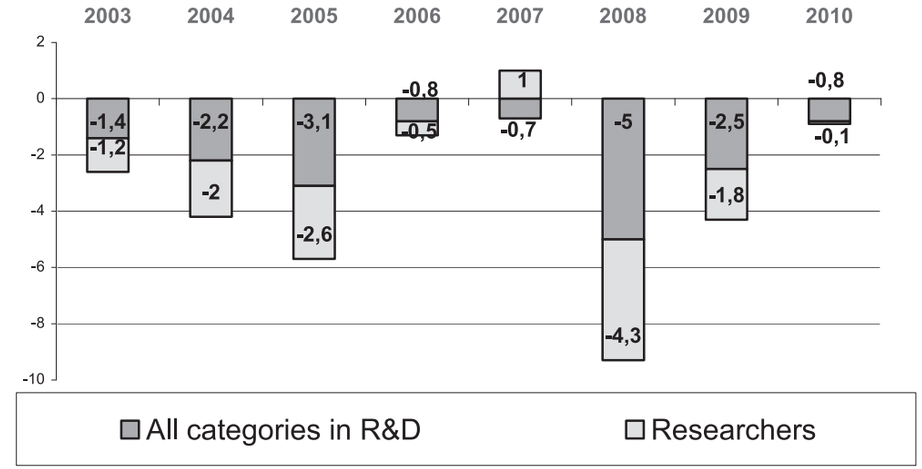


Sources: (OECD, 2011), (Nauka, technologii i innovatsii Rossii, 2011: 32)

Not very comfortable conditions for R&D in Russia as well as growing problems related to the scientific workforce preclude both domestic and foreign business from investments in R&D. By volumes of support for R&D and by number of personnel Russia is not any more among the world leaders, as it was in the Soviet Union. Russia spends on R&D just 1.16% of GDP (data for 2010) (Nauka, technologii i innovatsii Rossii, 2011: 9) while OECD countries — 2% on average (data for 2010), United States — 2.79% (data for 2008) and Japan — 3.45 % (data for 2008) (EUROSTAT, 2011). By the number of researchers Russia (369 thousand in 2010 (Nauka, technologii i innovatsii Rossii, 2011: 9)) is now ranked fourth in the world after China (1592 thousand), the United States (1413 thousand) and Japan (657 thousand) (OECD, 2010: 18). There was continuing outflow of researchers during the post-Soviet years; in 2007 there was a break in the trend[3] when a slight increase in the number of researchers has occurred (graph 2).

[3] There is no solid explanation why the growth in 2007 has happened. One of the reasons explaining the situation may be in the fact that government financing was growing since 2005 and there was a clear plan for development for science sphere until the year 2010 so R&D complex became more attractive in terms of stability and predictability of income. But in 2008 — when crisis started — it became clear that financial situation may worsen fast, and scientists started to leave — in particular, to higher educational institutes because teaching is more stable then contracts- and grants-based research.

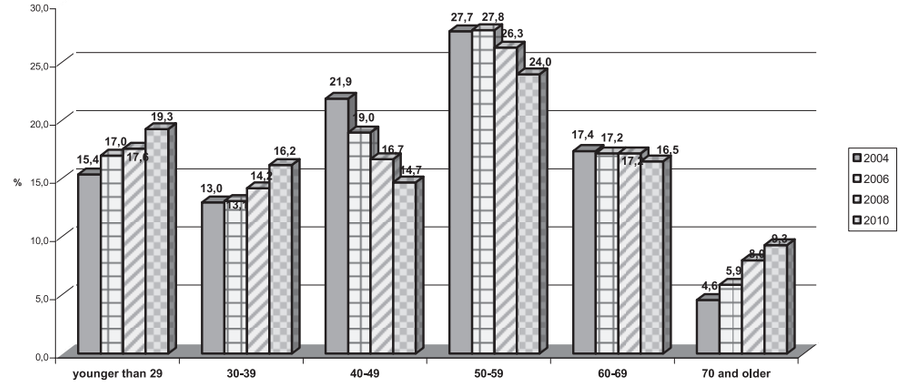
Graph 2. Changes in R&D Personnel, % to the Previous Year



Sources: (Nauka Rossii v Tsifrakh, 2010: 46); (Nauka, technologii i innovatsii Rossii, 2011: 9)

The economic crisis has lead to further decline in terms of number of R&D personnel and since the decrease over the years was spontaneous and not regulated by the government, the age structure of researchers was worsening. The latest data for 2010 confirmed continuation of a long lasting trend (graph 3): young researchers come and go, middle-aged group continues to be small, cohort of older generations of scientists is growing and the time is approaching when Russia will face a real crisis: there will be not enough teachers to educate the next generations of scholars.

Graph 3. Changes in the Age Structure of R&D Personnel in Russia



Sources: (Nauka, technologii i innovatsii Rossii, 2007: 17); (Nauka, technologii i innovatsii Rossii, 2011: 19)

Another hamper for development is the unreformed organizational structure of the Russian R&D complex. Academies and universities continue to perform their functions that were assigned to them in Soviet times. Universities are mainly teaching institutes with minor and not very productive involvement in research; Academies continue to play major role in fundamental research and are underestimated as teaching establishments.

The Russian Academy of Sciences (RAS) is the largest and most prominent research organisation in the country, which consists of 431 research institutes (Nauka RAN, 2010: 8)[4] and the number of institutes under the auspices of the RAS is rather stable, fluctuating between 448 in 2006 and 430 in 2009. In addition to fundamental research Academies also conduct some applied research and about 1/3rd of RAS researchers are involved in teaching at universities.

Universities occupy a modest place in the Russian R&D system. Even though over 500 higher educational institutes are involved in R&D (Nauka, technologii i innovatsii Rossii, 2011: 10)[5], financial and human resources in the higher education R&D sector amount to about 8.4 % and 10.5 % respectively of the national total (Nauka, technologii i innovatsii Rossii, 2011: 9; 46)[6]. Meanwhile this is an increase of 1.7 % both for financing and number of personnel in comparison with 2008. This change reflects new government policy started in mid-2000-s aimed to redirect financing from the Academy and some other institutes to universities through a number of policy initiatives, some of which will be discussed below. Overall Russian universities are almost not present in international rankings of the top universities, mainly because of a relatively weak research performance and lack of presence of international staff[7].

Finally, so-called "branch institutes" that in the Soviet Union were serving needs of various industries were mostly destroyed due to privatization that was taking place in the first post-Soviet decade. At the present time they started to revive in forms of corporate R&D divisions in private companies and in large government-controlled companies. Some continue to exist as government-owned R&D institutes, especially if they have large facilities and unique equipment.

Business not only provides modest financing for R&D but in a broader sense a very small percentage of firms is involved in any types of innovative activity. According to Rosstat data, the share of industrial enterprises implementing technological innovations was below 10 % for the last 5 years (Indikatory innovatsionnoy deyatelnosti, 2011: 9). Among those companies, which are involved in any type of innovative activity, only about 1/3rd invest in R&D — a decrease in comparison with the end of 90-s when the share of such enterprises was about 50 % (Indikatory innovatsionnoy deyatelnosti, 2011: 16).

Only in 2011 were the first signs of interest to innovation activity registered among large industrial enterprises. Most noticeable was the fact that investments in R&D became more in focus of companies' attention. This may be explained by the fact that purchase of technologies abroad, often — second-hand — the most widely used approach to modernization — was played out. This is especially true for the large companies competing at international markets. According to a survey conducted by PricewaterhouseCoopers, 58 % of Russian companies that sell their products in the internal market have certain

[4] Data for 2010.

[5] Data for 2007–2010.

[6] Data for 2010.

[7] See, for example, www.topuniversities.com

innovative technologies. For companies competing in international markets this figure is 85 % (Saraev, Medovnikov, Oganesyan, 2011: 22). Then, interviews conducted in 2011 by the Institute of Management among 22 large Russian companies (Association of Managers, 2011: 30–31) have revealed that none of the surveyed companies decreased their expenditures on R&D. Moreover, they have developed some interest to the R&D conducted by Russian research institutes.

As an overall result, the efficiency of the R&D complex in Russia is the lowest in the group of fast growing economies — BRIC countries: thus, average citation of one Russian publication is 4.8 times while of Indian — 5.8, Chinese — 6.1 and Brazilian — 6.3[8] (Nauka, technologii i innovatsii Rossii, 2011: 79). The field structure of cited publications shows that the strongest areas of research in Russian science continue to be those, which were traditionally strong in the Soviet Union — physics, space research, Earth sciences, chemistry, and mathematics. However, in each discipline a decrease in the share of world total publications can be observed. This means that science in other countries is developing in a more productive way than in Russia.

The international standing of Russia in terms of patenting is far behind developed countries of the world. Thus, the share of Russia in triadic patent families (triadic patent family means simultaneous patenting of the same invention in USA, Europe and Japan) is 0.14% while for the US it is 30 %, EU countries (27 countries) — 30%, Germany — 12 %, UK — 3.4 %, Japan — 28 %, China — 1 % (OECD, 2010: 89)[9].

The Russian government, understanding the role business plays in modern R&D complexes, in recent years initiated a number of measures aimed to increase innovation activity in the business enterprise sector, including a set of actions to push companies to outsource R&D in universities. The latter pursues three goals: 1) to strengthen linkages in innovation system and improve research in universities; 2) make universities to serve more industrial needs and in this way partially to substitute for the deteriorated "branch sector" of science, 3) encourage business to develop longer-term horizons for their R&D policy.

In 2010–2011 the government initiated three most important "linkages-oriented" measures, namely:

- Programs of innovation development at large government-controlled companies — total 47 companies have developed such programs;
- Establishment of technology platforms — total 28 platforms are created[10] in which 200 universities and 300 research institutes take part[11];
- Cooperation in R&D between universities and companies aimed to lead to new high-tech production; the measure is implemented according to government Decree № 218 from April 9, 2010[12].

Below each of these government actions is analyzed in more detail.

[8] Data for 2001–2011 from the database "Essential Science Indicators".

[9] Data for 2008.

[10] From 47 companies that developed innovative programs, 37 take part in technology platforms, and 9 are their coordinators (Government Commission on High Technologies and Innovations, 2012).

[11] Data for January 1, 2012.

[12] Government Decree № 218 as of April 9, 2010 "On the government measures to support the development of cooperation between Russian higher educational institutes and organizations that implement complex projects aimed to creation of high-tech production".

Large Government-Controlled Companies: Programs of Innovation Development

In 2010 the government decided to encourage R&D investments of large government-controlled companies by "pushing" them to innovate. Companies were obligated to develop long-term innovative programs. One of the obligatory requirements for the companies is cooperation with universities and partial outsourcing R&D to them that is necessary for the companies. The idea is that partial outsourcing will help to overcome internal monopolistic positions of R&D divisions at companies and raise the effectiveness of R&D spending in business-sector. Simultaneously this cooperation should help to increase the quality of research in universities.

By 2011, 47 large companies have developed such programs. According to the data from these programs, the volume of R&D to be outsourced to universities will be gradually increasing (table 3). Companies cannot know their future in such a detail but this is a reflection of Russian style of government order. Government asked companies to forecast their achievements within next five years, and companies, like in planned economy, made their predictions.

Table 3

Programs of Innovation Development of Large Government-Controlled Companies: Growing Outsourcing of R&D

	2010	2011	2012	2013	2014	2015
Total financing of R&D according to programs of innovative development, billion RUR	82.9	227.6	291.9	344.1	330.7	304.6
R&D to be outsourced to universities, billion RUR	2.9	11.5	16.5	20.2	21.0	22.8
Share of financing for R&D to be outsourced to universities, %	3.5	5.0	5.7	5.9	6.3	7.5

Source: Data from the Ministry of Education and Science of the Russian Federation

This approach may give a stimulus for companies to invest more in R&D. However there are a number of problems that will be obstacles to successful implementation of this approach. The financial forecasts presented by companies in their programs heavily rely on budget support for R&D because at the present time 60 % of expenditures on R&D at these companies are financed by the government (Government Commission on High Technologies and Innovations, 2012). Then, programs are not well coordinated with companies' long-term strategies (for those companies that have them), as well as with financial plans that are usually developed with 1-year horizons.

The problems related to cooperation with universities are associated with low quality of R&D in most universities, underdeveloped managerial skills in the government R&D sector, and the low ability of universities to follow requirements that companies set for R&D results. This was clearly revealed through the survey conducted by the Association of Managers as well as through the survey conducted by the author aimed to clarify the developments, and indirect effects that have occurred in course of cooperation between universities and companies. Companies obligated to outsource R&D faced the problem that they cannot find university teams that will be able to fulfill all necessary requirements for R&D. At the same time, since companies were instructed to cooperate with universities, 96 % of them included collaboration to their programs of innovation development. More likely this will be mostly outsourcing and not cooperative projects because only 17 % of companies plan to use jointly with universities research and experimental equipment located either at universities or at companies.

Programs of innovative development will be carefully monitored by the government. Monitoring will be conducted every quarter as well as annually, using a large number of indicators. Monitoring is based mostly on quantitative assessment of expenditures and resources rather than on evaluation of results. Then, each government agency involved in this initiative is interested in those aspects of companies' performance that are in line with their agendas. Thus, for the Ministry of education and science it is very important to see how cooperation between companies and universities is developing; for the Ministry of economic development the most important is compliance of companies' programs with large government programs of industrial development and modernization. With such an approach there is a broad range of indicators and this already has lead to the companies' dissatisfaction with the government policy. Indeed, the methodology of data collection is so complicated that it requires companies hiring special staff to deal with reporting to the ministries. Therefore this may lead to increased overhead, and to overall profanation. At the same time it is very difficult to check the adequacy of all data that will be supplied by companies. It could be more effective to cut a number of indicators in favor of better quality monitoring and to include not only quantitative but qualitative indicators aimed to measure the outcomes of these programs.

This initiative may be stimulating for companies that will find appropriate universities-partners and for those universities that are ready to learn new organizational and managerial approaches to conducting R&D and that have resources for that. Overall administrative "force" for innovations though is a questionable mechanism to encourage productive spending on R&D, and not just increase its volume.

New Mechanism to Establish Linkages: Technology Platforms

The initiative to create technology platforms started in 2010. The first idea was to create organizational mechanisms for negotiations of interests of various stakeholders in development of new innovative projects and products. Then, the idea slightly shifted to a concept according to which technology platforms should produce new technologies that will in turn encourage development of various economic sectors. The final goal of the creation of technology platforms is to raise high-tech production and stimulate growth of high-tech companies in Russia. The mechanism of negotiations based on technology platforms is not a Russian invention. The concept was largely borrowed from the European Union experience.

In August 2010 the government issued the rules for creation of technology platforms[13]. The definition of technology platforms was formulated in the following way: these are "communication instrument directed towards activation of efforts to create perspective commercially valued technologies, new products (services), towards attraction of additional resources for R&D based on participation of all interested parties (business, science, state,

[13] The procedures to create technological platforms were approved by the Government Commission on high technologies and innovations on August 3, 2010.

civil society), improvement of legal basis in the area of scientific-technological, innovation development". Two ministries — the Ministry of Economic Development and the Ministry of Education and Science — started to collect suggestions on technology platforms from groups that included enterprises, research institutes, universities, associations of professionals and other interested parties. More than 200 suggestions were collected from which 28 technology platforms were selected.

The mechanism of technology platforms was quite effective in European Union, and ideally it should be useful for Russia as well because technology platforms may open new opportunities for its participants due to:

- Access to new resources for R&D;
- Participation in priority setting for industrial development;
- Lobbying of corporate interests in development of technical regulations and standards;
- Optimization of business planning due to the fact that among participants of technology platforms there are both producers and consumers of new technologies;
- Possibility to use wider approach called "open innovation"[14];
- Development of international cooperation;
- Solving workforce problems for science and business sector.

However the Russian way of development technology of platforms from the very beginning was slightly different from the EU path. The European approach consists of three steps. At the first step priority directions for technological development are selected by platforms. At the second step technology platforms develop roadmaps. At the third step there should be the start of implementation of R&D projects initiated by technology platforms. Financing for these projects may come from various sources.

In Russia at the first step platforms had to fit themselves to already chosen federal-level priorities. Moreover, at the present time in Russia there are two lists of overlapping priorities for scientific and technological development. The first list includes 8 priority directions and 27 critical technologies clarifying these priority directions[15]. In parallel there is another list — of 5 directions of "technological breakthrough" that were defined by the President in 2009[16], and according to which, for example, Skolkovo "clusters" were formed.

Therefore the choice of thematic areas of technology platforms was conducted in line with already existing lists of priorities. However, the final list of thematic areas for 28 technology platforms does not fully duplicate government priorities. In the EU priorities that were identified by technology platforms then became part of thematic areas within the EU Framework program; in Russia, as one may see, technology platforms do not really open new avenues for development. Their role is more in bringing various stakeholders together.

As a result, R&D projects of technology platforms in their subject areas not fully fit to the thematic areas of the federal goal-oriented programs that may serve as a source of support for R&D projects selected within platforms. At the present time federal goal-oriented programs

[14] Open innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology (Chesbrough, 2003: xxiv).

[15] The list of priorities was approved by Presidential order № 899 from July 7, 2011 "About approval of priority directions for the development of science, technologies and techniques in the Russian Federation and the list of critical technologies of the Russian Federation".

[16] These are energy efficiency and energy saving, nuclear technologies, space technologies, medical technologies, strategic information technologies.

are structured according to federally approved lists of priorities. All that means that platforms represent the 3rd list of priorities but there is no clear mechanism yet of their implementation.

The second stage — development of roadmaps — in the Russian version is attached to the process of development of innovative programs for large government-controlled companies — the initiatives that were discussed earlier in the article. The 47 large companies who develop their innovation programs are obligated to take part in technology platforms[17].

Another government assignment is obligatory participation of universities in platforms. At the present time some companies see this requirement as an extra pressure while, on the other hand, universities were quite enthusiastic participants in the process of formation of technology platforms. Recent survey of 193 university employees has shown that creation of technology platforms is ranked third among the types of activities that universities would like to pursue jointly with companies (Klimov, Frumin: 2011). It is even more popular then training specialists for the companies' needs.

The third stage is realization of R&D projects developed by technology platforms. This stage is only starting in Russia, and the projects receive support mainly through the Russian Fund for Technological Development (RFTR), which, after its reconfiguration in 2011, was reoriented by the government towards support of applied-oriented projects initiated within technology platforms. However the RFTR budget is rather small and the Fund is able to support only a selected number of R&D projects. Other sources of financing that were discussed in policy documents — such as RUSNANO, federal programs, programs of fundamental research of government Academies, financial resources of corporations and private companies — are not used yet in the interests of technology platforms. More likely some support will be provided through federal goal-oriented programs but in this case R&D projects should thematically fit to the programs' priorities.

In general two scenarios for the development of R&D projects initiated by technology platforms may be foreseen.

According to the first scenario technology platforms will get a certain official status that will allow them to have priority access to government financial resources. Such statuses are a regular practice in Russian science and innovation policy. The examples are Federal research centers — status awarded to R&D institutes that have large and expensive facilities and unique equipment; status of federal universities — awarded to higher educational institutions that were created after merging of several previously existed universities and aimed for the regional development, etc.

In the second scenario technology platforms will combine status and special line of financing that they will receive for R&D projects. This may happen within new government Program of science and technology till the year 2020, which is under development at the present time.

Cooperation in R&D Between Companies and Universities

In 2010 the Russian government initiated one more new measure based on cooperation between companies and universities. It is outlined in the government Decree № 218 "On the government measures to support the development of cooperation between Russian higher educational institutes and organizations that implement complex projects aimed to

[17] Obligation is reflected in the Presidential assignment to the Commission on modernization and technological development of the Russian economy (№ пр-22 from January 4, 2010).

creation of high-tech production". This decree defines mechanism of competition-based R&D financing of industrial enterprises in order to implement complex projects aimed at organization of high-tech production. R&D projects should be conducted in cooperation with higher educational institutes. The goals of this initiative were defined by the Ministry of education and science in the following way:

1) Development of cooperation between Russian higher educational institutes and companies;

2) Strengthening research and educational components in Russian universities;

3) Stimulating industrial companies to utilize the potential of universities for the development of research-based production and innovation activity in Russian economy as a whole.

The new measure combines several components. First, it is competition-based — the winner is selected on the basis of open competition. Second, the support is provided to commercially valuable projects implementation of which should lead to high-tech production. Third, partnership is encouraged through support of joint project conducted by a company together with a university. The government money goes to the company that uses it to finance R&D project implemented by university for the company needs.

Financing of R&D provided by the government is for a period from 1 to 3 years and is up to 100 million RUR per project per year. Simultaneously the company should 100 % cofinance the project; from the company's money at least 20 % company should spend also for R&D. Thus, from the total amount of money for the project more than half should be spent for R&D. There are also quite strict requirements concerning monitoring of these projects — companies should submit to the government reports about the high-tech production during 5 years after the completion of the project.

The total number of projects that were selected in 2010 was 112 and the amount of financing that will be directed to their support during 2010–2012 is about 16.3 billion RUR.

In 2011 a selected number of R&D projects were monitored, and the author took part in interviews with project participants both from the side of companies and universities, and interpretation of their results. It is early to assess direct results of this imitative but it is possible already to identify some problems as well as positive not expected outcomes.

All problems that were identified in the course of projects implementation may be divided into internal and external ones. Internal problems are related to the interaction between companies and universities in their joint work. External problems are connected with economic and legal rules that are applicable for such cooperation.

The most common internal problem is related to unawareness of universities about real demand in the innovation area. Representatives of companies were expressing opinions that university researchers are "too academic" in their studies, they do not know real needs of companies as well as procedures that should be implemented to conduct applied projects properly. The complaint from side of companies also was that universities do not get used to accountability for their research results.

A logical explanation of this situation is in the fact that teaching loads are very high so university professors do not really have time for research. There is only a small number of universities in Russia which enjoy privileged conditions for teaching and only they have real potential to strengthen their research potential.

University representatives were quite objective in assessing their research capabilities. They admitted that applied research and developments need additional skills that were lost during the post-Soviet years or were nonexistent. The middle-aged generation of professors is very small, as in all Russian R&D complexes and thus human potential for research is

weak. Universities also claim the absence of certain specialists in their research teams — such as designers and technologists. Therefore the major problem that universities face today lies in the workforce area, not just in shortage of financial resources or infrastructure. Unfortunately this is the type of problem that cannot be solved easily. University administrators see this collaboration with companies as a possible tool to identify the best researchers, create productive research groups and thus move research forward.

Companies in certain instances have found ways to solve workforce problem in order to implement the project. One of the approaches was to look for necessary specialists in various universities, not just in the university that is their official partner. In this way companies could also learn more about educational programs that exist in universities and in some cases — to suggest improvements in the educational process to link it closer to the modern needs of research in business sector.

External problem were mostly related to different legal requirements, such as federal procurement regulations, reporting procedures to the ministry, bureaucracy. The biggest number of complaints was associated with excessive paperwork that is needed to report intermediate results. If universities already got used to this situation, for many companies this was one of unpleasant discoveries of dealing with federal money. However many companies took a quite rational approach and were able to overcome this obstacle by hiring special staff that deals with reporting and paperwork for the government.

Analysis of interviews also allowed identifying several major side effects of this measure. First, this is strengthening of university orientation towards solving practical tasks in the interests of business. Many university representatives were stating that an important factor for them was real interest from the side of companies in the research results that may be produced by universities. Indeed, work under government orders often leads to a paper report without any further practical applications. This is often a disincentive for university researchers.

A second side effect is in formalization of relationships among companies and universities. This means a shift from contacts at the level of selected professors or researchers to project groups or laboratories. In some instances joint company-university research groups were formed, including representatives from small innovative companies that were established by universities. This helped to solve the workforce problem and to develop horizontal linkages.

Third is integration of research and education. Cooperation in some cases resulted in development of new educational courses or supplementary courses for university students. Also, such cooperation is a better way to further employment of graduates. Students have a chance to take part in joint projects, learn more about the company and its operations, and even start part-time work in a company. For universities such developments are positive because graduates take jobs according to their specialization.

Fourth, there was some process of mutual adjustment and many teams overcame it successfully and even found supplementary competences. Therefore many respondents were saying that they plan to continue their collaboration in research. Some universities see a potential for future collaboration in further development of the project. For example, companies may have new needs both in research and new specialists-graduates in the course of the development of their high-tech manufacturing.

In conclusion it should be said that most of interviewed partners assess the new instrument positively, underlying that joint work with practical outcomes is much more interesting and satisfactory then R&D projects supported through the federal tender procedures. Universities could discover their major shortages both in personnel and management of research, and companies — to learn more about potential and culture of university R&D.

Conclusions

The analysis of the government policy towards creation of linkages between companies and universities allows several summarizing conclusions.

1. All newly initiated measures are important, each in its own way, to develop linkages in R&D area. They are to a certain extent complimentary and interconnected, and this is a positive approach. It is important from the side of the government not to expect immediate results from implementation of these measures and to conduct them on a longer-term because the results usually may be seen within 5–7 years. Many previous government initiatives have led to insignificant results because they were supported briefly, up to 3 years and then new initiatives started. This chaotic policy change is one of the reasons for low outcomes.

2. One of the most crucial factors in innovation area is increasingly people. Brain drain, aging in science and educational systems leads to gradual deterioration of research and innovation potential. There is no a single measure to resolve this situation. One of many measures that should be undertaken is investing in various educational, training courses and programs, including those ones that will be developed together with business. Implementation of new measures discussed in the article may help to reveal areas that need primary attention.

3. Borrowing of foreign experience was not very successful so far because in most cases it could not be combined with existing economic conditions and legal requirements. Technology platforms set a clear example that strictly following the European model is not possible so there should be found a "Russian way" to utilize mechanism of technology platforms as an instrument to link universities and companies closer together.

4. Monitoring and evaluation continue to be crucial factors to the successful implementation of the initiatives because it may help to make timely necessary corrections. However monitoring should not create too much pressure on companies and universities and thus should not be conducted too often and accompanied by the requirement to collect excessive amounts of data.

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