# Chapter 3

# The role of government

*Governments have important roles to play in shaping the performance of their national innovation systems. Beyond the support for R&D, a wide array of public policies needs to be mobilised covering areas as diverse as education and training, competition and trade, and industrial and regional development. These policy areas utilise a mix of instruments, including regulation and direct funding. The coherence and effectiveness of this mix and of overall governance arrangements are major concerns for innovation policy makers.*

*This chapter provides first a brief account of the evolution of Russia's STI policy over the last two decades, paying particular attention to the main actors and their roles and the achievements and shortcomings of the prevailing governance arrangements. It then considers the public funding of R&D, specifically the overall trends in budgetary support, the main funding patterns by institutional type, and the use of selectivity and priority programmes. This is followed by a functional assessment of Russia's innovation policy that takes a number of strategic tasks as its starting points. These include securing the availability of qualified human resources; adapting public R&D institutes to the requirements of a modern innovation system; promoting business R&D and innovation; fostering the development of competitive innovation-oriented industries; providing supporting infrastructure to innovators; harnessing global opportunities through international co-operation; and developing and mobilising regional innovation capabilities. The chapter finishes with some concluding remarks.*

## 3.1. Introduction

Creative individuals and market-oriented organisations are the central actors of innovation, but OECD work demonstrates that in all countries the government plays a key and continuing role in shaping and dynamising innovation processes (OECD, 2010a).[1] First, it must provide conducive framework conditions; these are discussed in Chapter 1. Second, it must compensate for various market and systemic failures that prevent optimal knowledge generation, diffusion and use within and between the public and private sectors through various regulatory, budgetary and institutional measures. These add up to what can be called an innovation policy *stricto sensu* and are the focus of this chapter.

Innovation policy presents similarities in all countries, in terms of broad rationale, generic principles and main objectives. It includes core funding and competitive grant schemes to support investigator-initiated research in universities, support for business sector innovation activities and a policy framework for overall strategies and for steering publicly funded research organisations, ensuring inter-departmental co-ordination in policy formulation, and evaluating policies and programmes. However, each country possesses unique characteristics and an inheritance from the past that condition its ability to translate common principles and objectives into concrete actions in order to exploit the opportunities offered by increasing globalisation, economic growth and social change, and developments in science, engineering and technology. This is particularly true for the Russian Federation, given its geography, strong cultural identity, political traditions and specific socio-economic fabric, including the still significant legacy of the Soviet system. The involvement of the Russian government in the governance of a still immature innovation system consequently has a number of distinctive features that must be taken into account when attempting to draw lessons from international experience with a view to making further improvements.

The current state of innovation policy in Russia results from an ongoing, often turbulent process of radical transformation of the socio-economic system, and should not be assessed in terms of the more common problem of incremental system optimisation. To convert a centrally planned economy, in which the main engine of innovation is military procurement, into an innovation-oriented market economy, in which the development of science and technology is pushed and pulled by multiple political, economic and social forces, is a formidable task.[2] Two decades is not very long, especially if one considers that during the first of these the economic reform agenda hardly included any innovation policy objective other than the downsizing of the public research system.

The shift and broadening of government objectives in the field of science and technology (S&T) and innovation – from “downsizing public research” to “modernisation and reconfiguration” of the entire innovation system – took time, because of adverse economic circumstances, the steepness of the learning curve, and the resistance of some powerful actors. In the 1990s, the main concern of S&T policy makers was to ensure that the downsizing of the research system would not destroy the most valuable pieces of the science and technology system built in Soviet times, in a situation in which market signals were still too weak to guide the selection process and the budgetary constraints too strong to permit a more proactive restructuring approach. At the turn of the current century, the oil boom and the improvement of the economic situation allowed S&T strategy to switch from a survival to a consolidation/renewal mode, with an effort to concentrate new resources on selected institutions, sectors, technologies and sites. But the integration of S&T policy in the broader economic development strategy, as part of an explicit national innovation strategy, did not really start much more than five years ago and only accelerated in the very recent past.

There is no single successful configuration of a national innovation system (NIS) that is appropriate to all countries once and forever. A successful NIS is one which, given the wider economic and technological environment, enables a country to build successfully on its inherited strengths and to remedy, offset or work around its inherited weaknesses in order to exploit to the extent possible its potential for future sustainable economic growth and social well-being. The three most striking features of the Russian NIS to be considered from this perspective are:

- Much more than in any other industrialised country, the bulk of research and development (R&D) is carried out by public organisations and financed by the government budget.[3] Publicly owned branch research institutes and design bureaus are the central players, while the private sector, including foreign firms, and higher education remain minor actors. The weakness of industry-science relationships reflects the lack of demand from, and absorptive capacity in, industry but also the inexperience of the research sector in transferring technology and knowledge, as well as the lack of appropriate incentives and institutional frameworks.
- The combination of radical transformation and the resilience of some former institutional arrangements and mindsets makes the development trajectory of Russia very different from that of any other emerging economy, including China,[4] and translates into some dualism in the NIS. In Russia today increasingly prevalent market-oriented mechanisms for allocating economic resources coexist with others that are based more on social/political networks, and there is a sharp contrast between progressive territorial, scientific, technological and industrial nodes of excellence and a rather large stagnant pool of firms and organisations with very low productivity and little innovation drive.
- Both centralisation and fragmentation characterise the institutional framework for policy formulation and implementation. A more top-down and centralist policy than in most OECD countries does not seem to lead to a greater ability to set and implement spending priorities because the fragmentation of funding and steering mechanisms and the persistence of a science and technology push approach give excessive power to some research-performing institutes with preservation strategies. As a result, despite considerable downsizing and restructuring over the last 20 years, the public R&D system has remained heterogeneous in terms of quality, overloaded with development activities, and generally poorly connected to both the education and the market-driven production systems.

In recent years, significant progress has been made in addressing these issues. This has brought the country closer to what could be a turning point in the maturation of an efficient national innovation system which, while maintaining distinctively Russian characteristics, would make a more decisive contribution to the realisation of the ambitious national socio-economic development agenda.

This chapter provides first a brief record of the evolution of Russia's science, technology and innovation (STI) policy; it then examines in more detail how Russia's government and government agencies currently support innovation, acknowledges achievements and identifies areas in which changes should be considered.

## 3.2. Institutional profile and system governance

The current policy setting – institutions in charge of policy supervision, formulation and implementation as well as the tools they use – results from an accumulation over two decades of far-reaching reforms and specific initiatives in a political environment and economic context that did not always facilitate the task of innovation policy proponents.

### *3.2.1. The evolution of Russia's science, technology and innovation policy*

Three main phases of Russian STI policy can be identified (Figure 3.1).

*Turbulent restructuring, with early experimentation of new innovation policy approaches*

Right after the breakup of the Soviet Union, a Ministry of Science and Technology was established and took over the responsibility of the State Committee for S&T. Under its leadership, priority was given to the rescue of the best parts of the system inherited from the Soviet period, at a time when resources were drying up and many S&T specialists, including some of the most brilliant, were moving either to foreign countries or to more lucrative jobs.

The most important "defensive" measures were the selection of state research centres for priority allocation of resources and the decision and effort to mobilise foreign assistance to help in the conversion of military science and technology (*e.g.* the International Science and Technology Centre).

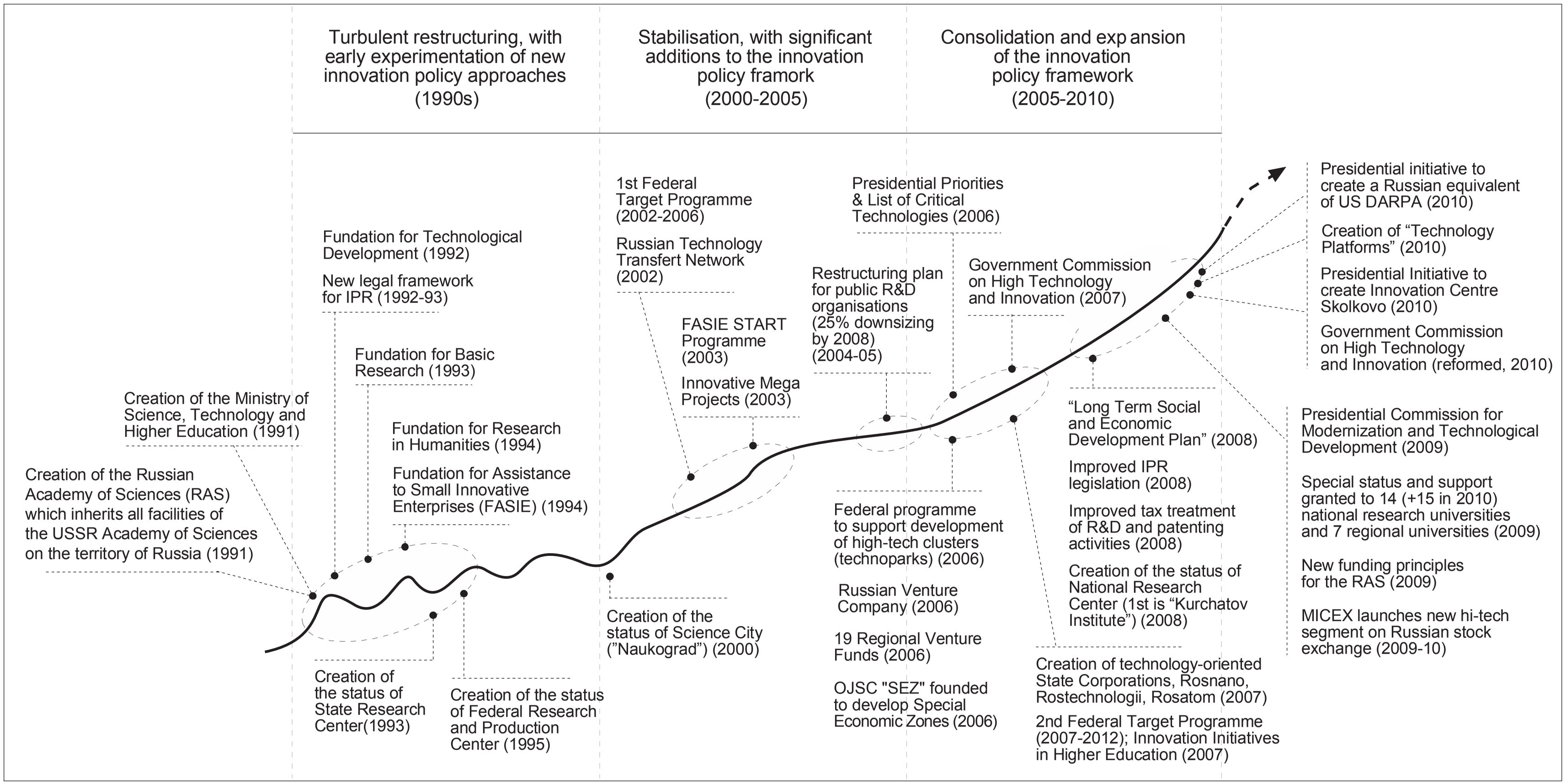
The most significant "early seeds" of a proactive innovation policy were the establishment of competitive funding mechanisms for basic research (the Russian Foundation for Basic Research) and for small innovative enterprises (the Foundation for the Assistance to Small Innovative Enterprises). In addition, important changes were made in the legal framework, notably a new intellectual property regime, to facilitate innovation in the emerging market economy, at a time of wrenching privatisation measures.

The second half of the 1990s was characterised by a very difficult economic situation, with further constraints on resources, high inflation and the 1998 financial crisis. Efforts in favour of research and innovation were rather limited. Noticeable initiatives included the development of technology centres and business incubators in liaison with local and regional authorities, at a time when the latter had acquired significant political and financial autonomy. A series of R&D tax incentives for the business sector were also introduced.

*Stabilisation, with significant additions to the innovation policy framework*

The situation began to stabilise in the late 1990s as the economic situation improved, owing to the oil and gas boom. In 1999, the federal R&D budget grew by 7% in real terms over the preceding year. Draft innovation laws, concerning in particular technology transfer mechanisms and collaboration between the research system and the economic sphere, were prepared, discussed by the Parliament, but not promulgated by the president, who was concerned with a lack of clarity in the concepts, objectives and priorities (Ivanova and Roseboom, 2006; Gijsbers and Roseboom, 2006).

**Figure 3.1. Innovation policy learning in the Russian Federation**



The situation was further consolidated with the change of the nation's leadership. A re-energised and a more powerful Ministry of Education and Science was established, with expanded responsibility and means, along with a Ministry of Economic Development and Trade. A clear turning point appeared in 2003 when a large-scale programme, Mega Projects, was launched, to mobilise the Russian scientific community for the development and production of breakthrough technologies defined jointly with the business sector.

**Box 3.1. From S&T policy to innovation strategy: some landmarks**

The foundations of Russian innovation policy were laid down in the 1990s, in the first federal law on "Science and State Scientific and Technological Policy" promulgated in 1996. At that time, the interest in innovation arose from a concern to protect and restructure scientific activities under crisis conditions. It took about a decade for the concept of a national innovation system to gain wider recognition and translate into a less "S&T-centred" approach. Some of the major landmarks are:

- *Fundamentals of the RF policy in the sphere of development of science and technology for the period up to 2010 and beyond.* This government document of 2002 was the first to emphasise the need for a transition to innovation-led economic development.
- *Principal directions of the RF policy in the sphere of development of innovation system for the period up to 2010.* This government document of 2005 was the first to define the objectives of S&T policy from an innovation system perspective. In 2006, the document *Science and State Scientific and Technological Policy* was revised accordingly.
- *The Strategy of Development of Science and Innovation in the Russian Federation for the Period up to 2015* was approved in 2006 by the Interdepartmental Commission for Science and Innovation Policy, chaired by the Minister of Education and Science. Its main stated objective is "the formation of a balanced effective R&D innovation system, providing the technological modernisation of the economy and enhancing its competitiveness through advanced technologies and the transformation of scientific potential in one of the major resources for sustainable economic growth". The first important step in the implementation of this new strategy was the *Integrated Programme of Scientific and Technological Development and Engineering Modernisation of the RF Economy until 2015*, elaborated in 2007 by the Ministry of Education and Science in 2007.
- *The Concept of Long-term Socio-economic Development of the Russian Federation for the Period up to 2020,* was adopted in November 2008. Section 6 ("Development of national innovation system and technology") defines how the creation and dissemination of innovations in all sectors of the economy should contribute to the achievement of development goals.
- *Innovative Russia – 2020*. In March 2010, the prime minister asked the government to translate the concept of long-term socio-economic development into a more fully articulated innovation strategy, with clear objectives, priorities and instruments of state support. In late 2010 the Ministry of Economic Development delivered a draft that emphasises the need for engaging all actors, including the business community.

### *Consolidation and expansion of the innovation policy framework*

In the mid-2000s decisions were taken to reinvest massively in strategic sectors, advanced research structures and selected sites. A series of well-endowed federal target programmes (FTPs) were launched. Significant measures were taken to stimulate research and innovation initiatives in the higher education system. Administrative restructuring led to the creation of special agencies under the Ministry of Education and Science, one to fund science and innovation programmes and another to fund education programmes.[5] Powerful national corporations were established, with a view to increase coherence and efficiency in the management of the state-owned technology-oriented business sector and to speed up the commercialisation of new technologies on global markets, notably in the field of nanotechnologies (Rosnano).

More recently, innovation has become a watchword at the highest level, with the creation, in 2009, of a Presidential Commission of Modernisation and Technological Development and also, a year later, the rise in importance of the Commission of High Technology and Innovation, now chaired by the prime minister. Resources have been further concentrated on strategic research centres or centres of excellence. Initiatives to make the higher education a more significant player have intensified, with additional resources for selected elite universities. A flagship innovation city project (Skolkovo) has been initiated. Most ministries concerned with technological development, notably the Ministry of Economic Development, have elaborated some form of innovation strategy. The global financial crisis, which severely affected Russia, had a short-term impact on the overall budget effort but did not reduce political commitment and did not affect the general directions of S&T and innovation policy.[6]

### *3.2.2. The main institutions and their role*

The institutional landscape is particularly complex and populated by many bodies, with at times overlapping responsibilities and mission and policy assignments that are not always crystal-clear. At the federal level, there are two major governance levels: overall policy guidance and supervision is ensured at the top state level (the president and the prime minister on the executive side and the two parliamentarian chambers on the legislative side), while detailed policy formulation and implementation are in the hands of ministries, agencies and a number of autonomous or semi-autonomous bodies (including the academies of science and the recently established state corporations). At a lower level of governance, regional governments and municipalities use their own resources to develop their S&T and innovation policies and influence how federal support is used by actors.

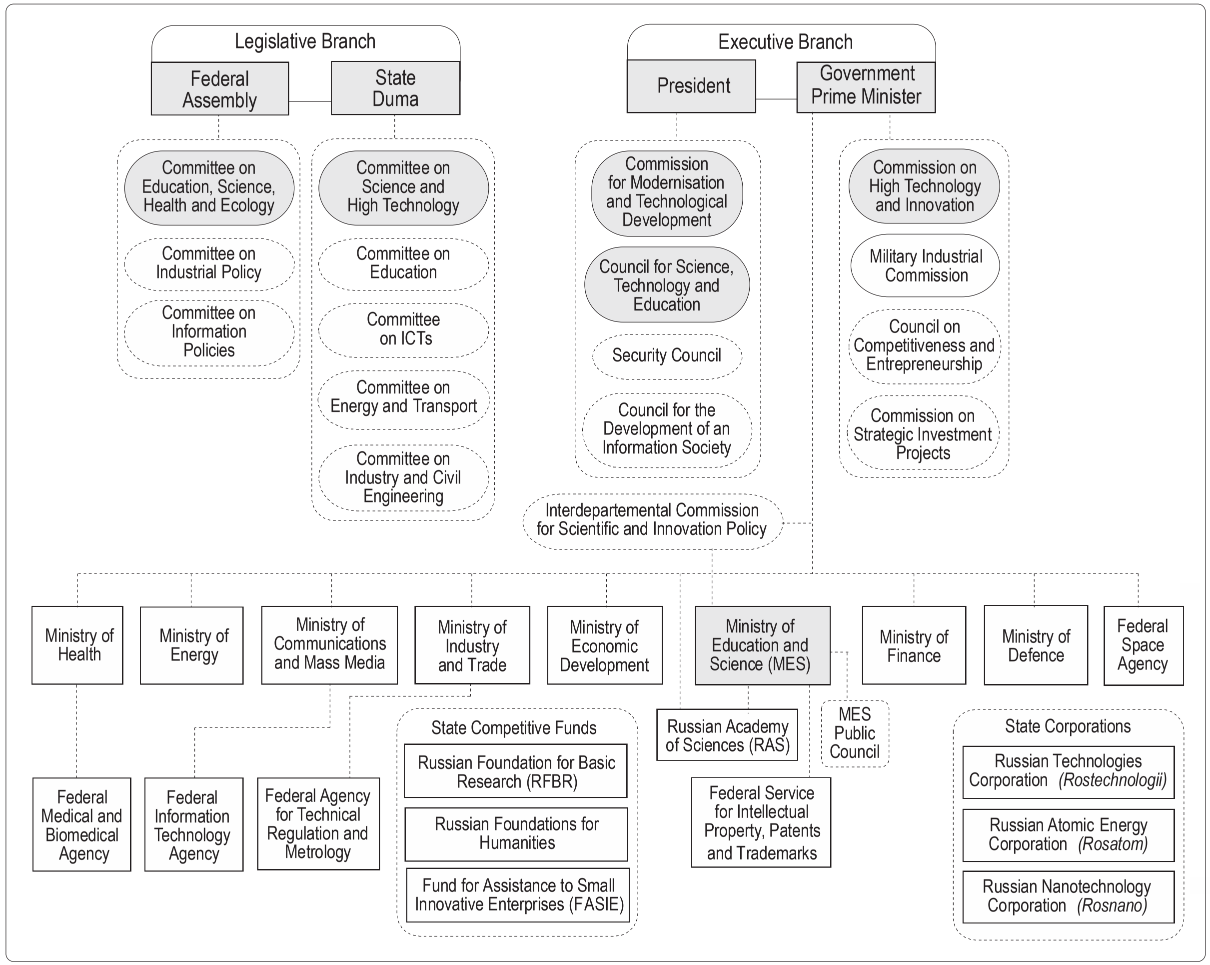
*Overall policy formulation, guidance and supervision*

At the highest level of the state, a growing awareness of the importance of innovation for Russia's future has led to the reinforcement of institutional mechanisms to develop and co-ordinate relevant policies.

The Presidential Commission for Modernisation and Technological Development was established in 2009 (Box 3.2). It has already formulated significant guidelines for the prioritisation of R&D efforts and for the areas in which urgent action is needed to stimulate innovation in state-owned companies and make Russia more attractive to highly qualified Russian expatriates and foreign scientists, engineers and innovative entrepreneurs. The president of the Russian Federation is also advised by a Science and Technology Council, composed of 60 high-level representatives from various spheres of the economy and society.

In early 2010, the prime minister took over the chairmanship of the High Technology and Innovation Commission, which was created in 2007 but had been chaired by a vice prime minister. It draws together the different ministers, as well as the heads of the key agencies concerned with innovation – 40 persons in all – and has become the main locus of policy decisions, with strong co-ordination powers, in matters relating to high technology and R&D policies.

**Figure 3.2. Policy governance of the Russian Federation's innovation system: Institutional profile**




*Source:* OECD, based on ERA Watch (2010) and Ministry of Education and Science (2010).

**Box 3.2. The Presidential Commission for Modernisation and Technological Development: Main orientations, 2009**

The main outcomes of the first year of activity of the Presidential Commission for Modernisation and Technological Development can be summarised as follows:

- Prioritisation of S&T efforts, with visible results by 2012.
  - Five priority sectors have been identified: energy efficiency, medical and pharmaceuticals, nuclear, telecoms and space, information technology (IT) and computers – a list of priorities that largely overlap those defined by the Ministry of Education and Science in 2007 and 2008. Roadmaps have been laid out, with target indicators, indicative financial investments, and instructions regarding implementation of related programmes by relevant ministries.
- Specific instructions.
  - Relevant ministries are to establish mechanisms: *i)* to attract prominent Russian expatriates and foreign scientists and entrepreneurs, notably by facilitating visa procedures and simplifying recognition of foreign diplomas and degrees by Russian universities; *ii)* to stimulate state-owned companies to invest in R&D by introducing mandatory innovation programmes, defining targets for R&D intensity, taking into consideration industry specificities and the results of international benchmarking, and proposing competitive grant schemes for technology developers.
- Emblematic large-scale initiative.
  - It has been decided to build from scratch a high-technology, innovative city at Skolkovo, near Moscow, with huge investments and strong tax incentives to attract foreign investors. The first facilities will be operational soon.

*Source:* Annual report of the Gaidar Institute (May 2010).

The legislative branch has been involved in the S&T policy-making process since the early years of the transition (Figure 3.2). The Duma, the Russian lower chamber, is quite active, mainly via its Committee on Science and High Technology, in discussing and amending laws and priorities. It has, for instance, added the management of natural resources to the five presidential priority areas. It has also helped to draw up the list of critical technologies. The Council of the Federation – the higher chamber representing the regions – also plays a role in the S&T policy-making process, mainly through its Committee on Education and Science.

### *Detailed policy formulation and implementation*

#### Ministries and agencies

Many ministries and agencies have historically shared responsibility for managing innovation-related programmes and budgets. With the transition from an S&T-centred to a broader innovation policy approach, their number is not likely to decrease but their relative importance may change somewhat. However, subject to the stability of the government structure, the main actors will remain: the Ministry of Education and Science, the Ministry of Economic Development, the Ministry of Defence, the Ministry of Trade and Industry, the Ministry of Communication and Mass Media, the Ministry of Finance, as well as the two major mission-oriented agencies in charge of the space and nuclear programmes (Roscosmos and Rosatom).

*The Ministry of Education and Science* has been an important proponent of innovation policy in Russia. It controls some 20% of the civil R&D budget. It supervises several key FTPs that support and orient the science and technology system in its civil dimensions and components. It is also in charge of national foresight exercises; it completed one for 2020 and is embarked on a new one for 2030 (Box 3.3). In charge of the education system as a whole – a task that mobilises much of the minister's time – it has led the effort to strengthen the higher education sector, including its research capabilities, with undeniable success. The ministry oversees the Patent Office, which has been modernised, aligned on world standards, and endowed with significant additional resources.

**Box 3.3. Evidence-based anticipatory policy making: The role of foresight**

The government has initiated several rounds of foresight exercises aimed both at identifying priority areas for concentrating limited budget resources and at developing future-oriented policy mechanisms that could enable Russia's transition towards a knowledge-based economy. During the last 15 years, the major focus of foresight studies has moved from mid-term priority setting activities (via a number of critical technologies exercises) to constructing the National S&T Programme on the basis of selected priorities and, later on, to developing large-scale exercises covering macroeconomic trends, future research agendas, and technological modernisation of particular industries. Accordingly, the ongoing foresight activities address a broad range of innovation policy challenges and are increasingly interrelated with development of practical policy instruments.

A key trend in applications of foresight in Russia is a move from large-scale nation-wide exercises towards regional and sector-specific projects. At the regional level, foresight activities are mostly confined to regions with significant S&T and production capacities: *e.g.* Moscow, Saint Petersburg, Krasnoyarsk, and Bashkortostan. Smaller-scale activities at a more local level have also emerged, for example, in science cities (*e.g.* Troitsk and Obninsk) or manufacturing centres (Cherepovets – the heart of Severstal's metallurgic production). At the sectoral level, the Ministry of Industry and Trade has already implemented several medium-scale projects for particular industries (*e.g.* the energy sector, metallurgy, and pharmaceuticals) while other agencies have launched other initiatives (*e.g.* for the nuclear energy sector, power engineering, natural resources, and information technologies).

Rosnano also uses foresight as one of its key instruments for priority setting. It has commissioned a large-scale Delphi exercise covering over 1 000 specific products with radically new nanotechnology-based components for 20 specific markets. This was followed up by a roadmapping exercise in support of developing a nano-industry in Russia. The roadmaps reflect development prospects of particular product groups (*e.g.* carbon fibres; light-emitting diodes), whole industries (rockets and space; aircraft construction) or problem-oriented areas (energy saving; drinking water purification). The results have provided a basis for identifying more focused long-term investments and analysis of alternative technological solutions that reduce investment risks. The roadmaps have also turned out to be useful practical instruments for long-term strategic planning in the sectors covered.

*Source*: L. Gokhberg and A. Sokolov (2011), "Evolution of Technology Foresight in Russia: Rationales, Implementation and Policy Implications", *International Journal of Foresight and Innovation Policy*, forthcoming.

The task of implementing the policies defined by the ministry was delegated in 2005 to two agencies: the Federal Agency for Science and Innovation and the Federal Agency for Education. The two bodies were dismantled in 2010 and their functions are now directly assumed by the ministry. The fact that key strategic policy orientations are now formulated at the presidential and prime minister level implies that ministries should concentrate more on detailed design and policy implementation. The multiplication of more or less autonomous bodies, with funding authority, might have been seen as a potential source of bureaucratic tensions and possibilities for corruption.

The *Ministry of Economic Development* has initiated a number of measures to support small businesses: tax incentives for R&D, venture capital, technoparks and industrial zones. More recently, it has devoted attention to the need to stimulate innovation in large, especially state-owned enterprises (SOEs). It also manages a number of FTPs that do not focus specifically on science and technology, but on broader aspects of sectoral competitiveness or regional development, which are important in an enlarged approach to innovation policy. At the end of 2010, the ministry completed the draft of a national innovation strategy, prepared at the request of the prime minister (Box 3.4).

**Box 3.4. Innovative Russia 2020**

This new comprehensive innovation strategy, a draft of which was ready at the end of 2010, has been based on a SWOT analysis of the national innovation system. It considers several scenarios for developing innovation in Russia and identifies a preferred path for government to promote. The overriding goal will be to rebalance the NIS to make business rather than government its centre of gravity, in terms both of performance and of financing of innovation activities. It identifies the strategic tasks to be accomplished to achieve this goal and the key principles to follow to ensure the efficient implementation of government actions.

It envisions two phases: unleashing the innovation potential of the business sector (2011-16) and phasing out government support (2017-20). It sets out the objectives of co-ordinated reforms and measures on a broad front, grouped under a number of key headings that are generally consistent with those of the OECD Innovation Strategy: innovative people, innovative firms, innovative government, an effective science system, supportive infrastructures, participation in global innovation networks, innovative regions and territories.

The *Ministry of Defence* controls probably in excess of 50% of the total government budget appropriations or outlays for R&D (GBAORD);[7] it acts principally via procurement which affects, to a certain extent, civil innovation actors, although most military R&D and high-technology production are still carried out in specialised state-owned laboratories and facilities. It oversees a large network of some 50 research and testing centres operating in a vast array of technologies and armament fields (naval and shipbuilding, armoured vehicles, missiles, nuclear, etc.); a number are located in (still) closed cities. The ministry also has control of armament factories (about 50). Assessing the organisation and efficiency of military R&D and technologies is beyond the scope of this report. However, it is important to note that given the high share of military-related R&D in total public R&D spending, and of the importance of the military-industrial complex in the state-owned business sector, changes in defence policy and procurement will have major impacts on the development of the innovation system as a whole (Box 3.5). Suffice it to say here that such changes are high on the agenda of the Russian government, and that the military leadership itself has to some extent joined the proponents of an active national innovation policy, as they are dissatisfied with the insufficient capability of the Russian "arsenal" to supply the modern systems the army understands that it needs but is reluctant to see imports fill the gap.

The *Ministry of Industry and Trade*, which controls significant amounts of resources for R&D in industry, is responsible for a number of sectors that were managed by branch ministries in Soviet times (aviation, electronics, machines, etc.) and in which many industrial R&D institutes continue to operate (sometimes after becoming joint stock companies). The ministry has developed a number of strategic plans for stimulating those sectors' competitiveness and improving their performance, export capabilities, etc. It also oversees the Russian Agency for Technical Regulation and Metrology.

**Box 3.5. Military procurement and innovation in Russia**

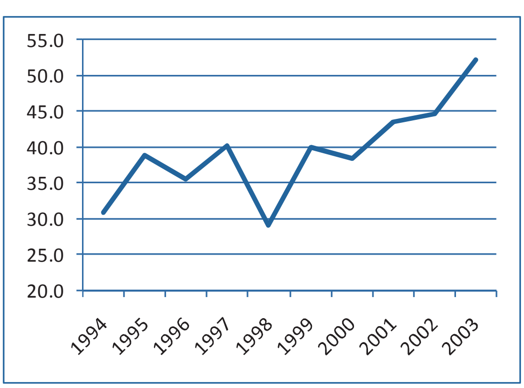
Mowery (2009) outlines three key channels through which public investments in defence-related R&D and procurement can affect an economy's innovation performance:

- *Support the creation of new bodies of scientific or engineering knowledge* – such knowledge can contribute to innovation in both defence-related and civil technology applications. Furthermore, investment in defence-related R&D will likely shape the development of institutional components of national innovation systems, such as national laboratories and university-based research and education.
- *Lead to spin-off technologies for civil use* – defence-related R&D programmes can yield technologies that have applications in both civil and defence-related sectors. The potential for spin-offs is greatest in the early phases of technological development where substantial overlap between defence and civil applications exist. Once technologies are more mature and innovation efforts more incremental in nature, the scope for spin-off technologies declines.
- *Act as a lead purchaser for early versions of new technologies* – defence procurement typically emphasises performance above all other characteristics, including cost. Large orders for early versions of new technologies can enable supplier firms to reduce the costs of their products and improve their reliability and functionality.

While there is wide agreement that these channels operate and have made major contributions to post-war economic development, particularly in the United States, strengthening them through policy intervention has proven much more difficult. Furthermore, the relationships between civil and military applications have changed dramatically with developments in dominant scientific and technological paradigms, especially in the field of information and communication technologies (ICTs). In many cases, the main direction of knowledge exchange flows for dual use technologies may have reversed. The armament industry now depends increasingly on critical technologies developed in an open civil environment.

The scale of Russia's investment in defence-related R&D is substantial. After falling dramatically during the 1990s, it has been rising since 2000 and almost certainly is in excess of 50% of GBAORD today (see figure below). Among OECD countries that declare defence R&D spending levels, only the United States devotes a similar proportion of GBAORD to defence. It should be noted, however, that GBAORD accounts for a much smaller proportion of GERD in the United States than in Russia (27% in 2008 compared to 65% in Russia). Defence R&D is therefore much more dominant in the Russian research system than in the United States or other OECD countries.

**Defence budget R&D as a percentage of total GBAORD**




*Source*: *OECD Main Science and Technology Indicators*.

Despite this level of investment, Russia faces big challenges for reconciling its defence and economic development policy from an innovation perspective. During the 1990s, the volume of new arms procurement fell sharply, only to increase again since 2005, though remaining at modest levels. Almost all the arms of the Russian forces date from Soviet times or are updated Soviet-era systems. The need for radical modernisation is clear (Cooper, 2010), but doubts remain about the current R&D infrastructure's ability to deliver them.

The recently announced creation of a Russian version of the US DARPA (Defense Advanced Research Projects Agency) responds to the need to mobilise creative resources better for radical innovations with military applications. At the same time, Russian defence policy should see the broader innovation agenda, notably the restructuring of the state-owned technology-oriented business sector, as an important contribution to its own objectives.

*Source*: J. Cooper (2010), "Military Procurement in Russia", unpublished presentation; D. Mowery (2009), "National security and national innovation systems", *Journal of Technology Transfer*, Vol. 34, pp. 455-473.

The *Ministry of Communications and Mass Media* plays a key role in the development of the information and communication technology (ICT) sector, either as industry or as enabling infrastructure. It controls the R&D for information technology, and has initiated large-scale programmes such as e-Russia which aim at speeding up the development of Internet equipment and use in the country. It is also in charge of public services, such as the postal system, which are in need of modernisation and are therefore important potential markets for innovation.

The *Russian Space Agency*, *Roscosmos*, created in 1992, is in charge of the entire Russian civil and military space programme, including research, commercial launching activities and exploration missions. It manages almost 25% of the civil budget.

Of course, the *Ministry of Finance*, as in any other country, exerts strong control over the use of public money invested in S&T and innovation. This function necessarily entails some friction with the "spending" ministries. In Russia, the likelihood of such frictions becoming conflicts is greater than in most OECD countries for two reasons. First, there is not yet a firm consensus on the rationale and scope of innovation policy and thus shared criteria on which to assess the costs and benefits of the corresponding public investment. Second, the fear of corruption makes the Ministry of Finance hesitant to accept the use of some instruments that have proved successful in foreign countries. As an example, it has imposed that public procurement must follow the same rules for R&D contracts as for the buying of goods, to the disappointment of the Ministry of Education and Science.

### Academies

The *Russian Academy of Sciences* (RAS) is a key actor in the overall innovation system. It is the home of the scientific elite, and its members enjoy significant privileges (in terms of income, access to public services such as health care, etc.). RAS is a prestigious learning society but also a powerful R&D actor with its own network of institutes. It has several regional affiliates: the Urals, Siberian and Far Eastern branches. It controls some 15% of the civil R&D budget. It used to enjoy full administrative and budgetary autonomy, with a president with the rank of minister. It has recently undergone a reform that aims at reducing its autonomy and decision-making power.

In addition to the Russian Academy of Sciences, which is focused on "generic" hard and soft sciences, several other academies cover specific fields: these include the Academy of Agricultural Sciences, the Academy of Medical Sciences, the Academy of Fine Arts, the Academy of Architecture and Construction Sciences, and the Academy of Education. Their budgets, altogether, amount to less than one-third of the RAS budget.

### State technology corporations

In order to facilitate the development and commercialisation of technologies considered of strategic importance for the competitiveness of the economy in a global context, the government created in 2007 three powerful organisations, fully owned by the state. These organisations have a special status which allows them to pursue public missions but operate at the frontier between the public and business sectors with more flexibility than other public bodies.

*Rosnano* is the corporation in charge of promoting the development of nano-technologies and related industries. It received at its creation RUB 130 billion from the federal budget. It works in tandem with the NanoNetwork in charge of co-ordinating

R&D actors (led by the Kurchatov Institute, see below). It is designed for multi-target interventions, including certification; infrastructure investment such as collective centres; education and training; support to innovative firms, including foreign enterprises if they invest in production in Russia, etc. It had invested some USD 500 million in 62 projects by the end of 2009, having received 1 600 project proposals in two years (two-thirds of them in the education and research commercialisation fields). It became a joint stock company in December 2010 in a move to facilitate further its market-oriented investment policy.

*Rostechnologii* (Russian Technologies) is in charge of the state's equity shares in more than 500 companies. Operating in many different sectors and technological fields, it is supposed to facilitate the development, production, marketing and after-sales services of new technologies, particularly military ones, in domestic markets and abroad. In 2009, its budget reached some RUB 6.4 billion, of which one-third was spent on personnel and administrative expenses. One of its important current tasks is to prepare a new wave of privatisation in its sphere of responsibility.

*Rosatom* was created as a result of the dismantling of the former Ministry of Atomic Energy (Minatom). It controls all parts of the nuclear chain: exploration of uranium fields, nuclear fuel, reactor development and production, reactor operation and sales. It oversees 200 enterprises (nuclear stations, uranium mines, fuel processing plants, specialised equipment, etc.), and its 70 research institutes employ a total of 300 000 persons. It operates on global markets and is much influenced by diplomatic and intergovernmental relations. It obviously has an important influence on both the demand and supply sides of part of the Russian innovation system.

Initially a legislative provision prevented state corporations from investing in R&D. This reflected a linear approach to innovation and met with the favour of the most conservative forces in the S&T system. From their point of view, the advantage of this legacy of the Soviet era was that enterprises were considered to lie at the end of the innovation process and were consequently not supposed to undertake R&D. Another reason may have been to prevent the use of public money to fund private R&D, because of fears of corruption. This provision has been suppressed *de facto*.

State corporations are too new to be thoroughly evaluated and each is a very specific case. Rosnano and Rostechnologii are the main subject of controversy but it is too soon to measure their achievements in order to convince those who opposed their creation, either because of their conservatism or because they favoured more radical solutions. Even for many of those who, like the government, consider them as the best current institutional response to crucial problems, state corporations nevertheless raise some concerns. First and foremost, and this applies especially to Rosnano, there is a fear that they take undue advantage of public money and of their links with influential networks and government departments to crowd out rather than stimulate the development of the Russian private high-technology sector. Second, there is also concern that pressures to demonstrate measurable results quickly have motivated short-sighted strategies. Third, and this applies to Rostechnologii, the lack of transparency of its management, owing in part to the military nature of many of its constituent firms and trading activities, fuels doubts about its will and ability to carry out a bold reorganisation that would include partial privatisation of the part of the military-industrial complex under its control. This will require a profoundly reformed corporate governance if it is to become more innovative and competitive.

## Foundations

Three autonomous foundations provide funding on a competitive basis to individual researchers and innovators:

- The *Russian Foundation for Basic Research*, modelled on the US National Science Foundation, which, according to law, should channel 6% of the civil R&D budget.
- The much smaller *Russian Foundation for Humanities*, which supports social science research.
- The *Foundation for Assistance to Small Innovative Enterprises* (FASIE, also called the Bortnik Foundation after its initiator), which, according to law, should channel 1.5% of the civil R&D budget.

A fourth foundation – the *Russian Foundation for Technological Development* – has been established with resources from taxes on enterprises, business associations and non-profit organisations, with a view to support technological development of collective interest. The scheme has been suspended, owing to intractable problems with the tax administration.

## Regional governments

Russian regions are very diverse in terms of their size and economic specialisation (Box 3.6). Outside Moscow and St. Petersburg, a small group of regions or republics have most of the remaining science-based and technology-intensive activities and high-quality higher education institutions (HEIs). However, a larger number (about 30) have become aware of the importance of S&T and innovation for their development and are now active in this field.

**Box 3.6. Regional governance and policy in Russia**

**Nature and constitutional status of regions**

The Russian Federation is divided into 83 constituent units or federal subjects (of which 21 republics) of very different sizes and economic specialisation. The federal subjects (members of the Federation) have equal representation – two delegates each – in the Federal Council (the upper house of the Federal Assembly). They differ, however, in the degree of autonomy they enjoy, which is much larger for republics than for other federal subjects, such as *krai* (territories) and *oblasti* (provinces).

The republics represent areas of non-Russian ethnicity. The indigenous ethnic group gives each republic its name, although it does not necessarily represent the majority of the population. Republics have the right to establish their own official language and have their own constitution. The chief executive of most republics has the title of president.

In the past the republics often enacted laws that were at odds with the federal constitution. However, their autonomy was lessened considerably under the former President of the Russian Federation. The establishment of seven large "federal districts" above the regions and republics of Russia, with presidentially appointed representatives overseeing their activities, has strengthened the rule of law and compliance with the federal constitution. The president of Russia now appoints the executive heads of republics, subject to approval by the republics' parliament.

…/…

**Box 3.6. Regional governance and policy in Russia *(continued)***

**Regional policy**

One of the results of Russia's economic reform has been increasing demand for the decentralisation of important aspects of socio-economic policy. Regional and municipal authorities, the scientific and business community, as well as civil society organisations have tended to favour regional strategic planning, programmes and schemes.

In responding to regional expectations, the federal government is more than ever confronted with an equity/efficiency dilemma. On the one hand, it has constantly reaffirmed that its main objective is to equalise regional socio-economic development throughout the territory of Russia, as stated in its current "Strategy of diminishing disparities between regions until 2015". In the last decade many programmes were implemented in this spirit, for example: "Diminishing discrepancies between Russian regions", "Socio-economic development of Kaliningrad, the Kuril Islands, Far-Eastern regions, Southern republics in European Russia". Federal funding has also been granted to a number of projects to boost social and communal infrastructure in the 40 oblasts, republics and okrugs with a below-average level of social and economic development. Recently, the Council for Research for Productive Forces (CRPF) has developed four new programmes of socio-economic development for less developed regions, the Republic of Komi, Kemerovo and Jewish oblasts, and Khanty-Mansi autonomous okrug.

On the other hand, the federal government is clearly tempted to bet more on "regional engines" of national performance, by concentrating investment in areas where local conditions ensure greater returns. Current trends in regional economic development in Russia are in fact increasingly close to the patterns found in most catching-up economies, i.e. polarisation of the economic space with nodal centres accumulating an increasing share of productive resources, to the detriment of lagging regions.

The sub-regional level of governance also deserves attention. Some interesting developments over the last decade could become more widespread in the future. For example, cities originally created as closed military-oriented research-industrial complexes have developed a social identity and their municipalities have become significant players in innovation system governance.[8]

Federal/sub-national relations take place in a context of limited fiscal decentralisation; the regional and local authorities are therefore very dependent on funding from the central government. Restrictions are also imposed on investment by regional/local authorities; for example, they cannot provide core funding to universities. Moreover, the national priorities and criteria that determine access to federal support seldom fit regional needs and capabilities perfectly. This reduces the impact of that support on local development and affects the overall efficiency of federal spending on innovation. Regional and local success stories demonstrate that strong self-organisation capabilities at the sub-national level are necessary to ensure the best use of federal resources (see below).

Another issue is the "high-tech myopia" of Russian innovation policy which leads to widespread neglect of non-technological innovation. Too little is known about the real innovation potential of regions with economies that are less R&D-intensive than the national average. For the modernisation of regions, all forms of innovation should receive more attention at both the federal and local level.

### *3.2.3. Innovation system governance: achievements and shortcomings*

A number of bodies are involved in the definition and implementation of policies that bear on innovation. They engage in a collective learning-by-doing process of definition and implementation of an innovation policy to fit the needs of the nation. It is no surprise that, under these circumstances, a number of issues arise regarding the efficiency of the resulting policy arrangements and processes.

The OECD Innovation Strategy has identified desirable "qualities" for innovation policy governance, including legitimacy, coherence, stability, adaptability, and ability to steer and give direction (OECD, 2010a). In Russia, legitimacy depends to a larger extent than in OECD countries on the involvement of the central government, particularly the offices of the president and prime minister. This leads to top-down approaches and, in theory, should also mean greater ability to ensure coherence and to steer and give direction to policy. As mentioned earlier, the situation has long been quite different, at least in the case of S&T and innovation policy, for two related reasons. First, innovation was not on the top-level national economic policy agenda until quite recently. Second, the fragmentation of the immediately lower layer of governance (ministries and autonomous agencies) has led to multiple and partly competing strategic visions, as well as to overlapping initiatives.

The major proponent of innovation policy has historically been the Ministry of Education and Science, but its control over the relevant resources and its influence on some key actors were too limited for it to ensure even the co-ordination of R&D. It had nevertheless the great merit of "incubating" what is now taking shape as a full-fledged Russian innovation policy. In addition, it addressed some generic S&T problems rather successfully. For example, a major criticism of S&T policy a decade ago was its inability to set and implement spending priorities. Funds were spread too thin and the support system lacked stability. The situation today is markedly different, at least in terms of new funding.

The recent establishment of two commissions at the highest level indicates not only the increased political commitment to an innovation agenda but also introduces new mechanisms for ensuring policy coherence. It remains to be seen how the co-ordination and steering functions of the presidential commission and the commission chaired by the prime minister will complement each other in practice. In principle the latter is in charge of ensuring and monitoring, at the "working level", the implementation of the orientations chosen by the former. However, there is significant overlap in the memberships of the two commissions, and they seem to meet only about twice a year, which may be too little, especially for the commission chaired by the prime minister, in view of its responsibilities.[9]

A major weakness of Russian policy decision and co-ordination processes is their lack of transparency and the insufficient involvement of actors that are important for the country's economic success but are not part of the influential informal networks that link top government officials, big business and powerful science lobbies. Of course, there are channels for some forms of consultation of various stakeholders (Box 3.7), but they should be broadened and strengthened and firmly linked to the new policy governance structures. A promising example is the recently initiated Technology Platforms programme, which brings together representatives of the business, government and research communities in defined technology areas (see below).

**Box 3.7. Participatory governance: The contribution of business associations**

The low level of R&D and innovation activities that are financed and carried out by the business sector has long been the Achilles' heel of the Russian innovation system. Measures to change this situation need to be taken with a full understanding of the business dynamics, expectations and constraints in different sectors and for different types of firms. The business community's strong participation in the policy formulation, implementation and evaluation process has become the rule in most OECD countries.

In Russia, some communication channels between the government and the business community are quite specific because of the importance of state-owned enterprises and for other reasons. Their relationship may appear either too strong or too weak, depending on the subject and type of business. It is worth mentioning the useful and exemplary role of some business associations: the Russian Union of Industrialists and Entrepreneurs (RSPP), the Union of Entrepreneurial Organisations of Russia (OPORA), and the Chambers of Commerce.

RSPP, which mainly represents large companies, focuses its efforts on the upgrading of the business environment and the improvement of the image of Russian business in the country and abroad. In order to contribute concretely to the development of legislative proposals, it has created some 17 working groups, including one on industrial policy, dealing with various matters affecting more or less directly the innovation climate.

OPORA gathers 88 sectoral and regional associations of SMEs, with about 20 working groups, including one on innovative SMEs. It has submitted several policy position papers to the government, notably on industrial parks and clusters (Ivanova and Roseboom, 2006).

The Chambers of Commerce is also involved in discussions of matters that concern framework conditions for innovation such as labour laws, quality and certification schemes, and transport and logistics.

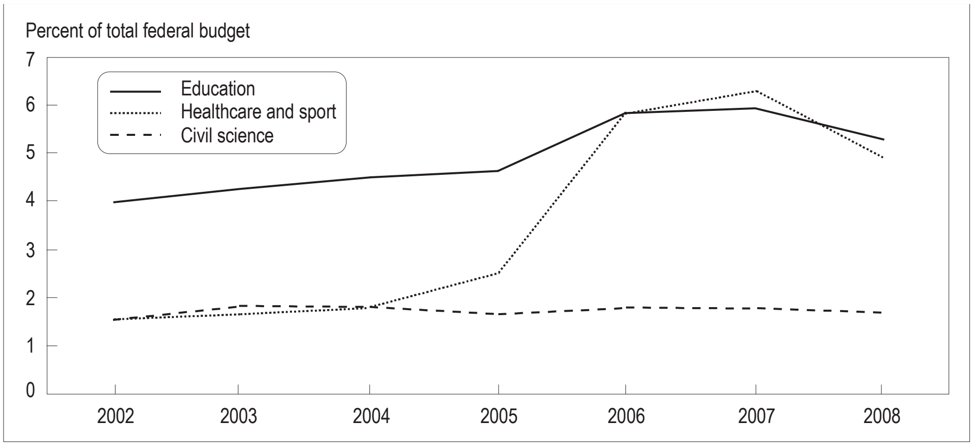
The fragmentation of the information system is another weakness of the governance of the Russian innovation system because evidence-based policy making requires a well-documented and constantly updated overview of the situation. However, the multiplicity of policy frameworks in which this system is embodied results in blind spots and some inconsistencies in the available data. The absence of consistent and internationally comparable information on several important aspects of policies and economic activities is striking to a foreign observer, including the OECD review team.

Russia has made considerable progress in adapting its statistics to international norms, including its R&D and innovation statistics, through intensive participation in OECD and EU work. It has excellent, often internationally renowned, experts and expert groups working in the university and government sectors and now in independent non-governmental organisations and the private sector. However, fuller use needs to be made of these assets to develop the information base and related advisory channels that the government now requires to steer economic modernisation effectively.

## 3.3. Public funding of R&D: Trends and allocation patterns

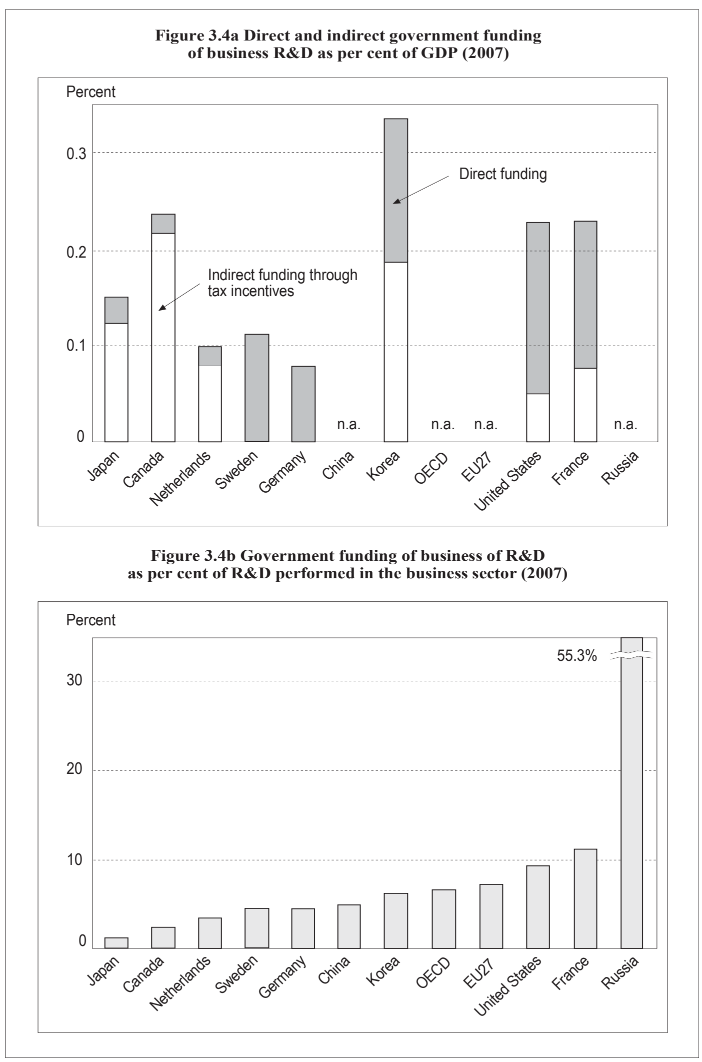
Financial support to R&D organisations and activities, in the form of grants (expenditures) and, marginally, tax incentives (foregone revenues) is the main steering mechanism of the Russian innovation system. Instruments such as open procurement policies or public-private partnerships so far play only a marginal role.

**Figure 3.3. Federal budget appropriations for science, education and health care**




*Source:* Ministry of Education and Science (2009).

**Figure 3.4. Government funding of business R&D**



### *3.3.1. Overall trends in budgetary support*

*Direct funding*

The science and technology sector benefited from the budgetary improvement brought about by a decade of high growth up to the 2008 global financial crisis. Budget funding of S&T enjoyed an annual increase of 15-20% over 2003-08. The federal civil R&D budget reached some RUB 140 billion in 2008 (USD 4.2 billion). However, in relative terms the evolution has been less impressive. S&T represents today around 1.6% of the total budget, a proportion that has been stable over the last decade, in contrast to the growing share of other budget items, such as education and health (Figure 3.3).

The budgetary situation changed dramatically with the sharp recession following the global financial crisis. Fiscal revenues dropped and the government gave greater priority to short-term goals. The R&D budget fell by about 30% in nominal terms between 2008 and 2009. The shock to the whole S&T system was aggravated by reductions in extra-budgetary investment, notably for the federal target programmes (see below) which required matching funds by enterprises severely hit by the downturn. It is estimated that only 60-70% of planned off-budget expenditures were made (Gaidar Institute, 2010).

Budget trends foreseen for the coming years are not very encouraging. Significant deficits are anticipated. It is hoped that the government will consider public S&T expenditures as a strategic investment to be protected from further cuts, as they are essential to the success of Russia’s innovation and economic modernisation agenda.

*Tax incentives*

Although precise data are not available, it seems fair to assume that tax incentives represent only a tiny share, much lower than in many OECD countries (Figure 3.4a), of the total budgetary effort in favour of R&D. One obvious reason is the exceptionally high level of government R&D grants to the business sector, which reflects the specific features of the Russian technology industry, notably the importance of former “branch” research institutes and design bureaus in the corporate R&D-intensive sector (Figure 3.4b). Another is the low level of R&D activity in part of the corporate sector, notably private firms, for which it makes more sense to consider tax incentives as a possible substitute for some grants.

The tax treatment of R&D expenditures is complex and changes frequently. Currently, companies can write off R&D expenditures over two years if the R&D is used in production or sales. The government is considering the possibility of allowing accelerated write-off, possibly up to 100% in one year, for related capital expenditures. Specific tax incentives include (ERA Watch, 2010):

- From January 2008, the tax exemption on funding used for R&D projects has been extended to cover not only funding from the federal budget but also funding from non-budgetary resources.
- Another tax exemption introduced in 2008 applies to the sales of intellectual property rights (IPR), including exclusive rights on inventions, databases and IPR licensing.
- Tax incentives are used to attract companies to special economic zones (SEZ) for technology development (see below). Companies settling in the SEZs are exempt from property and land taxes for a period of five years and benefit from reduced rates of social taxes.

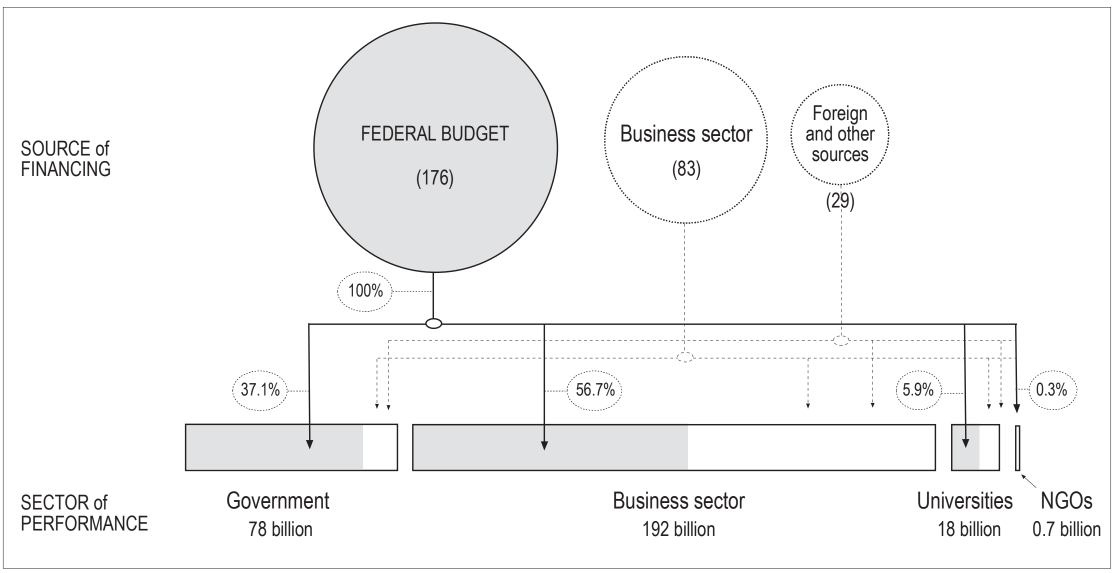
The individual and combined efficiency of these schemes has not yet been thoroughly assessed, but the government seems to consider that their impact on the overall level of business investment in R&D is generally rather modest. This explains why new fiscal stimuli are being prepared jointly by the Ministry of Education and Science, the Ministry of Economic Development and the Ministry of Finance.

### *3.3.2. Public funding patterns: main institutional channels*

The federal budget is the main source of R&D funding (Figure 3.5). Statistics on federal R&D funding distinguish between basic and applied research. The allocations by department and agency are given in Tables 3.1 and 3.2 for 2009 and 2010 (estimated expenditures for the former and planned expenditures for the latter, as of 1 January 2010).

**Figure 3.5. Federal funding of R&D (2006)**

RUB billion, %




*Source:* OECD, based on data from the Institute of World Economy and International Relations, (IMEMO), Russian Academy of Sciences.

The expenditures for basic research are half of those for applied research, although the criteria for classifying R&D activities in Russian statistics may sometimes give more weight to the nature of the institutional channels than to the actual nature of the research activities being funded. The Russian Academy of Sciences and its regional branches get the lion's share, with more than 60%, and they benefited from a significant increase in 2010, in both relative and absolute terms. The other academies altogether receive about 13% of total funding. The Russian Foundation for Basic Research has experienced a reduction of its funding in both absolute and relative terms. The Federal Agency of Education gets about 6% of the total, mostly to fund the strengthening of the research capabilities of universities (see below). The support to the two state universities (Moscow and Saint Petersburg) is in addition to the resources allocated by the Federal Agency for Education.

**Table 3.1. Basic research funding: Breakdown by institution**

| | 2009 | | 2010 | |
|---|---|---|---|---|
| | RUB billion | % | RUB billion | % |
| Russian Academy of Sciences | 46.0 | 60.6 | 49.1 | 64.0 |
| Other academies | 13.0 | 17.1 | 13.4 | 17.5 |
| Federal Agency for Education | 4.7 | 0.6 | 4.3 | 5.6 |
| Federal Agency for Science and Innovation | 0.5 | 6.2 | 0.8 | 1.1 |
| Russian Foundation for Basic Research | 7.1 | 9.4 | 6.0 | 7.8 |
| Russian Foundation for Humanities | 1.2 | 1.5 | 1.0 | 1.3 |
| Ministry of Economic Development | 0.5 | 0.6 | 0.1 | 0.0 |
| Moscow State University | 2.8 | 3.5 | 1.3 | 1.7 |
| Saint Petersburg State University | 0.0 | 0.0 | 0.2 | 0.3 |
| Others | 0.1 | 0.0 | 0.5 | 0.6 |
| Total | 75.9 | 100.0 | 76.7 | 100.0 |

*Source:* Ministry of Education and Science.

**Table 3.2. Applied research funding: Breakdown by institution**

| | 2009 | | 2010 | |
|---|---|---|---|---|
| | RUB billion | % | RUB billion | % |
| Russian Academy of Sciences | 1.8 | 1.0 | 1.3 | 0.1 |
| Federal Space Agency | 47.2 | 32.3 | 49.9 | 32.9 |
| Federal Agency for Science and Innovation | 20.5 | 14.0 | 18.3 | 12.1 |
| Federal Agency for Education | 4.2 | 2.8 | 5.6 | 3.7 |
| FASIE (SME support) | 2.4 | 1.6 | 2.4 | 1.6 |
| Ministry of Defence | 5.6 | 3.8 | 6.0 | 3.9 |
| Ministry of Health + Bio Med Agency | 4.0 | 2.7 | 3.5 | 2.3 |
| Ministry of Industry and Trade | 35.6 | 24.3 | 42.2 | 27.9 |
| Ministry of Economic Development | 0.6 | 0.4 | 0.5 | 0.3 |
| Ministry of Energy | 1.1 | 0.7 | 0.7 | 0.6 |
| Rosatom | 3.0 | 2.0 | 4.4 | 2.9 |
| Fed. Agency for Tech. Reg. and Metrology | 0.7 | 0.4 | 0.6 | 0.3 |
| Fed. Service for IP. Patents and Trademarks | 1.9 | 1.3 | 1.7 | 1.1 |
| Others | 17.7 | 12.1 | 20.0 | 13.2 |
| Total | 146.3 | 100.0 | 151.5 | 100.0 |

*Source:* Ministry of Education and Science.

The breakdown of applied research funding shows the importance of the Federal Space Agency (about one-third of the total) and the Ministry of Industry and Trade (more than one-quarter, mostly to fund the branch institutes under its control). Both benefited from an increase in their relative share in 2010. The resources of the Federal Agency for Science and Innovation (since April 2010 included under the Ministry of Education and Science) were reduced in 2010 and represent only about half of the resources of the Ministry of Industry and Trade. FASIE has maintained the level of its resources. The Ministry of Defence also benefits from significant civil R&D resources, some 6% of total civil support to applied research. Appropriations for Rosatom are quite small, but most of this agency's funding comes from the military budget.

When the funding of applied and basic research is consolidated, it appears that more than two-thirds of the federal civil R&D effort goes to three institutions – the Federal Space Agency, the Academy of Sciences and the Ministry of Industry and Trade. These three institutions manage the activities that were the pillars of the Soviet S&T system, including the former "branch" research institutes and design bureaus that are now "corporatised", generally as joint stock companies or unitary state enterprises. This reflects an important institutional continuity (if not inertia) in the Russian R&D system, even if significant resources are now allocated through the competitive schemes of the (former) Federal Agency for Science and Innovation, the Russian Foundation for Basic Research and FASIE.

*State contracts and public procurement*

A significant part of government R&D spending, especially for applied research, takes the form of state contracts – state orders in the Russian terminology – through which, in theory, the state buys R&D results to satisfy identified needs. To a certain extent, this looks like public procurement of R&D in OECD countries. However, many of these state orders are not filled through a transparent process; some are probably disguised unconditional subsidies and many others do not seem to be the result of fair competition in the tendering process. Although research themes are published on the web, it is generally considered that the conditions of competition are often biased and even at times affected by corruption practices.

**Table 3.3. Budget appropriations for applied research in selected ministries and public agencies, including state contracts (SC) and grants to subordinated organisations (SO)**

RUB billion

| | 2009 | | | 2010 | | |
|---|---|---|---|---|---|---|
| | **Total** | **SC** | **SO** | **Total** | **SC** | **SO** |
| Total | 146.3 | 98.6 | 14.4 | 151.4 | 104.9 | 15.8 |
| Ministry of Defence (civil budget) | 5.6 | 4.2 | 0 | 6.0 | 4.4 | 0 |
| Ministry of Health and Social Development | 2.7 | 0.2 | 2.4 | 2.6 | 0.2 | 2.4 |
| Ministry of Industry and Trade | 35.6 | 24.1 | 0.0 | 42.2 | 28.4 | 0.1 |
| Federal Agency for Science and Innovation | 20.5 | 13.9 | 2.4 | 18.3 | 11.4 | 4.5 |
| Federal Agency for Education | 4.2 | 2.7 | 1.3 | 5.6 | 4.2 | 1.3 |
| Federal Space Agency | 47.2 | 47.2 | 0 | 49.9 | 49.9 | 0 |
| Rosatom | 3.0 | 1.3 | n.a. | 4.4 | 2.3 | n.a. |

*Source:* Ministry of Education and Science.

In this context it is extremely difficult to evaluate the resources that are effectively allocated through fair and open competitive mechanisms, other than those channelled through agencies with very explicit and transparent procedures, such as the Russian Foundation for Basic Research. The information provided by the Russian government about funds appropriated for applied research includes data on amounts allocated through theoretically open state contracts, as well as on funds allocated to subordinated organisations as "sovereign" grants from their parent organisation. Table 3.3 presents this information for selected bodies.

**Box 3.8. Innovation-friendly public procurement: International experience**

Among OECD countries recent years have seen some shifts in the mix of policies used to support innovation. A common trend is to pay more attention to the need to correct on the demand side and to systemic failures that inhibit innovation processes. Examples include: information asymmetries that impair market introduction and the diffusion of innovations; high switching cost to new technologies; high entry costs (especially for areas with high network effects); difficulties to translate some user needs into clear market signals; and technological lock-in and path dependencies (Edler, 2007).

Countries such as Finland and the United Kingdom are quite advanced in articulating comprehensive demand-side innovation policies but all countries have taken new initiatives to remove demand-side bottlenecks to innovation. An important factor has been the fact that traditional mission-oriented technology policies have had to change in order to respond to evolving societal needs (*e.g.* green growth, health in ageing societies, security in the face of new risks) and must be now pursued through approaches that give higher priority to stimulation of demand, supply/demand articulation and public-private partnerships, often with the active participation of individual citizens/consumers.

If the scope and intensity of government intervention varies in different countries, it always relies on a combination of the same basic instruments that affect more or less directly the demand for innovations across the board or in more specific fields: public procurement; regulations and standards; pricing (or taxation) schemes; awareness and education. Public procurement is seen everywhere as having a central role in boosting demand for innovation. It can be made more innovation-oriented in two main ways.

First, government can incorporate an innovation dimension into general public procurement, *e.g.* by incorporating new qualitative criteria in tenders and in the assessment of tender documents. This is very demanding, however, since procurement is generally not carried out by the agencies or ministries responsible for innovation but by specialised agencies which are mainly responsible for cost-effective purchasing. The linking of the two is a major governance challenge which a growing number of countries have decided to tackle. In Finland, innovation-friendly procurement is a key pillar of the 2010 "Action plan for the implementation of demand and user-driven innovation". In Australia, according to the 2008 Commonwealth Procurement Guidelines, agencies "should seek to ensure that wherever possible their processes allow for suppliers to provide innovative solutions to their requirements". In the Netherlands, a new public innovation procurement (PIP) programme aims at promoting innovative solutions to solving societal problems in priority areas (water, energy, security, health, education, mobility, construction, and agriculture and fishing). The United Kingdom introduced an Innovation Procurement Plan in 2009, making innovation a key requirement in large facilities and capital programmes.

Second, public procurement of technologies and research can be made more strategic if greater attention is paid to their systemic as well as sectoral impact on incentives and capabilities to innovate in the public and private sector, including the search for greater synergies between civil and defence-related activities. In this context, the participation of small and medium-sized enterprises has received greater attention in many countries, following the pioneering example of the United States, which introduced as early as 1982 the Small Business Innovation Research (SBIR) programme. Examples of recent variants of the SBIR programme include: the United Kingdom's Small Business Research Initiative (SBRI) launched in 2001 and reinforced in 2009; the Dutch Small Business Innovation Research (SBIR) pilot programme introduced in 2004; in Australia, the Market Validation Program (MVP) introduced in 2008 by the Victoria State Government as part of its Boosting Highly Innovative SMEs (BHIS) programme; and the Canadian Innovation Commercialisation Program (CICP), launched in 2010 to help entrepreneurs, through contracts, to bridge the pre-commercialisation gap for their innovative products and services.

In addition to state orders for R&D, some state orders for goods are important for innovation, especially on the demand side. Such purchases by all levels of government in Russia would have been of the order of USD 133 billion in 2009 (OECD, 2010b). The procedures were modernised in the mid-2000s, inspired by those in place in OECD countries, *e.g.* competitive calls for tenders and rules reserving 20% of procurement markets for SMEs. Late 2010 and early 2011 saw a lively debate over a proposed overhaul of federal legislation on public procurements, following a call from President

Medvedev to amend the legislation. The existing regime, with its extremely rigid formal requirements, was adopted in an effort to eliminate corruption by depriving officials of discretionary authority in the procurements process, on the basis that such discretion merely enabled them to manipulate tenders for corrupt purposes. Critics of the law argue that it has not eliminated corruption in procurements, which the federal authorities estimate costs the state RUB 1 trillion (USD 35 billion) a year, but that it has nevertheless made it extremely difficult to conduct honest tenders. It has also eliminated any scope for using tenders to promote innovation, SME development or other policy goals, treating the procurements as a governance integrity issue pure and simple. The proposed reform would grant officials greater discretion, including the power to set some preliminary requirements for eligible suppliers, and would attempt to address the risk of corruption via greater transparency, to be assured in part by creating an all-powerful federal watchdog (possibly under the aegis of the Ministry of Economic Development) to oversee public procurement tenders.[10] While few would argue that the current system has proved its effectiveness at reducing corruption in procurements, there is much uncertainty about whether an approach that relies more on transparency than procedural rigidity can do better, let alone whether it might become an effective vehicle for using public procurements to promote innovation (Box 3.8).

Public procurement in the defence sector is a case apart. For obvious reasons its impact on the civil innovation system is especially important in Russia. It is important to distinguish between R&D procurement and purchases of goods and equipment (including repairs and modernisation). In 2009, in a total of some RUB 484 billion of military procurement, R&D amounted to some RUB 136 billion (*i.e.* 28%), of which a significant part went to the research and testing centres of the Ministry of Defence. As in the case of civil public procurement, there have long been serious problems and disappointments, excessive costs, lack of delivery, endemic corruption, etc. These problems, which date back to Soviet times, have motivated a serious reorganisation of the military-industrial complex, the outcome of which is not known to outsiders (Cooper, 2010).

### *3.3.3. Selectivity and focused programmes*

#### *Federal target programmes (FTPs)*

In order to speed up the modernisation of the Russian economy and society, the Russian government launched 51 FTPs in the mid-2000s as a way to focus a significant part of public investment on priority areas, and to test new approaches, inspired by the EU Framework Programmes, to selecting and funding relevant projects.[11] Twelve FTPs are directly related to science, technology and innovation and received some RUB 98 billion in 2009; the overall spending of the FTPs amounted to RUB 840 billion, including RUB 420 billion in capital investments.[12]

Table 3.4 shows the time scale and overall budget of S&T-related FTPs. State funding is complemented by business sector funding for several of them, in a proportion that varies, depending on the nature of the activities supported. As mentioned, the actual funding for 2008 and 2009 was significantly lower than planned (half in the worst cases).

**Table 3.4. Selected S&T-related federal target programmes**

| | Period | Total budget (RUB billions) | % share of state funding |
|---|---|---|---|
| R&D in priority areas of S&T[1] | 2007-13 | 195 | 70 |
| National technological base[1] | 2007-11 | 23 | -- |
| Development of nanotechnology infrastructure[1] | 2008-10 | 27 | -- |
| Research and academic teaching personnel[1] | 2008-15 | 187 | -- |
| Development of civil aviation | 2006-10 | 158 | 22 |
| Federal space programme | 2006-15 | 480 | 60 |
| Development of electronic components and radio electronics[1] | 2008-15 | 187 | 60 |
| Development of nuclear energy complex – radiation nuclear waste management | 2008-10 | 40 | -- |
| Global navigation systems (Glosnass) | 2002-11 | 140 | -- |

1. Managed by the Ministry of Education and Science.
*Source:* Ministry of Education and Science.

The largest S&T-related FTPs target high-technology sectors such as aerospace and ICTs, but also human resource development. In addition a large FTP supports a wide range of research activities in S&T priority areas (Table 3.5).

**Table 3.5. Planned budget appropriations for the FTP on R&D in priority areas of S&T**
RUB billion, 2007-13

| By technological field | | By functional activity | |
|---|---|---|---|
| Nanotechnologies and materials | 43.0 | Knowledge generation | 30.6 |
| Life sciences | 27.9 | Technology development | 68.7 |
| Power engineering and energy | 19.7 | Technology commercialisation | 12.5 |
| Rational nature management | 9.8 | Research infrastructure | 5.5 |
| Information and communication technologies | 8.9 | Innovation infrastructure | 15.5 |

*Source*: R. Burger (2008), "Russian Federal Targeted Programme for Research & Development in Priority Fields for the Development of Russia's S&T Complex for 2007–2012: An outside view', PowerPoint presentation, RUSERA-EXE training course: Opportunities & challenges for EU-Russian RTD co-operation, 30 January-1 February.

The programme on R&D in S&T priority areas should have RUB 195 billion, of which RUB 134 billion from the budget and the remaining RUB 61 billion from the business sector (Burger, 2008). With planned funding of RUB 17 billion in 2009, it accounted that year for about 10% of the civil R&D budget. The funds are allocated on a competitive basis. The impact of the programme is monitored on the basis of very detailed criteria.

When adding up the different relevant schemes one may estimate that around 30% of the overall civil R&D budget is now allocated through competitive funding.[13]

*Other approaches to selectivity*

In addition to the FTPs, the government has adopted other ways to concentrate resources on selected centres, institutions or sites considered of high potential and/or of strategic importance. The selection of beneficiaries has been made either based on "sovereign judgement" or through a competitive process. Examples are the special status and support granted to 27 research universities, 50 state research centres and 14 science cities.

The extensive use of the "special status" approach raises some questions. As noted by the Gaidar Institute, instituting such "progressive inequality" can contribute to the development of high-quality science and research by crystallising the research system around poles that better satisfy the criteria of excellence and critical mass and provide greater opportunities for cross-fertilisation of scientific disciplines and projects. Such concentration can also entail unwarranted consequences sooner or later, such as complacency in the chosen groups if they do not feel that their position is contestable in one way or another (increased competition between winners and/or from foreign institutions, social accountability) and frustration among the others if they have little hope of increasing their resources through other, more accessible forms of merit-based competition. Rigorous monitoring and evaluation are necessary to prevent such potential perverse effects. Also, it is important to consider this approach as commendable as an alternative to the Russian form of "pork barrelling" but not to generic support to individuals and research teams through competitive schemes. These remain invaluable for detecting, empowering and rewarding the talent – and the organisations in which they are nurtured – that, in the field of innovation, often emerges in unexpected ways and in unpredictable places.

## 3.4. Strategic tasks of innovation policy: A functional assessment

Against the background of the information provided by the preceding sections on policy-making institutions and government funding patterns and channels, this section undertakes an analysis and assessment of how and how well Russian S&T and innovation policy performs the following strategic tasks:

- Securing the availability of qualified human resources.
- Adapting public R&D to the requirements of a modern innovation system.
- Promoting business R&D and innovation.
- Fostering the development of competitive innovation-oriented industries.
- Providing supportive infrastructures to innovators.
- Harnessing global opportunities through international co-operation.
- Developing and mobilising regional innovation capabilities.

### *3.4.1. Securing the availability of qualified human resources*

The importance attached to education by the state and citizens is a positive legacy of the Soviet era and explains why Russia today has a higher proportion of university graduates in the population and workforce than any OECD country. The quality and quantity of people trained in science and technology was a key feature of the Soviet system. But Russia also inherited less desirable features, notably the strict separation of education and research and the lack of training in many disciplines required in a market economy. In addition, the collapse of former productive structures entailed that of certain layers of the education system, notably professional and vocational training, which were difficult to rebuild in the new environment. The government worked hard during the last two decades to solve these issues, with a good deal of success in many areas, but in a context of new challenges created by demographic trends.

*Minding a human a resource gap*

As a consequence of demographic losses, a major human resource gap is to be feared. The consequences for the innovation system, already badly affected by an "emigration shock" in the 1990s, might be aggravated by: *i)* the disaffection of students for science and engineering studies; *ii)* the fact that most of those finishing secondary school prefer to enter university rather than professional and vocational schools, although a lack of technicians already severely constrains the use and maintenance of scientific equipment in many places; and *iii)* the pronounced ageing of scientific and R&D personnel.

To counteract the disaffection *vis-à-vis* science and engineering studies, the government has put in place a strong policy of quotas for so-called "budget places", which are free of charge for students, and has reduced authorised entry contingents in some disciplines.[14] But of course quotas will not solve the problem if they do not match labour market trends. Only an increase in innovation activities in the corporate, especially private, sector can lead to the necessary changes on the demand side of the labour market.

The same holds true for the objective of making vocational and professional education more attractive to youth and better attuned to the evolving needs of more innovation-oriented economic development. Better-paid jobs and more interesting careers are essential for changing attitudes. However, this is not amenable to any specific policy; it can only result from the success of the overall economic development strategy. The government has the more direct responsibility to rejuvenate the professional and vocational education system itself. The most significant initiatives have been taken so far in sectors related to the defence industries. A programme was launched to review the skills needs and availability of qualified personnel, with a view to establishing "corporate universities" that can fill gaps through new training programmes.[15] Similar approaches should be considered in other sectors, with an effort to mobilise the business community and to learn from successful foreign experience (Box 3.9).

*Strengthening universities and enhancing their contribution to research and innovation*

The reform of the higher education system has been an important item on the reform agenda since the very early years of the transition. In broad terms, it involved the huge task of adapting curricula to the new political, economic and societal context, along with efforts to adopt, with adaptation to Russian conditions, international best practices regarding how universities should be organised, managed and internationally connected. This continuing adjustment process has come over time to focus more and more on generic issues similar to those dealt with by OECD countries, rather than on "transition-specific" ones. For example, Russia has recently engaged in the Bologna process by deciding to adapt key aspects of its education system to European norms. The law passed in October 2007 gave universities two years to introduce the system of Bologna-type credits.[16]

**Box 3.9. Vocational education and training (VET) – lessons from OECD policy reviews**

In recent years, vocational education and training (VET) has become a policy priority in OECD countries for three main reasons. First, VET has an important economic function, providing trade, technical and professional skills for the workforce. Second, there are signs of emerging strains in VET systems, including a lack of workplace training places and a shortage of vocational trainers and teachers. Third, VET has been neglected in the past, certainly by analysts, but also to some extent in the policy arena. In the light of this strategic priority, the OECD has launched a set of policy reviews covering 15 countries over the period 2007-10. Some of the main conclusions of this work are as follows:

- VET programmes should include an element of workplace training because, apart from the learning benefit, employers' willingness to provide such workplace training reflects labour market demand for the skills acquired in the VET programme.
- Within individual VET programmes, a good balance between generic and specific skills is important. VET graduates need the occupationally specific skills that will allow them to enter skilled jobs without lengthy additional training. They also need generic transferable skills to carry them through their working career, including the ability to adapt to fast-changing workplace requirements.
- Interchange and partnership between VET institutions and industry is important. Vocational teachers and trainers should spend time in industry to update their knowledge, and vocational trainers in firms should spend some time in VET institutions and enhance their pedagogical skills.
- VET policy development and implementation requires engagement with employers and unions. Their involvement helps to ensure that the content of VET – what is taught in VET schools and at the workplace and how exams are designed – is relevant to the labour market. Typically this means a set of interconnected institutions at national, regional and sectoral levels, with clear responsibilities for different elements in the VET system.

*Source*: OECD (2009), *Learning for Jobs: OECD Policy Review of Vocational Education and Training*, OECD, Paris.

The wish to give a more prominent role to universities in the national research system was present early on the reform agenda, but for some time mainly sought to counterbalance the excessive weight of the academies, with only modest results. However, more significant moves with broader motivations were made possible in the last decade with the establishment of a renovated Ministry of Education and Science possessing more resources and a stronger mandate.

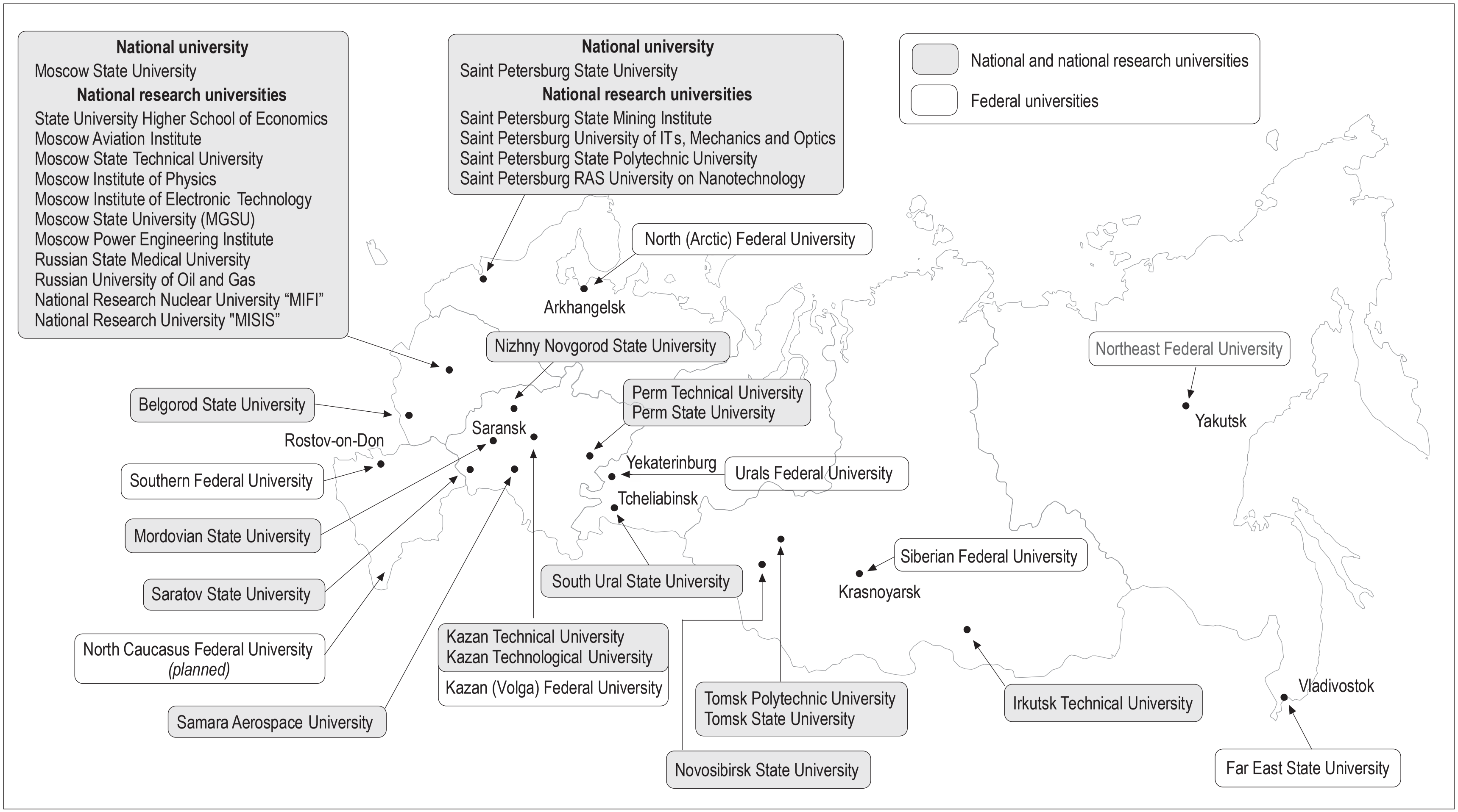
An important step was the launch in 2006 of a programme to fund innovation initiatives in higher education in which 57 educational institutes, 17 of which are universities, participated during the last three years (2007-10). The programme supports, for instance, student-business incubators and study-research-innovation complexes (following a model tested successfully in previous years in co-operation with the Academy of Sciences). In 2010 it was extended with the introduction of a new scheme. With a budget of RUB 2 billion, this scheme will provide RUB 50 million a year to universities' initiatives for three years (Government Decree 219).

The boldest recent decision was to accelerate the development of research capabilities of higher education institutes by selecting and supporting those most capable of playing an effective and leading role in this process, with the following hierarchy (Figure 3.6).

- At the top, the status of "national universities" was granted to two HEIs: the Moscow State University and the Saint Petersburg State University. Beyond the prestige it confers – helping to attract students, professors and resources – this special status also means greater autonomy for the rector and the university management. In addition, significant new block funding of some USD 400 million has been awarded to the two national universities.
- Next, 27 national research universities have been designated (12 after a first competition held in 2009, and 15 after a subsequent one in 2010). With this new status, given for a ten-year period, they will benefit from assured additional funding for five years to develop their research capabilities. The competition has been fierce, with an approximate rejection rate of 90%. The selection criteria gave significant weight to international exposure and connections. A committee of 36 members representing different communities (the government, the academic sphere and the business sector) administered the selection process. More than USD 600 million has been earmarked for the programme.
- Seven regional universities have received a "federal" status that distinguishes them as leading teaching institutions in the Russian territory, with a view to increasing their contribution to the development of the regions in which they are located. They are supposed to better integrate education, science and business in a number of thematically defined priority areas. The two first federal universities were selected in southern Russia and in Siberia in 2006. In 2009, a further five were created in other federal districts. USD 600 million has been earmarked for this programme.

This formalisation of the *de facto* stratification of the university system is consistent with the general approach pursued for some time by the Russian government; it consists in concentrating new resources on "hotspots" where greater returns can be expected. It should be understood against the background of the less helpful logic long imposed by conservative forces. In the field of S&T and innovation it is in particularly sharp contrast to what is still the practice of the Academy of Sciences in allocating the R&D budget under its control. A legitimate sense of urgency has motivated the decision to manage an accelerated selection proactively rather than wait for the results of a more organic but longer process. The cost of delayed restructuring should therefore be weighed against that of possible mistakes in the selection made.

**Figure 3.6. Universities with special status**




*Source:* OECD, based on information from the Ministry of Education and Science.

Beyond the natural disappointment of some of those that failed in the competition, independent experts have voiced concerns that the government must take seriously. One relates to the management of expectations when ensuring that the benefits of rewarding the best are not undermined by the costs of discouraging the others. As pointed out by the Gaidar Institute (2010), the shorter the list, the easier it is to ensure its legitimacy. When the list expands, so do the expectations of an ever larger number of candidate institutions. The risk of inequitable choices also rises, up to a point beyond which no selection, however appropriate, will gain acceptance. From this perspective, the government should probably resist pressure to add new rounds of competition and find other ways to maintain the motivation of non-selected HEIs to keep improving their performance.

Other issues relate to the need to ensure the balanced development of the innovation system and, consequently, balanced support to all the components of the education system that underpin it. It is important for the government to avoid misunderstandings about its approach to excellence and to demonstrate in practice that it rewards excellence not only in high-level R&D activities but also in others that require other types of skills which are vital for successful innovation even if they require a lower level of education.

*Renewing the scientific and teaching personnel and upgrading its qualifications*

As indicated above, a major FTP aims at rejuvenating scientific and teaching personnel while upgrading their skills. This programme is generously endowed with some RUB 90 billion for the initial period of 2009-12 (11% from non-budget sources). It provides multiple forms of support to facilitate the recruitment and career development of researchers and teachers, including through higher salaries, better training, increased mobility, easier travel and stays abroad, new equipment, improved residential infrastructure, etc.[17] The plan is to spend 40% for natural sciences, 40% for engineering sciences and 20% for social sciences. The implementation of the programme has been hindered by the economic downturn which could compromise the realisation of its ambitious objectives for 2015, the final year of the programme; these include lowering the average age of the research personnel by three to four years, increasing the share of researchers with higher qualifications (candidates of sciences and above) by 2-4%; increasing the share of Russian publications in leading world science reviews by 1-1.5%.

An important dimension of the new policy to strengthen the human resource base of the S&T and innovation system is the effort to draw on foreign experts, especially the Russian diaspora. It is estimated that more than 200 000 qualified scientists fled Russia during the most difficult times of the economic transformation, the vast majority to the United States, western Europe or Israel. Many have maintained their qualifications and often acquired new ones, while taking part in dynamic professional networks with global reach. A number renewed links with Russia when economic conditions improved, but most have not found conditions appropriate for stronger engagement in the Russian education and research system. The programme launched by the government in April 2010 to mobilise Russian scientists working abroad and other world-class foreign scientists is of great significance in this context.

The programme is reserved for universities, which submit their applications to a newly established Grant Council.[18] Funding is provided on a competitive basis to Russian teams who will work under the guidance of the selected scientists; these must spend at least two calendar months in Russia. RUB 12 billion are earmarked for the period 2010-12. In 2010, 110 projects were selected to be carried out in 84 Russian organisations.[19]

*Nurturing entrepreneurial spirit and training in innovation management*

Russia is not short of entrepreneurial energy and creative minds but needs to channel them towards the most socially useful purposes in a long-term economic development perspective. As Chapter 1 argues, a prerequisite is to provide framework conditions that at least do not discourage existing or would-be entrepreneurs from investing in innovation-oriented ventures. Creativity and genuine entrepreneurship cannot be taught as such, but the education system can help to reveal and empower these qualities by bridging the divide between S&T and management studies and by providing students with opportunities to experiment, in environments other than an academic lab, applications of the knowledge they acquire.

Many Russian universities are now equipped or associated with business incubators or science parks/technoparks in which students can test their motivation and acquire experience and specific management skills, with the help of business angels and other types of mentors, including foreign enterprises in some cases. There are also schemes managed by FASIE that offer training to scientists who intend to create their own business. Overall, many channels for commercialising academic research through entrepreneurship now exist in Russia, and they are used as training platforms for students. An evaluation of these necessarily dispersed initiatives would be timely and would help to identify and then upscale and spread the best practices.

Russia might instead be lagging behind the worldwide trend to offer students a dual curriculum combining science/engineering education with business/commerce/economics education. This grouping gives students the two areas of skills needed for successful innovation projects and creates favourable conditions for the emergence of multidisciplinary teams of young would-be entrepreneurs.[20] A project of the Management School of Skolkovo is therefore particularly welcome. It aims at training 500 scientists and engineers a year in business and innovation management with the involvement of foreign specialists and professors. The training programme should be available by 2013 and aims to double the student contingent to 1 000 by 2015.

### *3.4.2. Adapting public R&D institutes to the requirements of a modern innovation system*

As noted, under the Soviet system, the bulk of basic research was carried out by the institutes of what is now the Russian Academy of Sciences and most of more applied research in a large number of "branch institutes"; higher education institutions as well as enterprises were negligible players. Over the past two decades many reforms have changed this situation but less profoundly than would have been necessary to ensure the efficiency of the overall investment in the public R&D sector.

At first sight public, R&D investment patterns are not so different from what they were in the early 1990s. In 2008, the RAS received about 15% of the federal budget (a percentage close to its level in 1992), the university about 7% (against 6% in 1992), and the public research centres continued to attract the bulk of the federal money (about 60%). However, these aggregate data hide major changes in two respects: a strong concentration of resources on fewer institutes and an increasing share of competitive funding through various mechanisms. The result is an extremely heterogeneous set of public institutes, in which well-equipped world-class research groups working on national priorities coexist, sometimes under the same roof, with others operating with an unclear mission in survival mode.

*Concentrating resources on fewer selected public research institutes*

In the 1990s, as part of a defensive strategy to protect what were considered the most important and viable parts of the national research system, a number of institutes were granted a special status, that of either state science centre or federal research and production centre. More recently, as part of a more proactive strategy to exploit Russia's comparative advantages globally, the status of national research centre was introduced.

*State research centres (SRC)*: The status was awarded as early as 1993 in the harsh context of the early transition years. About 30 institutes, recognised for the quality of their research teams and equipment, received this qualification. It gives access to extra budgetary resources as well as tax privileges, especially regarding property and land. Today 50 organisations with this status operate in priority areas as diverse as nuclear physics, power generation, aerospace, chemistry, machine building, biology, computer science and optics. Many conduct research for the defence complex. There are 32 in Moscow, five in the Moscow region, and 10 in Saint Petersburg. A selection process takes place every two years under the aegis of the Interdepartmental Commission for Scientific and Innovation Policy. Altogether the SRCs employ 70 000 persons, of whom 42% are researchers; about 7 000 doctors and candidates of science work in the SRCs.

*Federal research and production centres (FRPCs)*. This status, introduced in 1995, is given to organisations operating in the defence, aerospace and nuclear industries that perform development, manufacturing, repair or testing activities and work on the basis of federal defence orders. Their legal status is that of a federal public enterprise or a joint stock company with federal ownership. The Ministry of Industry and Trade, the Russian Space Agency Rosatom, and the Ministry of Education and Science evaluate the activities of FRPCs every five years and decide, in consultation with the Ministry of Defence and the Ministry of Economic Development, whether or not to maintain their status.

*National research centres (NRCs)*. So far this status, introduced in 2008, has been awarded to only one organisation, the Kurchatov Institute, Russia's largest research centre (Box 3.10). NRCs are expected to provide platforms for the development of breakthrough advances in key technologies in which Russia would like to develop or maintain world leadership, such as nanotechnologies or neurosciences. Special funding procedures ensure flexibility and avoid red tape: the institutes are free to make R&D contracts, their researchers are free to take part in the commercialisation of their research results, including through technology-based firms and start-ups. Is it planned to grant the NRC status to eight other research organisations or consortia. These have not yet been selected.

**Box 3.10. The Kurchatov Institute: A prestigious research organisation for innovation**

The Kurchatov Institute is Russia's leading R&D institution in the field of nuclear energy. Founded in 1943 initially to develop nuclear weapons, it was named after Igor Kurchatov, the "father of the Soviet atomic bomb". The majority of Soviet nuclear reactors were designed in the Institute, which also led Russian research in the field of thermonuclear fusion and plasma physics. It developed the first tokamak system in 1968, the foundation of ITER, a current major international megaproject.

The Kurchatov Institute was the first Russian institution to receive the status of state research centre and, as such, became directly subordinated to the Russian government. The prime minister appoints its president, based on proposals from Rosatom.

It is the country's biggest research institution. It initially employed 5 000 researchers but currently has 15 000, following a merger with two other bodies. Thanks to its prestige and political clout, it was able to maintain its researchers' qualifications and research infrastructures at a very high level, even in the difficult 1990s, and expensive new equipment, such as a synchrotron, was inaugurated as early as 1999. More recently, the Institute received support to develop its multidisciplinary capabilities. Notably, a RUB 10 billion top-notch biotechnology lab (genome mapping, protein reactors, etc.) was started.

The government has mobilised the Kurchatov Institute in support of its innovation policy agenda with the idea of building new comparative advantages in emerging technological fields underpinned by sciences in which the country has built undisputed world leadership over many decades.

In 2007 the Kurchatov Institute was entrusted with the task of co-ordinating R&D efforts in nanotechnology to complement the commercialisation activities of the newly established Rosnano. There is a plan to develop a Kurchatov technopark/incubator, but the project has been frozen for budgetary reasons. Innovation developments are, however, taking place as expected, in co-operation with Rosnano.

The decision to concentrate resources on fewer public research institutes (PRIs) cannot be questioned. But the choice of a "special status" approach could be, in light of the historical circumstances under which it was made, the fact that the creation of SRCs and FRPCs had a different rationale from that of the NRCs, and the feasibility of alternative solutions in the current economic and policy environment.

In the case of SRCs and FRPCs, one may wonder why there is still a need for a special legal status to channel priority funding to well-functioning institutions performing quality research in areas important for Russian society. This admittedly somewhat candid question implicitly raises another very serious one. Why do hundreds of low-quality branch institutes continue to benefit from government funding and be to some extent exempted from evaluation as compensation for their lower level of support? Closure, restructuring or full corporatisation, including through privatisation, as occurred in China in less than a decade, would free idle resources, increase the productivity of others, and boost market-led R&D.

For NRCs the issues are quite different. On the one hand, and looking at the first of these, Kurchatov, NRCs can be welcomed as a Russian transposition of international good practices in the promotion of pre-competitive multidisciplinary R&D in areas of strategic importance. On the other, it remains to be seen how new NRCs will be configured in areas other than nanotechnologies, where a strong involvement of the business sector will be necessary and where the lack of an undisputed leader such as Kurchatov will entail greater rivalry among public research actors. Nevertheless, as already advocated by the OECD years ago (OECD, 2004), the centre of excellence approach implemented through research consortia, on a single location or in a more network-based approach, is the way forward for Russian science-based innovation.

*Reforming the Russian Academy of Sciences*

There have been, since the early years of the transition, several attempts to reform the status and management of the RAS. Finally, in 2006, new rules were imposed. The government now has the final word regarding the appointment of the president. The RAS must present an annual report to the federal government on its scientific, financial and other activities, together with plans and forecasts. These decisions, which have elicited intense discussions, have already triggered some significant changes. A number of institutes have been closed, staff reductions have been carried out in others, and budget allocation procedures have started to improve. For instance, the RAS has put in place an internal competitive fund for projects emanating from its institutes, and institutional funding has been reduced to support for staff salaries and maintenance of equipment (see below).

The tradition of separating research and teaching functions is still a source of tensions between the RAS and the universities, especially now that the latter benefit from strong support to develop their research activities. The government has adopted a pragmatic approach towards managing the frictions arising from the convergence of the RAS and universities towards common territories. The RAS entered the education sector a long time ago: its affiliated universities have a dominant position in places such as Novosibirsk, many academicians have always taught, and many RAS institutes have always been training platforms at the postgraduate level. The RAS has also contributed to innovative developments in the higher education sector (Box 3.11).

**Box 3.11. The Saint Petersburg Academic University: An innovative transgenerational campus**

The Academician and Nobel Prize Laureate Alferov created this unique institution under the auspices of the Russian Academy of Sciences. The novel idea is to bring together not only research and education activities, but also different generations, from eminent academicians to teenagers interested in science. The Academy University has three organisations:

- A higher education centre provides training for masters and PhD degrees (about 25 a year) in various fields, including theoretical physics, neutron physics, astrophysics, nanotechnologies, mathematics, information technology, and philosophy.
- A Nanotechnology Research Centre, equipped with most the modern technologies, pursues pioneering research; its funding amounted in 2009 to RUB 34 million (of which RUB 26 million from the federal budget).
- A special lyceum (last four years of secondary school) for educating talented youth recruited through a highly selective process (100 a year).

The Academy is located within a highly knowledge-intensive cluster. It co-operates closely with surrounding institutions such as the prestigious Ioffe Institute and the Saint Petersburg State Polytechnic University.

The intensity and forms of co-operation between the RAS institutes and universities vary from place to place, having often developed as a result of bottom-up initiatives backed by influential academicians, rather than according to a master plan. The federal government has only been directly involved when these relationships were important in the context of large national priority projects. Without stifling the ongoing organic development, the government could accelerate the crystallisation of more structured, stable and fruitful relationships. It should first take stock of the best experiences in Russia, draw the lessons of successes, and then invite proposals on how successful models could best be replicated in different institutional and regional contexts. In doing so it should mobilise a rich foreign experience, notably from countries such as France and Korea where strong public research institutes (PRIs) have had to leave room for growing university research (Box 3.12).

**Box 3.12. The changing role of public research institutes: An international perspective**

Public research institutes (PRIs) have always been important actors in innovation systems and have been the source of important technological and innovation breakthroughs. PRIs were set up to compensate for the market or systemic failures of their respective innovation systems. They have performed a wide range of functions in various disciplines, by conducting "strategic", pre-competitive research, offering technological support to business, support for public policy, support in creating and establishing technical norms and standards, and constructing, operating and maintaining key facilities.

Following World War II, the number and variety of PRIs established for civil and military applications expanded rapidly in many OECD countries. This growth continued in the 1960s but began to slow down in the 1970s. By the 1980s, the relative role of PRIs started to decline in most countries for several reasons, notably the reinforcement of the R&D capacities of the business enterprise sector, reductions in defence budgets and the rise of university research.

In many OECD countries the diversity of PRIs, in terms of their main function, their research orientations and their linkages with other innovation actors and the education system, has contributed to the "fuzziness" of their role in rapidly changing innovation processes. When governments' expectations regarding the contribution of public research to innovation-led sustainable growth rose, many institutes found themselves under considerable pressure to justify not just their performance, but at times their very existence. Significant changes were introduced in the steering and management of PRIs. Together with broader changes in the research environment, PRIs were induced to reconsider their management and strategies. Although this took place in quite specific national contexts, some common trends can be identified.

In many instances, the active involvement of and co-financing by the business sector have become mandatory through privatisation or public-private partnerships. The extension of the role of universities has led to considerable convergence with the activities of PRIs and to stronger competition but also greater collaboration. Competitive funding plays an increasing role in financing the PRIs. Even core institutional funding is often conditioned by terms and targets set out in performance agreements. PRIs are trying to adapt to these new environments, for example through the introduction of new business models based on concepts such as "open innovation". Many institutes are also taking steps to internationalise their operations by opening overseas branches and/or through cross-ownership arrangements.

*Source:* Guinet (2010).

### *Competitive funding of basic research projects*

The Russian Foundation for Basic Research (RFBR), established in 1992, supports basic research on a project basis. Its resources in 2009 amounted to RUB 7 billion, 4% (below the 6% defined in the law) of the total federal civil R&D budget. The budget was reduced by 10% in 2010. Only 2% of the budget is used for the management of the foundation, including the remuneration of its staff of 100 persons. It is overseen by a board of 26 persons from different parts of the society, although most are scientists. It operates as an independent body but has closer relationships with the RAS than with the Ministry of Education and Science.

RFBR funds research teams selected through a rigorous peer review process involving a broad network of 2 000 experts (Box 3.13). It also organises joint calls with foreign research institutions.

**Box 3.13. The review process of the Russian Foundation for Basic Research**

The RFBR outsources the reviews of incoming applications. It co-operates with independent experts throughout Russia; these are prominent specialists, mainly with PhDs. One-third of the experts are renewed every year. According to foundation rules a scientist cannot occupy the position of expert more than six years in a row.

There are nine expert panels (70-100 people each), elected for three years. Eight are thematic, covering an area of knowledge in accordance with the research priorities of the foundation; the other is for targeted basic research. The expert panels are divided into sections (5-15 individuals) in order to be able to cover all the main directions of research in the given area of knowledge. The expert panels and their sections make decisions by majority.

The expertise process is carried out in stages. First the applications are reviewed by 2-3 experts, who work independently and anonymously. Then, together with the results of the expertise, they go to the appropriate section of the expert panel. Next, the expert panel examines the outcomes and works out final recommendations which go to the Foundation Council, whose decision constitutes the last stage of the selection process.

*Source:* ERA Watch (2010).

Since its inception RFBR has financed about 10 000 projects. The distribution of RFBR funds by type of activity and by knowledge area is shown in Table 3.6. The major scheme is the Initiative Research Projects which supports unsolicited research proposals from the scientific community. The average project size in 2008 was about RUB 400 000 and is on a rising trend, and 8% of the budget goes to goal-oriented interdisciplinary fields. RFBR is generally considered a well-functioning source of competitive funding. However, to the knowledge of the OECD review team, no formal and independent evaluation of the impact of RFBR funding on scientific activities and achievements has been undertaken. An evaluation would be useful not only for fine tuning RFBR but also for providing new insights into the dynamics of research in Russia, at the level of teams rather than disciplines or institutions.

**Table 3.6. Breakdown of RFBR funding (2008)**

| By type of activity | % | By knowledge area | % |
|---|---|---|---|
| Initiative Research Projects and other competitions | 59.9 | Physics and astronomy | 19.8 |
| Goal-oriented interdisciplinary research | 7.9 | Engineering science | 13.9 |
| Support for acquisition of scientific equipment | 6.7 | Chemistry | 13.0 |
| Scientific electronic libraries | 4.5 | Biology and medicine | 18.9 |
| International collaborations | 4.5 | Mathematics, mechanics, informatics | 9.5 |
| Mobility of young scientists | 2.8 | ICTs and computing systems | 6.0 |
| Regional and CIS countries' competitions | 6.4 | Geosciences | 14.6 |
| Others, including joint calls with other organisations | 5.6 | Humanitarian and social sciences | 4.3 |
| RFBR staff and peer review panels | 2.2 | | |

CIS = Commonwealth of Independent States.

*Source:* RFBR, 2009 Annual Report.

*New funding structures for R&D institutes*

A research market has now emerged in Russia, together with multiple sources of competitive funding. This rewards good performance by research institutes and allows the government to use funding more effectively as a steering mechanism to induce desired changes in public research. For example, as a result of the reform mentioned above, a number of RAS institutes must now finance a significant part of their budget through contracts and competitive funding. Typically, their funding structure is now as follows: 30% from contracts for services to government departments or regional authorities, with Russian or foreign enterprises, and from international sources; 70% from the federal budget, of which more than three-quarters is core funding for staff and equipment, and the rest is competitive funding from RAS, the FTPs, and/or the Russian Foundation for Basic Research. Similar ratios can be observed in other public or university R&D institutes. The government has allowed public research institutes to reward the researchers involved in projects attracting non-core funding with salary increases.

This new funding pattern and the associated incentives help to raise the quality and relevance of public research institutes. But some safeguards are needed to avoid possible perverse effects of non-core funding: mission drift towards remunerative activities, at the expense of more strategic ones; crowding out of the development of a private sector of technological services; use of research contracts as quasi-subsidies in opaque research and production networks, etc. Experience in OECD countries would seem to suggest that some of these risks are real but only when the share of non-core funding is significantly higher than it currently is in Russia. However, in the Russian context they could materialise more easily if only because of the specific features of the technological services market: the lack of a strong private sector on the supply side, and the importance of state-owned firms belonging to the same networks as research institutes on the demand side.

The main safeguard is monitoring and evaluation of individual institutes and of the whole system.[21] As long as core funding is systematically renewed on a yearly basis with insufficient consideration of performance, there will be severe misallocations of resources, and inefficient organisations will survive. Also, in the absence of evaluation, new funding requirements might encourage good organisations to pursue adventurous strategies to maximise the proceeds from contract research. To reinforce the evaluation culture, methodologies and institutional mechanisms, Russia could draw on a rich international experience (Box 3.14).

### *3.4.3. Promoting business R&D and innovation*

Inducing the business sector to become more involved in innovation is an issue of paramount importance for Russia and calls for a whole-of-government approach. Chapter 1 discussed the need to improve key framework conditions (competition policy, corporate governance, public procurement, labour market regulations, the tax system, etc.). This section focuses on the contribution of S&T and innovation policy *stricto sensu*, against the background of the information provided by Chapter 2 on the specific features of the business sector in Russia.

A striking feature of the current S&T and innovation policy toolkit is that while the stimulation of business R&D is at top of the policy agenda, very few instruments channel direct financial transfer to the business sector through the types of schemes that are widely used with success in other countries. Financial support is provided indirectly, through the public research sector, an approach very seldom found in OECD countries.[22] This must be understood in a context in which the government, especially the Ministry of Finance, is extremely reluctant to use any tool that is not "corruption-proofed" and/or would be hard to manage by the existing bureaucracy. However, this reduces the overall efficiency of the Russian innovation policy mix.

**Box 3.14. Evaluation of publicly funded research: International experience**

Evaluation is now a central part of the management and governance of publicly funded research in OECD countries for two main reasons. First, greater expectations regarding S&T as a key driver of sustainable growth at a time of tighter fiscal discipline led governments to look at research activities in terms of their ultimate relevance while taking greater care to ensure that public investment in the research system achieves the expected social return. Second, changing drivers of increasingly globalised innovation processes have forced decision makers to become more adaptive in optimising support policies; evaluation has played a central role in more self-reflective and evidence-based policy making, including international benchmarking, which has helped to spread good practices. The refinement of evaluation methodologies has both enabled and resulted from changes in evaluation practices.

Evaluation is carried out at four levels: *i)* research performers, *i.e.* the groups that effectively carry out research activities, such as research departments, laboratories or teams; *ii)* research institutions, *i.e.* the large organisations in which research performers operate; *iii)* support programmes and schemes managed by ministries and S&T policy agencies; and *iv)* systems consisting of whole research systems or sub-sets of thematic R&D policies. Broadly speaking, the first two levels of evaluation show some main trends.

Research institutions have demonstrated renewed interest in the evaluation of their research groups and have adopted new approaches with some common key elements:

- They aim at improving the allocation of core funding, following two complementary models, one based on open competition between institutes for access to additional funding, and the other based on inducing individual institutes to focus their activities on strategic projects.
- Significant participation by foreign experts has become the norm and even foreign-based peer review committees are no longer rare exceptions.
- The evaluation processes are institutionalised in a way that strengthens their impact on decision making regarding the funding and organisation of research.

In the case of university research, a growing trend has been to provide budgetary support directly to research groups, based on an evaluation at a higher level than the research institution to which they belong. It has two main aspects:

- One is the sophistication of the allocation mechanisms of core grants to university research groups at the national level. It leads to bypassing the intermediary level of universities. The archetype is the United Kingdom's Research Assessment Exercise (RAE).
- The other, which first concerned university research institutes but later other public research organisations, reflects a growing concern to achieve critical mass and excellence and leads to a growing concentration of public funding on a limited number of laboratories or centres, often in the context of public-private partnerships.

There have also been interesting developments in the evaluation of research institutes, funding agencies or research councils. For a long time evaluations mostly focused on research institutes and were one-off events, following the "distinguished scientist model", in which a small group of scientists is entrusted with the task by political decision. In the last decade, this picture was altered, if not radically changed, by three main trends.

- The evaluation of funding agencies or research councils has become a frequent, if not yet common practice, with the professionalism of their management an important objective.
- The frequency, motives and focus of the evaluation of research institutions have changed, and greater attention is paid to their contribution to the efficiency of the overall innovation system.
- Correlatively, the "distinguished scientist model" of evaluation has been gradually replaced by one in which consortia of professional multinational evaluators – academics, economists, sociologists, in addition to scientists – play a central role in a process open to the participation of all major stakeholders.

*Source:* OECD, based on OECD (2006a).

Another problematic feature is the "high-technology bias" of the overall support system. The benign neglect of non-technological innovation cannot be justified by the nature of Russia's comparative advantages, since even in research-intensive industries value creation processes require many forms of creativity and thus a good deal of "soft" innovation.

Currently, the main policy initiatives undertaken are of three types, according to their main objective: fostering collaboration between the business and the public research sectors, promotion of new technology-based firms, and stimulation of innovation by large firms. Some specific measures directed at these objectives have already been discussed, *e.g.* public/private partnerships in the framework of some federal target programmes and R&D tax incentives.

*Fostering co-operation between the business and the public research sectors*

In contrast with OECD countries, where the mobilisation of the public sector to support business innovation became a top priority early, in Russia attention was for a long time mainly paid to restructuring the public research sector, at times with some consideration of the contribution that the emerging business sector could make. With the maturation of the Russian market economy and progress achieved in reshuffling the public research sector, policy orientation has gradually shifted and recent years have seen initiatives more in line with international good practices.

A turning point probably came in 2003 with the launch, at the initiative of the Minister of Education and Science, of Megaprojects, a pioneering public-private partnership to support innovation projects with a clear market orientation. A number of specific technologies with strong commercial potential were selected, with the active involvement of the business sector. Next, 12 projects were chosen for support up to the pre-industrialisation phase in diverse fields (*e.g.* new types of materials, genetically modified seeds, high-performing diesel engines). A total of about RUB 8 billion was invested over four years (2003-07), of which half from non-government sources and the other half from the budget of the RAS or of branch institutes associated with the projects. This programme can no longer be identified in the portfolio of instruments of the ministries concerned. It is likely to have been integrated in broader schemes, such as the FTPs.

In 2010, the government introduced a new mechanism to stimulate R&D co-operation between the business sector and universities.[23] It will provide the business sector with incentives to collaborate with research groups in universities. The novelty is that the scheme is not narrowly targeted at specific technologies and that support is explicitly directed at enterprises, through matching funds of up to RUB 100 million a year per project, provided that the enterprise invests an equivalent amount, of which at least 20% should be used to finance the part of project carried out by the university research team(s). This programme should have very significant impacts, given its large total budget (RUB 19 billion for 2010-12) and the fact that the implementation procedures seem to have been well designed.[24]

Another very recent decision that epitomises the renewed efforts of the Russian government to foster science-industry relationships is the creation of Technology Platforms, a programme to bring together the business sector and the R&D institutes and provide a framework for their more intensive co-operation. Promoted by the Ministry of Economic Development and officially announced by the government in October 2010, this initiative, inspired by EU experience with such platforms (38 currently in operation), aims at improving the efficiency of the overall national R&D effort by reducing "duplications that currently lead to enormous waste",[25] and by focusing on areas in which capabilities match market opportunities, as identified by the business opportunity, and which fit the priorities set out by the presidential commission. A preliminary list of 14 proposed platforms was presented in December 2010 (Box 3.15). Under each platform, "sub-platforms" (a total of 170) will be set up to discuss issues and perspectives in narrower technological fields. In each case a designated organisation, such as a state corporation (*e.g.* Rosnano or Rostechnologii), a leading research institute, or a business association, will lead the discussions and report on their outcomes.

**Box 3.15. Technology platforms (as of December 2010)**

| | |
|---|---|
| Energy | Traditional industries |
| Gas and oil production and processing | Biotechnology |
| Transport | Medical technology |
| Space technology | Radiation technology |
| Consumer technology | Agriculture and food |
| Information and communication technologies | Technologies for the development of the Arctic |
| Electronics and instrument making | Others |

*Source:* Ministry of Economic Development.

Technology platforms are particularly welcome as they will help the government to co-ordinate and assess from a systemic perspective a large number of scattered support measures and schemes, in order to monitor and magnify their impact. As a useful addition to the policy governance structure, they will also provide space for exchanges of ideas between policy makers and policy users and the elaboration of new proposals.

*Supporting new technology-based firms*

The development of the SME sector has been a key priority since the early years of the transition for the obvious reason that its development was vital for building a well-functioning market economy. The first step was the creation in 1992 of the Russian Agency for Small and Medium Sized Enterprises, with the support of the United Kingdom's Know How Fund. In 2007 a new law on SME development was passed which simplifies their accounting and taxation and secures access to public procurement (20% reserved for SMEs). Shortly after his inauguration in May 2008 President Medvedev signed a decree on urgent measures to eliminate administrative barriers to entrepreneurship and achieve speedy development of relevant legislation. Several initiatives followed, including one-stop shops where small firms can easily find information on and access to the different types of incentives available and the various regulations and related administrative channels.[26]

The Foundation for Assistance to Small Innovative Enterprises

SMEs, especially new technology-based ones, have also been identified as an important vector of innovation. The Foundation for Assistance to Small Innovative Enterprises (FASIE), also known as the Bortnik Foundation after the name of its initiator, was created in 1994 to support their creation and initial development.

Today, with resources amounting to 1.5% of the total civil R&D budget, FASIE channels its support through seven main programmes (Box 3.16). The largest is START, which was to some extent modelled on the US SBRI (Small Business Research and Innovation) programme. The foundation has funded some 7 500 projects and has reviewed more than 20 000 applications. While only 5% may have survived, a number are clear success stories.

FASIE has been adaptive. Its toolkit and procedures have evolved, not only in response to national policy guidelines but also because it has been able to learn from experience. For example, in recent years it has emphasised "seed financing" to the benefit of young scientists willing to commercialise their ideas (in co-operation with the Russian Venture Company, see below).

The work of FASIE is much appreciated in all circles. It obviously fulfils a special role in the Russian innovation system. It is a funding agency but also a strong and influential advocate of innovation and, more broadly, an efficient "agent of change" working in close contact with the new generation of talented Russians.[27] As a sign of the government's recognition of this role, the FASIE budget has recently increased substantially (RUB 3.4 billion in 2010, compared to the RUB 2.4 billion initially planned, and RUB 4.0 billion in 2011).

**Box 3.16. The programmes of FASIE**

- START provides assistance to would-be innovators in two stages, seed money for prototype development, test, patenting, etc., and start-up support. Up to RUB 6 million can be granted over three years, with RUB 1 million the first year, RUB 2 million the second, and RUB 3 million the third. There is no project selection in the first stage: all submitted projects can be funded; projects for the second stage are selected through competition. The support takes the form of fee-free, non-repayable grants (federal contracts).
  - Since 2004, more than 12 000 applicants have benefited from START; 2 906 small companies went through the second stage; and 62 companies have successfully completed the third stage, *i.e.* 5% of the 2004-06 winners (1 357). The average turnover per company is RUB 15.5 million a year, a significant amount in the Russian context.
- UMNIK (Clever) supports young scientists who wish to undertake innovation projects. It benefits students, postgraduates and young researchers aged between 18 and 38. Winners receive RUB 200 000 to advance their innovation projects and get training and, if selected for a second phase, they again receive RUB 200 000.
  - Since 2007 UMNIK has received more than 30 000 applications. Over 4 000 people were selected and 45 businesses have been created. It is planned to increase the number of young scientists supported by UMNIK to 1 500 a year.
- PUSK (Launch) supports projects developed through a partnership between a company and a higher education institution.
- TEMP (Technologies for small enterprises) supports the acquisition by small companies of new technologies and engineering solutions by paying the licence costs and the subsequent R&D expenditures for exploiting it (to be completed within three to four years).
- RAZVITIE (Development) supports development and commercialisation projects in established small companies through a competitive process.
- STAVKA (Interest rate) repays part of the interest costs of bank credits provided to small companies subsequently engaged in specific R&D projects.
- INTER supports small companies that are residents of special economic zones and designated technoparks.

The support provided to innovative start-ups by FASIE is obviously vital and could certainly be extended, as there is unmet demand (as shown by surveys undertaken by the Foundation in university and research structures). However, it is not only "more of the same" that is needed and FASIE cannot be expected to "do it all". Complementary measures are necessary to overcome current limitations, as a number of young firms do not survive the stage at which projects require more investment (much above the upper limit of some USD 150 000 per project provided by FASIE) but the market is still out of reach or insufficiently prepared. In Russia, this "Death Valley" seems to be even more daunting than in most OECD countries, owing to the underdevelopment of venture capital (see below) and alternative sources of financing that are able and willing to back promising but risky ventures.

The Russian authorities should take the need to correct this market failure seriously by opening new channels of support in the form, for instance, of subsidies that are reimbursable in case of success, or of state guarantees for bank credits, even though fears of corruption might complicate their design. They could find in many OECD countries examples of successful schemes, such as France's OSEO Agency (the former ANVAR), to mention only one (Box 3.17). A welcome first step in the right direction is the opening, in June 2009, of a new line of SME support by the Bank of Development and Foreign Economic Relations (Vnesheconombank). Through its programme *Financing for Innovations and Modernisation*, Vnesheconombank now supports innovative SMEs, not directly but via banks or infrastructure support entities (*e.g.* certified technology centres, technoparks or incubators) that select eligible enterprises.

**Box 3.17. OSEO: The French SME support agency**

The French government created OSEO in 2005, by bringing together ANVAR (the former French innovation agency) and BDPME (the former SME Development Bank) to strengthen and rationalise public support to SMEs. OSEO provides assistance and financial support to SMEs in all the main phases of their life cycle (start-up, development, business transfer/buy-out), using a set of instruments: information, grants, loan guarantees, equity financing.

In 2009, OSEO assisted 80 000 enterprises in their early or later stage of development, notably through EUR 12 billion in loan guarantees and EUR 500 million in financial support to innovation (which leveraged a total of EUR 2 billion in related investment).

This financial support for innovation has two interesting features. First, there are two types of risk sharing, depending on the characteristics of the firm and its innovation project: subsidies reimbursable in case of success (EUR 380 million in 2009) or pure grants (only EUR 180 million in 2009). Second, a significant part of this financial support is channelled through programmes that are not SME-specific in order to ensure consistency between SME support and the broader innovation policy strategy, *e.g.* priority innovative clusters ("poles of competitiveness"), collaborative innovation involving other firms and public research organisations, and international co-operation, especially in the context of European projects.

Improved financial support alone is unlikely to provide the necessary boost to the renewal of industrial structures through the market entry and subsequent growth of new companies that are more innovation-minded than incumbent firms. Specific regulatory obstacles might have to be removed and, most importantly, large firms have to play their structuring and leading role in dynamic innovation networks more fully, as they do in all advanced countries (see below).

Regarding regulations, the recent decision to facilitate scientists' investments in innovative ventures is worth noting. A government decree (No. 217) was passed in August 2009 to allow university and RAS researchers to invest in innovative ventures and science commercialisation undertakings. It has already had some impact.[28] However, serious problems of implementation have arisen, demonstrating that one regulatory obstacle can hide others.[29]

Young innovative enterprises that have to cope with the inherent risks of innovation are particularly vulnerable to uncertainties and other disincentives in their business environment.[30] Chapter 1 suggests guidelines for the upgrading of relevant aspects of the broad business environment, including those that influence the incentives of large firms to innovate and thus create markets and spillovers that benefit smaller ones.

### Venture funds

The government set up in 2006 the Russian Venture Company (OJSC RVC) with a total investment of RUB 30 billion in which it holds 100% of the equity shares. The government is represented in RVC by the FASIE. The RVC is a "fund of funds" which has invested in ten venture foundations (two under the jurisdiction of the United Kingdom) with a total capitalisation of RUB 22 billion, of which RUB 12 billion from RVC (Table 3.7). The legal status of the venture foundations is a "Closed Equity Investment Fund" (CEIF) with co-investment of RVC and a private entity at 49/51%. The foundations should invest in companies operating in areas corresponding to government priorities or a list of critical technologies.

**Table 3.7. Venture funds supported by RVC**

| | RUB million |
|---|---|
| VTB - Venture Fund | 3 061 |
| Bioprocess Capital Ventures | 3 000 |
| Maxwell Biotech | 3 061 |
| The Leader - Innovations | 3 000 |
| Tamir Fishman CIG Venture Fund | 2 000 |
| S-group Ventures | 1 800 |
| New technologies | 3 061 |
| The RVC Seed Investment Fund | 2 000 |
| Russian Venture Capital I LP | 300 |
| Russian Venture Capital II LP | 300 |

As of July 2010, the ten CEIF had examined more than 1 500 projects, and 31 companies had been supported for a total of invested capital of RUB 4.5 billion. The main areas of investment are biomedical technologies, power engineering and energy saving, information and telecommunication systems, and software manufacturing.

The relatively limited investment so far by RVC in Russian firms has elicited criticism, including by Russian auditors who have pointed to its under-spending. In particular, the venture funds do not seem to invest enough in early stages of project development. In order to fill this gap, a "seed investment fund" has been established jointly by RVC and FASIE, with a RUB 2 billion budget, which will provide up to 75% of the resources needed by eligible innovative projects.

The federal government has also encouraged the formation of regional venture funds, 23 of which have been created in 21 regions, in the form of CEIF with private partners and representatives from the regional government and the Federal Ministry of Economic Development (the experience of the fund established in the Republic of Tatarstan is discussed below). As of mid-2009, the total capitalisation of the regional venture funds was RUB 8.6 billion with federal appropriations amounting to RUB 2.1 billion, and 29 companies had been supported with a total of RUB 1.4 billion. In 2008, the Ministry of Economic Development initiated a new scheme to help three mono-industrial or depressed regions to support the creation and development of small companies through state/private partnership (RUB 100 million per region).[31]

The venture capital industry is obviously still in its infancy in Russia. The limited number of deals, considering the huge size of the economy, cannot yet have any significant impact on the country's economic performance. It is difficult to change this situation because in the current Russian context venture capital cannot be "the" trigger for accelerating the renewal of the industrial fabric. The growth of venture investment in innovative firms will be severely constrained as long as a new dynamic has not taken firmer shape on the demand side of the financial market. More innovative big firms will have to create much larger market opportunities and knowledge spillovers for smaller ones (see below). The government should continue to promote the development of VC funding and associated financial mechanisms such as specialised secondary markets, but also maintain as long as needed the different forms of transitory support that can compensate for their immaturity.

*Stimulating innovation in large enterprises*

The majority of large Russian firms, which account for a large share of gross domestic product (GDP) and employment, are currently not interested in innovation. Yet, the Russian government will not achieve its ambitious goals of economic modernisation and innovation-led growth without the active engagement of a large number of them, whatever the dynamism of the SME sector. When looking for ways to unblock this situation, it is important to be clear about the reasons for this widespread neglect of innovation in large firms' strategies. The two main reasons are interrelated but very different in nature. Government should therefore act on two fronts, and S&T policy should contribute on both. The first is the legacy of a system that separated research from production. The second is the lack of competition but also other factors that distort corporate investment patterns by creating "monopoly rents" that are much higher than "innovation rents" which are too low owing to the structural problems of the industrial research sector.

It is far beyond the scope of this report to review all of the policy implications. Chapter 1 has addressed those relating to competition and corporate governance. Here, it suffices to underline again the importance for Russia to take decisive actions and to mention some recent initiatives more closely related to the S&T and innovation policy agenda that seem to be important steps in the right direction.

The prime minister has instructed the Ministry of Economic Development to formulate R&D and technological performance contracts to be underwritten by state-controlled corporations. Two groups of about 20 enterprises each have been identified. The first comprises state-owned enterprises with a clear commercial orientation, such as Gasprom, Rosneft and Aeroflot. They are requested to establish strategic development plans with detailed objectives for R&D and technological renewal and will have to report on their implementation to the prime minister's Commission on High Technology and Innovation. The second group includes enterprises in the public services sector, such as transport, airports and communications. They are also to establish strategic development plans and will report to their respective parent ministries (*e.g.* trade and industry, communications and medias). A public/private partnership working group, chaired by a vice minister of economic development, will administer the whole exercise. It remains to be seen how well this contractual and, at the same time, directive approach is able to counteract the factors that have so far pushed the concerned enterprises in other directions.

Again, this points to the urgency of bold decisions regarding the organisation and governance of the large enterprises that are expected to play a vital role in the modernisation through innovation of the Russian economy. In this respect, the new round of privatisations of around USD 40 billion of assets decided by the government in autumn 2010 represents a golden opportunity. It will concern enterprises from many sectors, including many that are currently under the umbrella of the state corporation Rostechnologii.[32]

### *3.4.4. Fostering the development of competitive innovation-oriented industries*

Owing to the inherited scientific and industrial specialisation of Russia, discussed in Chapter 2, but also to the myopia of the dominant innovation policy concept, mentioned above, the government of Russia has so far directed the bulk of its S&T and innovation-related investment to high-technology industries such as space, aviation, nuclear and defence. More recently it has put major emphasis on nanotechnologies with the aim to build globally competitive industries. However, this does not mean that government innovation policy has shaped all sectoral patterns of innovation. For example, it played a rather limited role in the success of the software industry (Box 3.18).

*Space, aviation, nuclear and defence technologies*

These sectors were built during the Soviet era and went through very difficult times during the transition, as they found it hard to adjust to the new environment. They have lost weight and influence but remain centrally positioned in the technology-intensive part of the industrial structure. To survive and resist harsh changes, they could always count on some support from the government, and more broadly from society, because of their importance for national defence policy, because they employ a large number of citizens, and because they are repositories of "national treasures" of skills and sophisticated equipment that are hard to reconvert to other uses but have to be preserved and are a subject of national pride. For all these reasons they still capture today the lion's share of the federal budget devoted to S&T and innovation. Military R&D alone represents at least 50% of the national R&D effort.

In each sector, however, an important restructuring process has been going on and is set to continue, notably in light of the recent announcement of an imminent new round of privatisation. The creation of state corporations in 2007 was the climax of the effort to give a clear leadership role to a powerful organisation in each sector, a kind of "national industrial champion" that, in the Russian context, would also be a new layer of policy governance. The space industry is now in the hands of the Russian Space Agency, Roscosmos. The aviation sector is led by a consortium – the United Aircraft Corporation – a grouping of the major aircraft design bureaus (Sukhoi, Tupolev, Ilyushin and

Yakovlev), and the source of almost 50% of the total sales of the industry. Rosatom, and its subsidiary Atomenergoprom, in charge of civil assets, lead the nuclear industry. The armament industry is in the hand of a few large holding companies, notably Rostechnologii, which accounts for 25% of the total sales of the defence sector.

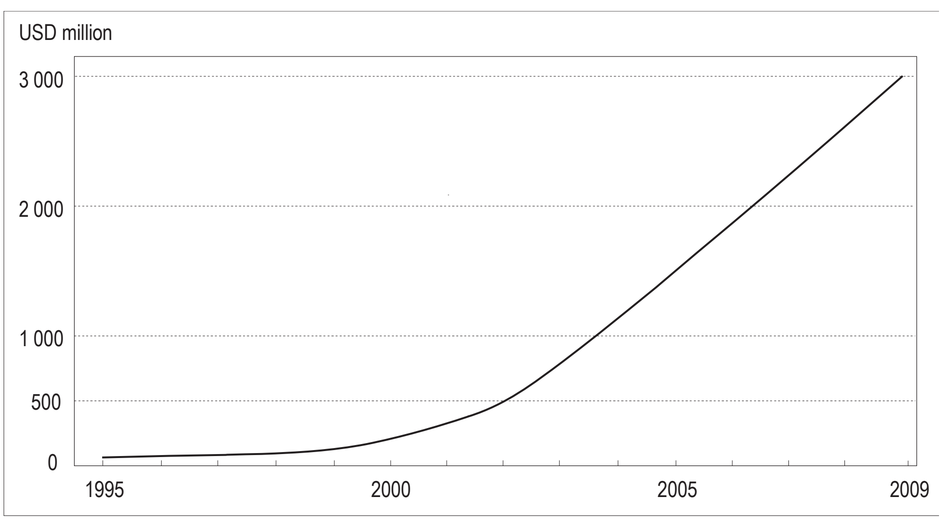
**Box 3.18. The Russian software industry: A success story**

The software and IT services sector is a clear success story. Starting in the early 1990s and developed by dynamic, highly qualified entrepreneurs from the Russian science system, it has grown at double-digit rates. The Russian software development revolution has been comparable to that of India and Israel, although with different patterns and prospects.

The Russian software industry is concentrated mainly in Moscow, Saint Petersburg and, to a lesser extent, Novosibirsk. It has three components: software packages, offshore programming and captive software development centres. The market is dominated by SMEs that occupy small market niches, so that they do not compete primarily with one another, but mainly with foreign software developers in both domestic and international markets. The most successful are small companies with flexible organisational structures located on major universities and research institutions, as well as R&D centres established in Russia by international ICT corporations.

A good indicator of the competitiveness of the Russian software industry is the skyrocketing growth of its exports, which reached USD 3 billion in 2009 (see figure below). The industry is also closely integrated in the world economy through substantial inward and outward foreign investment. It competes with global players without government protection.

**Dynamics of Russian software exports**




The Russian software industry specialises in complex and sophisticated projects requiring very strong technical skills and creativity. It needs to continue to maintain a competitive edge in the high-end segments of the offshore development markets and in packaged software. With higher wages in the IT sector than in India and China it is unlikely to challenge large emerging economies in the offshore IT business process outsourcing market. As a whole its future seems bright provided that the overall business overall climate allows Russia to retain the human capital on which its comparative advantage relies. As pointed out by Crane and Usanov (2010), currently "bribing inspectors, tax collection agents, and the police places a substantial burden on companies. … A climate of intimidation and fear discourages entrepreneurs from expanding their business and puts a premium on moving assets outside Russia." The improvement of framework conditions for innovation is therefore the major contribution that the government can make to the further development of this promising industry (see Chapter 1).

A recent evaluation of performance in these sectors shows a mixed picture (Crane and Usanov, 2010). In the space sector, Russia continues to hold a strong position on the launcher market, with its Soyuz rockets.[33] In aeronautics, attempts to enter civil export markets have not been very successful, except to some extent through joint ventures with foreign partners and for components and technological services (Table 3.8). In the nuclear industry, Russia has secured a strong position in uranium enrichment (with superior centrifuge technology), but faces greater challenges for selling nuclear power plants. For armaments, a large part of exports (around 70%) have been deals with China and India and some developing countries. At the same time, as mentioned, the Russian industrial-military complex has had increasing difficulty supplying the Russian army in a timely way and at the expected level of cost and quality, a situation that led the government to open some of its procurement to the foreign competition, recently in warships.

**Table 3.8. The Russian aviation industry: Some performance indicators (2008)**

| | Unit | |
|---|---|---|
| Sales of the aviation industry | RUB billions | 27.8 |
| Sales within co-operation projects | RUB billions | 4.1 |
| After-sales services | RUB billions | 3.9 |
| Exports of technologies and technological services | RUB billions | 0.5 |
| Sales of airplanes | Numbers | 11 |
| Patents | Numbers | 31 |

*Source:* ERA Watch (2010).

*Nanotechnology: A top national priority*

The Russian government has great expectations regarding the possibility of becoming a world leader in many applications of scientific advances in nanotechnology, as demonstrated by its large and growing investment in this field (Table 3.9).

**Table 3.9. Public and private spending on nanotechnology**

RUB billions, 2008-15

| | 2008 | 2009 | 2010 | 2011 | 2012-15 |
|---|---|---|---|---|---|
| R&D | 8.2 | 9.8 | 11.2 | 13.1 | 25.7 |
| Infrastructure | 10.9 | 9.1 | 9 | 2 | 0 |
| Rosnano spending | 20.3 | 21 | 22.8 | 19.5 | 80.5 |
| Private investments in Rosnano projects | n.a. | n.a. | 6.5 | 7 | 40 |
| Other | 0.1 | 0.3 | 0.4 | 0.6 | 0 |
| Total | 39.5 | 40.2 | 49.8 | 42.2 | 146.2 |
| In USD billion[1] | 1.3 | 1.3 | 1.7 | 1.4 | 4.9 |

1. At RUB 30 = USD 1.

*Source:* Crane and Usanov (2010).

In 2008, nanotechnology attracted about 5% of total federal civil R&D spending. The R&D programme is implemented though an FTP and mobilises a large network of institutes and higher education institutions (for teaching and training). It is co-ordinated by the Kurchatov National Research Centre. Complementary investment in commercialisation through Rosnano is already significant, and is likely to increase over time with growing co-investment by the private sector.

It is too early to assess the impact of the Russian policy to promote the development of nanotechnologies and their industrial applications. The jury will be out for some time (Crane and Usanov, 2010). For R&D, the government should closely monitor performance indicators, such as trends in scientific publications in nanotechnology; Russia ranked sixth in the world when the new policy was introduced. For commercialisation, one benchmark is that, in terms of patents, Russia only ranked 16$^{th}$, and there are hardly any other internationally comparable indicators (*e.g.* on firm creation, turnover of the nanotechnology industries). However, there is some anecdotal evidence on early successes.[34] It is also important to take into account that the first years of operation of Rosnano, a new institution in a new technological field, have necessarily been to some extent a trial-and-error process that is vulnerable to changes in the economic environment. For example, in 2009, as a result of the crisis, the Russian government instructed Rosnano to transfer approximately half of its funds back to the federal budget for other expenses.

*Revitalising other industries*

The Ministry of Trade and Industry has recently outlined a series of plans to revitalise a set of industries under its supervision, namely: electronic components and equipment, automotive, pharmaceuticals, metallurgy, shipbuilding and light industries (including agro-food, textiles and clothing). These industries suffer from common problems, partly inherited from the planned economy, partly created afterwards by government failure to put them under strict market discipline. This has translated into insufficient capabilities and incentives to innovate. Of course, certain exceptions reveal success factors that government should consider in orienting its action in more problematic industries.[35]

For each industry, strategic objectives have been set for the 2015-20 horizon, a diagnosis has been made (notably regarding the degree of technological backwardness), and a process of consultation with the concerned actors has been set up to define the need and form of government action, mostly using available instruments. Depending on the industry, these instruments may include federal technology programmes (of particular importance for the electronics industry), regulations and standards (for the consumer industries and pharmaceuticals), the restructuring of enterprises (automotive industry), or military procurement (shipbuilding). It is surprising that the potential role of collaboration with foreign partners for technological upgrading and better integration into global market is barely mentioned.

*The energy and natural resource sector: a source of wealth but not yet an innovation pole*

Large enterprises such as Rosneft and Gasprom seem to invest large amounts in R&D, but their technological performance has been weak compared to leading foreign companies, not only from the large advanced countries, but also from smaller ones (*e.g.* Norway's Statoil), as well as emerging ones (*e.g.* Brazil's Petrobras). The industry has long failed to invest in the latest technical advances, which explains why the production and transport of oil and gas in Russia give rise to enormous leakages. This represents a huge economic waste and is the cause of serious environmental damage.

The problem is recognised by Russian policy makers but they have so far found it difficult to resolve. It largely results from a "compromise" between the industry and the government, which balances the industry's desire to maximise profit with the government's desire to keep domestic energy prices low. Now that modernisation has become an imperative, the spotlight is on the fact that the Russian oil and gas industry has become increasingly dependent on foreign equipment and specialists. Moreover, although Russia has kept investing in high-quality specialised education and research, these are appropriated more by foreign than by domestic companies. For example, many of the graduates of the State Mining Institute, located in Saint Petersburg (Box 3.19), while they are not very numerous, cannot easily find jobs that fit their high qualifications in the Russian industry, one of the largest in the world.

**Box 3.19. The Saint Petersburg Mining Institute: A future-oriented heritage**

Founded by Catherine II in Saint Petersburg, the Mining Institute was the first higher education institution established in Russia. It is one of the oldest mining schools in Europe and home to one of the world's finest and most exclusive collections of minerals, gem samples and mining equipment miniatures. It was designed as an elite body in charge of training the nation's mining engineers.

It currently hosts 7 000 students – of which 45% are women – through a highly selective process (one position for 20 applicants in 2009) and provides engineering diplomas up to doctoral degrees. It performs almost 50% of the R&D work of the mining and natural resource sectors in Russia. It receives 85% of its funding from the business sector (Russian and foreign firms). It was recently granted the status of national research university.

The fact that foreign firms recruit the majority of the best graduates proves the excellence of the institution, but is also an indication of Russian firms' low interest in technological development.

Changing course is a difficult task but also a great opportunity if energy policy is properly included in the innovation policy agenda. Many actions to be considered fall outside the scope of this report, such as energy pricing, environmental regulations or competition policy. The actions that fall under the mission of S&T and innovation policy should be dealt with through a cluster approach that could be developed using the relevant technology platform(s)[36] (Box 3.20).

### *3.4.5. Providing supportive infrastructure to innovators*

The availability of and easy access to appropriate physical and immaterial infrastructure is crucial to the success of innovative firms. In this area Russia had to reconfigure a very large set of regulations, pre-existing facilities, sites and organisations, while creating new ones. A myriad of incubators, technology centres, science and technoparks, as well as special economic zones have appeared in the last 15 years, as a result of federal decisions but also of regional initiatives driven in part by interregional competition. For the federal government at least, the time has come to learn from sufficiently extensive experience in order to implement a more selective approach to infrastructural development, with priority to projects that are of global or national significance (*e.g.* Skolkovo Innovation City) or that can have a real impact at the regional level.

**Box 3.20. A cluster approach to innovation policy: Lessons from the experience of OECD countries**

Governments can nurture the development of innovative clusters primarily through regional and local policies and programmes to stimulate knowledge exchange, reduce information failures and strengthen co-operation among firms and between firms and knowledge institutions. But more direct policy tools can be used at the national level to encourage cluster formation and development, such as public-private partnerships for R&D, public procurement, and competition for government funding to provide incentives for firm networks to organise themselves on a regional basis. OECD work suggests that efficient cluster policies:

- Build a shared vision, based on a sound diagnosis of initial conditions, and ensure a vibrant dialogue between industry and government in defining and implementing the cluster development strategy.
- Catalyse rather than plan local development, by bringing actors together and supplying enabling infrastructures and incentives.
- Back and empower local leaders instead of trying to "pick winners".
- Improve availability of and access to key resources (skilled people, R&D, physical and "intangible" infrastructure, smart money).
- Avoid high-technology or manufacturing myopia and recognise the importance of knowledge-intensive services and of technological upgrading of traditional industries for innovation-led growth.
- Build on existing innovation networks, but keep incentive schemes open and attractive to outsiders, especially new firms.
- Customise policy approaches to fit the specific needs of different industries and technological fields, since, depending on a cluster's characteristics, the government's role for addressing the following problems varies: lack of interaction; informational imperfections, mismatch between knowledge infrastructure and business needs, lack of sophisticated demand.
- Leverage regional resources through interregional co-operation and participation in national and international innovation initiatives.
- Allow experimentation and learning-by-doing in an area which still has large scope for improved international diffusion of good practices.

**A typology of innovative clusters**

| | | Knowledge intensity | | |
|---|---|---|---|---|
| | | Low | Medium | High |
| Sectoral focus | High | Some industrial districts (e.g. shoes, textile)<br>Product-specific agro-food cluster | Sub-contactors co-located around a large firm<br>Some industrial districts (e.g. machine tools) | Small bio-tech firms co-located around a major university or public lab |
| | Medium to low | Natural resource-based network of small firms (e.g. tourism) | A diversified set of interrelated activities serving a localised physical infrastructure (e.g. the port of Rotterdam) | A diversified set of interrelated activities drawing from a localised knowledge infrastructure (e.g. Silicon Valley) |

*Source:* Guinet (2003), partly based on OECD (2001).

*Technical standards and metrology*

Technical norms and standards constitute a major element of the immaterial infrastructure of innovation. The size of the system in place in Soviet times was exceptional, with more than 30 000 employees, the presence in each industry of technical institutes specifically devoted to formulation, testing, certification, etc., and more than 100 antennas located all over the territory. Central bodies were plugged into international systems such as ISO (International Organization for Standardization), in order to facilitate linkages and compatibility with Russian practices and standards. Over a few years, this system fell into decay, owing to a lack of resources and the loss of the industrial structure in which it was embedded. A Federal Agency for Technical Regulation and Metrology is now in charge of all related matters.

There has been for some time renewed interest in this crucial topic, and a new policy has been formulated (Centre for Strategic Partnership, 2008). It is inspired by international good practices, which ensure a good balance between mandatory norms (called "technical regulations") and voluntary norms (called "national standards"). Committees have been formed in important fields such as production management, environment and ecology, health, ICT, and nanotechnologies. Harmonisation with ISO norms is occurring in certain sectors: *e.g.* in the environment field where 14 000 ISO standards, including for lifecycle management and greenhouse gas accounting, have been introduced as national standards.

*Technology centres and technoparks*

Innovation and technology centres (ITCs) bring together small innovative enterprises, provide them a set of technical, legal, commercial and other services in the same place, and facilitate their co-operation with surrounding research, educational or industrial bodies. Some also provide some form of funding support. The first pilot was established in Saint Petersburg (Svetlana project) (Box 3.21). There were 85 such structures at the end of 2008, 20 of which appeared in that year.

**Box 3.21. The Svetlana ITC pioneering incubator**

In 1995, the first innovation centre in Russia was created at the initiative of the St. Petersburg Regional Foundation for Scientific and Technological Development, with the support of the Federal Ministry of Science. It was located on the premises of Svetlana, the largest electronics company in Soviet times but which had lost most of its markets in the new economic environment. The idea was to use the land, premises and equipment to incubate new technology-based companies that would first exploit knowledge available on the site and in the region.

The impact of the ITC has been both national and local. It has been, and to some extent still is, a very influential policy experiment which has inspired further actions by the federal government. Locally it helped to reconvert some of Svetlana's assets and succeeded in nurturing a significant, although limited, number of new firms. Several companies grew to a respectable size after their incubation by ITC, such as Sveltana-Optoelectronics, Virial and Svetlana-Rost. There are currently more than 30 small innovative enterprises at the ITC working in the areas of opto- and micro-electronics, microwave engineering, chemistry and new materials, metalworking, and software.

ITC has also established itself as an important meeting place for many actors and proponents of innovation, as well as a reference point for would-be innovators.

Business incubators are also numerous and provide premises at special rates along with consulting, legal and other business services. There were 75 accredited incubators at the end of 2008, with about 11 000 working places.

Technoparks, which offer a visible image of modernity, have become popular. Russia had 83 registered technoparks in 2008 (up from 55 in 2006), some with ITCs and incubators. Technoparks are very diverse in terms of size and specialisation and their performance varies. Some are true success stories (see the example of Tomsk below), but a number are quite inactive. In order to raise the quality of the technoparks, the government plans a new series focused on high technologies with a dozen pilots located in several regions.

A large number of technology transfer centres (TTCs) have been established at RAS and university research institutes in order to facilitate the commercialisation of their inventions. There are currently over 100 such centres in Russia. In addition some 30 "collective use centres" provide would-be innovators with testing, measuring, modelling and other equipment.

**Box 3.22. Regional distribution of technoparks, ITCs and TTCs (2006)**


| | Number | | | | per 100 000 researchers | | |
|---|---|---|---|---|---|---|---|
| | **Research organisations** | **Techno-parks** | **ITCs** | **TTCs** | **Techno-parks** | **ITCs** | **TTCs** |
| Total Russian Federation | 3622 | 83 | 89 | 100 | 21.3 | 22.9 | 25.7 |
| 1. Central Federal District | 1426 | 31 | 37 | 33 | 15.0 | 17.9 | 16.0 |
| 2. North-Western Federal District | 531 | 3 | 16 | 11 | 5.5 | 29.3 | 20.1 |
| 3. Southern Federal District | 312 | 6 | 6 | 12 | 36.6 | 36.6 | 73.2 |
| 4. Volga Federal District | 547 | 11 | 7 | 16 | 20.6 | 13.1 | 30.0 |
| 5. Ural Federal District | 225 | 12 | 2 | 6 | 54.3 | 9.0 | 27.1 |
| 6. Siberian Federal District | 425 | 6 | 16 | 10 | 20.3 | 54.2 | 33.9 |
| 7. Far-Eastern Federal District | 156 | 4 | 5 | 8 | 60.3 | 75.4 | 120.7 |

*Source:* Centre for Science Research and Statistics.

Box 3.22 shows how technoparks, ITCs and TTCs are distributed in the different federal districts of Russia and how their numbers relate to the level of research activities. It appears that the ratio of technoparks, ITCs and TTCs to researchers is lower when the regional research and technological potential is higher. There may be several explanations, such as the fact that the need for such structures varies depending on the availability of alternative solutions, or the fact that regional governments see these structures as tangible proof of their commitment to innovation as well as a way to attract federal support. But the federal government probably sees this inverse relationship between innovation potential and number of innovation support infrastructures mainly as an indication of the need to consolidate the system.

The most dynamic ITCs, technoparks and the like tend to be located in or associated with the leading universities that are now emerging as research and innovation hubs of national and, in some cases, global importance. The Moscow State University is a good illustration (Box 3.23).

**Box 3.23. Moscow State University: An increasingly strong innovation platform**

Moscow State University (MSU) is, with the Saint Petersburg State University, one of the two Russian higher education institutions that enjoy the status of national university, which entails not only prestige but also greater autonomy. As a very large multidisciplinary university (more than 40 000 students, more than 6 000 professors and lecturers), its main mission is to educate, including through research (5 000 researchers) that is funded 50/50 by own budget and contracts, including with an increasing number of foreign firms.

Its involvement in research and innovation has intensified in the last decade. For research, a telling example is the Super Computer Centre (250 persons) which performs world-class research (parallel computing) with applications in many domains (drug, crystallography, optics, etc.); foreign companies are funding advanced software development; and co-operation with German partners was planned to begin in mid-2010.

As for innovation through the commercialisation of research results, the university science park is taking shape. After five years of operation it hosts 85 companies: average of 13 staff per companies, average turnover of USD 300 000; and 40 of the companies work directly with the MSU incubator programme. A special incubator programme with several complementary elements has been developed for students: *i)* awareness and information; *ii)* education in high-technology entrepreneurship with a three-month programme provided by multidisciplinary teams; *iii)* business plan competition, with the support of FASIE; *iv)* START programme with two years of support. This incubator programme is being replicated in Zelenograd and Moscow State Technical University (Baumann).

*Special economic zones*

Like many dynamic emerging economies, Russia has created several special economic zones (SEZ). They have the same basic rationale – to spur the development of interrelated activities considered important by grouping them in places that offer more favourable conditions than those available in the rest of the economy. So far, four have been established with a technological focus to host both Russian and foreign firms. They are located in Dubna (100 km north of Moscow), Zelenograd (20 km north of Moscow), Tomsk in Siberia, and Saint Petersburg. The tax privileges offered to attract enterprises are moderate: the social tax is lowered from 26% to 22% and the profit tax is lowered from 24% to 20%; but eligible firms have very cheap access to basic infrastructures (telecommunications, heating, power, etc.). Custom clearance procedures are also simplified.

They are still too recent to be evaluated. The Tomsk zone, opened in 2006, attracted 45 companies in three years, with some 650 jobs. The total investment in infrastructure amounts to USD 170 million, 75% of it financed by the federal government, the rest by the city and regional governments. The Dubna zone had 27 companies employing some 500 persons in 2009, for a total investment in infrastructure of USD 200 million.

In addition, the government has established two industrial zones in which technology considerations are of secondary importance, in Lipestk west of Moscow and near the city of Alabuga in the Republic of Tatarstan. The major objective is to attract Russian and foreign manufacturing companies by offering them very attractive conditions for logistics, export/import (customs), and even employment (lower labour costs). The total investment in infrastructure amounted in 2010 to more than USD 350 million.

From a national perspective the economic rationale of creating manufacturing-oriented SEZs is not very clear, as they entail distortions in the allocation of resources, the costs of which cannot be compensated by the benefits of agglomeration. These are at best very small in the case of activities that are not knowledge-based.[37] The story is different for innovation-oriented SEZs within which localised technology spillovers can increase significantly the return on investment of resident firms. They can become reduced-scale innovation systems that function as “mega-incubators” of new firms and of new strategies of existing firms to the benefit of the whole economy and useful hubs for international technology transfers.

*Science cities*

At the end of the Soviet era, there were 60 science cities, usually closed to unauthorised citizens. Most were opened quite soon after the collapse of the Soviet Union, including to the international community, but few were able to maintain truly viable activity. At the turn of the new century the government decided to accelerate the selection process by creating formal science city (SC) status and granting it to 14 cities considered to have the potential to make good use of additional support to carry out important activities. Currently, 26 others have applied. The SC status gives access to significant budget support and entails investment by the federal government, which leads to matching efforts by regional and local authorities. The impact of this policy is sometimes impressive. The city of Zhukovsky, specialised in aviation technologies, is an emblematic example (Box 3.24). But not all science cities, including some of those with the official status, show the same dynamism. Their role in the renewal of the Russian innovation system needs to be seriously reviewed, in co-operation with the authorities in charge of social and regional development, who should consider the implications from their perspective.

**Box 3.24. Zhukovsky: The rebirth of the Aviation City**

Zhukovsky, located 30 km south of Moscow, was created in the mid-1930s to host the glorious Central Aero-Hydrodynamic Institute (TsAGI), initially established in Moscow in 1918. All civil and military aircraft developed in the former Soviet Union and Russia have been designed and tested in Zhukovsky. It used to be equipped with the world best and most sophisticated specialised equipment, notably wind tunnels.

The city, which had some 30 000 families and 107 000 inhabitants in 1995, suffered greatly in the early phase of the economic transformation. Up until 2000 it was largely left on its own, with little support from any authority. The city shouldered the social expenses of enterprises and R&D centres established on its territory. It survived through diversification due to the development of the SME sector and, above all, foreign contracts, which represented up to 50% of TsAGI income in the mid-1990s. (In December 1992, the OECD organised the first international conference to attract contractors and investors.)

The turning point came in 2000. The regional and federal governments decided to reinvest in the city, partly in response to the active lobbying of the mayor, now in his third mandate, and thanks to the strong support of the governor of the Moscow Region, and the city received the status of science city.

The average salary was multiplied by ten in ten years and is now above the national average. In recent years, birth rates exceed death rates; the stadium and other cultural equipment have been fully renovated. The city now attracts youth, even from Moscow.

In 2008 President Putin signed a decree establishing the National Aircraft Construction Centre, to be located in Zhukovsky by a consortium of three founders: Rostechnologii, United Aviation enterprises, and the regional government. It would be complemented by the creation of a (corporate) Technical College (university) to train technicians and specialists. In the long term, the future of the city will obviously depend on the capability of the Russian aviation industry to confront successfully competition from established Western producers, as well as from new ones, notably in China.

**Some key data on TsAGI**

- 4 000 employees, of which 1 000 researchers.
- 60% funding from federal budget and 40% from contracts, of which less than 10% from foreign sources.
- Working relationships with all major aviation R&D stakeholders throughout the world.
- 180 Russian patents; 20 foreign (USPTO, EPO, JPO, etc.)
- Diversification sought in design and innovation for high-speed trains, high buildings, bridges, etc.

*The Skolkovo Innovation City*

Many technoparks in Russia have not reached critical mass and operate in a regional environment that may prevent them from doing so. They lack international standing and will never become beacons that inspire and guide would-be innovators and attract foreign talent and investment to Russia. The decision to create one that would in Skolkovo was announced by President Medvedev in early 2010. Box 3.25 lists some of the privileges that residents of Skolkovo will enjoy. A multi-partner foundation was established to oversee the development of the overall project.[38] The Skolkovo Foundation was to receive RUB 19 billion in 2010 and RUB 15 billion in 2011. In the following three years (2012-14) budget appropriations for the Skolkovo project may reach as much as RUB 50-60 billion. The corresponding bills were submitted to the state Duma in the second quarter of 2010.

The total population of Skolkovo will be 25 000-40 000, of which 20 000 permanent residents. The city will have its own police and local administration. It is envisaged to build at least 1 million square metres of housing. The area of the R&D centres should be about 400 hectares. The project should be completed in three to seven years.

A novel feature of the project is the broad involvement from the beginning of international expertise through different mechanisms, such as an international advisory council,[39] a partnership with foreign foundations, such as the MIT Foundation, and the decision to host foreign firms and laboratories of world calibre among the first residents. Leading IT enterprises such as Microsoft, Cisco and Nokia have already signed memoranda of understanding.

The decision to create Skolkovo science city has prompted lively discussions in Russia, with arguments that are sometimes difficult for outsiders to fully appreciate. On the one hand, this decision was clearly dictated by a legitimate sense of urgency and by the realisation that existing innovation infrastructures, although useful, are unable to spur the necessary renewal of the high-technology sectors rapidly, if only because of their insufficient linkages with large firms, including foreign ones. On the other, if bold decisions to improve general business conditions are not taken very soon, Skolkovo could be seen as another disappointing attempt to bypass rather than remove generic obstacles to innovation at quite high opportunity cost, given the size of its budget and the need to upscale other instruments of Russian innovation policy.

It may be surprising that this innovation city is to be built from scratch, when Russia has many sites, *e.g.* some science cities with a developed infrastructure, which have demonstrated some dynamism and would probably have welcomed such a boost. However, it could have been more difficult to develop the international dimension of the project as easily in these locations. One may also note that the results of similar undertakings were disappointing in many countries, *e.g.* the Japanese technopolis. But that was in the past – when the risk was to build "a cathedral in a desert" rather than "a church in the global village" – and in contexts that already possessed strong competitors.

Skolkovo will certainly not become the advertised Russian Silicon Valley but one can reasonably hope that this is a slogan of political rhetoric rather than the expression of a real policy objective. More comparable perhaps to the Beijing's Zhongguancun science city because of its location near many of the nation's best universities and research organisations, Skolkovo has the potential to become an important hub in the innovation system. It could develop and implement a new open innovation model of science-based innovation in important fast-growing industries that fits the Russian context. It is however important for the Russian government to succeed in this project without crowding out others that are vital for the success of "Innovative Russia – 2020".

**Box 3.25. Incentives for companies and organisations locating in Skolkovo**

- Tax incentives for companies: ten-year exemption from profit, land and property taxes, lower rate for compulsory insurance (14% instead of 34%), customs privileges, etc.
- Simplified technical regulations.
- Simplified procedure for transferring land.
- Special sanitary and fire safety rules.
- Simplification of conditions for interaction with the government, with the establishment on site of special departments of federal bodies such as the Ministry for Internal Affairs, Federal Migration Service, Federal Tax Service, Federal Customs Service.
- Availability of the services of new R&D centres for the five "technological priorities": power industry, information technologies, telecommunication, biotechnologies and nuclear technologies.
- Establishment of special departments of RosPatent that will register and protect IPR more speedily.
- Attraction of foreign scientists and entrepreneurs by securing for them free arrival in Russia and movement throughout the territory of the country. They will benefit from the new legal regime that took effect on 1 July 2010 (see the section on international co-operation below).

*Source:* Gaidar Institute.

### *3.4.6. Harnessing global opportunities through international co-operation*

International linkages played different roles at different stages of the transformation of the Russian research and innovation system. They were vital during the first decade of the transition for ensuring the survival of many good R&D institutes and research teams, and reached a peak of as much as 18% of total R&D funding in 1999. Later, they diversified to include foreign direct investment (FDI) in knowledge-based industries, although this has remained rather limited owing to the limited space open to private firms in these industries and a restrictive policy regarding FDI. Today foreign sources finance 7% of total R&D expenditures and are channelled through various institutional arrangements, mostly bilateral and multilateral government agreements.

*Multilateral and bilateral S&T co-operation*

The engagement of Russia in European programmes, notably the 7th Framework Programme of the European Union (EU FP7), is a prominent example of the intensification of international co-operation through a multilateral approach (Box 3.26). Russia is one of the most active countries involved in the EU FP7 under "third party" status. This is reflected in co-ordinated calls for jointly defined thematic areas.[40]

**Box 3.26. Russia in the EU 7th Framework Programme**

Russia is, among "third countries", the most active participant in FP7 in terms of funding and second in terms of the number of projects. Russia had more than 20% of successful applications to FP7. By the end of 2009, 134 contracts with Russian participation were signed (the United States was first with 248 projects). Russian participation in FP6 was already at the same high level; by both number of projects and funding Russia ranked first.

More generally, during the first two years of FP7 (2007-08) Russia participated in 110 competitions and made 25 419 applications, of which 5 520 were successful. The number of participating organisations from Russia was 235 (second place), following 340 for the United States.

*Source:* Gurova and Kiselev (2010).

A European review evaluated the quality of Russia's contribution as positive (CREST, 2008). It recognised the mutual benefits for the different parties. It recommended, however, a more co-ordinated approach by the participating organisations (on both the European and Russian sides), and suggested reviewing and streamlining visa procedures, notably on the Russian side, to facilitate exchanges and the circulation of scientists. It also suggested the need to better find and exploit the complementarities between Russia and European countries in basic research, to develop co-operation in more applied research and innovation-related programmes,[41] and to draw up a joint agenda for upgrading S&T infrastructure and large-scale equipment in Russia. As Russia desired, it recommended engaging in an association agreement, *i.e.* going beyond the "third party" status. The advantages for Russia, beyond the prestige and credibility it would give its science profile, need to be assessed against the increased costs that this status entails.

The Russian communities concerned generally value co-operation in the context of the EU FP, although two very different types of reservations are heard in some circles. The first is the difficulty for Russian researchers and research teams to comply with the procedures, given the complexity of the documents to be filed and the lack of familiarity with EU procedures. The second, which is less constructive, reflects the reluctance of some groups, particularly in the RAS sphere, regarding any evaluation involving independent, especially foreign, experts.

The INTAS programme was an important early European initiative.[42] Established in the early years of the transition, it provided financial support to Russian scientists and offered them networking opportunities. In its initial form, the programme provided support of USD 150 000 to selected teams; this was later complemented by another mechanism which offered USD 50 000 to individual projects. It is gradually phased out, but it was still disbursing USD 50 million in 2008; 800 Russian teams have benefited over the period 2002-08.

The International Science and Technology Centre (ISTC) was another multilateral scheme established very early during the most difficult phase of the economic transition. Its mission was to prevent the risk of proliferation of sensitive technologies by helping defence-oriented researchers to transfer their skills and experience to civil science. A consortium including the United States, the EU, Japan and Korea established the ISTC. The funding amounts today to USD 50 million a year funded at 50% by EU and the rest by the United States (40%) and the other partners.

In terms of bilateral co-operation, more than half of EU countries have S&T co-operation agreements with Russia; instruments include joint projects, fellowships, workshops, mobility grants and so on. Bilateral co-operation with the United States principally goes through private foundations and non-government organisations (Soros, CRDF), and now focuses on capacity building in universities. China has maintained significant links with Russia, co-operating in basic science in the framework of the Russian Foundation for Basic Research at a rather modest level (about 100 projects) and in the space programme, as well as with selected universities.

Not only are many Russian R&D centres renowned worldwide, but some are also platforms for multilateral scientific co-operation. This is notably the case of the Dubna research complex which hosts the Joint Nuclear Research Institute (Box 3.27).

**Box 3.27. Dubna: A pole of international co-operation in nuclear physics**

Located 120 km north of Moscow, along the Volga, the science city of Dubna has 70 000 inhabitants. It has grown to host large research centres developed in the 1960s and is specialised in nuclear physics, missile design and space telecommunications by two main organisations, MKB Raduga and the Joint Nuclear Research Institute.

The Joint Nuclear Research Institute (JNRI) is an international organisation involving 18 former CIS countries and 6 associated countries (including Germany and Italy). Its budget amounted to USD 83 million in 2009, of which 80% was funded by Russia. It pursues world-class research in nuclear physics, high-energy physics and condensed matter physics. It has an impressive scientific record and is world famous for several breakthrough discoveries, including "element 105" of the Mendeleev table, known as Dubnium. It hosts major particle accelerators, neutrino source equipment, the Heavy Ion Collider, and has been actively involved in the development of the Large Hadron Collider at CERN.

JNRI employs 5 000 persons, of whom 3 000 are supported by the budget of the institute, including 1 300 researchers, of whom 500 are from abroad, and 1 000 doctors of science and PhDs. It runs an extensive education programme (jointly with Dubna University) involving 300 students and postgraduates. Co-operation has been developed with Kazakhstan, the Slovak Republic, Uzbekistan and other places to install cyclotrons, especially for medical purpose.

Russia is also engaged in co-operative megascience projects, such as the creation of an X-ray-free electron laser. This project involves 14 countries, including EU countries and China, carries out research on new properties of matter, and covers various disciplines such as femtochemistry, plasma physics and biomedicine.

Because of its strong reputation in high-level scientific research Russia is offered many opportunities to co-operate with foreign countries. It has already accepted many of them, but can do more and more efficiently. In particular, restrictive and cumbersome procedures for visas and the remuneration of foreigners constitute a serious drawback for attracting foreign university teachers and academic exchanges, including for short stays. For instance, foreign professors cannot be paid for their lectures. To circumvent this obstacle, they receive research contracts, but this entails other problems for the parties involved and makes Russian auditors suspicious. The transfer of funds between foreign and Russian bodies is also often complicated, at times because of corruption. This delays the implementation of joint projects when it does do not render them impossible (CREST, 2008).

Recent measures, the new scheme to attract foreign scientists and the very open regime that will be tested by the Skolkovo project (see above) are therefore particularly welcome, since they will solve some of these problems for a part, hopefully the best part, of the research community. The new law to attract foreign scientists, a regulatory breakthrough, came into effect in July 2010.[43] The work permits for foreigners recognised as "highly qualified specialists" will be now issued for three years with the possibility of multiple renewals.[44] The selected foreign scientists will also be granted the tax regime of Russian residents, including notably an income tax rate of 13%.

*Internationalisation of R&D and technology through the business sector*

Co-operative R&D activities involving foreign firms are of crucial importance. In the future, investment in Russia by foreign technology-oriented firms and outward investment by their Russian counterparts should become the main vehicles of the internationalisation of the Russian innovation system. This is already the case in the most advanced countries, as well as in the most successful emerging ones, notably China.

There are many seeds of these new desirable patterns, but major obstacles that inhibit desirable developments also remain.

At present, practically all Russian research institutes with international standing that do not work exclusively for defence have developed strong linkages with foreign (multinational) enterprises.[45] These relationships take various forms: service contracts; joint research projects; entire labs funded by foreign partners. There is no doubt that foreign enterprises draw considerable benefits from their collaboration with high-level Russian researchers who, in return, can keep up more easily with the latest world developments, especially as regards scientific equipment and applications of scientific discoveries, in addition to enjoying access to additional financial resources.

In comparison, the Russian business sector does not yet profit from the opportunities created by the adoption of open innovation models by many foreign firms in the context of the rapid globalisation of R&D and technological activities. The main exceptions are sectors, such as software or scientific instruments, in which market structures have modernised faster, leaving more space to dynamic new-technology-based firms. Other significant co-operative ventures are negotiated at the government level and are part of large-scale programmes implemented by Russian "champions". The Sukhoi Super Jet project – a regional airplane seating 75-95 people – developed jointly with Italian and French aerospace and mechanical engineering firms – provides a telling example.[46]

A "quantum leap" is needed in this area. Two important changes on the horizon could, together, open new perspectives. The first is accession to the World Trade Organization and the OECD which, as mentioned in Chapter 1, would significantly increase the incentives for innovation in Russia by introducing additional competitive pressures from foreign firms, by easing the access of innovative Russian firms to foreign markets, and by facilitating co-operation and technology transfers between Russian and foreign firms. Complementary measures to remove other barriers to foreign investment would magnify the positive impacts. In this respect, the announced privatisation of large segments of the Russian industry and banking sector could offer huge opportunities.

### *3.4.7. Developing and mobilising regional innovation capabilities*

The importance of the regional dimension of Russian innovation policy is discussed above, including the overall institutional and policy context for and trends in current regional/federal co-operation in innovation. This section looks more closely at three examples, with a view to gaining insight into how well this co-operation is working, and where authorities should look for improvement, focusing on the implications for the federal government, in accordance with the terms of reference of this OECD review.

Regional innovation systems do not generally coincide strictly with administrative regions, and this points to the need for interregional co-operation. Roughly speaking, there are in Russia, three main types of functional regional innovation systems, with several sub-variants:[47]

- The "metropolis" model built around the present and former capital cities, Moscow and Saint Petersburg, which have the bulk of the S&T effort, host most of the leading universities and undertake a large share of industrial and financial activities (30% in Moscow and 15% in Saint Petersburg).[48]
- The "high-technology island" model built around cities with a very high concentration of higher education and research institutes, in the middle of a vast territory

lacking any other knowledge-intensive activities, such as Tomsk in Western Siberia.

- The "reduced-scale NIS" model which has developed in regions enjoying greater autonomy and/or with a diversified economic structure, such as the Republic of Tatarstan and its capital Kazan.

Some headline indicators for the three models are set out in Figure 3.7.

**Figure 3.7. Headline statistics: Saint Petersburg, Tatarstan and Tomsk**


| | Saint Petersburg | Tatarstan | Tomsk |
|---|---|---|---|
| Constitutional status | Federal City | Republic | Oblast |
| Area (km$^2$) | 1 439 | 67 847 | 316 900 |
| Population | 4 600 000 | 3 780 000 | 1 035 000 |
| of which capital city (%) | Saint Petersburg (100) | Kazan (31) | Tomsk (48) |
| Population density (per km$^2$) | 3 200 | 56 | 3 |
| GRP per capita (RUB, 2008) | 337 000 | 246 000 | 232 000 |

*Source*: Background report and other sources.

### *The metropolis model: Saint Petersburg*

Saint Petersburg is a major trade gateway and the location of strong and diversified financial and industrial clusters (Box 3.28). Possessing 10% of the intellectual capital of the country, it is one of the three largest scientific, educational and innovation centres of Russia, along with Moscow and the Moscow region. About 100 universities educate 8% of all Russian students. The city has well-developed innovation infrastructures:

11 innovation and technological centres, a technology-oriented special economic zone, venture funds, business incubators, etc. Some 23 000 PhDs work in 252 scientific institutes, and R&D-intensive enterprises employ about 300 000 people.

According to the "Concept of the socio-economic development of Saint Petersburg to the year 2025" the city's government is determined to make innovation a key pillar of its long-term development strategy. Saint Petersburg's innovation policy involves two types of measures, those implemented and financed exclusively by the local authorities, and those implemented with the financial, organisational and informational support of the federal government (Table 3.10).

**Box 3.28. Saint Petersburg: A world cultural heritage and the second most powerful engine of Russian economic development**

The Saint Petersburg federal city includes Saint Petersburg proper and 9 municipal towns as well as 21 municipal settlements. With 4.6 million inhabitants it is a large conurbation and a cultural, industrial, financial, educational and research centre of global significance. The industrial base is composed of many sectors, from resource-based to highly knowledge-intensive, notably: oil and gas trade, shipbuilding, aerospace, electronics and electrical engineering, software and computers, machine building, heavy machinery and transport equipment (including tanks and other military), professional instruments, ferrous and non-ferrous metallurgy, chemicals, pharmaceuticals, medical equipment, publishing and printing, food and catering, textile and apparel industries.

**Table 3.10. Federal and regional government support to innovation in Saint Petersburg**

| | Financing (RUB million) | |
|---|---|---|
| | 2009 | 2010 |
| 1. Measures implemented and financed exclusively by the government of Saint Petersburg | | |
| 1.1. Training of personnel for the innovation actors | 20.70 | 35.60 |
| 1.2. Development of the innovation infrastructure | 230.35 | 269.76 |
| 1.3. Development of clusters | 13.50 | 9.00 |
| 1.4. Support to exports of and demand for innovation | 44.00 | 34.20 |
| 1.5. Attraction of investments into innovation sectors | 8.60 | 10.30 |
| 1.6. Promotion of innovation activities | 65.80 | 77.30 |
| 1.7. Assistance to the implementation of federal goal-orientated programmes and projects | 8.00 | 10.00 |
| Total financing of part 1 | 390.95 | 446.16 |
| 2. Measures implemented with the support of the federal government | | |
| 2.1. Development of the technology-oriented special economic zone | 1 457.30 | 3 138.80 |
| 2.2. Development of the technopark in Nevsky district | -- | -- |
| 2.3. Development of Petergoff *naukograd* (science city) | -- | -- |
| 2.4. Development of the Fund for support of the development of venture investments | 100.00 | 100.00 |
| Total financing of part 2 | 1 557.30 | 3 238.80 |
| Grand total | 1 948.25 | 3 684.96 |

*Source:* Committee for Economic Development, Industrial Policies and Trade, Government of Saint Petersburg.

Interim achievements are encouraging. In addition to the progress made in the development of the technology-oriented special economic zone and of the Petergoff science city, there are many other examples of new initiatives to accelerate the emergence of a functional regional innovation system: the launch of two additional innovation centres, Innovaciya and Technopolis Ventures; the agreement with Rusnano to implement major infrastructural and commercialisation projects in the area of nanotechnologies; the creation of innovative clusters in the fields of machine building and metalworking; the establishment of a fund to support the development of venture investments in small technology-based enterprises, and of a Russian-Finnish innovation centre; etc.

Cross-border co-operation has become a significant dimension of the regional S&T and innovation policy. The SPbInnoReg project epitomises this new orientation. It aims at promoting sustainable economic development and competitiveness in Saint Petersburg and north-west Russia by leveraging resources available in neighbouring countries. With the support of the European Union, it engages 12 partners in the Baltic Sea region.[49]

*The high-technology island model: Tomsk*

The Tomsk region is very well endowed in both natural resources and intellectual capital (Box 3.29). Over the last decade it has been for the federal authorities a policy laboratory in which, in co-operation with regional actors, new approaches to escape "Dutch disease" by promoting innovation-led sustainable development could be developed and tested.

The Tomsk city administration, with the support of the regional government, has been active since the mid-1990s in developing a vision of knowledge-based development. It created a Commission for Science and Innovation in 1997. Public procurement of innovative products is a common practice. A special fund for innovative activities was established by the city which is also helping firms to connect to national and global innovation markets and networks, *e.g.* by supporting their participation in exhibitions and fairs (six in 2009, including one in China).

But the region depends heavily on the considerable financial transfers from the federal government, which supports R&D and innovation activities through all available channels (Box 3.30). Co-ordinated actions by the regional and city authorities and the federal government, acting through FASIE, have allowed the development of a significant number of new technology-based firms, most as spin-off from universities. They are established in very active technoparks. A technology-oriented special economic zone has also been established.

**Box 3.29. Tomsk city: A "knowledge-intensive island" within a vast territory rich in oil and gas**

The Tomsk oblast population is about 1 million, half of whom reside in the city of Tomsk while the others are scattered across a vast territory (almost 90% of the surface of Germany). Initially developed as a trading place on the road from China to Moscow, Tomsk became an academic centre at the end of the 19th century with the opening of the first Russian university east of the Ural mountains. A polytechnic university was created soon after in 1900. In the 1950s, the decision to locate important facilities of the nuclear military-industrial complex, especially nuclear facilities, in Tomsk created an important new layer of activities. Later, in the mid-1990s, the expansion of the oil and gas extraction and processing industries had a profound impact on all regional economic parameters. Oil and gas production became the only profitable sector in a number of districts in the region and the source of almost one-third of the tax revenues for budgets of all levels.

In 2009 the regional GDP amounted to RUB 270 billion. The oil and gas industry employs 28% of the workforce and generates 60% of GDP. Nearly 200 large and medium companies form an industrial structure built around the exploitation of the oil and gas industry, petrochemicals, nuclear power, electro-mechanicals, metal working, woodworking and pharmaceuticals. The agriculture sector, located in the southern part of the region, employs 11% of the workforce and supports an agro-food industry specialised in meat, dairy and bakery products.

In both a short- and longer-term perspective, Tomsk's human potential is clearly a comparative advantage when compared to most other regions in Russia. Tomsk oblast has a strong concentration of students and substantial research capability (150 researchers and 18 doctors of science or PhDs per 10 000 residents). Tomsk hosts six state universities, two research institutes and 15 branches of universities headquartered in other cities and oblasts. It trains 85 000 students in more than 300 disciplines. Another 20 000 are trained by secondary vocational schools. Every fifth inhabitant of Tomsk is a student. The universities generate consolidated revenues from their educational services and scientific developments amounting to EUR 75 million a year.

The Tomsk higher education system is organised around complementary high-quality organisations: a research pole with Tomsk State University (TSU), an academic innovation pole with Tomsk Polytechnic University (TPU) and an entrepreneurial pole, Tomsk University of Control Systems and Radio-electronics (TUCSR). Each university has a technology transfer office. A number of incubators have been set up relatively recently: there are now three at TPU and one at TSU. TUCSR organises a business plan competition prior to integrating new firms in its incubator. It also manages a network of spinoffs (106 in 2009, expected to increase to 150 in 2012).

**Box 3.30. Federal support to science-based innovation development in Tomsk**

The Russian Federation provides the bulk of the support for R&D (about 90% of the volume of grants). The total number of grants of the Russian Foundation for Basic Research (RFBR) and the Russian Foundation for Humanities (RFRH) rose from 269 in 2002 to 470 in 2007. Combined with the regional support, RUB 35 million were invested in basic R&D in 2007. Tomsk research organisations and R&D-based firms also benefit from the FTP, and 39 projects are being supported for 2007-12 with funds amounting to more than RUB 0.5 billion, a large share of which for nano-industries.

Another important objective of federal support to the Tomsk oblast is to encourage the formation of high-technology firms. FASIE is the key instrument. Its START programme supports 12 projects in the Siberian region, of which 5 in Tomsk. Its UMNIK programme, which targets young scientists developing innovative R&D, has provided grants to 80 projects involving 220 students and researchers of the Tomsk Polytechnic University. FASIE has also already facilitated the creation of 20 companies, of which 10 by TPU in IT technologies, new materials, medicine and machine building.

Given the relatively small number of large innovative firms, the central government has tried to attract more international firms to the region, primarily through its tax incentives policy. A special economic zone was established in 2005, which had 45 resident companies in 2010, including several firms with foreign participation. More than 650 jobs have been created, and it supports 140 projects annually, mainly in the fields of ICT, new materials, nanotechnologies, biotechnology and medicine. The federal government and the municipalities have invested in the SEZ on a 74%/26% basis.

There are also weaknesses. Many established companies continue to use outdated technologies. Some restructuring has taken place in large businesses, but it does not yet seem sufficient to make them dynamic leaders of viable innovative clusters. The oil business is not yet committed to change and diversification in other sectors is slow. FDI remains modest. Therefore, under current circumstances, innovation-driven growth prospects depend largely on the ability of the emerging new-technology-based firms to expand.

There is obviously a critical mass of competences and there are many would-be innovators. The challenge is to speed up a virtuous growth and cluster process among the many start-ups and spin-offs that are burgeoning in technoparks and around higher education establishments. This process should be linked to an accelerated restructuring and strategic re-orientation towards innovation of the large firms that have the potential to become anchors of the regional innovation system. There are many projects, but too few seem to reach the stage at which they become attractive to venture capitalists; this points to a gap in development funding. There is also a need to develop marketing channels and skills to sell new services and products to the rest of the Russian Federation and abroad. Connections with foreign enterprises and networks are crucial in this respect and the growing number of partnerships established by higher education institutions with foreign counterparts should help.

*The reduced-scaled NIS model: Tatarstan*

Located some 800 km to the east of Moscow, the Republic of Tatarstan is one of the most economically developed of the Federation, ranking in the top five in terms of GDP per capita. Its GDP reached RUB 930 billion in 2008, distributed as follows: 46% in manufacturing and primary industries, 8% in agriculture, 9% in construction and 13% in retail. Oil is a main source of its wealth (with production of 32 million tons of crude a year and estimated reserves of more than 1 billion tons), but it also has a large manufacturing base. Among the particularly noticeable enterprises are Kamaz, which builds big trucks and employs one-fifth of the industrial workforce, and Tupolev, the producer of passenger and military airplanes and helicopters, with one of the world's largest helicopter plants. The territory of Tatarstan also has highly developed transport networks with major railways lines, is irrigated by four navigable rivers (notably the Volga), and is crossed by the main gas and oil pipelines supplying the western part of Russia and further European countries.

The development of SMEs has helped to diversify an economy that is dominated by large industries. The share of SMEs in GDP now exceeds 25%, *i.e.* significantly above the Russian average. In 2009, a difficult year, 4 700 new SMEs were set up, increasing their number in Tatarstan by one-quarter, as compared to only 9% on average in Russia. However few are innovative or operate in high-technology sectors with strong growth potential. A priority for the regional government has therefore been to enlarge the role of SMEs in the local economy by stimulating entrepreneurship and innovation and by favouring clustering processes around technoparks, some of which are quite dynamic (Box 3.31).

**Box 3.31. Regional and local support to innovative SMEs in Kazan (Republic of Tatarstan)**

A top priority of the economic strategy of the government of Tatarstan is to enlarge and renew the stock of firms, giving priority to those that are knowledge-based. To stimulate and support entrepreneurship a number of initiatives have been implemented recently.

Created in 2004 and located in the centre of the city of Kazan, the Idea Technopark hosts 28 new innovative companies and actively supports 150 others. The Idea park is a member of the European Business Network. Major foreign companies (Siemens, Honeywell, DHL and GE) are established as anchor residents.

Another new innovation infrastructure is the Kamsky Industrial Park Master, which was created in 2004 as a joint initiative by Kamaz and the local and regional authorities. It already hosts 127 enterprises. In the chemicals sector, the Technopolis Khimgrad project was launched in 2007 to build a complete innovation platform, including an industrial park with the necessary infrastructure for producing and shipping petrochemical products, a corporate university, a business incubator, as well as pilot petrochemical facilities and petrochemical research laboratories.

The region, with federal support, has also created a VC fund, which is relatively active. It has invested in 180 start-up projects over the last five years for a total of USD 250 million. Two-thirds of the enterprises funded have survived. However, most of the enterprises which have benefited from the investments are very small (three to five persons) and do not grow much. Moreover, less than 20% of the deals can be considered real VC investment.

The higher education sector is fairly well developed. The 93 higher education institutions train some 200 000 students a year. Four institutions rank among the top 50 Russian universities: the Kazan State University, the Kazan Institute of Finance and Economics, the Kazan State Technological University and the Kazan State Technical University, named after Tupolev. The last two of these have gained the status of national research universities. Tatarstan, however, suffers from a serious brain drain: each year about 25 000 students find jobs in Moscow and Saint Petersburg.

The links between higher education institutions and established industries are unevenly developed and there is little spin-off of new technology-based firms from education establishments. Another weakness concerns foreign investment. At USD 2 billion in 2008, foreign investment was not negligible, but it has largely been concentrated in real estate, transport equipment and construction. To attract foreign investment a special economic zone was created near Abaluga, the second city of the region; so far ten companies have located there (see above). But as noted in the section on innovation infrastructure, this zone is a manufacturing platform and thus unlikely enrich the surrounding economy from an innovation and technological viewpoint.

The future of the economy of Tatarstan may depend largely on an active and diversified policy to exploit the various assets which the republics have accumulated over the years: its heavy manufacturing industries of world reputation (Kamaz and Tupolev) need to innovate more to expand further in export markets; the consolidation of the innovative small-scale sector located so far in a few technoparks requires further support; a strong university sector needs to become more dynamic and more open to new economic trends; and it needs to exploit its cultural heritage and geographical opportunities with the active development of the tourist industry.

To face these challenges and exploit clearly important opportunities, it is important for the government of Tatarstan to remain committed to the innovation agenda that its Ministry of Economy developed a few years ago in collaboration with the business and scientific communities and which is outlined in the "Innovation Memorandum of the

Tatarstan Republic for 2008-2010". It is also important to implement this agenda in an adaptive manner, enriching and fine tuning it as experience is gained in a policy field that is quite new to most actors in the region.

*Common issues*

Beyond their specific characteristics, the description of these models highlights the importance of some common drivers of and obstacles to innovation-driven regional development, as well as related issues regarding the articulation of regional/local and federal policies:

- Many initiatives result from a combined and concerted approach by federal and local/regional authorities. This co-ordination is essential for the funding and deployment of any significant project.
- The small-scale firms, and more particularly new-technology–based firms, are an essential source of dynamism in local economies. They are a key contributor to the regeneration of the economic fabric of cities and regions.
- The higher education sector plays a pivotal role, as a source of knowledge, competence and entrepreneurship. If higher education institutions are insufficiently engaged, no economic development strategy can be sustainable.
- There are serious difficulties for linking the education and research structures, as well as the small business sector, with established industries, which are not interested in such links; federal policy therefore has an important role to play to support local and regional objectives.
- International linkages of various forms are an important element of dynamism for both the higher education and the enterprise sectors.

It is clear that regional and local policies (see the case of Zukhovsky above) can play a decisive role in rejuvenating the Russian economy while preventing excessive concentration. However, the strong dependence of regional and local policies on the orientations of and funding from the central government raises some issues.

There is a serious risk that local investments may be oriented towards technologies in which the region does not necessarily have the right competences, simply because these are government priorities and a means to obtain funds. Concomitantly, the current "high-tech myopia" of the federal innovation policy entails the risk that local assets – including in traditional industries or in non-science-related sectors (*e.g.* tourism, culture) – will be neglected. Yet, if appropriately exploited, they can be areas in which non-technological innovation creates jobs and wealth.[50] Excessive dependence on federal bodies is also not very conducive to initiatives by those concerned, whether in government organisations, education institutions or business firms. Finally, without sufficient financial and other means, local and regional authorities are largely dependent on locally based but federally driven enterprises as sources of employment and lack the means to propose alternatives strategies. It would therefore be appropriate for the federal government to consider giving more autonomy to regional bodies in their choice of investments and projects.

At an Innovation Forum held in Tomsk in May 2010 the leaders of eight Russian regions decided to establish an Association of Innovative Regions. The founding regions are the Tomsk oblast, the Republic of Tatarstan, the Novosibirsk oblast, the Republic of Mordovia, the Perm krai, the Krasnoyarsk krai, the Kaluga oblast and the Irkutsk oblast.

The Academy of National Economy of the Government of the Russian Federation and Rosnano have joined the agreement. This initiative is very welcome, as it will provide a platform for exchange of experience among regional policy makers. It will foster a learning process that will be beneficial to all actors, including the federal authorities, and can lead to a better understanding of the different regional development dynamics and their policy implications. In this regard, international initiatives with similar aims, *e.g.* the EU's Regional Innovation Monitor (Box 3.32), could be useful reference points for international policy learning.

**Box 3.32. The European Union's Regional Innovation Monitor (RIM) initiative**

Launched in 2010, the Regional Innovation Monitor (RIM) is an EU-funded initiative to describe and analyse innovation policy trends across EU regions. It sets out to provide policy makers and other innovation stakeholders with the analytical framework and tools for evaluating the strengths and weaknesses of regional policies and regional innovation systems. It provides several tools:

A "knowledge base" on regional innovation policy measures, policy documents and organisations. Each region covered by RIM has a baseline profile, which gives the user a quick overview of the socio-economic situation, research and innovation performance, innovation governance and policy trends.

A benchmarking tool that enables the user to conduct an online quantitative comparison of innovation policy approaches and trends at the regional level.

A single point of access for knowledge sharing and good practice dissemination on regional innovation policy in Europe. Each year, thematic papers and policy workshops of high relevance for the design, delivery and evaluation of regional innovation policies will be undertaken, bringing together communities of policymakers, experts and academics.

A new platform of communication for innovation stakeholders. Registered users can contact each other through an integrated messaging service. Users can also share via their RIM profiles blogs on regional innovation issues as well as their Linked-In or Twitter account details.

*Source*: Regional Innovation Monitor web site (*www.rim-europa.eu*), accessed January 2011.

## 3.5. Concluding remarks

Over the past few years, the Russian government has made innovation a national priority. This chapter has shown that Russia now has a rather sophisticated mix of policy measures to tackle a host of market and systemic failures associated with its relatively weak innovation performance. These failures, many of which have their origins in the legacy of the Soviet and transition eras, are often more extensive and intractable than those found in most OECD countries. This implies the need for sometimes extraordinary policy measures that would be difficult to justify in other economies. Furthermore, with many strategic sectors of the Russian economy dominated by large state-owned enterprises, the government has more scope than most to actively promote industrial innovation. Nonetheless, much of the "heavy lifting" of modernisation will still have to be done by the private sector, which should be provided with appropriate resources and incentives to innovate.

Along these lines, perhaps the most important failure that requires urgent redress is the continuing lacklustre innovation performance of Russia's largest firms, both public and private. The key question is how to stimulate demand for innovation in large firms. This requires a broad change in policy orientation, away from a supply-side dominated science policy towards a more balanced innovation policy that pays equal attention to the demand side, as well as the creation of more favourable framework conditions for innovation. As this review shows, such reorientation is already under way, though much remains to be done. The primary goal should be to shift the national innovation system's "centre of gravity" away from the publicly owned R&D system and towards production firms, whether public or private.

Various organisational and institutional arrangements have hindered the emergence of a more firm-centric national innovation system. In particular, the continuing organisational separation of industrial R&D from production – a legacy of the Soviet branch system – needs to be tackled as part of a wider programme of reform of public research institutes. But the main obstacle lies with firms themselves, which have too few capabilities to innovate, little absorptive capacity, weak linkages with existing knowledge infrastructure (which has itself been progressively weakened) and, above all else, too easy access to economic rents that provide few incentives to innovate. These conditions offer formidable challenges to policy makers but few quick-fix solutions.

Improving the framework conditions for innovation – a gargantuan task in itself – will be a necessary undertaking. But a full-fledged innovation policy will need to be more expansive and will need to pay particular attention to extending and deepening innovation capabilities in firms and other actors of the innovation system. It will also require significant means of co-ordination to ensure its coherence and will have to perform careful balancing acts along a number of critical dimensions:

- First, policy needs to support innovation in both large firms and SMEs, as both play crucial, often complementary, roles in innovation systems.
- Second, there should be stronger recognition of the scope and benefits of innovation in low-technology and service industries. Innovation policy is currently overly focused on high technology and thus neglects large parts of the Russian economy, particularly in regions in which low-technology industries dominate.
- Third, the innovation system needs to open up more extensively to foreign sources of knowledge, as complements, not as substitutes for Russian knowledge. Russian research policy is increasingly geared to greater international co-operation and a similar openness is now needed in support of learning and accumulation of innovation capabilities in firms.
- Fourth, policy should pay greater attention to the knowledge demand side, particularly given the problems highlighted above. Until now, innovation policy has overly emphasised the supply side and has been strongly framed by a technology-push philosophy. It thus has serious limitations in a market economy, as the knowledge of users can be critically important in shaping innovations.
- Finally, policy should find an appropriate balance between the need for competition and consolidation in industry. Both have benefits for innovation, but too much of either will be inhibiting.

In carrying out these balancing acts, policy needs to create and empower agents of change. The federal government cannot, and should not, try to do everything itself through directives but should instead enable others to take more initiative through appropriate incentives. In some instances, this will mean nurturing a great deal of capacity building, *e.g.* in regions, as regional authorities often lack the necessary capabilities to formulate and implement a bespoke innovation policy. Policy makers also need to be aware of the opportunity costs associated with any intervention. For example, the Skolkovo initiative looks set to provide an important boost to efforts to attract major overseas technology-based firms and promises to function as a useful demonstrator and incubator for policy experiments. But it is also an expensive initiative and one that colonises much of the innovation discourse in Russia. It therefore risks diverting attention and resources away from much-needed reforms in other critical areas.

Pursuit of the dual goals of excellence and relevance should lie at the heart of Russian innovation policy. Too much R&D funding is still allocated without adequate accountability or reference to performance, and this leads to waste. Furthermore, prioritisation and selectivity should be used to focus public R&D resources in centres with a critical mass of research excellence while recognising that other quality criteria, *e.g.* around teaching in HEIs, commercialisation links in industrial R&D institutes, etc., should also be included as a basis for rewarding good performance.

Finally, the necessary transformation of Russia's innovation system outlined in this report will not happen overnight, but it must be achieved in the medium term if Russia is not to fall further behind its international competitors. Many initiatives will take time to bear fruit and transitory imbalances in the innovation system will have to be, where possible, counterbalanced by transitory measures. At the same time, transitory measures should not postpone longer-term solutions indefinitely. The new Innovative Russia 2020 strategy of the Ministry of Economic Development recognises the risk of this happening and sets out a two-stage implementation process to avoid it. A first stage proposes significant direct intervention in firms to develop greater willingness and capacity to innovate. The proposal for the second stage sees this intervention being gradually withdrawn and resources being redirected towards more indirect support. Some bold decisions will be necessary if this is to happen, but if they are taken, Russia will have reached an important turning point in exploiting its remarkable innovation potential.

# *Notes*

1. Ministerial report on the OECD Innovation Strategy: Innovation to Strengthen Growth and Address Global and Social Challenges: Key Findings, OECD, Paris, 2010.
2. See the *OECD Review of Science, Technology and Innovation Policies: Russian Federation* (OECD, 1993).
3. In 2007, government-financed R&D in business, as a percentage of R&D performed in the business sector, amounted to 55.3%, compared to an average of less than 7% in the OECD area.
4. In China, the combination of a gradualist approach to the transformation of the overall politico-economic framework has been accompanied, in a context of rapid industrialisation, by faster and more radical microeconomic structural reforms, notably in the admittedly less developed S&T and R&D corporate and public sectors.
5. They were subsequently dismantled in 2010.
6. This was confirmed at the conference held in Yaroslavl in September 2010, under the chairmanship of the president and with the participation of a number of foreign heads of state or prime ministers.
7. Precise figures are unavailable as much of the defence R&D budget remains classified.
8. This is the case of science cities such as Dubna and Zhukovsky.
9. A somewhat similar body, the Finnish Committee for Research and Innovation Policy (formerly Committee for Science and Technology Policy), which is an important reference in any international policy benchmarking, used to meet every month.
10. Checking tenders is currently the job of the Federal Anti-Monopoly Service, which has the authority to cancel them — and often does so.
11. The 51 programmes cover very diverse areas, including (according to the Ministry of Economic Development website): "the support for reforms in education and health care; reform of the judicial system; the formation of a market of affordable housing; agricultural modernisation and the creation of conditions for its sustainable development; construction and improvement of the country's transportation facilities of strategic importance; state support for the implementation of major transport infrastructure projects; implementation of innovative projects and programmes of a technological profile; support for sectors of the economy with high potential for innovation (aerospace, information and communication technology); etc."
12. Data from the Ministry of Economic Development.
13. Including some RUB 30 billion for the FTPs, RUB 10 million for RFBR and FASIE, and RUB 5 billion for internal RAS competitive allocations.
14. For instance, the number of budget places in popular specialties in Moscow-based universities in 2010 were: Finance and credit: 538; Law: 1 546; Psychology: 486, Management: 601; Software: 166; Computer systems and networks: 180.
15. In 2009, RUB 1 billion were allocated to this programme.
16. This applies to bachelor and master degrees; the adaptation of the PhD has been postponed.
17. The Presidential Grants for Young Researchers is a smaller programme with comparable objectives that has been in place for ten years. The competition is open to candidates of sciences less than 35 years old, and to doctors of sciences less than 40 years old. The

programme provides two-year grants of RUB 600 000 for the latter and RUB 1 million for the former. It has benefited 500 candidates of sciences and 100 doctors each year since 2005, but the number was reduced to 400 and 60, respectively, in 2009.

18. The institutes of the Russian Academy of Science and of the Russian Academy of Medical Sciences are excluded from the schemes, as are the other public research centres.

19. 60% of the project leaders are scientists from the United States, Germany and France, and 52% have a (second) Russian citizenship.

20. It is possible to join technology, business and design together even more boldly. Finland has recently created Aalto University by merging the Helsinki University of Technology, the Helsinki Business School and the Finnish Art and Design School.

21. A systemic evaluation is particularly necessary to explain why the productivity of the Russian science system, as measured by bibliometrics indicators, does not seem to improve.

22. Switzerland is a rare example, but also a country in which the business sector, at least large firms, does not need much support, as it is already exceptionally active in innovation (OECD, 2006b).

23. Decree No. 218 "About measures of the state support to develop co-operation between the Russian higher education institutions and organisations (enterprises), carrying out complex projects aimed at establishment of high-technology manufactures".

24. A co-ordination council was established at the Ministry of Education and Science to oversee the administration of the scheme and monitor project implementation and outcomes. RUB 280 million will finance the organisation of calls for tenders.

25. Andrey Klepach, Deputy Minister of Economic Development, Press conference of October 2010 announcing the creation of the platforms.

26. It should be also noted that an anti-crisis fund in support of SMEs, with USD 300 million, was established in 2009.

27. The foundation is, however, currently facing a legal issue. According to the Russian budget and civil code for (public non-profit) foundations, it is not supposed to allocate money to organisations that are not under its supervision. This is precisely the case of all beneficiaries of FASIE support.

28. According to the Gaidar Institute, by the end of 2009 116 business entities had been established by 44 higher education institutions.

29. The implementation of the law is made difficult, notably owing to a lack of clarity regarding property issues, e.g. the need to lease premises at market prices, even when the premises are located on the academic campus. Such rules, imposed by the Ministry of Finance to prevent corruption, increase the cost of operations and reduce their potential interest. The premises need to be negotiated with the Russian Property Agency. In addition the IPR regime is still unclear.

30. A high-technology entrepreneur interviewed by the OECD review team put it bluntly: "There is a reasonably good support provided by government schemes, the tax burden is not heavy, there is even a regulation to reserve 20% of procurement contracts to small businesses, but all that counts little when it takes months to get clearance for our imported equipment, and when one of those newly state corporations comes and captures my export markets, in collusion with the Russian agency in charge of armament trade."

31. Tcheliabinsk and Orenburg regions and the Khanty-Mansi autonomous area.

32. About 200 companies of the industrial-military complex belong to the Rostechnologii holding.

33. The Russian rocket industry experienced double-digit growth in 2005-08, prior to the economic crisis. The number of spatial experiments grew yearly by 20%.

34. Notably the firm NT-MDT, created in Saint Petersburg in the late 1980s by researchers of the Ioffe Institute, and which has about 10% of the world market of scanning probe microscopes, a key instrument for nanotechnology research.

35. The poultry industry is one example. In a context wide open to the domestic and foreign competition, Russian producers offer good quality goods, at competitive prices, thanks to rationalised production chains, efficient logistics, and well-designed and enforced safety regulations.

36. Important issues that only a cluster approach would make tractable relate to the development of open networks of innovative suppliers providing materials, components, research and engineering services, etc.

37. The experience of China is not really a counterexample, since the good performance of Chinese SEZs did not create but resulted from the competitiveness of China as a low-wage manufacturing platform.

38. The Foundation of the Centre of Development and Commercialisation of New Technologies, registered in Moscow as a non-profit organisation, have as founders the RAS, the state corporation Bank of Development and Foreign Economic Relations (Vnesheconombank), Rosnano, the Moscow State Technical University, the Russian Venture Company, and FASIE.

39. The Council is chaired by the Academician Alferov, Nobel Laureate (physics, 2000). The foreign co-chairman is Roger Kornberg, Nobel Laureate (Chemistry, 2006), Professor at Stanford University.

40. Co-ordinated calls have been agreed in the following areas: aeronautics; food, agriculture and biotechnology; energy; health; nanotechnology and new materials. Discussions on co-ordinated calls are ongoing in the fields of nuclear fission (within Euratom and the ITER project) and space research (with the European Space Agency).

41. Russia already participates in some Eureka programmes, but to a very limited extent.

42. International Association for the Promotion of Co-operation with Scientists of the New Independent States of the Former Soviet Union.

43. The Federal Law *On making changes to the Federal Law on the legal status of foreign citizens in the Russian Federation* (from 19.05.2010 No 86-FZ).

44. A “highly qualified specialist” is defined as a “foreign citizen having experience, skills or achievements in a particular field if the conditions of his work in the Russian Federation envisage a remuneration of RUB 2 million or more over a period not exceeding one year.”

45. As noted in most places visited by the OECD review team. In Zukhovsky, TsAGI works for Boeing and Airbus; at Moscow State University a German firm finances the computer lab; at Saint Petersburg State University, Schlumberger funds the geological research lab; at the State Mining Institute, Total funds research work, etc.

46. Design and manufacturing are led by Sukhoi Civil Aircraft in which Italy’s Finmeccanica owns 25% plus one share. Finmeccanica owns 51% of SuperJet International, which is responsible for marketing, sales and aircraft delivery in Europe, North and South America, Africa, Japan and Oceania. The engine is developed by PowerJet, a 50/50 joint venture between France’s SCNECMA and Russia’s NPO Saturn. The first deliveries of the aircraft are expected in 2011.

47. There are also regional innovation systems that are not really functional in areas facing serious difficulties, such as mono-industrial cities or depressed regions, and those distant from main urban centres and being deserted by their populations.

48. The resources used by these regions and cities are very substantial. For instance the City of Moscow has a programme with a budget of RUB 12.2 billion for 2009-11 (Programme on applied scientific research and projects in the interest of the city of Moscow) (ERA Watch, 2010).

49. The Baltic Institute of Finland (lead partner), The City of Helsinki, Culminatum Ltd (Finland), Hermia Business Development Ltd (Finland), Seinäjoki Technology Centre Ltd (Finland), Lappeenranta Innovation Ltd (Finland), University of Tampere (Finland), TZW Technology Centre Warnemunde (Germany), Innovation and Trendcenter Bentwisch GmbH (Germany), WISTA Management GmbH (Germany), Saint Petersburg Foundation for SME Development (RU), and City of Saint Petersburg.

50. In this perspective, it is worthwhile noting the effort of the Ministry of Economic Development to promote regional branding as well as support traditional industries.

## *References*

Burger, R. (2008), “Russian Federal Targeted Programme for Research & Development in Priority Fields for the Development of Russia's S&T Complex for 2007–2012: An outside view”, PowerPoint presentation, RUSERA-EXE training course: Opportunities & Challenges for EU-Russian RTD Co-operation, 30 January-1 February.

Center for Strategic Partnership (2008), *New Economy, Innovation Insight into Russia*, published by the Center for Strategic Partnership, under the auspices of the Committee for Education and Science of the Federation Council, and the Committee for Science and Science-intensive Technologies of the State Duma, Moscow.

Cooper, J. (2010) “Military Procurement in Russia”, unpublished presentation.

Crane, K. and A. Usanov (2010), “The Role of High Technology Industries”, in *Russia after the Global Economic Crisis*, Petersen Institute, Washington, DC.

CREST (2008), “Internationalisation of R&D, Country Report Russia, An Analysis of EU-Russia cooperation in S&T”, CREST/OMC Working Group, Brussels.

Edler, J. (2007) “Demand-based Innovation Policy”, *Manchester Business School Working Paper*, Number 529.

ERA Watch (2010), “Inventory Report: Federation of Russia”, European Commission, Brussels.

Gaidar Institute (2010), *Russian economy in 2009. Trends and outlooks*, Issue 31, Gaidar Institute, Moscow

Gijsbers, G. and J. Roseboom (eds.) (2006), *The Russian Innovation System in an International Perspective: A Critical Analysis*, Science and Technology Commercialisation Project, EuropeAid, Brussels.

Gokhberg, L. and Sokolov, A. (2011) “Evolution of Technology Foresight in Russia: Rationales, Implementation and Policy Implications”, *International Journal of Foresight and Innovation Policy*, forthcoming.

Government of the Russian Federation (2008), *Concept of Long Term Social and Economic Development of the Russian Federation until 2020*, Moscow.

Guinet, J. (2003), “Drivers of Economic Growth: The Role of Innovative Clusters”, in *Innovation Clusters and Interregional Competition*, Springer, Berlin.

Guinet, J. (2010), “The Changing Role of Role of Government Research Institutes in Innovation Systems”, *STI Policy Review*, Inaugural issue, STEPI, Seoul.

Gurova, A. and V. Kiselev (2010), “The opportunity for Russia to join the 7h Framework Programme”, CSRS Bulletin, Moscow.

Ivanova, N. and J. Roseboom (eds.) (2006), *A Functional Analysis of the Russian Innovation System: Roles and Responsibilities of Key Stakeholders*, Science and Technology Commercialisation Project, EuropeAid, Brussels.

Ministry of Education and Science of the Russian Federation (2009), “Background Report prepared for the OECD Review of the Russian Innovation System and Policy”, Moscow.

Mowery, D. (2009) "National Security and National Innovation Systems", *Journal of Technology Transfer*, Vol. 34, pp.455-473.

OECD (1993), *Review of Science, Technology and Innovation Policies: Russian Federation*, OECD, Paris.

OECD (2001), *Innovative Clusters: Drivers of Innovation Systems*, OECD, Paris.

OECD (2004), *Fostering Public-Private Partnership for Innovation in Russia*, OECD, Paris.

OECD (2006a), "Evaluation of Publicly Funded Research: Recent Trends and Perspectives", Chapter 6 in *OECD Science, Technology and Industry Outlook 2006*, OECD, Paris.

OECD (2006b), *OECD Reviews of Innovation Policy: Switzerland*, OECD, Paris.

OECD (2007), *15 Years of Reforms - What Has Been Achieved*, OECD, Paris.

OECD (2008), *OECD Reviews of Innovation Policy: China*, OECD, Paris.

OECD (2009), *Learning for Jobs: OECD Policy Review of Vocational Education and Training*, OECD, Paris.

OECD (2010a), Ministerial report on the *OECD Innovation Strategy: Innovation to strengthen growth and address global and social challenges; Key Findings*, OECD, Paris, 2010.

OECD (2010b), "Collusion and Corruption in Public Procurement", Contribution from Russia, OECD Global Forum on Competition, 29 January, Paris.

PricewaterhouseCoopers (2010), *Innovation by Large Companies in Russia*, PricewaterhouseCoopers, Moscow.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