Investment and Financing of Innovation

The financing of science, technology and innovation in Bulgaria is an example of being unique in an area where uniqueness is of no use. Governments in other countries have been investing vast resources in the faltering world economy and making large investments in new research and innovation projects (in the past year a number of European states, the US, Asian states and Russia increased both public and private R&D spending). Bulgaria, though, has chosen a different solution:

- budget cutbacks in all areas with no clear idea about the state and development perspectives of each specific sphere and withholding of mandatory state payments, resulting in growth of the domestic debt and compromising of the **short-term** performance of business;
- investment cuts in science, technology and innovation in addition to failure of the government to make their development a priority – another way to handicap the Bulgarian economy in the **long term.**

Research and innovations are high-risk and costly endeavors, but they are the definitive factor that ensures the growth and competitiveness of modern economies. Moreover, forgoing innovations is still costlier and is bound to deepen a country's lag and cause a loss of valuable human resources, a dependence on foreign investors and a mere low-tech survival.

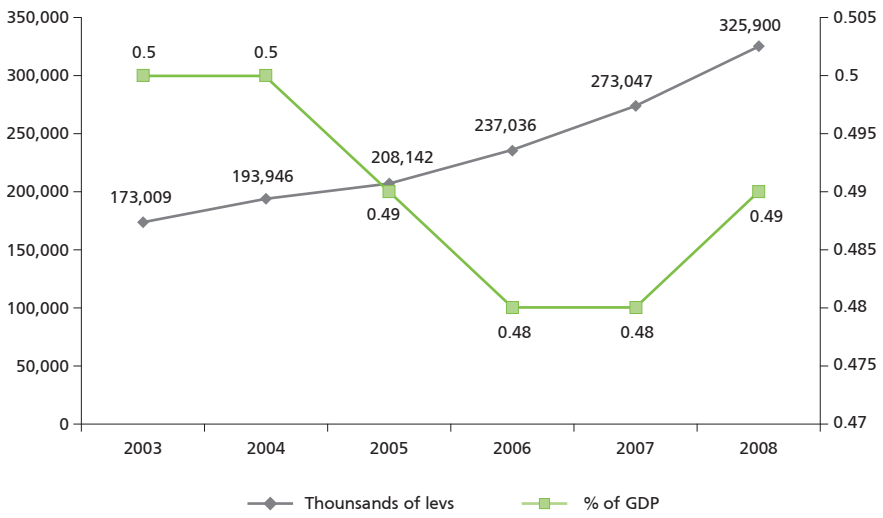
Public Financing of Science and Innovation

R&D spending measures the investment in the creation, use and dissemination of new knowledge in the public and business sectors. They are viewed as an indirect indicator of the innovation capacity of national economies. High R&D intensity (R&D funding as proportion of the GDP) is a factor fostering dynamic economic growth and competitiveness.

Most governments have undertaken similar measures to counter the effects of the recent crisis on the world economy – such as to support domestic competitive advantages and national champions (sectors, technologies, companies) that create them. In exchange for this support, governments insisted on picking the priority areas in which to invest the released financial resources – namely, innovation and new technologies. Taking on the private sector's liabilities has led to considerable increase in long-term indebtedness in most developed countries, so governments have tried to direct the funds to long-term projects with potentially high returns, such as financial support to firms which earmark sizeable resources for R&D, promotion of fundamental and applied research and investment in strategic technologies (e.g. renewable energy resources).

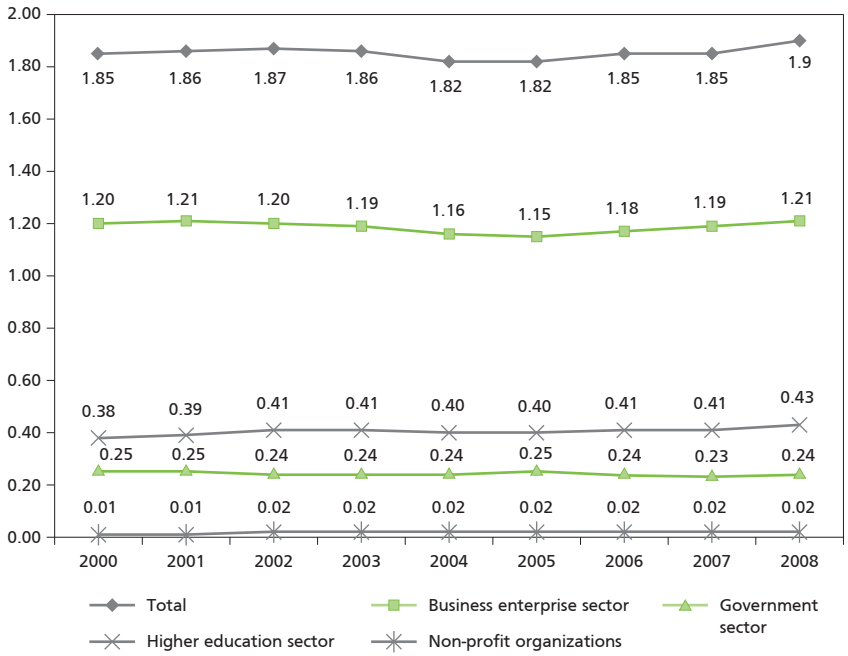
The alternative path taken by Bulgaria was to reduce as early as 2009 state funding for R&D (including innovation financing facilities like the National Innovation Fund with the Ministry of Economy, Energy and Tourism (MEET), which did not commence any new projects in 2009, and the National Science Fund) in order to preserve the macroeconomic balance. It was promised, though, to pursue reforms improving performance in the public sector (the Bulgarian Academy of Science, universities and budget expenditures). Despite the declared increase of funds for education, general university budgets for 2010 are lowered and their scientific research and artistic spending is also to dwindle. In 2009, the costs reported in research project

Figure 20. R&D EXPENDITURES IN BULGARIA



Source: NSI, 2010

Figure 21. R&D INTENSITY IN EU–27, %



Source: Eurostat, 2009

budgets at universities were 40 % as low as those initially approved.

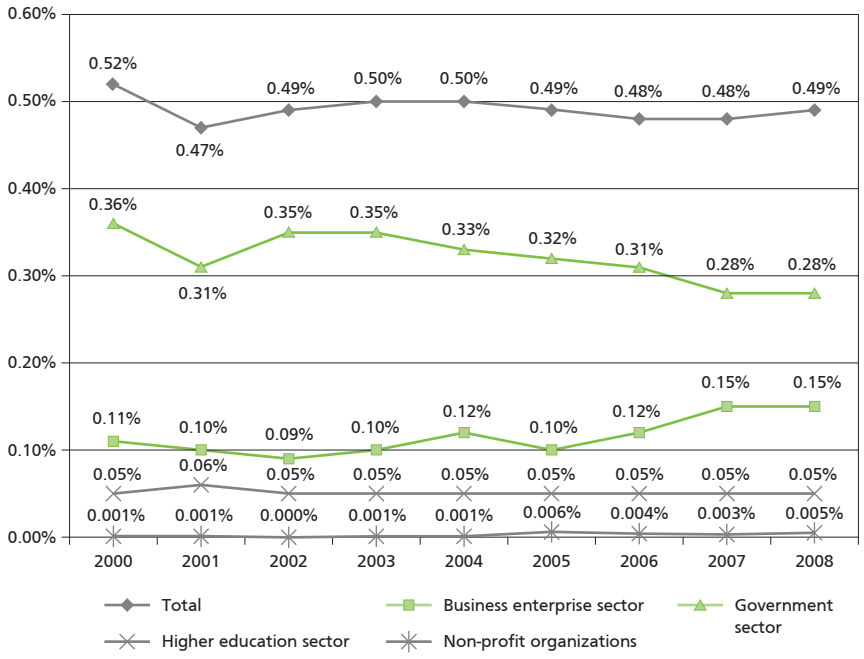
So far Bulgaria has reported highest R&D intensity in 2000 – 0.52 %. Economic growth in the last decade has failed to entail restructuring to more science-intensive activities and so the share of R&D spending in the GDP has remained unchanged. Preliminary NSI data for 2008 puts the share at 0.49 %, which is less than one fourth of the EU–27 level. For 2010 prognostic data indicate a drop down to 0.35 % of the GDP, which will be the lowest value since 2000.[38] Like most countries in EU–27, since 2005 enterprises' R&D spending in Bulgaria has been rising at the expense of public sector R&D costs. Nevertheless, in real terms both private and public R&D expenditures remain rather low and government funding for R&D as proportion of the GDP has consistently been cut since 2000 – from 0.36 % in 2000 down to 0.28 % in 2008. However, it is quite probable that part of R&D spending in private sector enterprises is hidden due to the lack of both adequate statistical coverage and appropriate tax incentives.

The structure of R&D spending by field of science is indicative of the field's innovative potential. NSI data for the period 2000 – 2007 shows that R&D spending in real and in growth terms has been highest in technical sciences followed by natural and agricultural sciences.

A breakdown of these expenditures by sectors, however, shows essential differences between natural and technical sciences regarding both the sectoral balance of R&D spending and expenditures in real terms. Government spending dominates the natural sciences and is therefore of primary consequence in R&D spending growth. In contrast, R&D expenditures of the business enterprise sector in technical sciences are greater than those in the public sector both in real and in growth terms. This trend corroborates the lack of strategic vision on the development of science, technology and innovation in the public sector, as it makes investments in knowledge fields of

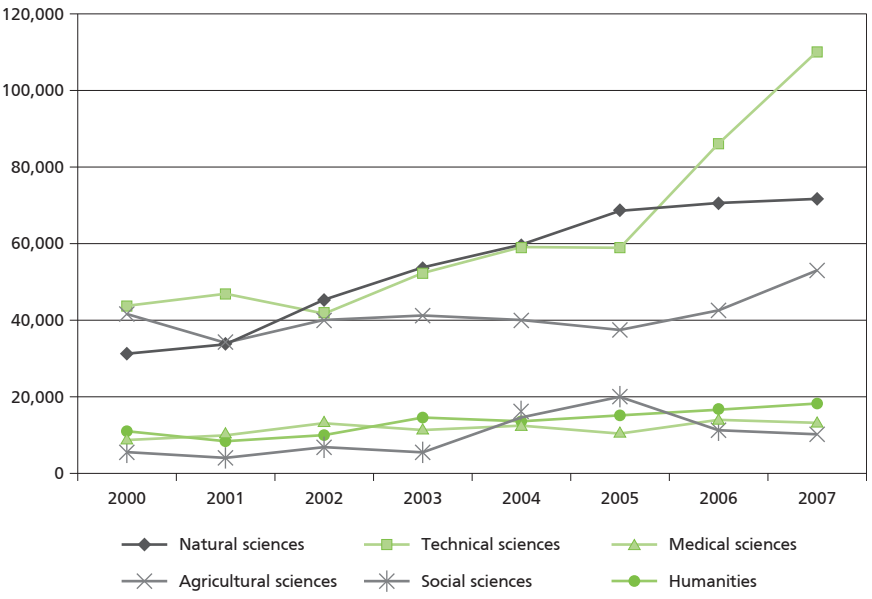
[38] Report to the Draft Law on the State Budget of the Republic of Bulgaria for 2010, Ministry of Finance.

Figure 22. R&D INTENSITY IN BULGARIA, %



Source: Statistical Yearbook 2008, own calculations

Figure 23. R&D EXPENDITURES BY FIELD OF SCIENCE, THOUSANDS OF LEVS



Source: NSI, 2009

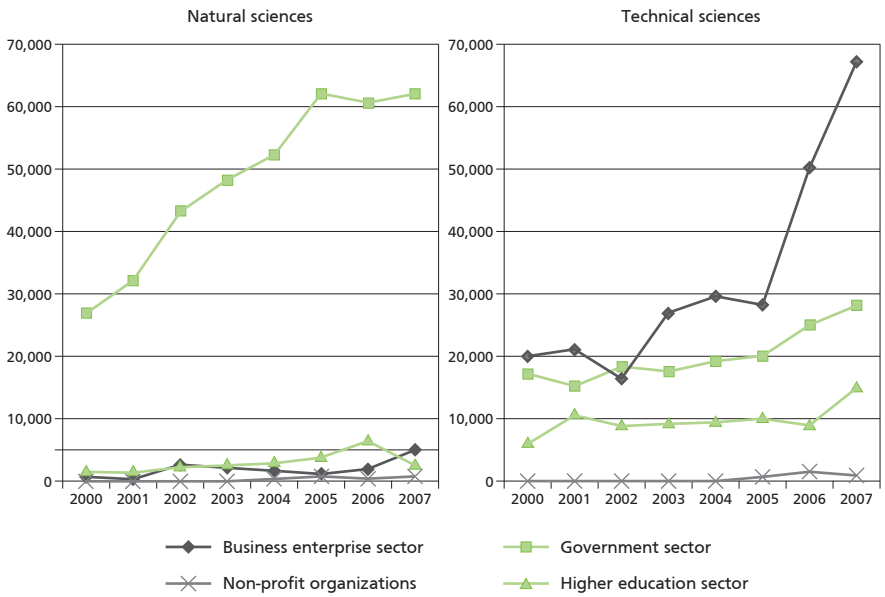
small practical value. Although the state naturally has a priority role in the fundamental sciences, the scarcity of available financial resources requires rethinking of this strategy or a radical restructuring of R&D expenditures across institutions and scientific fields as well as binding these to EU and private sector programs. For instance, the ongoing neglect of social sciences, particularly applied social sciences, drastically narrows the opportunities for developing national policies.

Disparities between R&D spending in natural and technical sciences are not due to increase of personnel – that remains rather steady over the years, but to the growth of average R&D expenditures per individual (measured through FTE). This growth (more than double) is most clear-cut and stable for natural and technical sciences, although in real terms it is agricultural sciences that have the highest R&D expenditures per person.

The relative share of R&D expenditures in the overall budget expenditures measures the degree of importance the government attaches to R&D and its role in providing resources for the production of scientific knowledge. In 2010, expenditures on science will amount to 221 mln levs or 1 % of all budget expenditures. The bulk of them (nearly 97 %) will be spent on running costs (mainly salaries) and barely 3.2 % are distributed for capital expenses, including means for developing the research infrastructure.

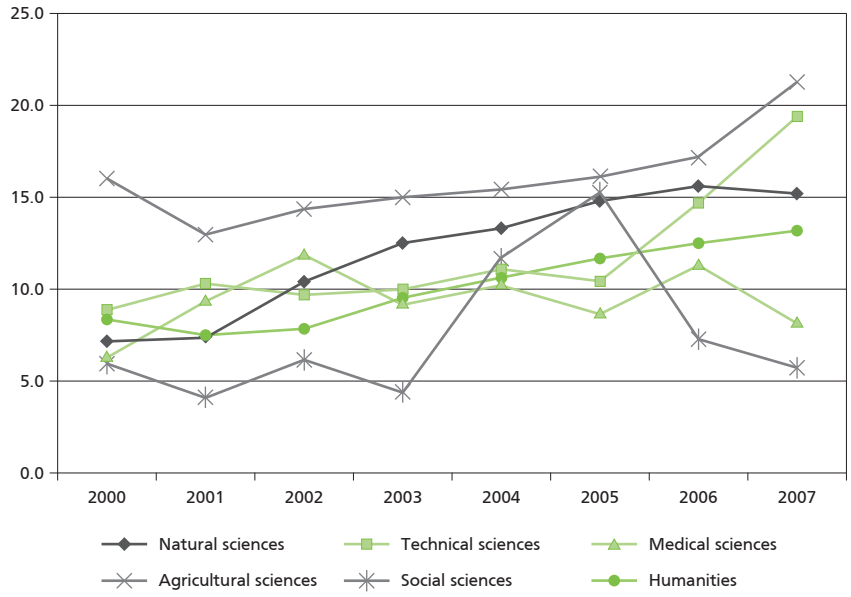
Bulgaria remains the only EU member state that has not set an R&D intensity target for 2010 as part of the process of building the European Research Area.[39]

Figure 24. R&D EXPENDITURES BY FIELD OF SCIENCE AND SECTOR, THOUSANDS OF LEVS



Source: NSI, 2009

Figure 25. AVERAGE R&D EXPENDITURES PER PERSON, THOUSAND OF LEVS PER YEAR/FTE EQUIVALENT



Source: NSI, 2009

[39] *A More Research-Intensive and Integrated European Research Area,* Science, Technology and Competitiveness key figures report 2008/2009, European Communities, 2009, p. 27.

Bulgaria in the European Research Area

There are several alternative public sources of funding of key importance to the research and innovation activities of Bulgarian business: **EU programs,** such as the Seventh Framework Program for Research and Technological Development (FP7) and the Competitiveness and Innovation Framework Program; resources from the **European structural funds and the Cohesion Fund** for the development of science and innovations distributed through the Operational Programs Competitiveness and Human Resource Development; **national programs for indirect public funding** within the National Innovation Fund and the National Science Fund. As sources of private funding are extremely insufficient, these programs could be defined as fundamental for the development of the Bulgarian economy's innovation potential. Since there is no adequate administrative capacity for the management of government-funded projects, though, this could be a rather challenging task that calls for innovative solutions to combine resources from national as well as European, public as well as private sources.

Each R&D and innovation financing source is available at specific conditions and a specific price, which may often involve extra efforts on the part of beneficiaries to overcome administrative delays and incompetence and thus influence the decision whether to innovate or not.

COMMUNITY PROGRAMS

The EU has a number of programs supporting the activities of enterprises. Strongest priority is placed on enterprises' technological development, the introduction of new products and technologies, the development of an innovation-oriented business culture (new knowledge, products and technologies designed to enhance business performance and contribute to its success).

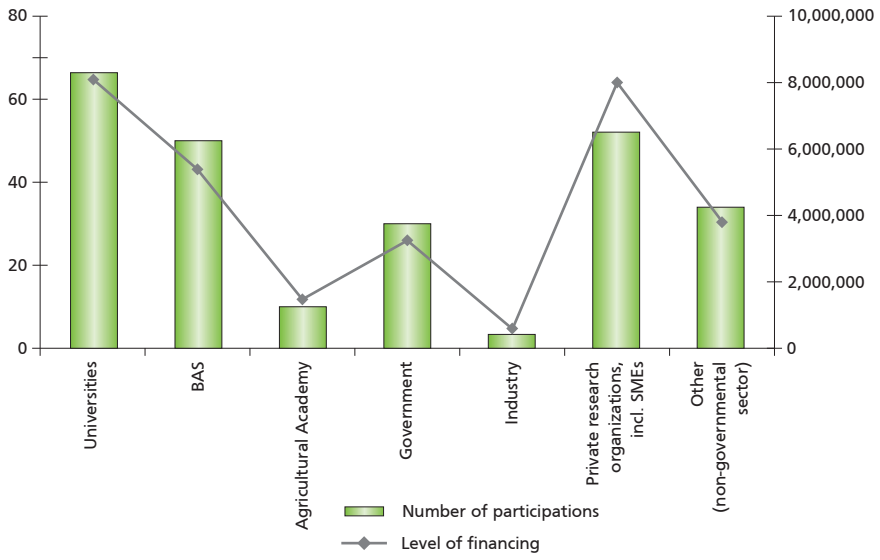
Seventh Framework Program

So far Bulgaria has taken part in 181 projects funded under FP7, with 248 Bulgarian teams participating, the total value of the contracts of Bulgarian participants amounting to €28,649,011. Universities have had the broadest participation.[40]

FP7 applicant teams from universities and the Bulgarian Academy of Sciences have already won grants and accumulated project experience under FP5 and FP6. There are two BAS institutes that stand out, each having successfully completed five projects – the Institute of Oceanology and the Institute for Parallel Processing, also successful under the Sixth Framework Program. Many BAS institutes have not been involved in any projects, while over 30 % have not even applied. Biological and technical sciences are the areas that attract the greatest number of tender participants.

Similarly, project participation is not balanced across universities in regional terms. The ones with highest approval rate are Sofia University and the Technical University in Sofia, followed by Plovidv and Varna. In terms of awarded amounts universities rank at the top of all FP7 beneficiary organizations. It is also notable that private organizations attract a larger share of the program funds than BAS institutes which rely on a

Figure 26. Bulgarian participation in FP7 by applicant organization



Source: MEYS, 2009

[40] Data submitted by the Ministry of Education, Youth and Science (MEYS).

regular state subsidy. NGOs and government agencies draw comparable financial resources as well. This is why the National Science Fund's scheme for providing national co-financing of the participation of Bulgarian private organizations should be extended to other ministries managing EU programs, such as Competitiveness and Innovation Framework Program (MEET) and the Justice and Home Affairs Program (MoJ and MoI).

According to MEYS data, at the end of 2009 seven institutes of the Agricultural Academy were participating in FP7 with 13 successful projects altogether amounting to €2,178,690. This is way above the Academy's FP6 participation when six of its institutes had won a total of 18 projects (€870,740).

An impressive number of SMEs appear as FP7 beneficiaries. **The European Commission points out the positive balance of Bulgaria's non-state sector participation in the program as an example of good practice.** Moreover, the fact that companies participate in research projects suggests that private business is involved in the pursuit of scientific findings and products.

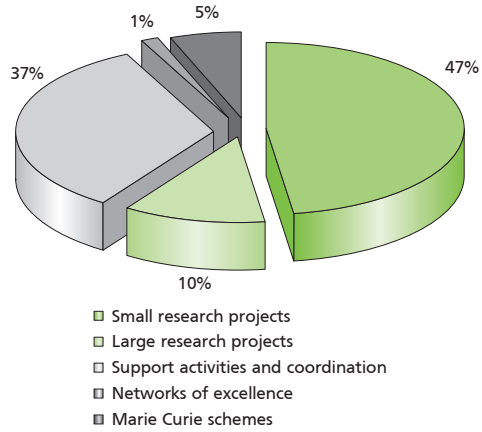
The industry's participation is insufficient (for the purposes of FP7 analysis an industrial enterprise is one that employs over 250 people), but the fact that such enterprises show a growing interest and commitment to co-funding (as the pertinent tender participation rules require) is a positive sign.

The types of instruments where Bulgaria is most often involved are the small research projects followed by horizontal non-research measures. The approval rate of large research project applications is low.

Bulgaria continues to have a high participation rate under the ICT priority theme and, in contrast to FP6, in the Health priority theme area as well. Growing interest is observed in the thematic area new materials and nanotechnologies as well as environment. Bulgaria already has three working research centers under the Research Potential scheme aimed at establishing centers of excellence.

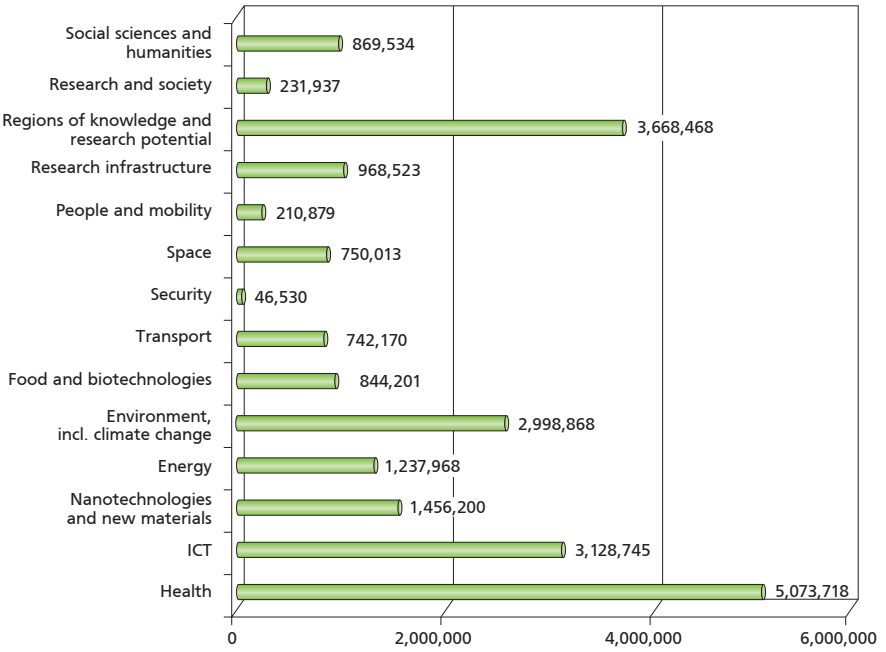
Bulgaria has not scored well in the thematic areas for food and biotechnology as well as energy despite these being considered a declared priority and having established research traditions in these areas. The application rate in the human potential improvement scheme is also very low. FP7 provides varied project opportunities under the scheme – from individual fellowships to young and senior scientists, through reintegration or skills improvement grants, to build-

Figure 27. Distribution of Bulgarian FP7 participation by type of instrument



Source: MEYS, 2009

Figure 28. Project funding by priority area



Source: MEYS, 2009

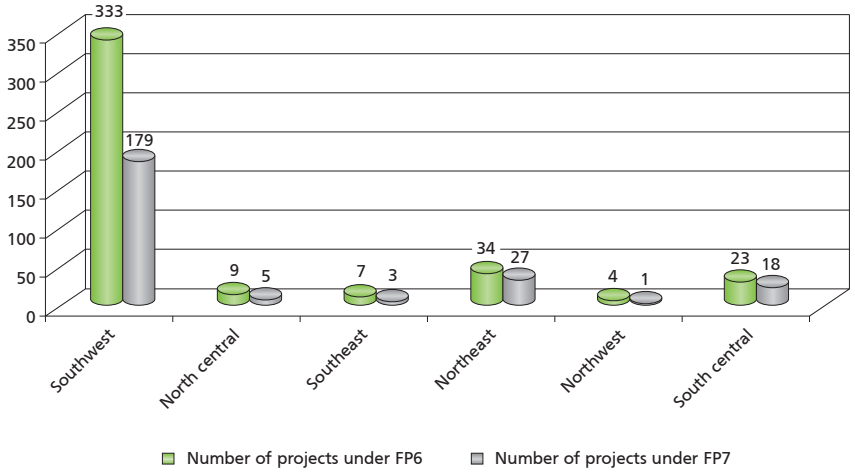
ing research training networks and partnerships with the business. Bulgaria has not submitted any project under most of these facilities, which is in sharp contrast to the great shortage of qualified human resources on the national labor market. The latter is yet another proof that the country lacks an integrated policy on the development of its economy's innovation potential. As a result, the private sector and government remain divided in their efforts thus neither achieving any substantial effect.

The regional distribution of participants is the same as in FP6. The Southwest Planning Region centered round Sofia has the top project approval rate, but the remaining regions are barely active in seeking funding under the two framework programs, which reflects the irregular distribution of Bulgaria's research potential.

Based on experience in recent years, the following groups of factors hamper Bulgarian organizations in their participation in research and innovation funding under Community programs:

- Poor awareness. Despite the efforts of some ministries to raise public awareness about the programs they are administering and those of several organizations conducting information and consultation projects within these programs, the average potential beneficiary is poorly informed about them, not least because the media focus on local instruments (operational programs and national funds) and on topics other than innovation, new technologies and science.
- The administration of responsible ministries does not sufficiently appreciate the opportunities provided under the framework programs and earmarks insufficient resources to inform the public about them. The Competitiveness and Innovation Framework Program (CIP) to be popularized by MEET represents the most alarming case. While MEYS has already developed and is using working mechanisms for the co-financing of R&D projects under FP7, MEET has made no significant move to provide such funds to CIP participants, contrary to some public statements of the minister made back in 2008. This smothers Bulgarian organizations' interest to apply and, through the failure to use fresh financial resources, incurs large opportunity costs to the country's economy.
- Some of the organizations are held back by the framework programs' requirement of forming international consortia, which is a direct consequence of the poor foreign contacts of Bulgarian SMEs (they are narrowly focused on the local and regional market, the geographic range of an enterprise's main activity being no wider than 100 km) and the language barrier (all programs require that the language of communication and of project documents is English).
- The development of a **national mechanism for co-financing of major Community programs,** such as CIP under which several large-scale projects are underway, should be perceived not as an expense but as an investment. Thus, providing national resources to co-finance CIP up to 2013 will attract Community funding of at least the same amount, as well as resources from the EU funds several times as large.

FIGURE 29. PARTICIPATION OF BULGARIA'S REGIONS IN FP6 AND FP7



Source: MEYS, 2009

OPERATIONAL PROGRAMS

The European Regional Development Fund (ERDF) is the largest Community financial instrument for the support of SMEs. It aims to correct the imbalances and to strengthen social and economic cohesion between EU regions.

ERDF differs from all other Community funding sources in that its programs are managed by national and regional authorities rather than by the EU directly. The former play the role of contact points for the calls for

proposal and the project selection procedure. Programs are managed and projects selected at the national and/or regional level. Bulgaria carries out ERDF funding via its operational programs (OP).

Operational programs are replete with cumbersome administrative procedures and the responsible bodies do not have the capacity to implement them. As a result, they barely manage to spend a small share of the resources allocated for Bulgaria under the Fund. Three years after EU accession, the payments made are below 2 % of the total operational programs' value, with the Competitiveness OP, designed to support economic innovation, lagging behind most significantly.

Interest to all OPs is growing as a consequence of the severe economic crisis, but so is disappointment by its actual implementation, as payments in the first three years have either been withheld or considerably delayed. This problem should be tackled via the introduction of more flexible implementation and co-financing mechanism (e.g. in-kind contributions). While in 2007 and 2008 the Bulgarian economy was not in need of financing under the EU funds, in 2009 and 2010 these financial instruments have turned in one of the few possible sources of new capital. Thus, due to the crisis, EU funds – besides their intended use in modernizing and restructuring the economy – have become a possible source of liquid assets for implementing corporate projects. Since national contributions (from the state budget or private entities) are also required but are shrinking as the crisis goes on, the absorption of EU funds should be prioritized as a national strategy; their structure should be streamlined to fit national priorities.

As a comprehensive review of all member states' achievements is pen-

Box 3. BEST PRACTICES IN EU STRUCTURAL FUNDS ABSORPTION

Accomplishing an innovation project from its initial design, through the search of a scientific and technical solution of a specific problem, to its final use in practice involves each of the national innovation system's units. Whether they interact successfully is particularly important in today's global information-dependent society. It is a mandatory condition for being able to work in EU projects and absorb EU structural funds whose main goal it is to disseminate best practices and multiply the effect of innovations across the Community.

Innovation projects depend for their success on the ability to formulate a practice-oriented idea as well as to create organizational and production conditions to implement it. It is the so called "hard" structures of the innovation systems – research bodies and the business – that perform the latter function. "Floating" structures, such as transfer centers and research foundations, however, are ultimately more important for success, as they provide everything else – they form and coordinate the research consortia, draw up project documentation, manage finances, and store and circulate the project know-how.

This is what the PERA innovation centre, located near Leicester, UK, does. It is registered as an applied research foundation, which is the **first indispensable condition** if an organization is to get 100 % financing for EU projects. Among PERA's main functions are project organization and management under the EU operational programs, including preparation of research themes, lobbying, team formation, completing CfP documents, coordination of approved projects, creation of experimental models and reporting of results. PERA has won projects for €180 mln under FP6, all of which are run by several project managers – young engineers of managerial excellence.

Point L-Bulgaria Ltd. is the Bulgarian partner in the PERA's research consortia in the implementation of the following FP6 and FP7 projects:

- A Novel Laser-Inkjet Hybrid Printing Technology for Additive Printed, High Resolution, Mass Customised Conductive Copper Tracks (FLEXTRONIC) 2005 – 2008;
- A Novel Hybrid Regenerating Filter for Improving Air Quality by Safely Destroying Biologically Active Airborne Particulates in AgriFood Production Operations (VOLTAIR) 2005 – 2008;
- Innovative Design for Wind Energy Capture in Urban Environments (ROOF-CAPTURE) 2009 – 2011.

The Foundation has formulated a concise presentation of scientific ideas and the way these would be implemented and benefit the EU (project applicants get more points for cutting-edge research ideas that could be widely applied for the public benefit). Drafting such dossiers is the **second indispensable condition** in securing funding.

It is crucial to attract to the project team a leading research institute from Europe or another country with top scientific achievements in the technology field to be researched (this institute could also get 100 % financing). This is the **third important condition** to make a successful project and enable the transfer of breakthrough technologies to PERA (the terms of CRAFT projects require that the research carried out becomes property of

ding in 2010, cuts in the Structural Funds for Bulgaria are quite possible. It is the practice in the EU to redirect thus freed financial resources to member states achieving better results in their use and management.

The European Parliament is to begin funds planning for the 2014 – 2020 programming period, distributing them among member states on the basis of the preceding period's results in terms of both absorption of the funds and their transparent management in compliance to EU rules.

Box 3. BEST PRACTICES IN EU STRUCTURAL FUNDS ABSORPTION (CONTINUATION)

the SMEs participating in the project consortium, which are obliged to apply the developed idea in their production practice. The project coordinator also has full access to the information and the right to disseminate and elaborate on the technology developed under the project).

Lobbying, the **fourth important condition,** is crucial in how the themes will be formulated and raises a project's chances of approval. It is part of the overall government efforts and policy. In proof of their understanding how important lobbying is PERA have their Brussels office in proximity to the British Council and right next to the European Commission's premises.

Source: Point L-Bulgaria Ltd.

National Funds and Programs for R&D and Innovation Financing

National Innovation Fund

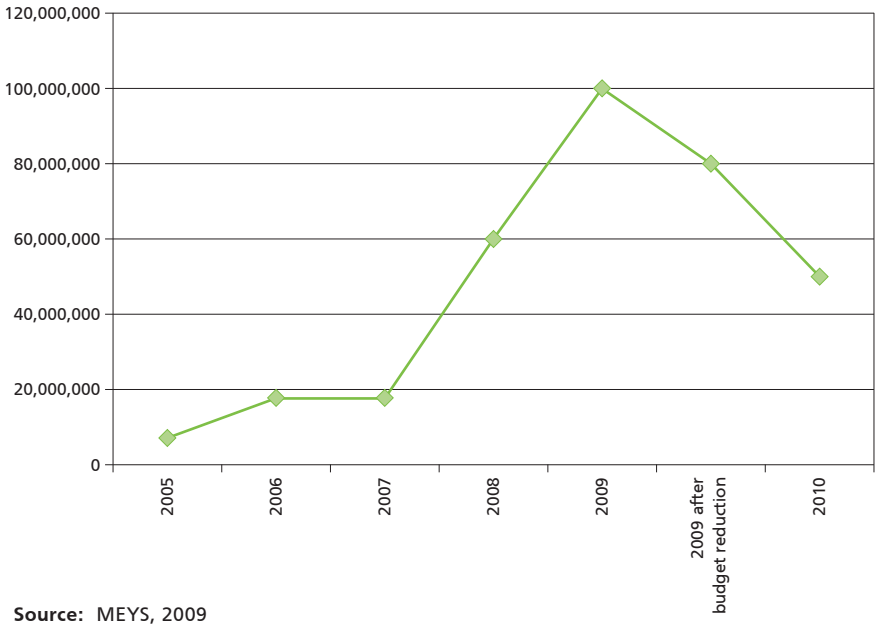
The National Innovation Fund (NIF) was launched in 2005 by a Council of Ministers Decision in implementation of Measure 1 of Bulgaria's National Innovation Strategy. Its resources are intended to promote R&D projects and feasibility studies targeted at the development of new or improved products, processes or services capable of enhancing the economic performance, innovative potential and technological capacity of enterprises.

In the period 2005 – 2007, the number of submitted projects has gradually increased, while in 2008 it sharply dropped. This could partially be explained by the firms' growing interest in selection procedures under the Competitiveness OP and also by the widely shared opinion that project reporting of actual costs is rather challenging, particularly where salaries and social security contributions are concerned.

Although initially it did not run smooth, NIF has managed to attract SMEs to the opportunities it offers for funding their R&D activities. What hinders NIF's operation are the cumbersome administrative project implementation and reporting procedures, and the distrust concerning the transparency of project selection. Solutions could be sought through the following approaches:

- Restructuring and making NIF an autonomous legal entity. Thus, it could flexibly manage its resources, forego cumbersome procedures and become

Figure 30. BUDGET OF THE NATIONAL SCIENCE FUND, LEVS



Source: MEYS, 2009

the major instrument for the co-financing of Community programs (e.g. CIP). The re-structuring could follow the models of the National Science Fund and the instrument for co-financing of approved projects under FP7.

- Improvement of NIF rules. It is not feasible to assess technical and economic (pre-project) studies and applied science research projects using the same methods and criteria.
- The criteria for evaluating business prospects should also be corrected. Although it finances research up to its pre-market stages, the criteria of innovativeness and business prospects currently have equal value.
- The overall management of NIF should be improved by extending the period of planning of the sessions to and over 3 years. It is viable to assess the results of implemented research of concluded projects and perform a comprehensive evaluation of NIF activities.

National Science Fund

The National Science Fund (NSF) finances research activities under projects and programs. It plays an important part in the implementation of scientific research and supports the Bulgarian scientific community in the establishment of multinational research networks and the participation in European consortia and infrastructures. NSF was set up in 1990, but only in the period 2005 – 2009 it was given the resources to contribute sufficiently to the establishment of the Bulgarian research area.

NSF supports both the development of scientific projects and the protection of scientific products. In some of its competitions SMEs can partner with research organizations in applied research and the development

Table 8. INDICATORS FOR ASSESSMENT OF THE ACTIVITY OF THE NATIONAL INNOVATION FUND

Indicators	I session 2005 г.	II session 2005 г.	III session 2006 г.	IV session 2007 г.	V session 2008 г.
Submitted projects, number	118	120	146	168	123
Submitted projects growth compared to base year (I session = 100 %), %	100	101.7	123.7	142.4	104.2
Submitted projects growth compared to previous year, %	100	101.7	121.6	115.1	73.2
Selected projects, number	43	67	108	102	61
Selected/submitted projects ratio, %	36.4	55.8	74	60.3	49.6
Selected projects growth compared to previous year, %	100	155.8	161.2	94.4	59.8
Agreed subsidy (mln levs)	6.7	8.3	16.6	16.9	12.3
Subsidy growth compared to base year (I session = 100 %), %	100	123.9	247.8	252.2	183.6
Subsidy growth compared to previous year (I session = 100 %), %	100	123.9	200	101.8	72.8
Average value of the financed project (thousands of levs)	155.8	123.9	153.7	165.7	201.6
Average subsidy growth compared to base year (I session = 100 %), %	100	79.5	98.6	106.4	129.4
Average subsidy growth compared to previous year, %	100	79.5	124.1	107.8	121.7

Source: Bulgarian Small and Medium Enterprises Promotion Agency (BSMEPA), 2009

Box 4. NEW FINANCIAL SCHEMES OF THE NATIONAL SCIENCE FUND

In 2007 and 2008 several new financial schemes were introduced:

- Schemes to support project preparation under FP7 and COST (starting 2009);
- Schemes to co-finance research and demonstration projects under FP7; since 2009 these also finance the research efforts of teams engaged in ongoing activities under COST;
- Advanced research centers and integrated research units at universities;
- Reintegration grants encouraging the return of Bulgarian scientists working abroad to engage in research at home;
- Fellowships for senior scientists to enhance their skills, experience and knowledge.

Source: MEYS, 2010

of new products. Its instrument for co-financing FP7 projects is a strong incentive for the prospective participation of Bulgarian organizations in the program.

The highest funding was provided by NSF in 2008. In 2009, however, considerable cuts were made which amounts to reducing public resources spent through tendering.

Over the period 2005–2007 international expertise started to be used in evaluating project applications to the NSF without exception. This reduced the approval rate from 45 % in 2005 to 30 % in 2007, but opportunities were provided to increase the average funding of projects and thus enhance the efficiency and quality of research (in 2005 and 2006 the average per-project funding was about 20,000 levs, in 2007 it exceeded 80,000 and in 2008 reached 250,000 levs). In 2008, the selection procedure was changed to include a national-level selection round, which breaches international practices of independent and objective expertise based on scientific quality. This compromised NSF's transparency and effectiveness in 2008 and 2009. It is necessary to restore the good practice of international evaluation and to foreclose the possibility of politically influenced award decisions.

There are several internationally applied principles that Bulgaria should embrace with regard to the public funding of R&D and innovation: project funding should prevail over institutional funding; resources should be distributed according to clearly stated priorities and a mechanism to assess the achieved effects; the various funding sources should complement each other where possible depending on the overall conditions and value of any particular investment; business investment into the introduction of new products and processes should be encouraged through a variety of regulatory mechanisms.