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Forms and Mechanisms of Public-Private Partnerships in Innovative Modernization of the Western Europe Economies

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Abstract

The main purpose of the article is to review the contemporary forms and mechanisms for financing of public-private partnership (PPP) in the context of a new innovation policy of the European countries. The authors reveal the essence and specific features of PPP in innovation sector, and provide a comparative characterization of direct and indirect mechanisms for PPP financing. The authors analyze the innovative development of the EU countries and divide them into several groups depending on their innovation performance. The performed analysis led to the conclusion that the economic crisis and the slow pace of economic redevelopment have a negative impact on the innovation-driven growth of the EU countries. The authors conclude that the decrease in the volume of public resources may have a negative impact on R&D budgets in the EU member countries. Solution to social and economic problems will require a technological breakthrough. To this end, the governments of European innovation-active countries held a "new course" for innovation policy, including the priorities for the development of national systems of innovation measures to enhance and improve the mechanisms for financial support of innovative entrepreneurship.

Keywords: public-private partnership (PPP), R&D spending, testing and evaluation, debt finance, tax incentives, state funding, government and business cooperation forms, innovation policy

1. Introduction

In an open global economy, competitiveness relies on business capacity to create high value-added goods and services. One of the main challenges, facing the economies of the European countries, is the modernization of their industrial base by accelerating innovation. Industrial modernization in Europe requires the successful commercialization of products and services, innovation, and commercial exploitation of innovative production technologies and processes, as well as innovative business models (Butova, Ragulina, & Krivtsova, 2013).

Innovation is an important driver and its importance has become even more significant in recent years. Huge innovation potential can play a critical role not only in economic redevelopment of the country after the crisis, but also to ensure sustainable economic growth (European Commission, 2013).

Innovation development is reflected in official documents of both external and internal strategic planning of Western European countries.

In June 2010 heads of states and governments endorsed the European strategy for 2020, which aims at targeting the European economy. One of the selected targets under the EU strategy "Europe-2020" is focused on the research and innovation. In this regard, the "Europe-2020" highlights three complementary priorities (European Commission, 2010):

-Smart growth: economy development based on knowledge and innovation;

-Innovation: improving the framework conditions and access to finance for research and innovation in order to strengthen the innovation chain and increase the level of investment throughout the EU as part of "Innovation Union" initiative;

-Inclusive growth: development of innovative capacity in European countries, improvement of education outcomes and quality, and use of the economic and social benefits of a digital society.

Important role in innovation policy of the European countries is given to the development of public-private partnership to create new and modernize existing production facilities. Public-private partnership can improve the efficiency and sustainability of public services, such as water supply, sanitation, energy, transport, telecommunications, health, and education. Public-private partnership also allows for a more efficient allocation of risks between the public and private sector organizations, taking into account their ability to manage these risks (World Bank Institute, The WB and Public-Private Infrastructure Advisory Facility (PPIAF), 2012).

2. Methodology

2.1 The Essence and Forms of the Public-Private Partnership Implementation

Currently, there is no unified globally accepted definition of the term "public-private partnership". Sometimes it is used to refer to any association of public and private sectors to achieve public policy goals. The World Bank defines public-private partnerships as a "long-term contractual agreements between the government agencies or authorities and private person to create a state-owned assets or deliver services, wherein a single party bears a significant risk and leadership responsibility» (Posner, Shin Kue Ryu, & Tkachenko, 2009).

In general, public-private partnership describes a project to provide public services or goods that are financed and implemented on a contract basis in the framework of partnerships between government and private business or non-profit enterprise.

Public-private partnership is characterized by the following main features (Seleznev, 2012):

- The parties of the partnership should be represented by both the public and private sectors;
- The relationship between PPP parties should be filed in official documents (agreements, contracts, etc.);
- The relationship between PPP parties should base on partnership and be of equitable nature;
- The parties should have common goals and clearly defined interest;
- The parties should join their contributions to achieve common goals;
- The parties should share the risks and costs, as well as be able to use the results obtained.

There are several means of communication between the state and the private sector. These means can range from privatization, where proprietorship and risks are transferred to the private sector, to conventional procurement models, where government contracts with the private sector are made for individual work or service packages. Normal procurement in the public sector, as a rule, involves risks, associated with the ownership, operations and integration of services. As a rule, public-private partnership does not include service contracts or contracts for the "turnkey" construction, which belong to the category of public procurement projects, or privatization of public enterprises, where the state is constantly represented. However, it should be noted that vertically integrated corporations play a dominant role in the development of territorial economic systems. In many instances, vertically integrated corporations are making a decisive contribution to the formation of territorial budgets, investment attraction, filling local markets, and the development of social and economic infrastructure (Mokrushin, 2011). In this context, forms and methods of public-private partnership with major corporations are in-demand.

Depending on the nature of collaboration and risk sharing between the public and private sectors in the accomplishment of innovative projects, public-private partnership may take a variety of forms. Stage of involvement of the private sector is fixed in the contract or agreement, which also defines the responsibilities of each of the parties and clearly distributes risks. Comparison of the main cooperation forms between government and business is presented in Table 1.

Table 1. Comparison of the main cooperation forms between government and business in the framework of PPP

PPP form	Ownership of assets	Operation and Maintenance	Investments	Commercial risk
Service contract	State	State and private sector	State	State
Management contract	State	Private sector	State	State
Concession	State	Private sector	Private sector	Collective
Lease agreement	State	Private sector	State	Collective

Depending on the final effect and the initiator, four main cooperation forms between the innovative partnership actors can be identified: adoption of technologies, support of demand, concentration of resources, and shopfloor initiative (Sudas & Koryakina, 2014). General characteristics of these cooperation forms are presented in Table 2.

Table 2. Cooperation forms between the public and private sectors in scientific and technological innovation

Form of interaction	Initiator	Final effect	
Adoption of technologies	State (State research institutions)	Contract with the "consumer", which adopts the technology, developed at the expense of the state budget	Technology transfer centers and spin-off companies
Support of demand	State	Development and/or adoption of technology, important from the state's point of view, with account of business resources and needs	Mega-projects, VIP projects, etc.
Concentration of resources	State	Intensification of network relationships within the cluster	CRITT, CNRT, ANRT (France); Fraunhofer Society
Shopfloor initiative	Business	Cooperation of public research organizations with private companies that results in the update of the state resource base and practical knowledge about the industry, as well as in the scientific and technical outcomes and professionals training in private companies.	Corporate universities, cooperation agreements

In most countries, the technologies are assimilated based on commercialization and transfer of those ones, which were developed at the expense of the state budget (the sale of patents and licenses, belonging to public research institutions). In addition, this cooperation principle is evidenced when creating companies based on university research and development (spin-off companies).

Cooperation model called "Support of demand" is realized mainly when implementing joint innovation projects, in which the government pursues a goal to achieve the public interest and supports only the priority innovation areas. At that, business gets state support only at the initial R&D stages.

Contradictory interaction of globalization and localization trends results consequently in the formation in the regions of trans-regional territorial industrial clusters and inter-industry structures, integrated horizontally and vertically. These structures provide integrating of local structures into broader reproductive systems, namely inter-regional, national, cross-country, and global systems, and transform regions into world economy business entities (Kerashev & Mokrushin, 2011). Cooperation model "Concentration of resources" is characterized by the creation of clusters and network structures using mechanisms of public-private partnerships. Cluster policy is becoming increasingly common in Western Europe and is focused on supporting of market dynamics and the knowledge exchange between companies and other organizations in the region, as well as in the international value chain of the global networks.

2.2 Financing Mechanisms for Public-Private Partnerships

Business is the main driver of innovation, though as a rule, it is involved in R&D to differentiate from the competitors, to be more successful and increase profits (Kondratyev, 2013). However, the costs and uncertainty of R&D works, as well as the time required to obtain a return on investment, and the likelihood that competitors can steal the obtained research results, reduce business incentives for the development of innovation.

Encouragement of innovative entrepreneurship and creation of conditions for its development is effected through various state mechanisms, including grants and subsidies; debt and participatory finance, and innovation vouchers.

Government finances innovative business through a combination of direct and indirect mechanisms. Direct funding allows governments to form a specific platform for R&D and focus necessary efforts toward projects involving high social returns, though have low profitability, such as "green" technology, i.e. social innovation.

Direct financial support is carried out through public procurement mechanism for R&D, as well as a variety of grants, subsidies, donations, debt and participatory finance, and innovation vouchers.

Grants and subsidies are the most common financing instruments, which are used as seed funding for start-ups and innovative small and medium-sized enterprises (SMEs). They are provided on a competitive basis and in some cases under the terms of private co-financing. Usually, no payoffs are required. Here, the Central Innovation Program for SMEs (Germany) may serve as an example.

The debt finance mechanism includes loans, returnable grants and loan guarantees. Key features of debt finance of innovative business are presented in Table 3.

Table 3. Key features of debt finance of innovative business

Financing instruments	Key features	Examples of some countries
Loans	Certain types of collateral or surety commitment are required. Obligations as debt repayment. The investor /creditor does not receive shares.	Novallia (Belgium), High-Tech Grflnden'onds (Germany), Public Investment Bank (France), British Business Bank
Returnable grants	Return grants must be repaid, partially or completely, sometimes in the form of royalties. May be granted on the basis of private co-funding.	Returnable grants for start-ups (New Zealand)
Loan guarantees and risk-sharing mechanisms	Is widely used as an important tool to alleviate financial difficulties for SMEs and start-ups. In the case of an individual assessment of loans, company's credit information is sent to the bank. Often used in conjunction with the provision of additional services (for example, information assistance, training).	Mutual guarantee schemes (Confidi, Italy), R&I loan services (European Commission), business finance, (Parinership, UK)

The participatory finance tools include: participation in home equity, mezzanine financing, venture capital and funds, and business angels (Kutlaca & Radosevic, 2011). Key features of participatory finance of business innovation are presented in Table 4.

Table 4. Key features of participatory finance of business innovation

Financing instruments	Key features	Examples of some countries
Nonbank financing / owner's equity	New financing channels. Innovative lending of platforms and nonbank debt and participatory finance.	Business, finance, and partnership (UK)
Mezzanine financing	Combination of several financing tools with varying extent of risk and return, which includes elements of debt and equity capital as a single investment tool. It is used at a further stage of enterprise development. More suitable for SMEs with a strong financial position and a moderate pace of increase.	Guarantees for a mezzanine investments (Austria), Ouriertransform (Sweden).
Venture capital and funds	Funds provided by institutional investors (banks, pension funds, etc.) will be invested in the company at the early stages of the expansion. As a rule, more funds are invested in the later less risky stages. They are called the "patient" capital due to the long period of return (10-12 years). The investor gets capital share.	Scottish Co-Investment Fund (UK), Seed Fund (Finland)
Business angels	Provide funding, expertise, and monitoring. As a rule, are invested in the form of groups and networks for early stage start-ups.	Seraphim Fund (UK); IQ Capital Fund (UK); Eurofund (Germany); Inventech (the Netherlands)

The mechanisms of indirect public funding include the following (Farquharson, Torres de Mästle, & Yescombe with Encinas, 2011):

- The corporate income tax incentives. Is used in most countries. It is characterized by a wide range of taxation mechanisms of corporate income tax, including tax incentives for R&D spending, and more rarely tax incentives for IP. For example, SR&ED tax credit (Canada), R&D Tax Credit (France), exemption from income tax on wages (the Netherlands), and the patent box (UK).
- Personal income tax (PIT) and other tax incentives. Are available in many countries. A wide range of tax incentives for R&D, business investments and income that are subject to PIT (value added tax or other taxes, such as consumption, land, or property tax, etc.)

Tax incentives allow one to reduce the R&D spending and innovation costs. Usually, they tend to be more neutral than the direct support of industry, region or company, although this does not exclude some differentiation, often in terms of the company size. Direct subsidies are more focused on long-term research and

R&D. Tax schemes more often encourage short-term applied research and increase incremental innovations, rather than radical breakthroughs.

3. Results

During the period of 2003-2012 gross domestic R&D spending of EU Member States increased by 1.3 times and amounted to 281.9 bln US dollars (Figure 1).

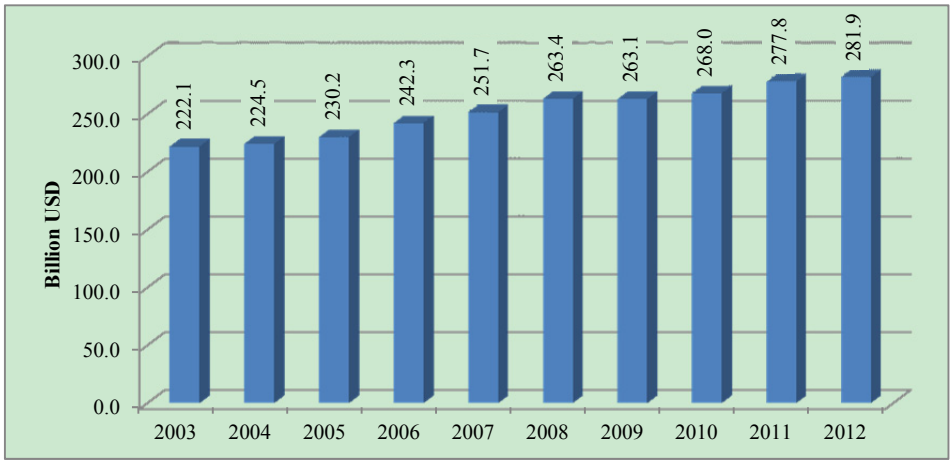

Figure 1. Gross domestic R&D spending in the EU Member States during 2003-2012 (OECD, 2015)

In general, the R&D spending in EU states accounts for 2.02% of GDP (Eurostat, 2014).

The most significant R&D spending in overall GDP is observed in the Nordic countries (Denmark, Finland, and Sweden), as well as in Austria, Germany, and Slovenia (Figure 2).

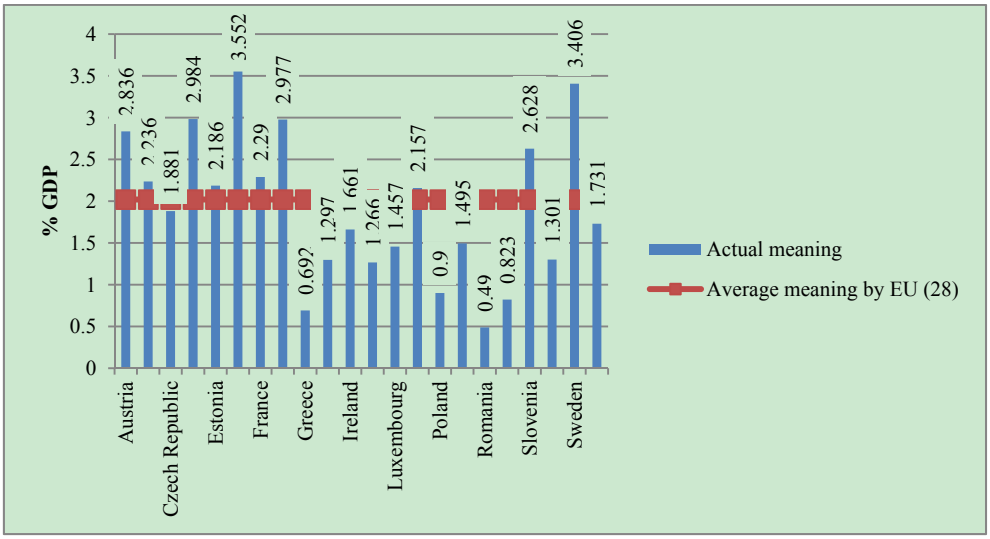

Figure 2. Proportion of gross internal R&D spending

The share of the business sector accounts for 54.9% of total domestic R&D spending. Public funding of R&D ranges from 10 to 20%.

In general, public funding of R&D and innovation has increased over the period of 2006-2013, both in real terms and as a percentage of GDP. In general, during the eight-year period the average annual growth rates of innovation in the EU countries reached 1.7%.

All EU Member States have improved their innovation activity. The growth has been particularly noticeable in Belgium, Estonia, Ireland, and Slovenia, where direct support and tax incentives for businesses ensured almost double increase since 2006. The lowest innovation growth rates were observed in Sweden, the UK and Croatia (Kroll & Stahlecker, 2013).

In 2009, many countries experienced a sharp increase in government funding, though over a short period of time. This was caused by the fact that innovation has been an important part of the economic redevelopment package. State budgetary appropriations or spending on R&D (GBAORD) rose by about 9%.

Most of investments were directed into infrastructure and businesses (credit guarantees to small businesses, the return on R&D tax credits, government procurement, etc.) (European Commission, 2013b). This partially compensated the decrease in enterprises expenditures. For this reason reduction of the total amount of R&D spending in 2009 was not as great as it could be otherwise. However, in 2010 and 2011, as the budgetary constraints were hardened, many countries began to slow down or reduce their spending on R&D (in 2010 GBAORD OECD index decreased by about 4%). The most significant curtailment of spending occurred in France, Finland, Spain and the UK.

Depending on the innovation activity indicators, EU Member States are divided into four groups in terms of their efficiencies:

-Denmark (DK), Finland (FI), Germany (DE) and Sweden (SE) are "Innovation leaders" with innovation activity higher than the EU average;

-Austria (AT), Belgium (BE), Estonia (EE), France (FR), Ireland (IE), Luxembourg (LU), the Netherlands (NL), Slovenia (SI) and the United Kingdom (UK) are "Innovation followers" with innovation activity higher or equal to the EU average;

-The innovation activity in Croatia (HR), Czech Republic (CZ), Greece (EL), Hungary (HU), Italy (IT), Lithuania (LT), Malta (MT), Poland (PL), Portugal (PT), Slovakia (SK) and Spain (ES) is lower than that of the EU average. These countries are "Moderate innovators";

-Bulgaria (BG), Latvia (LV) and Romania (RO) refer to a "Modest innovators", innovation efficiency in these countries is much lower than the EU average.

Sweden is the leader in terms of innovation system efficiency and steadily occupies the first position in the overall EU ranking. It is followed by Denmark, Germany and Finland. The most innovative countries work better than others in all areas: from research and innovative developments to innovation outputs and cost advantages, which reflects the balance of the national science and innovation system (European Commission, 2013c).

Innovation followers are next to innovation leaders. They are characterized by small deviations from the established investment efficiency criteria. This means that the effectiveness of innovation leaders (Sweden, Denmark, Germany, and Finland) differs just slightly. Innovation leaders are mainly on the upper level and definitely above the EU average (Figure 3).

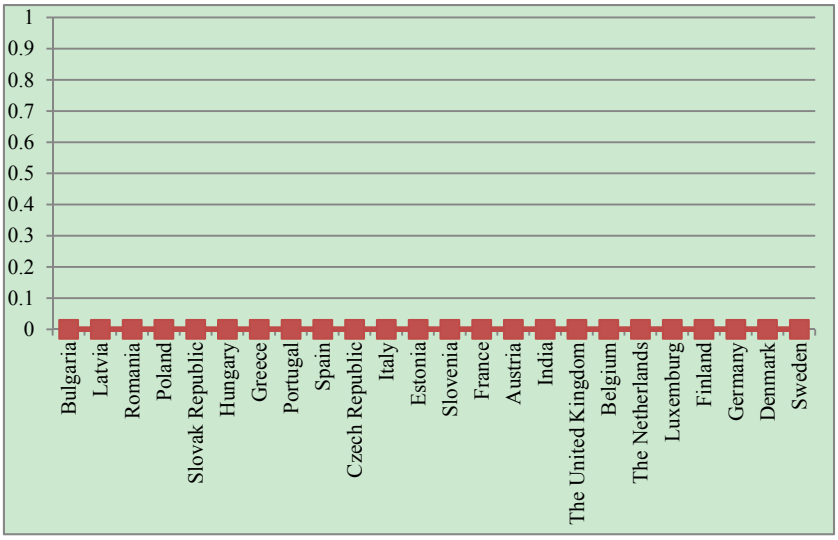

Figure 3. Innovation index (SII) of the EU Member States at the end of 2013
(Garcia Porras, Nicklas, & Jerzyniak, 2014)

However, some other countries achieve the best results in specific individual indicators. Thus, Sweden, Finland, Ireland, and the United Kingdom have a better appreciation of human resources. Denmark, the Netherlands,

Sweden and the United Kingdom have reached the top position in terms of transparency and efficiency of their scientific research system.

Estonia, Finland, Sweden, and Denmark topped the ranking in terms of financial support for innovation. Sweden, Germany, Finland, and Slovenia took first place with respect to investment campaigns. Denmark, the United Kingdom, Belgium, and Sweden are among the top countries in terms of cooperation with business. Denmark, Austria, Germany, and Sweden have reached the top position in relation to intellectual assets. Ireland, Germany, Luxembourg, and Denmark have achieved high performance and good economic impact of innovation.

Innovation activities in Sweden showed steady growth until 2012. However, there was a slight decline in 2013 primarily due to the reduction of venture capital investment. As compared with the EU average, innovative performance in Sweden for the entire period reduced from 148% in 2006 to 135%.

Innovation activity of Denmark has significantly decreased in 2008 (in particular due to a lower share of innovative products and innovative processes, marketing and/or organizational innovators, and innovative SMEs). Despite the subsequent increase in productivity, Denmark failed to reach the level of 2008 (40% above the EU average); at the end of 2013 its innovation index was just 32%.

The relative advantages of Denmark as compared to the EU average concern international scientific collaborative research, public-private partnership, the design of production prototypes, as well as R&D spending in the business sector. Though, in terms of a total number of PhDs and the contribution of high-tech into the export surplus, Denmark's index is below the EU average.

Innovation followers include also highly developed countries of Western Europe, such as the United Kingdom, Germany, and France.

After the recession in 2008, innovation performance in the United Kingdom significantly enhanced during the years of 2009-2010, particularly due to the increase in the number of innovative SMEs. Since 2010, the innovation indicators were quite stable, showing a slight decline in 2013. Though, over the period of 2006-2013 innovation performance in the UK decreased from 120% in 2006 to 111% in 2013 relative to the EU average. Inferiority of the UK innovation policy is the low proportion of innovative products and technologies in total sales (Chernomorova, 2013).

Innovation performance of Germany for the period of 2006-2013 has increased, showing a temporary decline in 2011. In relation to the EU average, innovation performance of Germany decreased from 33% in 2008-2009 to 28% in 2013. Germany dominates by the number of international scientific co-publications and doctoral graduates, as well as the efficiency of innovation spending. Weaknesses concern venture capital investment, licensing and patent revenues from abroad.

Innovation performance of France was increasing until 2010. However, for the past four years, the growth rate was slowing down, and the level of innovation performance declined in 2013 mainly due to the small share of fast-growing companies in the innovation sector. Performance level in relation to the EU has reached a peak of 107% in 2011, though in 2013 decreased down to 103%.

4. Discussion

In 2014, almost all EU countries acknowledged their commitment to innovation policy and intentions, either retaining or, in most cases, increasing the national budget in the field of science, technology and innovation.

Thus, ***France*** is implementing the second phase of its program "Investing in the Future" with funding of 14 bln US dollars (12 bln Euros). In 2012, the spending for R&D amounted to 1.48% of GDP. This indicator is lower than that for Germany and the Nordic countries. To increase R&D and innovation, the French government retains a tax credit, which is one of the highest in the world, with a total demand of about 6 bln US dollars per year (5 bln Euros). Also, a number of measures were adopted to strengthen the direct support of 34 key industry sectors (OECD, 2014).

De-industrialization of the country affected the competitiveness of industrial enterprises. In this regard, the mobilization of mechanisms of public-private partnerships to promote innovation-based growth is a major focus of the state.

Priority #1: Promoting restructuring and a new approach to growth. France puts innovation at the center of its growth strategy, which focuses on the new industrial policy, in particular, on the "management" of energy, and on information technology. Policies to promote R&D business and development of new companies are formalized in legislation, and clear plans are shaped for its implementation.

Priority #2. The solution of social problems. French policy is aimed at increasing the contribution of publicly supported R&D in solving critical social problems (environment, nation's aging). This will be a major component of the national strategy of France (SNR), which is developed in the first half of 2014 through extensive consultations with concerned parties. Implementation of the plan will allow identifying the necessary resources. It will be associated with investments into the future (PIA), based on a budget amounting to 23.8 bln US dollars (20 bln Euros) for research and innovation for a period of 2010-2020.

Priority #3. Reforming the public research system. French public research system continues developing. France is going to take measures to strengthen the links between parties having social and economic interests, to enhance the integration of universities, as well as engineering and business schools (grandes écoles).

The United Kingdom plans to unlock additional funding and prioritize long-term infrastructure costs. Since 2011, the UK's growth strategy envisages a key role of the government as a leading customer of innovative products and services. In 2012, the British government adopted an industrial strategy, which focuses on innovation policy in areas, where the government can have a quick and real effect.

Priority 1: Focus on preferred areas/sectors and new industrial policies. State industrial strategy is aimed at developing of strategic partnerships with industry in 11 sectors, which are capable of initiating the growth of the entire world economy. Among them, the most important are co-funded Institute for Aerospace Technology (2.8 bln US dollars or 2 bln pounds sterling), Automotive Power Center (1.5 bln US dollars or 1 bln pounds sterling), and the centers for agricultural innovation and agricultural technology (231 mln US dollars or 160 mln pounds sterling).

Industrial strategy involves public investment in eight new cross-platform technologies, for which the United Kingdom in 2012 allocated from the budget 879 mln US dollars (600 mln pounds sterling). In addition, the government is developing a network of Catapult centers, which give businesses access to specialized equipment and the cutting-edge technologies.

Priority #2: Extension of international cooperation. In the UK, researchers are well integrated into the international network. Federal initiatives contribute to closer ties with developing countries.

For example, Technology Strategy Board (TSB) has launched two R&D cooperation programs funded jointly by China (on sustainable production technology) and India (on affordable medical care and "clean" technologies, especially for energy systems) totaling 15 mln US dollars (10 mln pounds sterling). The government is also investing 115 mln US dollars (80 mln pounds sterling) in the framework of joint global program on cooperation with emerging nations in the field of space resources and technology development.

Another 108 mln US dollars (75 mln pounds sterling) will be invested annually to improve the research and innovation capacity of emerging countries and to create a research partnership with the UK.

Priority 3: Promoting innovation in companies and supporting entrepreneurship and SMEs. The UK government has taken some measures to increase innovation in companies and support SMEs, especially through the TSB programs. The government has announced the extension of the Small Business Research Initiative (SBRI) program, which aims at encouragement of innovation through public procurement. This extension will include specific key targets with a view to increase the value of procurement contracts through SBRI in 2014-2015 by more than 290 mln US dollars (200 mln pounds sterling).

The innovation vouchers program was officially launched in 2012. Now in the UK, small and medium-sized enterprises can get for start-ups up to 7,000 US dollars (5,000 pounds sterling).

In order to increase the supply and diversity of available funding for small and medium-sized enterprises, the United Kingdom is currently creating British Business Bank as a new national development bank.

Germany also has selected the priority of public expenditure on R&D and innovation. Thus, budget of the Federal Ministry for Education and Research in 2014 provided an additional 402 mln US dollars (313 mln Euros) for education and research.

Germany is one of the leading players in the global innovation and science. The High-Tech (HTS) Strategy of the German Federal Government sets the medium-term strategic guidelines for the innovation, namely strengthening the scientific and technological base, enhancing innovation activity and creating jobs, as well as helping to solve global problems in order to improve standard of living. Integrated innovative interagency strategy covers technological and social innovation, and is focused on the transformation of research results into practice.

Priority #1: Innovative contribution to the solution of social problems (which includes also their transparency). Unlike the previous R&D policy, HTS will contribute not only to the development of individual technologies, but will also meet public need for sustainable development in the field of clean energy, effective healthcare service, sustainable mobility, communications security, and the future competitiveness of German industry.

The HTS also aims at creating and bringing to market promising projects (Zuleunfts-projelete), which will have an impact on society. Implementation of HTS is supported by many initiatives, related to the financing private and public R&D, reforming the education system and improving links between science and production. A budget of 960 mln US dollars (770 mln Euros) is currently provided on healthcare service innovation for 2011-2015.

Priority #2: Focus on promising trends. The implementation of promising projects is inseparably associated with the achievement of specific R&D goals during the course of the next 10-15 years. As part of the research program in the field of sustainable development (FONA) (2010-2014), a studies on climate change mitigation and adaptation have been conducted, as well as on sustainable resource management and innovative environmental and energy technologies, with a budget of 2.5 bln US dollars (2 bln Euros). The program aims at maintaining and strengthening Germany's leading status in these technological areas.

National research strategy in bio-based economy up to 2030 with a budget of 2.6 bln US dollars (2 bln Euros) for 2011-2016 is aimed at strengthening the future competitiveness of German industry and biotechnology.

Other sectorial programs include Nano-2015 initiative with a budget of 526 mln US dollars (410 mln Euros) for 2012-2015, and the German space program with an annual budget of 1.5 bln US dollars (1.2 bln Euros).

Priority 3: Enhancing conditions for the innovation activities and improving competitiveness of SMEs. Germany stands for direct public support of innovation business and tax incentives. Financing of technologies for SMEs by the Federal Government has increased from 943 mln US dollars (783 mln Euros) in 2007 to 1.8 bln US dollars (1.4 bln Euros) in 2013. Central innovation program for SMEs provides the allocation of grants for small and medium-sized businesses, which are engaged in applied research and implement innovative projects worth 705 mln US dollars per year (550 mln Euros).

5. Conclusion

The economic crisis and the moderate pace of economic redevelopment have a significant impact on innovation policy in the EU. Gross expenditure on R&D in the EU fell by almost half compared to that of 2001-2008.

The challenges facing the governments of developed European countries consist in increasing the rates of economic growth and providing the solution to urgent social and environmental problems. However, the decrease in the volume of public resources may have a negative impact on R&D budgets (HM Treasury, 2012).

Since 2011, the growth rates of business expenditure on R&D have redeveloped to pre-crisis levels and amount currently to 3% per year. Here growth prospects are better than those for investments into physical assets, because companies, expecting weak demand, improve products and processes, but do not extend their production capacities.

State support for innovation business has helped to mitigate the ramifications of the crisis. Over eight years state financing has increased mainly due to the extension of tax incentives. Along with direct state funding, tax incentives amount to 10-20% of the R&D business costs. Indirect support is equal to or greater than direct support in thirteen of the twenty eight EU countries.

Direct government funding of R&D business is increasingly done through competitive grants and contracts, while debt finance (loans and loan guarantees) as well as participatory finance (venture capital, funds of foundations) are becoming more popular. Many countries have made to finance a particular industry or certain company category (especially SMEs) as part of their new industrial policy.

Solution to social and economic problems will require a technological breakthrough, the rapid deployment of existing or new technological solutions and systemic changes (in policy, regulation, behavior, etc.). Innovations of the aging society, for example, can lead to a new growth in industry, though suffer from a lack of funding and policy coherence.

Therefore, the governments of many European countries are initiating a "new course" for innovations that will enhance the status of innovation policy when adapting to new conditions. Current prospects for slow GDP growth and tight government budgets indicate the continuing strategy of using innovation to achieve social goals for the coming years.

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