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Innovation Agenda for Sustainable Growth and Competitiveness

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LIST OF ABBREVIATIONS

ARC Fund	– Applied Research and Communications Fund
B2B	– business-to-business
B2C	– business-to-customer
BAS	– Bulgarian Academy of Sciences
BGN	– Bulgarian lev
BNB	– Bulgarian National Bank
BPO	– Bulgarian Patent Office
BSMEPA	– Bulgarian Small and Medium Enterprises Promotion Agency
CF	– Cohesion Fund
CIP	– Competitiveness and Innovation Programme
COSME	– Competitiveness of Enterprises and Small and Medium-sized Enterprises
CRM	– customer relationship management
ERA	– European Research Area
EBRD	– European Bank for Reconstruction and Development
EC	– European Commission
EEA	– European Economic Area
EIT	– European Institute of Innovation and Technology
ERDF	– European Regional Development Fund
ERP	– enterprise resource planning
ESF	– European Social Fund
EU	– European Union
EUWIN	– European Workplace Innovation Network
GDP	– gross domestic product
INA	– Survey of Innovation Activity of Bulgarian Business conducted by ARC Fund
IP	– intellectual property
ISSS	– Innovation Strategy for Smart Specialisation
JEREMIE	– Joint European Resources for Micro to Medium Enterprises
JSC	– joint stock company
LLC	– limited liability company
MEE	– Ministry of Economy and Energy
MES	– Ministry of Education and Science
NACE	– Statistical Classification of Economic Activities in the European Community
NGO	– non-governmental organisation
NIF	– National Innovation Fund
NRA	– National Revenue Agency
NSF	– National Science Fund
NSI	– National Statistical Institute
OECD	– Organisation for Economic Cooperation and Development
OP	– Operational Programme
OPC	– Operational Programme Competitiveness
OPSESG	– Operational Programme Science and Education for Smart Growth
PATLIB	– patent libraries
PPP	– public-private partnership
R&D	– research and development
RES	– renewable energy sources
RIS	– regional innovation strategy
SMEs	– small and medium-sized enterprises
SMJSC	– single member joint stock company
SMLLC	– single member limited liability company
ST	– sole trader
STEM	– science, technology, engineering, and mathematics
UMIS	– Unified Information System for Management and Monitoring of EU Structural Instruments in Bulgaria
WPI	– workplace innovation

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EXECUTIVE SUMMARY

The tenth issue of the annual *Innovation.bg* report continues a tradition of presenting and analysing the status of the national innovation system and its building blocks, and assessing the innovation potential of the economy as a factor for competitiveness on international markets. Ten years are a period, which allows a retrospective look assessing what has been achieved, while understanding the prospects for the future and providing recommendations based on good and bad practices. In addition, ***Innovation.bg* 2014 is an agenda** for addressing the main challenges of the rapidly changing business environment and upcoming hard decisions in the search of drivers for technological development and innovations.

National Innovation Policy

The assessment of the innovation policy of Bulgaria should be considered in the **context of the developments in the innovation system:**

- the state of **the economy** – 2014 marked the fifth consecutive year without economic growth in Bulgaria, depressed consumption and investment, shortage of new quality business projects and financial resources, and persistently high unemployment;
- serious external and internal **political instability**, high corruption and regulatory risk, which caused significant turbulence in the banking system, uncertainty in the management of EU funds and the national budget, growing public debt without adequate public investment decisions;
- apathy and extremely **low happiness levels in society** – lack of prospects for professional development and seeking opportunities abroad, primitive conditions in the health and education services, and the perception of national failure as compared to other EU member states.

In this context, the spread of social innovations and the development of entrepreneurial and innovation culture as fundamentals of the innovation potential at corporate and macroeconomic levels has been an exception and a result of

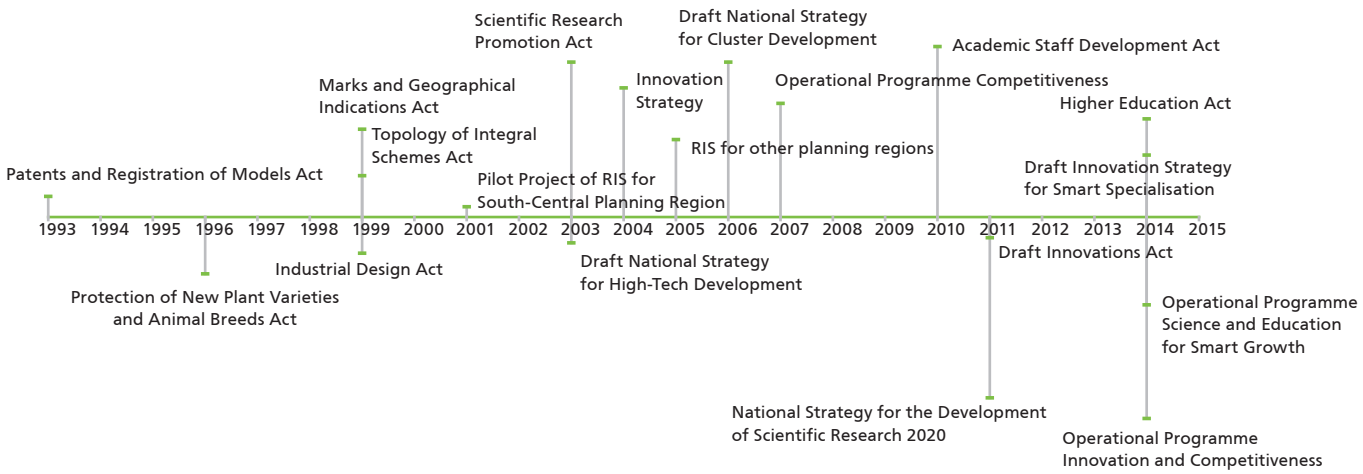
improved well-being associated with the beneficial effects of the country's EU membership. Innovation and research have been developing despite, not thanks to government policies.

In the last 10 years, the regulatory framework on innovation in the country can be defined as modest. There is no inner driving force in the country's innovation and scientific policy and progress has been made only in areas influenced by external factors:

- patent legislation, the harmonisation of which was part of the conditions for full EU membership;
- draft documents designed by non-governmental expert teams, which were never enacted (strategies for development of high technologies and clusters, a law on innovations);
- deliverables from European projects, which were not taken up as commitment by central and local government (regional innovation strategies);
- documents, which development the EU set as a precondition for the utilisation of EU funds – Operational Programme Competitiveness for the programming period 2007 – 2013, and for 2014 – 2020 – the operational programmes Innovations and Competitiveness and Science and Education for Smart Growth, as well as the Innovation Strategy for Smart Specialisation.

The political will for the advancement of science, technology and innovation in the last decade boils down to three documents: the *Scientific Research Promotion Act* (2003), the Innovation Strategy (2004) and the National Strategy for the Development of Scientific Research (2011). The implementation of these documents has not been supported by a clear and steady financial and administrative commitment, which made the implementation of their measures and instruments dependent on current financial and political conditions.

Figure 1. REGULATORY FRAMEWORK AND INSTRUMENTS OF INNOVATION POLICY IN BULGARIA



Source: ARC Fund, 2014.

The Innovation Strategy for Smart Specialisation and the two operational programmes Innovations and Competitiveness and Science and Education for Smart Growth, which are in the process of approval and will be effective in 2014 – 2020, have set the ambitious goal to create a comprehensive and adequate framework

for the advancement of research, technology, innovation and entrepreneurship in the country. The preconditions for this are promising:

- one completed programming period for Bulgaria as a full member of the EU and higher capacity of Bulgarian institutions and public administration to acquire experience and learn lessons for more accessible and efficient absorption of European and national financial resources;
- two government ministries – of economy and of education and science – have established a joint mechanism for agreeing on priorities and objectives and joint instruments of financial support of projects at all stages of the innovation lifecycle.

Innovation in Bulgarian Enterprises

Unlike innovation policy developments, Bulgarian enterprises continued enhancing their innovation potential. The 2014 Innovation Index of Bulgarian Enterprises shows a positive development: **the average index has been growing over the last 5 years** (2009 – 2014), though at a much slower rate. The innovation intensity of enterprises and the diversity of innovations has increased. The total number of innovating enterprises has been increasing too.

In 2014, 75 % of innovative companies made more than one type of innovation, versus 62.5 % in 2009. **The share of the most innovative companies** (those making the four types of innovations – product, process, organisation and marketing) **rose from 6.3 % in 2009 to 14.7 % in 2014.** Product innovations are the most common, followed by marketing innovations, which show expansion and deepening of the markets in the country. Bulgarian companies competing on the European and international markets are much more innovative than those which opted for national and local markets. In 2014, the average amount indicated by the enterprises as necessary for implementation of their innovation projects is BGN 4.7 million (€2.4 mln).

The positive development of innovative enterprises in Bulgaria shows the high potential in this field, provided their efforts are supported by better public policy.

Innovation Potential of the Bulgarian Economy

The progress of the national innovation system in the last decade does not correspond to its potential. Nevertheless, a number of **positive developments** took place in 2014:

- An Innovation Strategy for Smart Specialisation and two operational programmes – Innovations and Competitiveness and Science and Education for Smart Growth – were drafted as documents in support of R&D and innovation. Mechanisms for their coordinated application have been created.
- Indicators of the amount and structure of R&D financing and the number of persons engaged in research show an improvement, though remaining at lower levels compared to other EU member states.
- The contribution of the intellectual property intensive economic sectors to GDP and employment is rising. Still, a substantial part of the technological know-how is the property of foreign investors, without adequate connection to the local innovation ecosystem.
- There are more opportunities for the promotion of entrepreneurship.

Serious **weaknesses** persist and some display deteriorating trends:

- Lack of coordination, inconsistencies and inefficiencies in the use of the limited public funding for R&D and innovation. Good practices in this field are the exception.
- Insufficient financing in all institutional sectors, mainly in higher education. NGOs outperform higher education in the indicator "source of R&D financing." Universities have a deteriorating technological portfolio.
- The Bulgarian government has continued to substitute European funds for national public funds and commitments for innovation.
- The regional distribution of R&D financing and staff is returning to the status in 2000, after being more balanced in recent years. There is an extremely high concentration of innovation potential in the South-West Planning Region and neglect of the innovation systems of the other regions.

Bulgaria's experience from the first programming period in the EU shows that **membership alone cannot change significantly the relative backwardness of the country** in terms of innovation. The neglecting of science and innovation led to the country's further absolute and relative lagging behind in innovation capacity and intensity in implementing the new technological knowledge within EU. Furthermore, additional efforts are needed to counteract **European policies, which in some aspects are negative for the development of the country's innovation potential**. For example, increasing emigration is turning into a serious problem, as it facilitates the draining of top researchers and administrative staff to European research institutions as a result of the double standards of pay for equally highly-qualified personnel in EU research programmes.

INTRODUCTION

In recent years, there has been a clear trend of **globalisation** (free movement of capital, goods, people, information, ideas) **combined with deepening regional specialisation** in terms of technological chains for manufacture of products and their components and in the context of the innovation process. There are centres, regions and countries which specialise in entrepreneurship and fostering of new ideas, and other centres, regions and countries which develop competences and business models in support of effective implementation of such ideas in mass production at the lowest price.[1]

The benefits are allocated among all participants in the value added chain, and include new jobs, higher value added, better standard of life, pull-effect on other economic sectors. For the government and Bulgarian companies to benefit from these benefits, however, it is necessary to identify precisely the sources of comparative advantage (for example, creative potential based on developed innovation culture, quality education product and favourable business environment; disciplined labour force and available cheap raw materials, etc.) and apply aggressive tactics to reinforce them on the international markets. The line of behaviour based on contemplation, waiting out (e.g. till the end of the crisis), and/or passivity is bound to lead to losing positions in international rankings.

For a decade, the annual report ***Innovation.bg*** **has been providing a reliable measure of the innovation potential of the Bulgarian economy**, and of the state and opportunities for development of the Bulgarian innovation system. It makes recommendations for improvement of the public innovation policy in Bulgaria and the EU, based on the latest theoretical and empirical surveys, while taking into account the specific economic, political, cultural and institutional framework in which the country's innovation system operates. *Innovations.bg* has made a number of specific recommendations for improving the innovation policy and practice in the country, which were supported by businesses and sci-

[1] The 2015 Global Entrepreneurship Index, http://thegedi.org/

ence. The lack of specific consistent actions by the Bulgarian governments on these recommendations – despite commitment at the highest political level – is a sign of **serious institutional deficiency in the development and implementation of policies in this field.**

Innovation.bg 2014 analyses the status and potential for the development of the national innovation system on the basis of five groups of indicators:

- aggregate innovation product;
- entrepreneurship and innovation networks;
- investment and financing for innovations;
- human capital for innovation;
- information and communication technologies.

A highlight in *Innovation.bg 2014* is the analysis of **green innovation** – European and national policies, economic sectors (transport, renewable energy sources, energy efficiency, clean technologies), and green business practices.

European and Bulgarian Innovation Policy

European policy priorities in research and innovation

The origins of an explicit innovation policy can be traced back to the vision of the Organisation for Economic Cooperation and Development (OECD) that "knowledge in all its forms plays today a crucial role in economic processes. Intangible investment is growing much more rapidly than physical investment. Firms with more knowledge are winners on the markets. Nations endowed with more knowledge are more competitive."[2]

At the 2002 Barcelona Summit of the EU, it was decided that overall spending on R&D and innovation in the Union should be increased with the aim of approaching 3 % of GDP by 2010, while stimulating investment from the private sector. This goal was subsequently reinforced in the strategic document Europe 2020. The roadmap for the implementation of EU innovation policy lays down several priority measures, such as:

- Modernising the education system with a view to creating innovation skills;
- Improving the transfer of knowledge among universities, research organisations, and industry;
- Developing new technology markets;
- Modern innovation policy is defined as: non-interventionist, not actively impacting the sectors but setting the framework conditions for development; system-oriented – taking an inclusive approach to the innovation system as a whole and supporting innovation in all sectors and at all levels.

Modern innovation policy is essentially expected to reinterpret and rearrange the internal links within the innovation system, placing special emphasis on the integration of the key elements and stakeholders within the system. Success-

[2] OCED, "Technology, Productivity and Job Creation", 1996.

ful innovation policy not only encourages the creation of knowledge, which is viewed as a public good, and guarantees social cohesion but also helps achieve economic prosperity and high competitiveness.

In the past decade, Europe has made innovation a priority as the basis for sustainable competitiveness and economic growth. The goal is to catch up with the leading economies in the world – United States, Japan and South Korea, as well as with the economic achievements of the BRIC[3] countries. This calls for the implementation of a number of initiatives and measures outlined in various strategic documents – smart specialisation strategy, higher education strategy, etc. Since the success of innovations largely depends on high-quality human resources, availability of funding, organisational environment and physical infrastructure, each of these factors has a set of relevant measures and programme activities.

A number of factors have been identified as important to the development of innovation: the accumulation of knowledge; building human resources with creative thinking and innovative skills and knowledge; the transfer of technologies; knowledge exchange through research institutions; facilitated access to publications; open method of coordination.

Europe has been making efforts to ensure that its innovation policy is in line with sector-specific policies. The aim is to achieve a synergy between the various instruments of the framework programmes for research and innovation, the European education programmes, the structural funds, and other European and regional instruments.

Public-private partnerships (PPP) are of particular importance for the speedier adoption of innovations. That is why they occupy a prominent place in the new research and innovation programme, Horizon 2020. Seven initiatives representing a total investment of €19.5 billion, of which €7.3 billion is the EU contribution, support public-private partnerships. Some initiatives date back to the Seventh Framework Programme for Research and Technological Development, and others are the result of the integration of various additional initiatives.

The initiatives which are operating on a PPP basis (the Innovative Medicines Initiative, Fuel Cells and Hydrogen, Clean Sky, bio-based industry, Electronic Components & Systems for European Leadership, and Single European Sky ATM Research) are expected to raise close to €12 billion from the private sector and member states. PPP is considered particularly necessary for:

- achieving Community goals in the area of competitiveness;
- tackling societal challenges;
- raising more industry investment in research and innovation.

The new framework programme Horizon 2020 is an important instrument of European innovation policy. It brings together all existing forms of Community R&D financing, including the framework programmes for research, technological development and demonstration activities, Competitiveness and Innovation Programme (CIP), the European Institute of Innovation and Technology (EIT), the Euratom Programme. It provides financing for the intergovernmental framework European Cooperation in Science and Technology (COST), as well as the Joint Research Centres.

[3] Brazil, Russia, India and China.

The main goal of Horizon 2020 is the mobilisation of resources and their effective deployment via an inclusive approach and open access to new participants, as well as coordination of research and innovation efforts. Horizon 2020 has three essential and complementary priorities:

- excellent science;
- industrial leadership;
- tackling societal challenges.

The Programme has a budget of €70.2 billion, by current prices. It is allocated as follows:

- excellent science – €24.4 billion;
- industrial leadership – €17 billion;
- societal challenges – €29.7 billion;
- Euratom – €1.6 billion;
- EIT – €2.7 billion;
- other – €3.2 billion.

A number of other European documents stress the importance of developing and adopting more innovative practices. The European Economic and Social Committee shares the view that combining different initiatives based on various partnerships would improve conditions for the development of innovation. Achieving a synergistic effect is particularly important, as is attracting funds through the implementation of more flexible and less bureaucratic initiatives. Different types of partnerships are being developed with the aim of achieving a synergistic effect:

- institutional and contractual PPPs;
- European technology platforms;
- European partnerships for innovation as common platform for cooperation;
- knowledge and innovation communities, created with EIT as networks of innovation and excellence;
- partnerships for smart specialisation.

Given that for more than 10 years the common framework for R&D and innovation has been the European Research Area (ERA), it is necessary to take into account progress made under its key elements. One of the goals of ERA is the open labour market for researchers in terms of employment and dissemination of knowledge. In its report of September 2013, the European Commission concluded that although progress has been made, there remain a number of problems to tackle by 2020 (the scope of the Europe 2020 strategy). The identified challenges include existing obstacles to cross-border mobility, achieving both cooperation and competition among researchers and organisations. The share of researchers in the business sector remains low.

Achieving the target of spending 3 % of GDP on R&D and innovation is of great significance, yet there have been alarming indications that in some member states total R&D spending has been declining. An important element of building up a coherent ERA is the development of high-quality research infrastructure ensuring added value for the entire community. However, a number of political, financial, and administrative obstacles still exist.

The analysis of the progress made in building ERA has helped define five key priorities on which further efforts are to focus:

- more effective national research systems;
- improved cooperation and competition through the creation of joint re-

search infrastructures;
- enhanced openness of the labour market for researchers;
- optimal circulation and transfer of scientific knowledge;
- gender equality in research.

European innovation policy instruments

The priorities of European policy in the area of research and innovation are reflected in the financial support programmes and the new guidelines for distribution of financial resources in the 2014 – 2020 programming period.

Horizon 2020

One of the five main goals of the Europe 2020 strategy is to increase investment in research and development. Building an innovation and knowledge-based economy throughout the European Union while at the same time promoting sustainable development, is a key priority. The Horizon 2020 programme was developed in support of this strategy and its goals are to develop ERA by encouraging all forms of innovation and attracting a broader range of talents and ideas. Its operation covers the entire cycle from the birth of a project idea to its market entry. One of the key objectives of the programme is to encourage new, creative, and innovative forms of education and training in order to broaden the limits of knowledge. Horizon 2020 also aims to enhance the potential and human capital of research infrastructures, to support R&D partnerships with industry, as well as to stimulate the creation of innovation clusters. The programme further aims to optimise the rules and procedures and to broaden and facilitate access to scientific knowledge through various online platforms and training.

Horizon 2020 provides the best European researchers with the necessary resources to improve their competitiveness on a global scale and also finances research teams on a Europe-wide competitive basis. The programme brings together researchers, academics and innovators through knowledge and innovation communities working jointly on research projects and the development of new technologies.

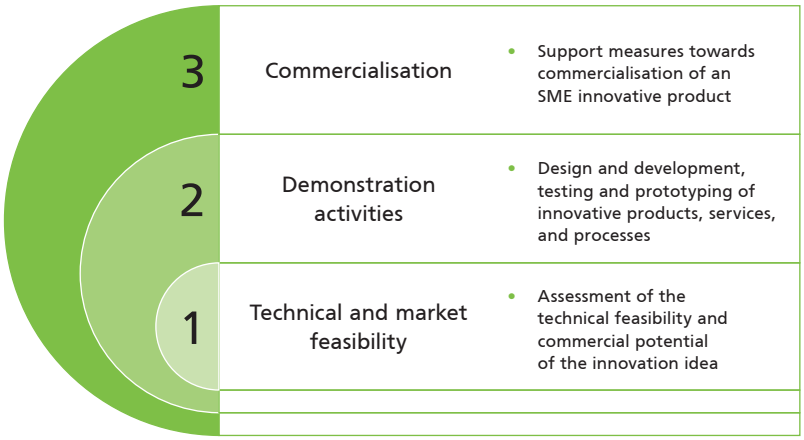
Expanding international cooperation, increasing productivity and innovation capacity in Europe would help advance a sustainable and competitive European economy with leading global positions in the high-tech sectors and with the capability to find effective solutions to societal challenges. Increasing strategic investment in R&D would lead to scientific advancement, sustainability and long-term prosperity for Europe.

The SME Instrument

Via the SME Instrument, Horizon 2020 for the first time provides targeted financing for innovative projects developed by one or more small and medium-sized enterprises within the European Union. The SME Instrument is the European analogue of the federal program of the United States government, Small Business Innovation Research, which has been operating in the U.S. since the 1980. One distinctive characteristic of the SME Instrument is that it consists of three separate phases and SMEs can apply for funding for each phase sequentially.

Funding applications are structured more like business plans than the typical Horizon 2020 project proposals.

Figure 2. SME INSTRUMENT PHASES



Source: ec.europa.eu/programmes/horizon2020

Phase 1: Assessment of the innovative concept and its technical feasibility and commercial potential

Activities funded: assessment of the project's technical feasibility and commercial potential; risk assessment; design or market studies; intellectual property exploration; development of an innovative strategy; searching for partners. The maximum grant amount is €50,000 for duration of up to 6 months. The innovation project needs to be of considerable novelty to the respective industry sector and must have reached Technology Readiness Level 6 or higher (i.e. working prototype, pilot system demonstrated in operating environment, or system ready for manufacturing).

Phase 2: Demonstration Activities

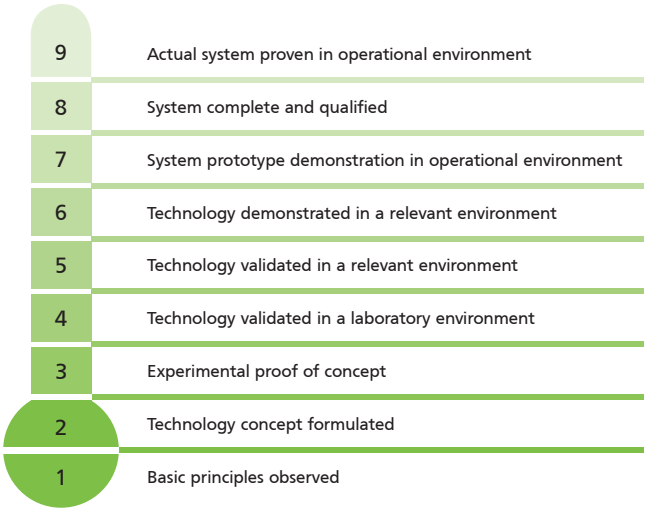
Activities funded: R&D activities for prototype creation and improvement, miniaturisation, design, testing, demonstration, development of pilot lines, and other activities aimed at bringing the innovation to investment readiness and maturity for market take-up. The activities are aligned with a business plan developed separately or as part of a Phase 1 project. The amount of funding is up to 70 % of eligible costs or a maximum of €2.5 million for duration of 12 to 24 months.

Phase 3: Indirect support for commercialisation of the innovation by facilitating access to markets, risk capital, and other financial instruments

Phase 3 does not involve provision of direct funding. Activities in this phase are related to support measures towards the commercialisation of the product/service developed in Phase 1 or 2. The SMEs that have successfully completed Phases 1 and 2 are awarded the EU Quality Label, which guarantees better visibility before foreign investors.

Technology readiness levels are measures used to assess the maturity of a newly developed technology.

Figure 3. TECHNOLOGY READINESS LEVELS



Source: Horizon 2020, Work Programme 2014 – 2015, General Annexes.

The following different types of innovation are distinguished within the Horizon 2020 applications:

- Disruptive innovation[4] – any innovative concept, product and service that creates new markets by applying new sets of rules, values and models which ultimately disrupt and/or overtake existing markets by displacing earlier technologies and alliances (examples: telephone, photocopier, email).[5]
- Social innovation[6] – a new or significantly improved product or service of non-commercial application, e.g. aimed at improving social services or addressing social needs.
- Open innovation[7] – the outcome of collaboration between government, industry, academia and civil participants to co-create and drive structural changes far beyond their individual capacity. Open innovation is based on the principles of integrated collaboration, co-created shared value, cultivated innovation ecosystems, unleashed exponential technologies, and extraordinarily rapid adoption.

COSME

The EU programme for the Competitiveness of Enterprises and Small and Medium-sized Enterprises (COSME) is a new programme for the 2014-2020 period, aiding small and medium-sized enterprises to improve their competitiveness. Since SMEs constitute the backbone of the European economy, their development is a key priority to the European Union. COSME is an improved version of the Entrepreneurship and Innovation Programme (EIP) and actively continues the activities of the CIP.

With its €2.3 billion budget, COSME aims to facilitate access to financing and participation in global markets, as well as to raise competitiveness and improve

[4] http://ec.europa.eu/digital-agenda/en/open-disruptive-innovation-0

[5] There is a difference between disruptive and radical innovation since the former is defined in terms of its impact and the change it brings about in the market, whereas radical innovation is based on the magnitude of improvement in performance and a change in technology but without creating a new market.

[6] http://www.h2020.md/en/content/qa

[7] http://ec.europa.eu/digital-agenda/open-innovation-20

entrepreneurship conditions. One billion euro from the budget will be allocated to already established programmes from the Framework Programme for Innovation, such as Erasmus for Young Entrepreneurs, to various training projects aimed at improving entrepreneurs' skills, particularly female and start-up entrepreneurs, as well as information centres, programmes for reducing administrative burdens, etc.

The exchange of experience and best practices is of key importance to the development of enterprises in the member states. These practices are still essential in any R&D programme. Various projects, procedures and ideas have inspired many entrepreneurs to develop their own business projects. One such example of exchange of experience, knowledge and know-how is the EU-Japan Centre for Industrial Cooperation financed under COSME. Its aim is to improve competitiveness, expand trade and relations between companies in the European Union and Japan, and to increase investments leading to technological advancement. Cooperation between the European Union and Japan takes place in the form of various management training courses, information centres and seminars, business forum, studies, etc.

Eureka and Eurostars

Eureka is an intergovernmental organisation for market-driven industrial R&D facilitating the coordination of national funding on innovation and aiming to boost the productivity and competitiveness of European industries. Eureka was established in 1985 and the European Union has been a member ever since.

Today more than 40 countries are members of the Eureka initiative and together develop technologies of great importance to improved productivity and European competitiveness in the global market. The efforts of governments, companies, and research institutes are being coordinated in order to develop the best possible approach to innovation. Support is extended both to small and medium-sized enterprises and to large industries, universities, and research institutes. Eureka finances projects which are market-driven and demonstrate innovative policies and the use of new technologies. In 2010, Bulgaria became a full member of Eureka and has been involved in two projects. The first one is EurekaTourism+ for the 2013 – 2015 period, aimed at developing the tourist industry through innovative technologies and approaches. Bulgaria is one of the 10 participating countries in this initiative. The second one is "Development of a Next Generation Sequencing Panel and Software for Diagnosis of Hypetrophic Cardiomyopathy" and is a collaborative project with a Turkish partner.

The Eureka initiative worked jointly with the European Commission to develop the Eurostars programme with a budget of €1.14 billion. It is supported by 33 Eureka member countries, including Bulgaria. The main priority of Eurostars is to improve the competitiveness of small and medium-sized enterprises and to facilitate their access to international markets. The programme finances innovative projects and products that find broad application upon completion and market launch.

European Cooperation in Science and Technology

European Cooperation in Science and Technology (COST) is an intergovernmental framework for cooperation in science and technology among 35 member countries, including a cooperating state – Israel. With its mission to enable scientific developments leading to new concepts, ideas, and products for a more

innovative Europe, COST is creating a network of highly qualified and motivated researchers. COST has 9 key focus areas:

- Biomedicine and molecular biosciences;
- Food and agriculture;
- Forests, their products, and services;
- Materials, physics, and nanoscience;
- Chemistry and molecular sciences and technologies;
- Earth system science and environmental management;
- Information and communication technologies;
- Transport and urban development;
- Individuals, societies, cultures, and health.

A new COST initiative – Gender, Science, Technology, and Environment, (gender-STE) – aims to ensure gender equality and promote women's careers in science and technology. It is the first targeted network approved by the Committee of Senior Officials of COST and promotes the development of human potential, knowledge, and resources with integrated gender dimensions and implementation of gender-focused policy measures.

The second approved targeted network is Sci-Generation, dedicated to excellent next-generation scientists and aiming to develop the potential of young researchers whose experience and input are of crucial importance to Europe. It promotes innovative ideas and proposals, which are essential to economic progress and the competitive global market.

The third approved targeted network is BESTRAC which aims to develop a network of administrative, financial, and legal services in universities and research organisations in order to facilitate the exchange of knowledge and experience and stimulate career advancement in the field of science and technology innovation.

In 2014, a Framework Partnership Agreement was signed between COST and the European Commission for a seven-year cooperation with Horizon 2020 for greater contribution in the field of science, technology, and innovation. COST is to dedicate 50 % of its budget to research and activities involving researchers from the target countries of its inclusiveness policy.

Since 1999, when Bulgaria joined COST, the country has been an active participant in all key areas and most notably in: food and agriculture; individuals, societies, cultures, and health; earth system science and environmental management; materials, physics, and nanoscience.

Creative Europe

Creative Europe is a new programme for the 2014-2020 period supporting the cultural and creative sectors in member states and aiming to strengthen their competitiveness. The main objectives of the Programme are:

- supporting the creative sectors aiming to operate beyond national borders in and outside of Europe;
- improving financing models and instruments in these sectors;
- expanding cross-border cooperation with a view to promoting innovation, development, and the implementation of new business models.

For the 2014 – 2020 programming period, Creative Europe has been allocated a budget of €1.46 billion, which is 9 % higher than its predecessors – the Culture

and Media programmes. Financing will be provided mainly in the areas of culture and media. In the field of culture, 4 key pillars have been identified: cooperation projects, literary translation, European platforms, and European networks. All four aim to promote cross-border circulation of works of culture, increased mobility of cultural players, improved experience, creative skills and competencies, testing of new business models, expanding cross-border cooperation between the countries in and outside of the European Union for career advancement, testing of innovative approaches to reader and viewer audiences, etc. In media, the activities are aimed at improving collaboration, facilitating access to markets, financing of individual projects, organising festivals, developing innovative approaches to audiences, etc.

LIFE Programme

The protection and conservation of the environment are among the key priorities of the European Union. The use of sustainable resources and efficient technologies is of extreme importance to Europe and that is why the LIFE Programme will be one of the main initiatives in the 2014 – 2020 period. With this programme, the European Union aims to protect nature and biodiversity, ensure efficient use of resources, reduce carbon dioxide emissions, counteract climate change, etc. It comprises two sub-programmes: Environment and Climate Change.

The Programme's budget is €3.46 billion, of which €864 million are allocated to the Climate Action sub-programme. The Environment sub-programme aims to promote efficient use of natural resources, conservation of the environment, natural habitats, and biodiversity. The Climate Action sub-programme is concerned with climate change and climate adaptation. What the two sub-programmes have in common are the trainings they offer in order to raise awareness and help save plant and animal species.

The Climate Action sub-programme envisions support for and investment in organisations and enterprises (particularly small and medium-sized ones, public authorities, and individual companies) that use non-polluting technologies and facilities, as well as for new ideas, methods, and approaches aimed at reducing greenhouse emissions. At the beginning of the 2014 – 2020 period, special emphasis will be placed on urban adaptation to climate change.

A new type of project will be introduced in the Climate Action sub-programme – integrated projects. These will involve investment in local and regional initiatives implementing different methods and concepts for addressing climate change, as well as climate adaptation strategies.

Erasmus+

The Erasmus+ programme is part of the Europe 2020 strategy and aims to promote the development and effective use of human and social capital. It will strive to enhance the professional skills of students with a view to meeting business needs. Its budget for the 2014-2020 period is €14.7 billion, which is 40 % higher than previous levels of EU spending on education and sport. It is estimated that in excess of 4 million people will benefit from this programme to study, train, teach or volunteer abroad.

The new Erasmus+ programme unites seven previously existing ones: Lifelong Learning, Youth in Action, Erasmus Mundus, Tempus, Alpha, Edulink, and the Industrialised Countries Instrument Education Cooperation Programme. Since

2014, eTwinning, which was previously part of the Comenius programme, has been integrated in Erasmus+. Three key areas of action are envisioned for the 2014 – 2020 period:

- learning mobility;
- cooperation among educational institutions, youth organisations, business, local and regional authorities, non-governmental organisations;
- supporting policy reforms in member states and cooperation with countries outside the European Union.

In the new programme period, eTwinnings will focus on:

- student, teacher, and staff mobility in the fields of education and training;
- reform of overlapping structures;
- broader cooperation in the area of education with countries outside the European Union.

Starting in 2014, Erasmus+ will for the first time provide support for sport. Also included for the first time is a new loan guarantee scheme for students planning a full Master's degree abroad.

Innovation policy in Bulgaria

Design and development of innovation policy in Bulgaria is associated with actions and measures arising from compliance with the criteria for EU membership. The document guiding policy in the field is the 2003 Innovation Strategy. It was developed with the understanding that its focus should be on creating a favourable environment for promoting the potential for entrepreneurship and innovations.

The Innovation Strategy provided for measures enhancing the competitiveness of the national industry and dealing with the competitive pressure in the EU market. To this end, the Innovation Strategy introduced a special instrument – the National Innovation Fund (NIF).

The Strategy provided for an incremental increase of innovation funds for a period of 10 years and active use of the NIF. In addition, there was to be an increase of the funds of the other national instrument – the National Science Fund (NSF), also established in 2003 through the *Scientific Research Promotion Act*. Expectations for a successful application of the Innovation Strategy were associated with the following parameters:

- GDP growth;
- higher value added generated by Bulgarian industry;
- higher productivity;
- export growth;
- improved balance of payments of the country;
- foreign investments.

Most of these expectations did not materialise mainly for two key reasons:

- **insufficient funding of the national innovation system** which covers scientific organisations, innovative firms, traditional large and small corporate structures, non-governmental innovative institutions, etc.;
- **lack of coordination between strategic and statutory documents** in order to have in place a consistent regulatory framework.

Although the Innovation Strategy focuses on the need for a sustainable research and innovation policy, there are no clear signs of its implementation. There was no coordination between the Innovation Strategy and the National Scientific Research Strategy in the period when both strategies were applicable. Neither do they have mutually complementary action plans, which are highly needed as stated in some European findings and recommendations, nor is there any coordination in the updating of the two strategies.

The draft Innovation Strategy for Smart Specialisation (ISSS) for the 2014 – 2020 period takes into account government support delivered through instruments such as the NIF, Operational Programme Competitiveness (OPC) and NSF, and outlines the potential for accelerated technological progress leading to sustainable economic growth. Prioritising in the ISSS is based on international considerations, assuming that business would not only be ambitious but also realistic as to what can be achieved. The following technological areas are highlighted as priorities:

- mechatronics and clean technologies;
- information and communication technologies;
- biotechnology;
- nanotechnology;
- creative industries, incl. cultural ones;
- pharmacy;
- food industry.

The ISSS is to be implemented through the Operational Programme Innovation and Competitiveness (OPIC), Operational Programme Science and Education for Smart Growth (OPSESG), NSF, NIF and the national budget within the three-year budget forecast. Thus, the priorities of these instruments should be consistent and complementary, if not identical. At present, there is no sign of this but it could be achieved through the short-term measures of the individual instruments.

A review of the policy framework fostering a successful innovation policy should consider its degree of coordination with the priorities of the National Development Programme Bulgaria 2020. The latter ensures consistency among the national priorities of Bulgaria and the EU goals in the context of Europe 2020. One of its main innovation-relevant targets is boosting the competitiveness of the economy by providing proper environment, promotion of investment, application of innovative decisions and enhanced resource efficiency. Among its eight priorities is support for innovation and investment to improve the competitiveness of the economy.

Instruments for innovation policy implementation

The new operational programmes – OPIC and OPSESG – play a key role in the implementation of innovation policy, while the two national funds – NIF and NSF – and the European instruments supporting science and innovations, i.e. framework programmes and other European initiatives, are complementary.

The Operational Programme Science and Education for Smart Growth includes a priority axis "Research, Innovation and Investment for Smart Growth" which takes into account the specific recommendations made to Bulgaria by the Eu-

ropean Commission.[8] The programme is aligned with the specific sector documents at European[9] and national[10] levels. OPSESG offers financial support in the following areas:

- Increasing investment resources. The OP is to play the role of complementary financing which diversifies the portfolio of budget sources for the research sector in Bulgaria by amplifying the impact of research and innovation financing so as to achieve more and higher quality applied scientific results, processes and services, to intensify the potential for European and international cooperation within Horizon 2020 and the other EU programmes and to create a favourable environment for accelerated transfer of knowledge and practices for commercialisation.
- Development of research infrastructure. The technological capacity of the research environment needs to be modernised through support for centres of excellence, competence centres with enhanced cooperation among research organisations, universities and industry, modernisation of laboratories and scientific institutions universities in support of regional economic growth and productivity.
- Increasing the number and retaining specialists in the field of research and education.
- Development of the potential for innovation by promoting applied research and contacts among research organisations and more knowledge-intensive industry/sectors of the economy.

The ISSS supports the consistency between research priorities and technological advantages by financing applied research programmes and joint projects of the research sector and industry in specific areas with proven achievements and positive growth (ICT, new materials and technologies, etc.).

The programme should focus on specific priorities which should be aligned with the other sector strategies, which is not clearly achieved.

At present, the draft OPSESG is still at the stage where stakeholders provide their input. Defining clear targets would play a positive role for the innovation capacity of the country while having a complementary effect to other instruments.

Operational Programme Innovation and Competitiveness (OPIC) aims to achieve three types of growth defined in Europe 2020:

- smart growth: developing an economy based on knowledge and innovation;
- sustainable growth: promoting a more resource efficient, greener and more competitive economy;
- inclusive growth: fostering a high-employment economy delivering economic, social and territorial cohesion.

The operational programme is closely linked to the targets for growth and jobs in the EU. It is developed in 5 priority axes, of which 4 are fully or inherently supporting the development of innovation at different levels. Furthermore, it is aligned with a number of national strategic documents and is focused on addressing several serious problems:

[8] Recommendation for a Council Recommendation on Bulgaria's 2013 national reform programme and delivering a Council opinion on Bulgaria's convergence programme for 2012 – 2016, (COM(2013) 352.

[9] European Research Area Progress Report 2013; EU Strategy for the Danube Region; Strategy for Key Enabling Technologies – A Bridge to Growth and Jobs (COM/2012/0341 final); State of the Innovation Union Report – Innovation Profile of Bulgaria.

[10] National Scientific Research Strategy; Innovation Strategy for Smart Specialisation; National Roadmap for Research Infrastructures; National Development Programme Bulgaria 2020.

- low level of innovativeness of Bulgarian enterprises as a result of inadequate cooperation among businesses, the research community and universities. Bulgaria ranks last in the EU by innovation performance and is last but one by the share of SMEs having sold new products or services (17 % versus 39 % for the EU);
- complicated access to funding and low investment activity – 16.7 % of Bulgarian SMEs have access to public financial aid, including guarantees;
- insufficient entrepreneurship and sectoral structure of the economy which differs significantly from the structure in the other EU member states;
- low level of international outreach of SMEs in contrast to the much higher internationalisation of research institutes;
- high resource and energy intensity of production, low degree of application of new technologies.

OPIC will apply the same priorities as OPSESG, which is indicative of a coordinated policy. The main instruments of the two operational programmes for innovation policy are set to have a serious impact on economic growth and sustainable development. The problem with these instruments is their absorption and utilisation, which is what is needed to achieve a noticeable value added. The OPs operate with substantial financial resources as compared with the other two instruments – the NIF and the NSF.

The National Innovation Fund and the National Science Fund may be considered complementary instruments of the innovation policy in terms of their financial capacity. They do not have a consistent budget, thus the implementation of projects with their support is unstable and with irregular funding. They work under different priorities which are not consistent with each other and with European priorities. They apply different evaluation tools and there is not enough transparency in the assessment procedure. There is no product analysis of the result of the funding of these two instruments and their applicability or sustainability. The NIF has not had an independent assessment by foreign evaluators and the NSF has not been assessed since 2007 (before which it had been assessed twice). Such assessment is needed in order to ensure compliance with European standards and transparent rules for their operation. In a policy of transparency and accountability, which is integral part of the other sector policies, such assessment is absolutely necessary. It would give an independent view not only of the relevance of disbursed funds but of the usefulness of the results achieved and their impact on the development of the national innovation system.

Along with the national instruments, a number of European instruments can be employed in support of innovation – framework programmes of the European Union for science and innovations, the COSME programme, Erasmus+, as well as regional programmes for target regions where Bulgarian participants have access either as non-key partners or have full rights for participation. If these instruments are efficiently used, they may create a strong positive effect and contribute to the successful implementation of innovation policy.

Besides the instruments in support of successful innovation policy, the notion of the so-called "cultural capital" should be considered as well. It does not refer to the ability of a nation to produce innovations but concerns its tolerance of risk and interpersonal trust in a society, which affect the attitudes of innovators when starting up business and implementing new ideas. Risk is inherent in each innovation project and innovators need tolerance so as to take that risk. This type of capital is still not well developed in Bulgaria.

Innovation Potential of the Bulgarian Economy

Gross Innovation Product

The Gross Innovation Product of an economy – its innovativeness – is assessed by the new products and services introduced, the new technologies created and the scientific outputs. It results from the interaction of the innovation, technological and scientific products of a country. It is a major benchmark for innovation policy because it allows decision-makers to compare the outcome of the innovation system in temporal and geographical terms, as well as to estimate the need for changes in the organisation and resources of the innovation process.

Innovation Product

The innovation product results from new and significantly improved processes, products and services based on new and/or adapted knowledge and know-how. It is determined by the innovation activity of enterprises in the country and is the most important indicator for assessing the national innovation system. Innovation activity in business and innovation demand by the public, along with the factors which determine these, comprise the innovation potential of an economy – its capacity to develop on the basis of new knowledge.

Innovation index of Bulgarian enterprises

Bulgaria's performance has been continuously worsening by many indicators. In terms of GDP per capita, Bulgaria ranks last in the European Union. The World Competitiveness Yearbook 2014 of the Institute of Management Development shows that from the 38th position in 2009, Bulgaria has dropped to 56th in 2014 by overall competitiveness, while its economic performance has been downgraded from 26th to 47th position between 2009 and 2014.[11] In terms of the perception among the public of the level of well-being, the country belongs to the most pessimistic quarter in the world.[12]

At the same time, in terms of GDP by person employed (constant 1990 PPP $) Bulgaria does better than Romania (producing almost twice as much), surpasses Russia and produces almost as much as Hungary.[13] Bulgaria's export as a percentage of GDP is 70 % (for 2013), ranking it 16th in the world and 6th in the European Union (only Luxembourg, the Netherlands, Estonia, Belgium and the Czech Republic are ahead of Bulgaria).[14] In 2012, the country ranked 8th by balance of commercial services (including IT services) as share in GDP (of the EU countries only Luxembourg, Croatia, Greece, Estonia and Latvia are ahead of Bulgaria).[15] By contribution of the ICT sector to GDP Bulgaria ranked 6th among the 28 EU member states with 5 % for 2010, outperformed only by Ireland (9.3 %), Malta, Luxembourg (6.3 %), Sweden (5.4 %) and Finland (2 %).[16]

In Bulgaria, negative signals spread and are accepted more easily than positive ones, while policy makers almost never set high goals based on an accurate assessment of the country's strengths. Moreover, often the actions of policy makers are to the detriment of the country's development. In 2010, Prof. Sergey Ignatov, minister of education, science and youth in the period 2009 – 2013, suggested the adoption of a target of 0.6 % of GDP for expenditures on scientific research and innovation until 2020, which significantly underestimated the country's innovation system. The proposal was based on NSI data for 2008 (0.49 %) and the forecasts of the Ministry of Finance in the report on the draft state budget for 2010 (0.35 %). At that time (Prof. Ignatov tabled the proposal in May 2010 at a meeting of the Council of Ministers), the preliminary NSI data for 2009 had not been released yet, but ARC Fund had already brought to the attention of policy makers the findings of its research that NSI data on R&D in ICT (and in other sectors) are significantly underestimated (by 3 to 10 times) and that R&D as a share in GDP is expected to grow in 2009 and 2010, not decline. Mr. Traycho Traykov, minister of economy and energy in the period 2009 – 2012 accepted the arguments of ARC Fund and persuaded the Council of Ministers to adopt the more realistic and still insufficiently ambitious target of 1.5 % (the target discussed with him was 2 %, but against the background of the MES argument it was impossible). Later NSI data confirmed the expectations of ARC Fund of 0.53 % for 2009, 0.6 % for 2010, and reaching 0.63 % for 2013 against the background of reduced government expenditure compared with 2009 and 2010.[17] This reduced expenditure is the direct result of the policy of

[11] http://www.imd.org/wcc/wcy-world-competitiveness-yearbook/

[12] Gallup World Poll, February 2012, quoted in the Happy Planet Index 2014.

[13] World Bank indicators, Social Protection and Labour.

[14] World Bank indicators, Economy and Growth.

[15] World Competitiveness Yearbook 2013.

[16] Digital Agenda Scoreboard 2014.

[17] In the debate on an adequate target for R&D in GDP, ARC Fund stated that in 2010 Bulgaria would have fulfilled the target for 2020, if the proposal of Prof. Ignatov was adopted.

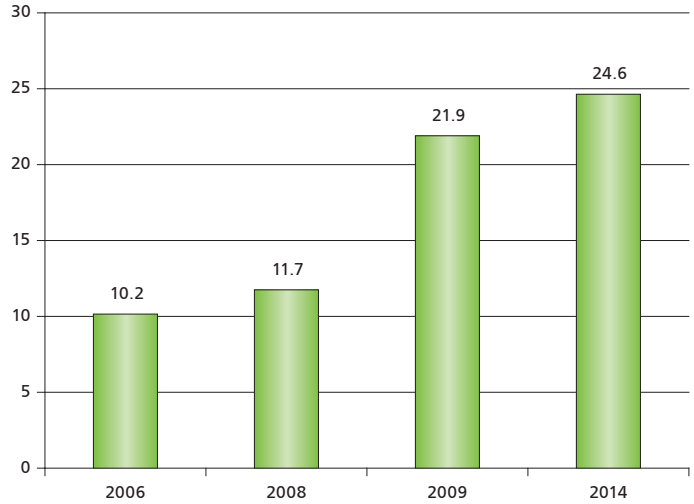
Prof. Ignatov, reflecting his pessimistic stance on developments in Bulgarian science and economy, rather than of a shortage of funds.

Similarly, underestimation of the innovation activity of Bulgarian enterprises or of the interaction between business and academia may lead to inefficient allocation of public funds, further imbalance of the innovation system and lower competitiveness of the country. In order to provide information about innovations in advance (compared to NSI), ARC Fund conducts regular empirical surveys of the innovation activity (INA) of enterprises which result in an Innovation Index of Bulgarian enterprises.

The index is an aggregate indicator of the innovation activity at corporate level in Bulgaria and aggregates seven kinds of innovations across four types undertaken by enterprises (product, process, organisation and marketing), and their degree of novelty (novelty for the enterprise, novelty for the market/sector, novelty for the world), particularly in terms of product and process innovations. Organisation innovations include implementation of new or considerably elaborated management methods and systems, significant changes in the organisation of work and establishment of new or significantly changed relationships with other enterprises in the chain of adding value. The index takes values from 0 to 100, 0 meaning that the enterprise has made no innovations at all, while 100 meaning it has made all types of innovations at maximum degree of novelty (for product and process innovations).

October 2014 data (INA-5) show significant positive trends in the economy. **The average innovation index has been continuously rising over the period 2009 – 2014, mainly due to the higher innovation intensity of enterprises (increased number and more diverse innovations), compared to the extensive growth in the period 2006 – 2009** when innovating companies doubled from 35 % in 2006 to 70.7 % in 2009.

Figure 4. INNOVATION INDEX 2006 – 2014*



* The methodology for calculating the innovation index is presented in *Innovation.bg 2010*.

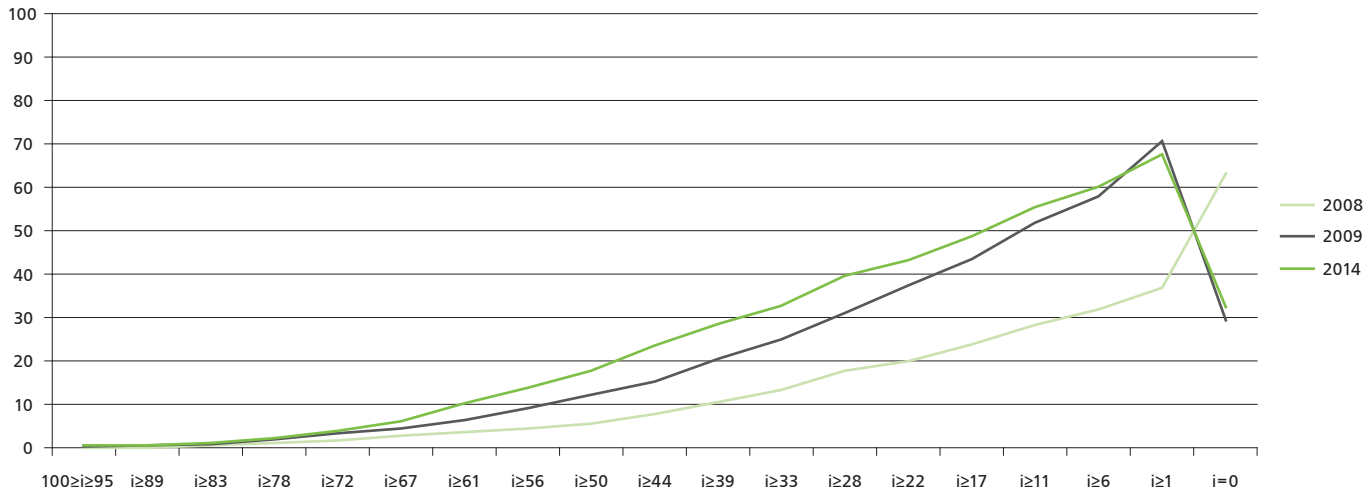
Source: ARC Fund, 2014.

The number of companies without any innovation in 2014 has increased by some 3 points compared to 2009, but the survey sample in 2014 had 32 % micro companies compared with 22 % in 2009 (small companies innovate less).[18] Fewer companies in 2014 (7.5 % versus 12.6 % in 2009) have a minimum index (1 to 6). Such value of the index corresponds to the "innovation periphery" where companies perform only one of the seven kinds of innovations which are new only for the company (in case of product or process innovations). Values above 6 correspond either to two innovations or to a higher degree of novelty – at least innovation for the market/sector in Bulgaria. Companies in the innovation periphery usually become either sustainably innovative and increase the intensity of their innovation activity, or revert for some time to being non-innovative. In this sense, the thinning of the innovation periphery is a positive indicator, particularly if it is combined with a noticeable rise of the index line level (in this case most visibly within the range of 17-50 index points).

Enhancement of innovation intensity is displayed in diverse ways. **In 2014, 75 % of innovative companies made more than one type of innovation simultaneously**, versus 62.5 % in 2009. The most innovative companies – those which make the four types of innovations (product, process, organisation and marketing) – increased from 6.30 % in 2009 to 14.70 % in 2014. Already 3.4 % of the companies made the seven kinds of innovations in the preceding year, and some of these made world-class product and process innovations. Such data are indicative of **systematic innovation**, which often goes through cycles (changing the types of innovation over the years). More than half of the companies (60 %) which introduced a new product in the preceding year plan to work on a new product in the following one. 17 % of the companies which did not introduce a new product in the pre-

[18] The higher share of micro companies in the sample reflects the actual rise in the number of micro companies of new entrepreneurs (including non-residents) in the economy.

Figure 5. DISTRIBUTION OF COMPANIES IN THE INNOVATION INDEX

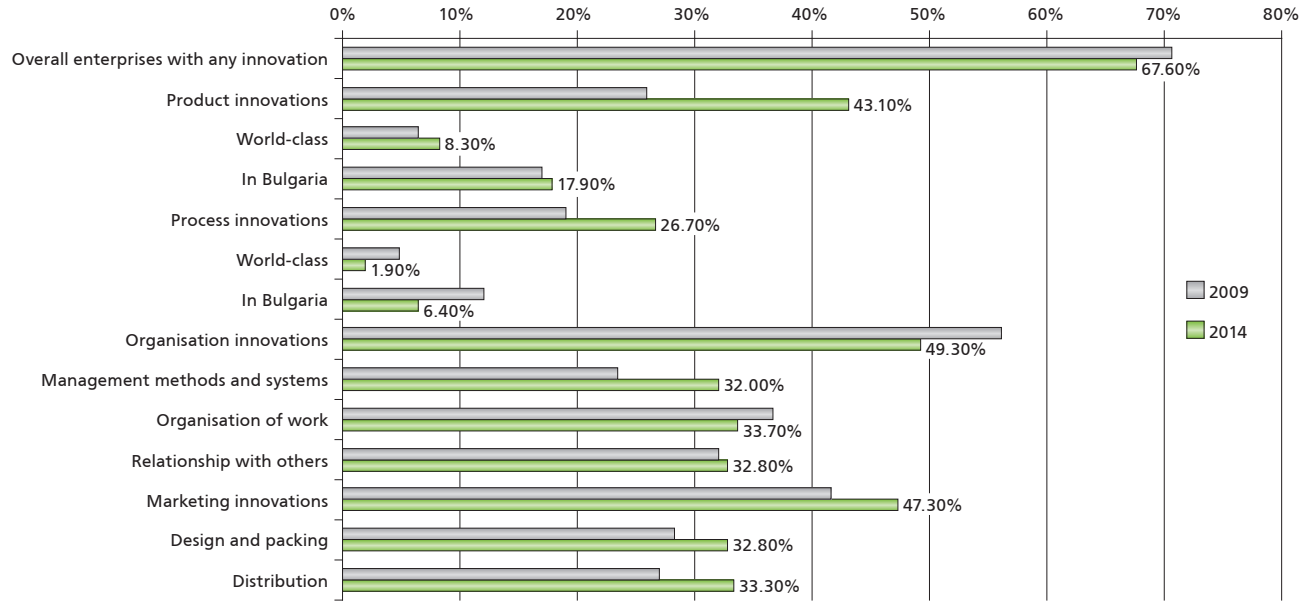


Source: ARC Fund, 2014.

ceding year intend to start work on the implementation of new or highly advanced products. Moreover, 9 % of the companies which did not make any innovation in the preceding year plan to work on a new product, and 16 % consider whether to do it.

The companies making simultaneously product and process innovations increased from 10 % to 19 %, and those making at least one of the two – product or process innovations – rose from 35 % to 50 %. The trend is relevant to the focus of the OPC on technological (product or process) innovations both in terms of start-up enterprises and for existing ones.[19] Although the claim of 8.3 % of the companies that they make world-class product innovations seems incompatible with the general negative view of Bulgaria's economy and competitiveness, there are valid grounds for it. A number of foreign companies participate in integrated R&D-production centres in Bulgaria which make leading world-class innovations in different sectors, mainly ICT (IMI, Sensor-night, Melexis, ZMD Eastern Europe, SAP labs,

Figure 6. INNOVATION DYNAMICS BY TYPE AND DEGREE OF NOVELTY



Source: ARC Fund, 2014.

[19] See further the section "Investment and Financing for Innovation" in this report.

Visteon, VMWear), machine-building (AMK, Mechatronica), joint ventures (Spesima, Sopharma) and Bulgarian companies which compete successfully on international markets with their own brands and sometimes rank first in their niches (Datecs, Walltopia, Optics, Ava Sport, Niki Rotor Aviation, Interconsult, Software Group, House Group, Alpi, etc.).

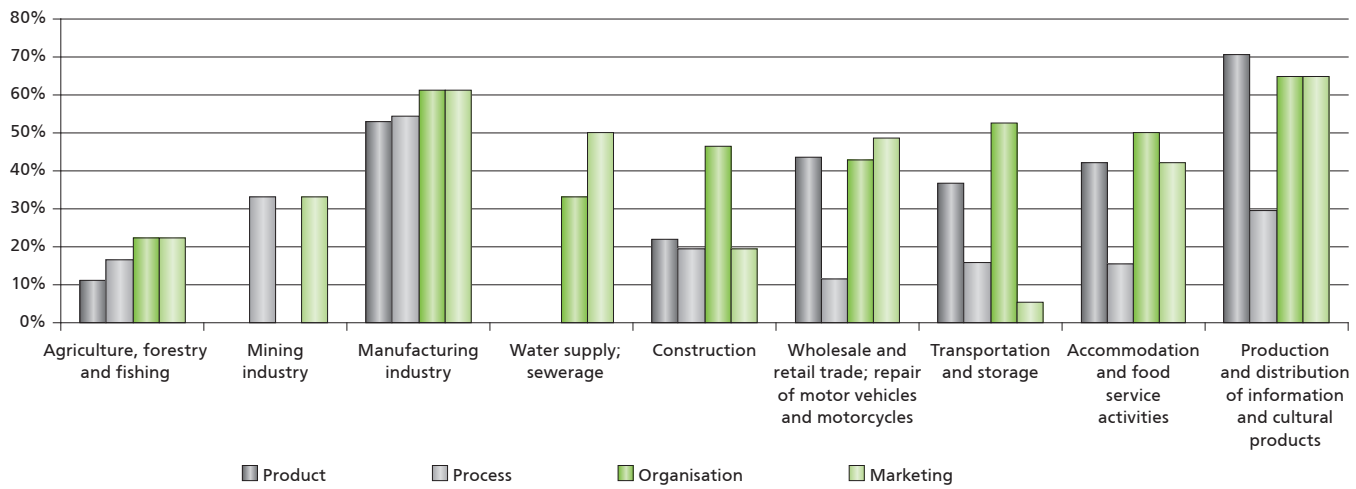
A significant share (43.1 %) of the companies introduced a new product in the preceding year and in 16 % of the cases where no new product was introduced, relevant work was performed but was either not completed or was terminated. **Unlike product innovations, which also mark growth in terms of different degrees of novelty, process innovations are characterised by diffusion of technologies which are already popular in the respective industry and therefore the share of companies with a claim to world-class innovation or at least nation-wide is declining.** Entry of already approbated technologies is mainly under the pressure of core clients (e.g. in textiles and clothing) and owners (e.g. in telecommunications) or as a result of implementing a new standard (in the food processing industry). Similar opposing trends are observed in organisation innovations (overall decline) and marketing innovations (overall growth, including by sub-innovations – design, packing and distribution). Despite the overall decline in organisation innovations (share of companies making at least one), there is integration of different organisation innovations – 75 % of the companies that introduced new management methods and systems (probably all of them supported by IT systems) also made significant changes in the organisation of work, and 62 % changed their relationships with other enterprises. This corresponds to the fact that industrial companies introduce increasingly enterprise resource planning (ERP) systems, rather than customer relationship management (CRM), and when the system has both functionalities, first the ERP functionalities are implemented and a suitable time in the future is sought for the other type.

Most product innovations are made by companies in the information sector ("Information and communication, professional, scientific and technical activities") – 71 %, and manufacturing industry – 53 %. Similarly, these sectors are leaders in organisation and marketing innovations (with 65 % and 61 %, respectively). Most process innovations were made in the manufacturing industry (54 %) and mining industry (33 %). **The innovation index is highest in the manufacturing industry (33), followed by the information industry (31)**. The index is lower than the country average in the sector "Wholesale and retail trade; repair of motor vehicles and motorcycles" (24), and the lowest value is in sector "Transportation and storage" (10).

The market in which a company competes has a major impact on its innovativeness. Companies competing only on the local market (within 30 km) and the regional market (within 100 km) have a lower average index. It is not surprising that international markets are more innovative (index 36) than European ones (index 30), as they include the United States, South Korea, Israel and Switzerland, which are much more innovative than the average European level. Data show that the innovativeness of relevant markets has increased by 30 to 50 % in the period 2008 – 2014. Learning by exporting continues to be a major source of stability in the economy.

The local and regional markets in Bulgaria include mainly micro and small companies (up to 50 employed

Figure 7. INNOVATIONS BY NACE SECTOR

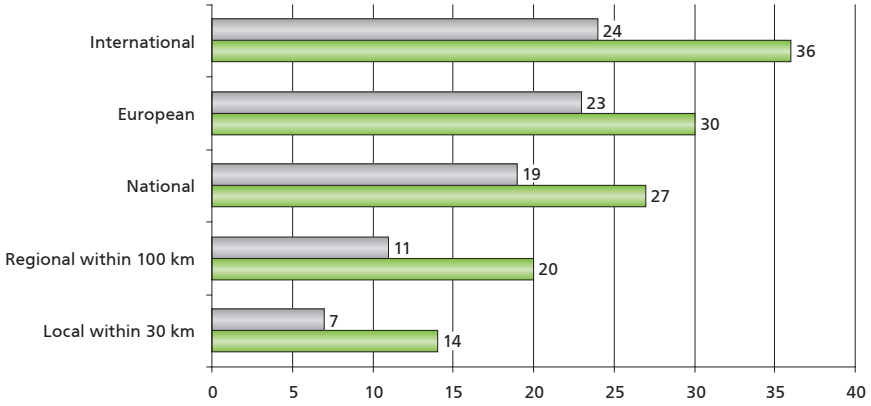


Source: ARC Fund, 2014.

persons), while the European and international markets are dominated by medium-sized and large enterprises (over 50 employed persons). The correlation established in 2009[20] **between the size of the company and its innovativeness**, as measured through its index, continues to be valid. Still, in certain sectors small niche companies (e.g. in trade – small boutique shops for e-trade; in the education of children – robotics schools, online video lessons, tests and games, etc.) are more innovative. In recent years, a source of innovative potential for micro companies, including self-employed persons, is the increased number of highly qualified staff and staff engaged in R&D. The trend in small companies is the same.[21] Smaller companies also use fewer types of innovations and have a smaller average number of innovations.

Despite the positive news from INA-5, there are some worrying signs. First, the share of companies which find it difficult to determine the size of the investment (if they can get it as grant) they would need for the development of innovations is high – 53 %. 63 % of the companies which find it difficult to respond are in fact innovative enterprises. This means that **planning of innovations is not effective or is not present at all.** The requested funds range from BGN 1,000 (a small non-innovative firm) to BGN 500 million (a large innovative company) and an average requested amount of BGN 4.7 million. Those requesting more than BGN 1 million are merely 5 %, 39 % request from BGN 200,000 to 1 million, and 56 % request less than BGN 200,000. Half of the latter group even needs up to BGN 50,000, which equals the investment proposal under JEREMIE funds (LAUNChub and Eleven). **More companies are disappointed with the operational programmes** (particularly OP Competitiveness) because of red-tape, and abandon already awarded projects for fear they may lose funds instead of receiving gains. However, the resources of investment funds fall well short of those needed for larger-scale projects, except for start-up micro companies oriented towards the development of applications (in the so-called "app economy"). Small enterprises (10 – 49 employed persons) have the highest requirements for grants – BGN 5.6 million versus BGN 1.5 million for micro and medium-sized enterprises, and BGN 1 million for large enterprises.

Figure 8. INNOVATION INDEX ACCORDING TO THE COMPANY'S MAIN MARKET (2008 – 2014)



Source: ARC Fund, 2014.

Box 1. WORKPLACE INNOVATION

The term workplace innovation (WPI) can elicit a number of notions as to its meaning. While technological, and particularly digital innovation is indeed vital for firms to maintain competitive advantage, it is important to broaden the notion of what workplace innovations can be. Although there is no universally accepted definition, a report by the European Agency for Safety and Health at Work defined it as:

...strategy induced and participatory adopted changes in an organisation's practice of managing, organising and deploying human and non-human resources that lead to simultaneously improved organisational performance and improved quality of working life.[22]

Thus, while "non-human resources" are included in the definition, and are what commonly comes to mind when WPIs are conceived, they only constitute part of the picture. Additionally, these non-human resources need not be sophisticated technology, but could also include a rethinking of the way that an office is physically designed, or how the

[20] *Innovations.bg 2009.*

[21] See further the section "Human Capital for Innovation" in this report.

[22] European Agency for Safety and Health at Work, "Review of workplace innovation and its relation with occupational safety and health", 2012, p. 4.

linkages in a workflow chain are ordered. Further, how human resources are managed, organised and deployed, also plays prominently in the above definition. While drawing distinctions between human and non-human resources can be useful when conceptualising a definition of WPI, these divisions dissolve when examining WPIs in practice. For example, the introduction of a non-human resource, such as a remote work sharing environment, can enable changes in the ways that human resources are organised, managed and deployed.

Underlying all forms of WPIs, however, is the idea that a trade-off between productivity and employee satisfaction does not need to be made. Indeed, the practice of implementing workplace innovations is predicated upon the assumption that these two elements are, in many cases, mutually reinforcing.

Actual workplace innovations in Bulgaria can be illustrative when operationalising the theoretical benefits of WPIs and in promoting a more practical understanding and increased uptake of them.

Within the framework of the European Workplace Innovation Network (EUWIN), established by the European Commission, ARC Fund conducted interviews and surveys with two firms and one university in Bulgaria which provided a better understanding of the WPI landscape in the country.

One of the firms, Herti, is a Bulgarian manufacturing company specialising in the production of aluminium, plastic and composite closures that have applications in the food, beverage and pharmaceutical industries. Three workplace innovations were investigated within the company, including the introduction of the 5S method in the company's production facilities, the introduction of organisation innovations in the various areas of operation of Herti in the form of a Technical Council, and an internally developed signalling system for the manufacturing process.

The signalling system was adopted as it has allowed employees to share production-relevant information in real time through the company's computer network. When deviations from the technical specifications of a production line are experienced, machine operators can make note of this in the system. Such signals are visible both to the production and marketing departments, as are the subsequent corrective measures taken to rectify them. The system allows for the faster resolution of production problems, fewer production delays, and improved inter-departmental communication.

Workplace innovations were also investigated in Overgas Inc., the largest company specialised in developing and building the natural gas infrastructure in the country. The workplace innovations investigated at Overgas Inc. included a summer internship programme which aimed to alleviate shortages of specialists in the field, and a professional education initiative where the company organises competitions, trains teachers, sends mentors and invests in laboratory equipment. A third WPI that was studied, was a knowledge management system called OGpedia, which provides a virtual space where information and know-how can be easily shared by staff. It has helped to overcome the fragmented distribution of knowledge in the company.

The practices of the South-western University "Neofit Rilski" were also explored. The South-western University is a public institution with more than 800 teaching staff. It offers training in more than 60 Bachelor's, 80 Master's and 40 specialised PhD programmes in both Bulgarian and English. The workplace innovations investigated included the practice of self-managing teams, where staff is given the flexibility to self-manage their work. Another organisational innovation is referred to as "meetings of consent". These meetings are weekly round-table discussions, where teaching and administrative personnel meet to consider possible solutions to issues, and where joint decisions on how to resolve them are taken. A third WPI that helps the university increase its productivity, as well as the quality of life for its staff, is its focus on supporting lifelong learning. The university offers good-quality infrastructure and a variety of classes for their personal and professional development.

The WPIs in these organisations offer a snapshot of the efforts being made in Bulgarian organisations to simultaneously improve organisational performance and increase employee satisfaction. While it would be rash to generalise about the entire country from these cases, they indicate that there is awareness that continuous re-invention and self-improvement is indispensable to success.

Box 1. WORKPLACE INNOVATION (CONTINUED)

The challenge that EUWIN aims to address is how this awareness, along with tools and knowledge to act upon it, can be deepened and widened in the country. Leaders within organisations shape workplace cultures, and a complex and layered interplay of influences affect their value systems. Empirical studies of cultural differences between countries have shown notable differences between their value systems. In their book *Cultures and Organizations: Software of the Mind,* Geert Hofstede, Gery Jan Hofstede and Michael Minkov compared over 70 countries across six cultural dimensions (including power distance, individualism, masculinity, uncertainty avoidance, pragmatism and indulgence).[23] They investigated how differences across these dimensions can affect workplace values and how these can, in turn, affect innovation outputs through their effects on workplace dynamics.

In Bulgaria, it was found that there is a strong **power distance**. This is associated with the perception that people accept inherent inequalities between managers and subordinates, rather than viewing hierarchies as artificial but efficiency-promoting constructs developed for the sake of workplace efficiency. On the dimension of **individualism**, Bulgaria was seen to be more of a collectivist than an individualistic society, where loyalty to a group fosters very strong relationships, and where promotion decisions are based more on adherence to group norms than on employee achievements and competencies.

Regarding **masculinity**, Bulgaria was termed as a 'feminine' society. Competition and achievement are not as highly valued as in more 'masculine' countries, where standing out from the crowd is not as admirable as it is in more competition-oriented contexts. Rather, the more dominant values centre on ensuring a work-life balance. A very high predilection for **avoiding uncertainty** was also found in the country. According to the authors, such a finding can be associated with maintaining rigid codes of belief and behaviour and can downplay the acceptance of new ideas and innovation.

On the dimension of **pragmatism**, Bulgaria was seen to be somewhat pragmatic, with the ability to adapt to new environmental conditions and change practices to prepare for the future, rather than being stuck in paradigms of the past. On the sixth dimension of **indulgence**, Bulgaria was viewed as a restrained culture, where actions tend to be tempered by the need to adhere to accepted social behaviours. The researchers note that these dimensions are not measured on an absolute scale, but on a relative one, by comparing a particular country against aggregated averages of all other cultures under investigation.

These six dimensions are clearly generalisations, and the dynamics of individual cases differ wildly. However, they can offer insight into the challenges for WPI and help in the consideration and selection of the tools and approaches used to overcome them. In 2012, in a Flash Eurobarometer poll of all EU member states, the lowest share of respondents replying that they would prefer to be an employee, rather than be self-employed, was in Lithuania (32 %), followed by Bulgaria (40 %).[24] The highest share was in Sweden (74 %). While there are likely a multitude of factors for this, such as the income potential of self-employment versus being an employee, there is certainly potential for workplace innovations to improve employee satisfaction while simultaneously promoting the economic development of Bulgaria.

Source: ARC Fund, 2014.

Technological Product

The technological product (protected and unprotected new technological knowledge) is a result of the creative activities of the participants in the process. Its unique characteristics and economic significance make it attractive as an object of transfer. The analysis of applicant and patent activity, as well as the attitudes of Bulgarian and foreign persons in this field make it possible to assess an essential aspect of the innovation system operation and to seek ways of improving it.

The protection of intellectual property rights is an important condition for successful innovation, although the connection between new technological knowledge and its practical application is frequently indirect. Contradictory as the opinions in this direction may be, one of the latest

[23] "Power distance" is defined as the extent to which the less powerful members of institutions and organisations within a country expect and accept that power is distributed unequally. "Individualism" is defined as the degree of interdependence a society maintains among its members. "Masculinity" is what motivates people, either wanting to be the best (masculine) or liking what you do (feminine). "Uncertainty avoidance" involves the extent to which the members of a culture feel threatened by ambiguous or unknown situations, and have created beliefs and institutions that try to avoid these. "Pragmatism" describes how every society has to maintain some links with its own past while dealing with the challenges of the present and future. "Indulgence" is defined as the extent to which people try to control their desires and impulses.

[24] Flash Eurobarometer 354 – Entrepreneurship in the EU and Beyond, DG Enterprise and Industry, August 2012.

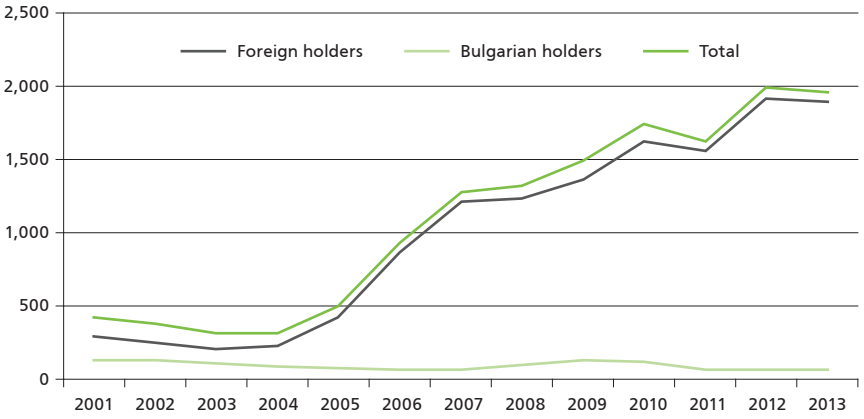
joint studies of the Office for Harmonisation in the Internal Market (OHIM), acting through the European Observatory on Infringements of Intellectual Property Rights, and the European Patent Office (EPO) in co-operation with the European Commission, in particular DG Internal Market and Services and Eurostat,[25] taking into account the major IP rights (patents, trademarks, designs, copyrights, geographical indications), presented data about the considerable contribution made by the IPR-intensive industries to national GDP levels (38.6 % of total EU GDP), employment (25.9 % of total employment), wages and trade (90.4 % of exports and 88.3 % of EU imports).

For this reason, the importance of the intellectual property protection system, including the need for it to correspond more to the open innovation concept continues to be widely discussed as part of Europe's strategic innovation agenda.[26]

Following the two-year peak of 2009 – 2010, **in the last three years the Bulgarian Patent Office has registered some of the lowest number of patents issued to Bulgarian patent holders**. The decline approaches 50 % and is equally serious for both the business sector and individuals. Considering the 3-year lag at the registration of patentable technological knowledge, **the decline corresponds to the business slump at the time of the economic crisis**.

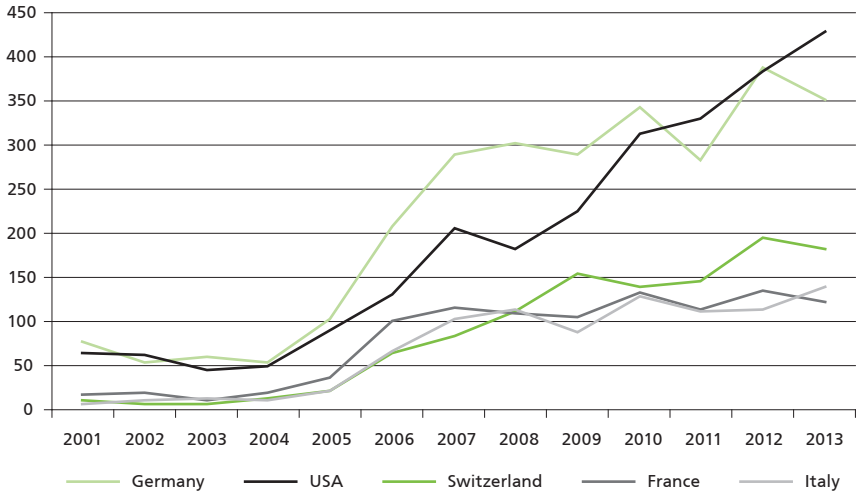
The patent activity of foreign patent-holders in Bulgaria fluctuates but with an upward trend. Bulgaria continues to be an attractive part of the geographical portfolio in respect to the protection of technological innovations for the United States, Germany and Switzerland, which hold half of all 13,053 patents registered by the Bulgarian Patent Office in 2001 – 2013. Outside the top 5 patent-holding countries in Bulgaria, the remaining 75 formed a mere 35 % of the patent activity in the country.

Figure 9. NUMBER OF PATENTS FOR INNOVATIONS ISSUED IN BULGARIA, 2001 – 2013



Source: Compiled on the basis of data from the *Official Gazette* of the BPO.

Figure 10. TOP 5 COUNTRIES BY NUMBER OF PATENTS REGISTERED IN BULGARIA, 2001 – 2013



Source: Compiled on the basis of data from the *Official Gazette* of the BPO.

EU member states have been the largest foreign patent holder in Bulgaria after 2000, with a total share of slightly over 62 % of patents, followed by the United States with nearly 20 %. **Germany, with 1/5 of all patents registered in Bulgaria and 1/3 in Europe, is the leader in respect to the protection of new technologies**. Malta alone does not have registered any patents with the Bulgarian Patent Office.

[25] "Intellectual Property Rights Intensive industries: Contribution to Economic Performance and Employment in the European Union", Industry-Level Analysis Report, September 2013; A Joint Project Between the European Patent Office and the Office for Harmonization in the Internal Market.

[26] "Boosting Open Innovation and Knowledge Transfer in the European Union", Independent Expert Group Report on Open Innovation and Knowledge Transfer, Directorate-General for Research and Innovation, European Commission, 2014; "Final Report from the Expert Group on Intellectual Property Valuation", Directorate-General for Research and Innovation, European Commission, 2014; "State of the Innovation Union, Taking Stock 2010 – 2014", Directorate-General for Research and Innovation, European Commission, 2014.

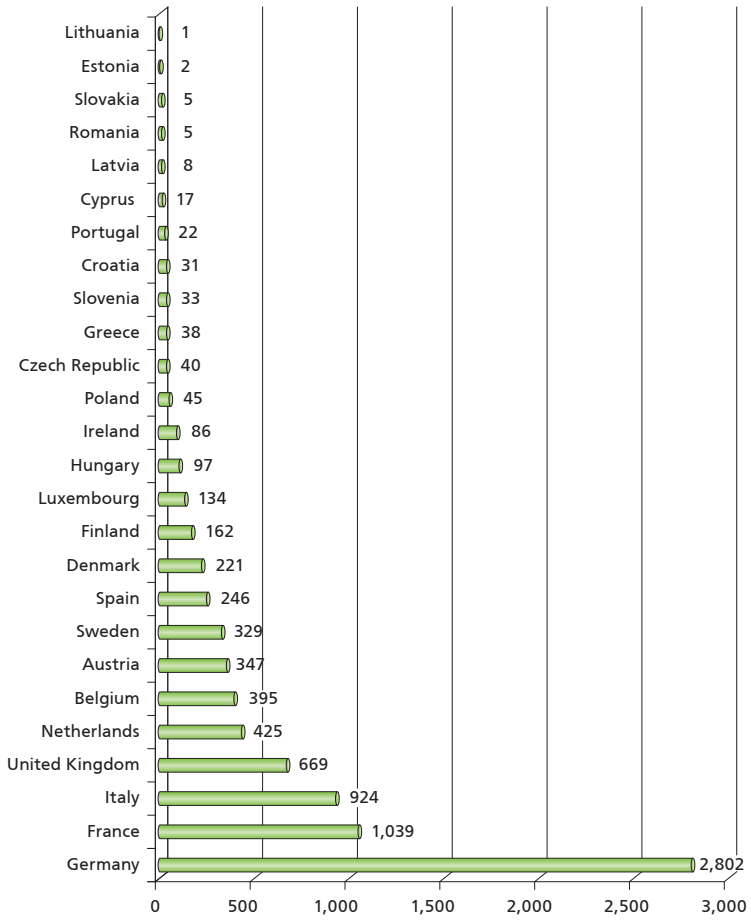
The first five EU member states with the largest patent activity in Bulgaria in 2001 – 2013 also form the top five foreign investment countries, albeit with small reshuffles in the ranking. In this way, by managing technological and financial assets jointly company investors demonstrate a well-designed long-term strategy of technological and economic presence on foreign markets.

The structure of registered patents by institutional sector in Bulgaria has been following a positive trend: since the early 2000s, **the share of individuals has declined by over 25 % to the benefit of business and the public sector, mainly represented by the institutes of the Bulgarian Academy of Sciences (BAS)**.

The portfolio of universities is deteriorating, having a mere 18 new patents registered in the last 13 years – a natural result of the lack of adequate policy towards the assessment of the contribution and comprehensive use of technological knowledge generated in higher education. Some of the identifiers of such deficiency include:

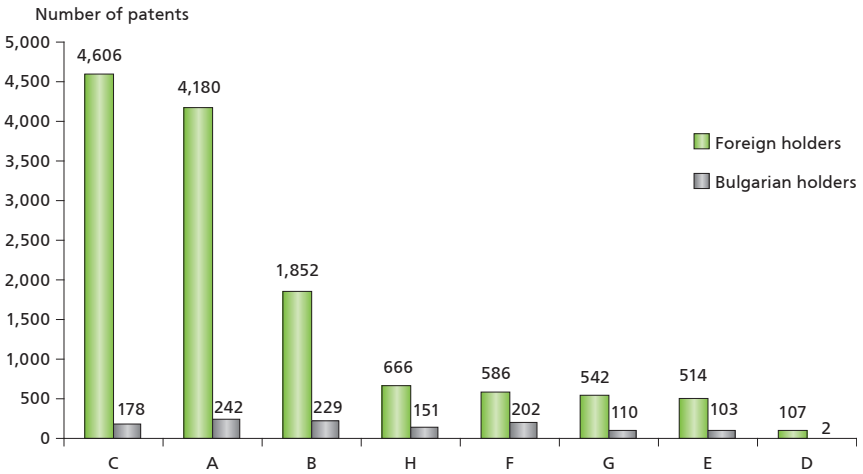
- lack of institutional support of the cooperation with business, which is carried out largely based on personal contacts without any essential contribution to the university;
- lack of a strategic document reflecting intentions towards the protection, usage and transfer of new technology;
- lack of functioning technology transfer offices;
- lack of rules and procedures for the creation and shared use of research infrastructures;
- insufficient information and lack of training programmes on matters related to the protection of intellectual property;
- lack of interest in establishing new and financing the existing intellectual property offices (IP points).

Figure 11. NUMBER OF FOREIGN PATENTS IN BULGARIA BY EU-28, 2001 – 2013



Source: Compiled on the basis of data from the *Official Gazette* of the BPO.

Figure 12. NUMBER OF PATENTS FOR INNOVATIONS ISSUED IN BULGARIA ACCORDING TO IPC CLASSES, 2001 – 2013[27]



Source: Compiled on the basis of data from the *Official Gazette* of the BPO.

[27] A – Human necessities; B – Performing operations; Transporting; C – Chemistry and metallurgy; D – Textiles and paper; E – Construction; Mining; F – Mechanics; lighting; heating; engines and pumps; guns and ammunition; G – Physics; H – Electricity.

Table 1. TOP 15 TECHNOLOGICAL CLASSES (IPC CLASS) OF OVERALL PATENT ACTIVITY IN BULGARIA, 2001 – 2013

No.	IPC class	Name	Number of patents	%
1.	C07	Organic chemistry: general methods; acyclic, carboxyl, heterocyclic compounds; sugar; steroids; proteins	**3,417**	23.9
2.	A61	Medical or veterinary science; hygiene; dentistry; medicinal preparations	**3,217**	22.5
3.	B65	Conveying; packing; storing	**542**	3.8
4.	C12	Biochemistry; beer; spirits; wine; microbiology; enzymology; genetic engineering	**508**	3.6
5.	A01	Agriculture; forestry; animal husbandry; hunting; trapping; fishing; pesticides; herbicides; disinfectants	**467**	3.3
6.	H04	Electric communication technique; transmission; secret communication; telephonic communication; pictorial communication (e.g. TV); wireless communication networks	**350**	2.5
7.	H01	Basic electric elements: cables; conductors; insulators; resistors; magnets; detectors; transformers; capacitors, switching devices; resonators, etc.	**279**	2.0
8.	G01	Physics – measuring; testing	**245**	1.7
9.	A23	Foods and foodstuffs; their treatment; milk; butter; coffee; tea; chocolate; confectionery	**237**	1.7
10.	B01	Physical or chemical processes or apparatus – dissolving, emulsifying, dispersing	**236**	1.7
11.	E04	Building; structural elements; building materials	**235**	1.6
12.	C08	Organic macromolecular compounds; their preparation or chemical working-up	**224**	1,6
13.	F16	Engineering elements or units; general measures for producing and maintaining effective functioning of machines or installations; thermal insulation in general	**208**	1.5
14.	A47	Furniture; domestic articles or appliances; sanitary equipment	**198**	1.4
15.	B29	Working of plastics; working of substances in a plastic state in general	**141**	1.0
Total top 15			**10,504**	**73.6**
Other (100)			**3,766**	26.4
Total all			**14,270**	100.0

Source: Compiled on the basis of data from the *Official Gazette* of the BPO.

Table 2. TOP 10 TECHNOLOGICAL CLASSES (IPC CLASS) OF BULGARIAN PATENTS, 2001 – 2013

No.	IPC class	Name	Number of patents	%
1.	A61	Medical or veterinary science; hygiene; dentistry; medicinal preparations	**136**	11.2
2.	H01	Basic electric elements: cables; conductors; insulators; resistors; magnets; detectors; transformers; capacitors, switching devices; resonators, etc.	**85**	7.0
3.	E04	Building; structural elements; building materials	**57**	4.7
4.	G01	Physics – measuring; testing	**50**	4.1
5.	A01	Agriculture; forestry; animal husbandry; hunting; trapping; fishing; pesticides; herbicides; disinfectants	**40**	3.3
6.	A23	Food or foodstuffs; treatment; milk; butter; coffee; tea; chocolate; confectionery	**39**	3.2
7.	F42	Explosive charges, blasting, fireworks	**39**	3.2
8.	H02	Generation, conversion and distribution of electric power; electric machines; generators; electric motors; control and regulation	**39**	3.2

Table 2. TOP 10 TECHNOLOGICAL CLASSES (IPC CLASS) OF BULGARIAN PATENTS, 2001 – 2013 (CONTINUED)

No.	IPC class	Name	Number of patents	%
9.	F16	Engineering elements or units; general measures for producing and maintaining effective functioning of machines or installations; thermal insulation in general	**35**	2.9
10.	B60	Vehicles in general	**34**	2.8
Total			**554**	**45.5**
Other (83)			663	54.5
Total all			**1,217**	**100.0**

Source: Compiled on the basis of data from the *Official Gazette* of the BPO.

Box 2. INDUSTRIAL PROPERTY CENTRES ESTABLISHED BY THE BULGARIAN PATENT OFFICE

In implementing the Concept Paper on the institutional, structural and functional development of the Bulgarian Patent Office (BPO) and its strategy to promote public awareness of intellectual property, and in the context of the decisions made at the annual conference of the patent information centres, also known as Patent Libraries (PATLIB), organised in 2009 in conjunction with European Patent Office, the BPO launched an initiative to create a **Bulgarian Industrial Property Network** (BIPN). In the first years of its existence the network included **14 structures**, including four regional PATLIB centres and ten university IP points across Bulgaria.

PATLIB centres have been developed with the BPO, the Bulgarian Industrial Association chapters in Plovdiv and Varna, and the Rousse Industrial Association. The role of the centres is to provide information services and assistance to SMEs, R&D and academic circles, as well as individual inventors. The trend in PATLIB centre development is their gradual evolution to innovation centres, which will support business representatives and entrepreneurs to boost innovation, guarantee higher competitiveness of the Bulgarian economy and good positions on the single European market.

The **IP points** network includes:

1. Technical University – Sofia.
2. Angel Kanchev University of Ruse.
3. Technical University – Varna.
4. Prof. D-r. Assen Zlatarov University – Bourgas.
5. Medical University – Sofia.
6. University of Library Studies and Information Technology – Sofia.
7. Technical University – Gabrovo.
8. University of National and World Economy – Sofia.
9. University of Forestry – Sofia.
10. University of Food Technologies – Plovdiv.
11. Union of Inventors in Bulgaria.

The university IP points are structures aimed to create a favourable environment and appropriate infrastructure to promote creativity and research, guarantee and speed-up the process of their development, spreading knowledge, technological transfer and partnership with enterprises in order to maximise the benefit from investment in R&D and innovation.

The Concept Paper of the Patent Office to establish these industrial property information and consultation centres maps out the opportunities for interaction with the universities and the measures to achieve a number of objectives: organisational and technical support for the establishment and popularisation of such centres; methodological assistance at various stages of the development and implementation of scientific projects (evaluation of patentability, application drafting, evaluation of technology transfer opportunities, licensing of R&D results, analysis of potential risks of introducing new technological solutions); development and implementation of joint programmes for training of students, lecturers and academic staff; provision of consultancy.

Box 2. INDUSTRIAL PROPERTY CENTRES ESTABLISHED BY THE BULGARIAN PATENT OFFICE (CONTINUED)

In spite of the support by the Patent Office, **nearly five years after the initiative was launched, in 2014 only the Technical University in Sofia confirmed that it would continue operating a centre**. For various reasons – economic (lack of funding), organisational (lack of administrative capacity), human (above all, lack of understanding of the role of intellectual property as a fundamental asset of the university and the outcome of its comprehensive use, including through the forms of technological transfer) **the IP points at the other universities are not operational**. The PATLIB centre in Varna was also closed.

Source: Bulgarian Patent Office, 2014.

The following sectors hold the top ranks in the above-mentioned study by OHIM of the contribution by IPR-intensive industries to national GDP: machines and machine tools; pharmaceutical preparations; chemical products; biotechnologies; data processing equipment and computers; electronic and optical apparatus. The situation in Bulgaria for the period after 2000 has been similar to the average European:

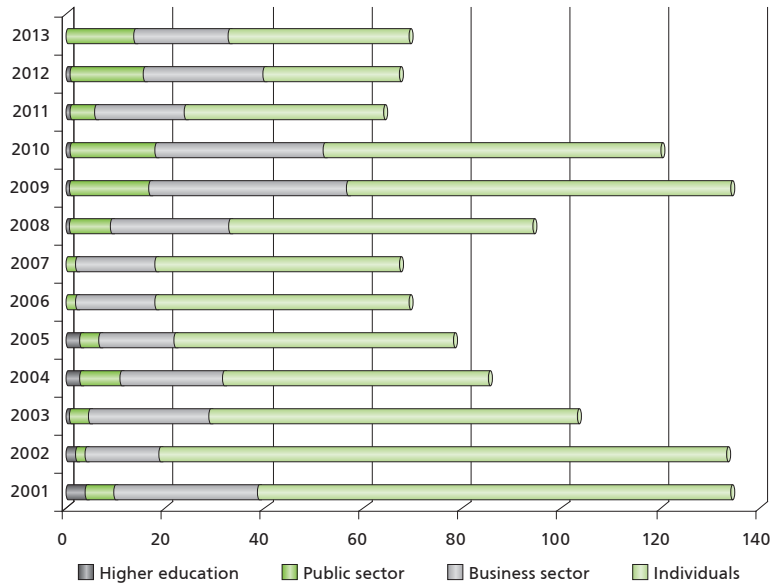
- Patent-intensive sectors

Patent-intensive industries contribute to 10.3 % of the employment and 13.9 % of the EU GDP. In terms of the first indicator, the best results at national level were shown by the Czech Republic, Finland, Germany, Slovakia, Slovenia and Sweden. In respect to added value, Bulgaria is among the leaders (16.2 %), along with Austria (16.3 %), Hungary (20.0 %) and Ireland (18.8 %). Against the backdrop of the relatively low share of patent-intensive industries in national employment (7.4 %) Bulgaria ranks third in the EU in terms of labour productivity.

- Sectors with high trademark use intensity

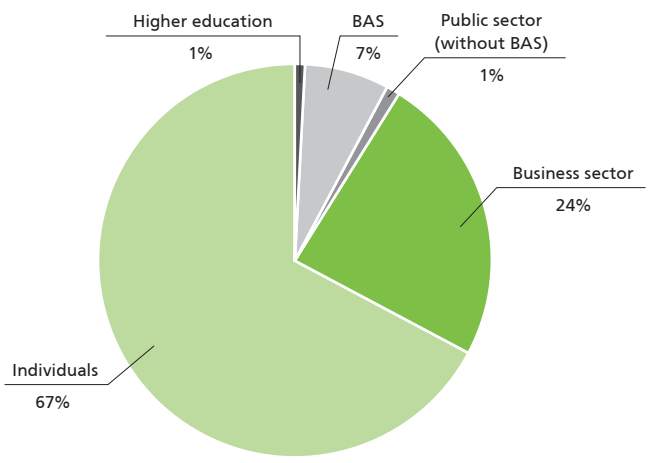
In terms of employment (20.1 %) and GDP (33.0 %) this group of economic sectors in Bulgaria have similar results to the average European levels – 20.8 % and 33.9 % respectively. Only Hungary, Romania, Slovakia and Lithuania of the new member states have better results.

Figure 13. NUMBER OF PATENTS OF BULGARIAN PATENT HOLDERS BY INSTITUTIONAL SECTORS, 2001 – 2013



Source: Compiled on the basis of data from the *Official Gazette* of the BPO.

Figure 14. SHARE OF PATENTS BY INSTITUTIONAL SECTORS IN BULGARIA, 2001 – 2013



Source: Compiled on the basis of data from the *Official Gazette* of the BPO.

Table 3. PATENTS OF BAS INSTITUTES, 2001 – 2013

No.	Patent holder	Patents (number)	Share (%)
1.	Institute for Control and Systems Research	21	25.0
2.	Institute of Metal Science	15	17.9
3.	Institute of Solid State Physics	12	14.3
4.	Space Research and Technology Institute	7	8.3
5.	Institute of Mechanics	5	6.0
6.	Institute of Electronics	4	4.8
7.	Institute of Chemical Engineering	3	3.6
8.	Institute of General and Inorganic Chemistry	3	3.6
9.	Central Lab of Mechatronics and Instrumentation	3	3.6
10.	Institute of Physical Chemistry	2	2.4
11.	Institute of Plant Physiology	2	2.4
12.	Institute of Oceanology	2	2.4
13.	Institute of Optical Materials and Technologies	2	2.4
14.	Institute of Organic Chemistry	1	1.2
15.	Institute of Electrochemistry and Energy Systems	1	1.2
16.	Central Laboratory of Optical Recording and Processing of Information	1	1.2
Total:		**84**	100

Source: Compiled on the basis of data from the *Official Gazette* of the BPO.

Table 4. PATENTS OF THE HIGHER EDUCATION SECTOR, 2001 – 2013

No.	Patent holder	Patents (number)	Share (%)
1.	Medical University, Sofia	**6**	33.3
2.	Lyuben Karavelov Higher School of Civil Engineering, Sofia	**3**	16.7
3.	Technical University, Sofia	**3**	16.7
4.	Technical University, Varna	**2**	11.1
5.	University of Chemical Technology and Metallurgy, Sofia	**1**	5.6
6.	Vasil Levski National Military University, Veliko Turnovo	**1**	5.6
7.	National Academy of Arts, Sofia	**1**	5.6
8.	Yambol Department of Technology with the Trakia University	**1**	5.6
Total:		**18**	100.0

Source: Compiled on the basis of data from the *Official Gazette* of the BPO.

Table 5. PATENTS OF THE AGRICULTURAL ACADEMY, 2001 – 2013

No.	Patent holder	Patents (number)
1.	Dobrudja Institute of Wheat and Sunflower, General Toshevo	1
2.	Agricultural Institute, Shoumen	2
3.	National Centre of Agricultural Sciences, Sofia	1
4.	Institute of Soil Science "Nikola Poushkarov", Sofia	3
Total:		**7**

Source: Compiled on the basis of data from the *Official Gazette* of the BPO.

- Sectors of high design use

This group contributes to 12.2 % of the employment and over 12.8 % of EU GDP. Bulgaria's results are above the European average in terms of employment (12.4 %) and a little below the average for GDP (12.1 %).

- Sectors with intensive copyright and neighbouring rights usage

Bulgaria ranks third in the EU by contribution of the sectors of high intensity of copyright and neighbouring rights use in GDP (4.8 %) following Ireland (8.1 %) and Sweden (5.4 %). United Kingdom, Finland, France, the Czech Republic, Greece, Hungary and Estonia are above the average European level (4.2 %). The contribution of the same group of industries to employment in Bulgaria is 2.2 % (compared to average European values of 3.2 %).

- Sectors with highly intensive use of geographical indications

Since the number of the economic sectors included in this groups is the smallest – only four (milk and dairy products, except ice-cream; spirits; wine from grapes; beer) their share in European employment and GDP for all member-states, Bulgaria included, varies at around 0.1 – 0.2 %. Expected exceptions include France (0.3 % of GDP and 0.5 % of national employment), Portugal and Spain, with results over the average European in terms of employment, 0.6 % and 0.3 % respectively.

In the case of Bulgaria, the share of these activities in the added value of food and drinks industry is 1.97 %, evidence of unused potential as regards natural and climate conditions (France achieves 14.83 % by this indicator, Portugal – 9.83 %, Italy – 9.77 %), intellectual capital and traditional technologies.

Table 6. BULGARIAN COMPANIES WITH MORE THAN 3 PATENTS ON THE TERRITORY OF BULGARIA, 2001 – 2013

No.	Company patent holder	2001 – 2013
1.	SOPHARMA JSC, Sofia	21
2.	VMZ JSC, Sopot	14
3.	HYUNDAI HEAVY INDUSTRIES CO. Bulgaria, Sofia	11
4.	BIOVET JSC, Peshtera	9
5.	BALKANPHARMA-DOUPNITSA JSC, Doupnitsa	7
6.	BALKANPHARMA-RAZGRAD JSC, Razgrad	6
7.	ARSENAL JSC, Kazanluk	5
8.	LB BULGARICUM SMJSC, Sofia	5
9.	NON-FERROUS WORKS JSC, Plovdiv	4
10.	KOZLODUY N-PLANT SMJSC, Kozlodui	3
11.	AMV-AGRO JSC, Plovdiv	3
12.	DENDRITE LTD., Sofia	3
13.	ZEOREX INTERNATIONAL LTD., Sofia	3
14.	IONTECH LTD., Sofia	3
15.	NITI-SHC, Kazanluk	3
16.	CHEMICAL PHARMACEUTICAL RESEARCH INSTITUTE, Sofia	3
17.	PROMAX-99 LTD., Sofia	3
18.	SOFIA PUBLIC ELECTRICAL TRANSPORT COMPANY JSC., Sofia	3
19.	EUROCONSULT LTD., Plovdiv	3
20.	NEOCHIM PLC., Dimitrovgrad	3
21.	LACTINA LTD, Bankya	3
	Total	118

Source: Compiled on the basis of data from the *Official Gazette* of the BPO.

The complex influence of IP intensive sectors is reflected in the 25.9 % share of total employment in the European economy and a 38.6 % share of EU GDP. **Bulgaria is among the countries where the contribution of these sectors to national GDP (41.1 %) is above the average European level, which ranks it fifth after Ireland, Germany, Romania and Hungary – an important consideration when choosing which sectors of the national economy are to be prioritised and considered an object of a policy of development and supporting instruments**.

Beyond the domestic reference, in a comparative analysis of member states in respect to IP rights registered at the European Patent Office Bulgaria comes last in both the absolute number of objects of intellectual property and per 1,000 persons employed. The absolute leader in both groups is Germany, along with the United Kingdom, France, Spain and Italy. Northern countries like the Netherlands, Sweden, Finland, Denmark, as well as Austria, register good results. Poland is the leader among the newly-acceded member states.

Research Product

New scientific knowledge is an important precondition for enhancing the country's innovation activity. An analysis of the dynamics and structure of this process reveals Bulgaria's potential to enter global scientific networks, the comparative advantages of the country in different fields of knowledge and its ability to compete successfully on the market of intellectual products.

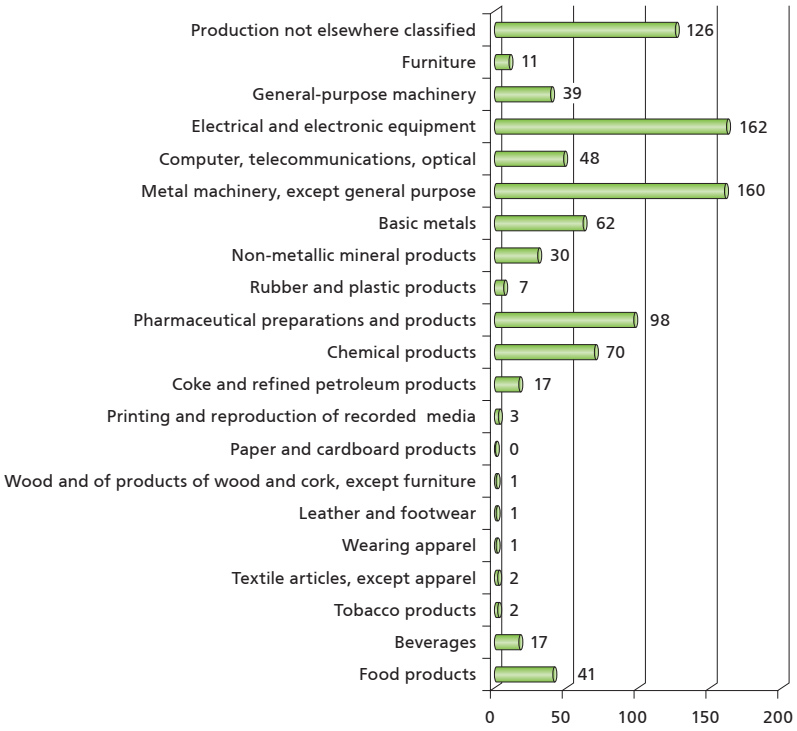
Structure and dynamics of research publications

In the period 1996 – 2013, the total number of scientific papers and reports from Bulgaria available in the Scopus reference database stood at 50,312, ranking the country 50th among 239. The United States, with 7,846,972 documents tops the ranking, followed by China (3,129,719 documents).

With 2,141,375 referenced documents, or 285 per 1,000 staff engaged in R&D, the United Kingdom ranks first among EU-28 (for 2011, according to Eurostat data). Bulgaria, which is 22nd in the EU, has registered 164 documents per 1,000 staff engaged in R&D. In Eastern Europe, Bulgaria ranks 10th among another 23 countries by publication activity.

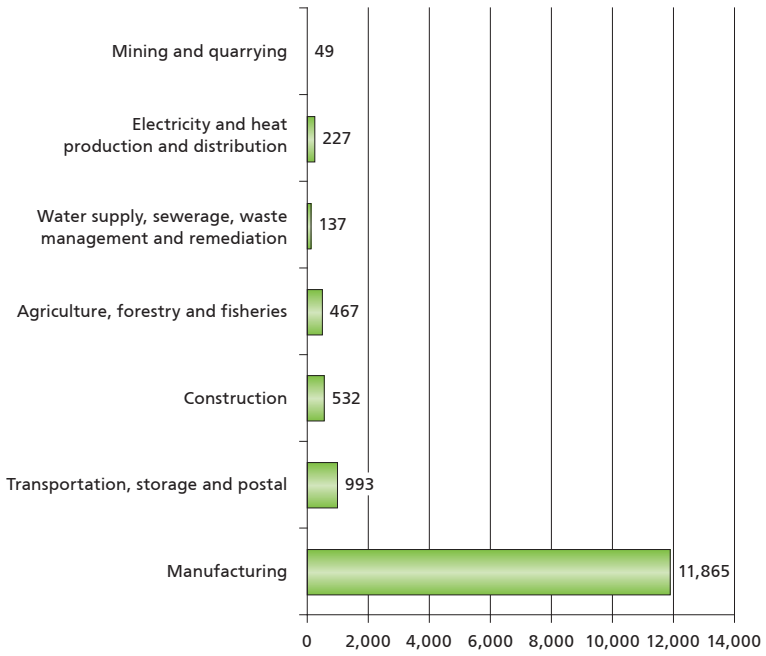
For the first programming period 2007 – 2013 in which Bulgaria was a full-fledged member of the EU, the number of articles registered by the country in the Scopus database increased gradually by slightly over 20 %. However, the rates of change of the resources which ensured this development were different – expenses for R&D nearly doubled and the staff engaged in R&D increased only by 12 %. This indicates a **declining efficiency for the funds spent for R&D measured by the number of articles published in Scopus referenced publications**. It is obvious that against the backdrop of the still

Figure 15. NUMBER OF PATENTS OF BULGARIAN PATENT HOLDERS BY MANUFACTURING SECTOR (NACE 2008), 2001 – 2013



Source: Compiled on the basis of data from the *Official Gazette* of the BPO.

Figure 16. OVERALL NUMBER OF PATENTS IN BULGARIA BY ECONOMIC SECTORS (NACE 2008), 2001 – 2013



Source: Compiled on the basis of data from the *Official Gazette* of the BPO.

insufficient funds for R&D in absolute terms the largest research institutions in the country (BAS – 7,100 articles in Scopus for the 7-year period, the higher education sector represented by 5 universities with a total of 6,783 articles and Alexandrovska University Hospital with 547 articles) engage in research and development with declining relative results.

In 2007 – 2013, **nearly 50 % of the articles with Bulgarian participation were in the scientific fields of "Physics and astronomy" (26 %) and "Medicine" (21 %)**. Other priorities for Bulgarian researchers included "Chemistry" (20 %), "Biochemistry and molecular biology" (17 %) and "Materials science" (16 %), which formed strong clusters of connected problem-oriented zones of scientific knowledge.

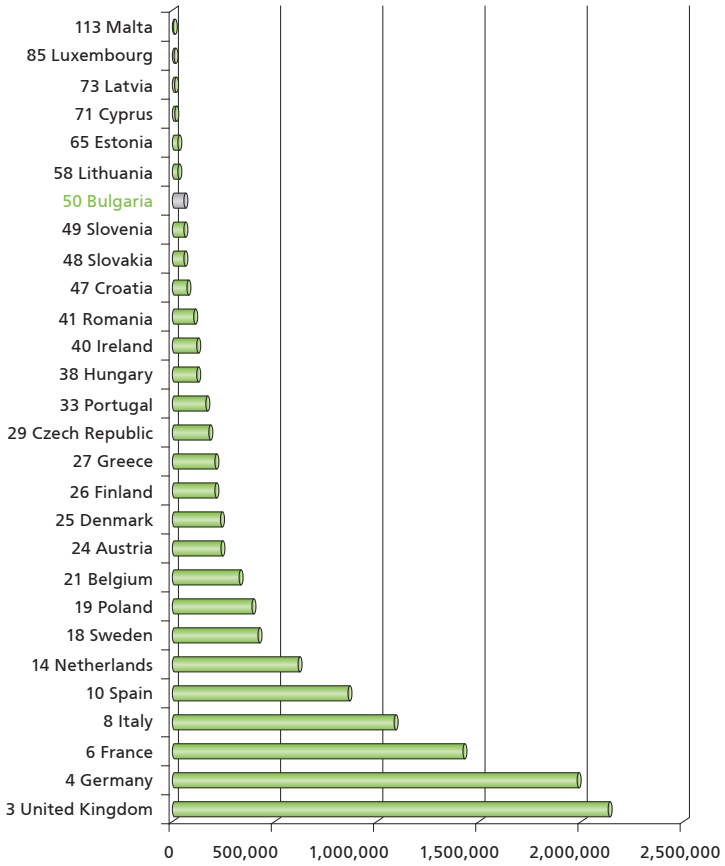
After 2002, the joint publication activity of Bulgarian researchers increased by over 30 % and for the period until 2013 maintained average values of about 45 % compared to the total volume of scientific output. The unquestioned leader in the choice of country for a partner organisation is Germany, followed by the United States, France, Italy and the United Kingdom. Poland, the Czech Republic, Hungary and Romania were the countries from the group of the new member states preferred in joint projects.

Impact of the research product

In 2013 Bulgaria registered 3,654 documents in Scopus forming **2.31 % of the research product of Eastern Europe (by over 25 % less in comparison with 1996) and 0.14 % of the research product in the world (at the same percent of decline)**.

There are a total of 45 journals of Bulgarian research institutions referenced in Scopus – a number which has been increasing after 2000 (25 journals). The expansion of the

Figure 17. TOTAL NUMBER OF REFERENCED REPORTS IN SCOPUS BY COUNTRY, EU-28, 1996 – 2013[28]



Source: SCImago (2007). SJR – SCImago Journal & Country Rank. Retrieved October 23, 2014, http://www.scimagojr.com

Table 7. TOP 10 EAST EUROPEAN COUNTRIES BY THE NUMBER OF PUBLICATIONS IN SCOPUS, 1996 – 2013

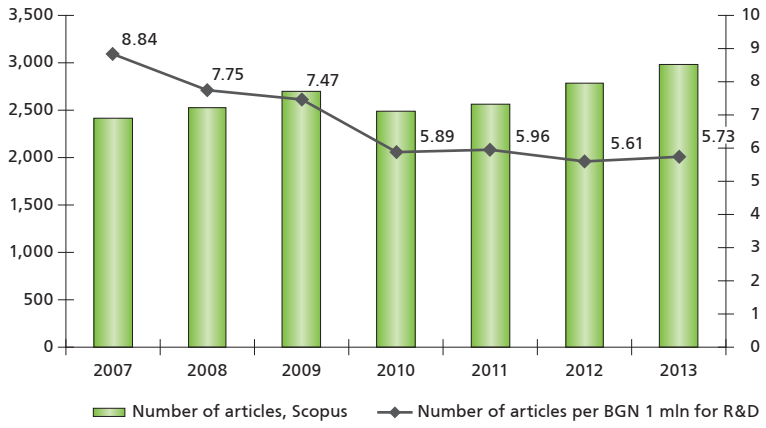
	Country	Number of documents
1.	Russia	639,598
2.	Poland	387,982
3.	Czech Republic	185,849
4.	Hungary	124,265
5.	Ukraine	122,263
6.	Romania	109,831
7.	Croatia	65,197
8.	Slovakia	64,247
9.	Slovenia	57,652
10.	Bulgaria	50,312

Source: SCImago (2007). SJR — SCImago Journal & Country Rank. Retrieved October 23, 2014, http://www.scimagojr.com

[28] The figure before the name of the country shows its place in world ranking.

number of Bulgarian journals which meet the requirements for inclusion in the reference databases with scientific publications of the publishing houses of Thompson Reuters and Elsevier is a **joint effort of Bulgarian scientists, research institutions and the Ministry of Education and Science** (including through the National Science Fund and the Bulgarian Scientific Periodicals competition). This makes Bulgarian researchers, organisations and journals more visible to the world research community as a condition for joint participation in research projects, institutional cooperation and the development of products.

Figure 18. PUBLICATIONS BY BULGARIAN AUTHORS IN SCOPUS, 2007 – 2013



Source: Scopus, 2014 and NSI, 2014.

Table 8. TOP 15 BULGARIAN JOURNALS REFERENCED IN SCOPUS

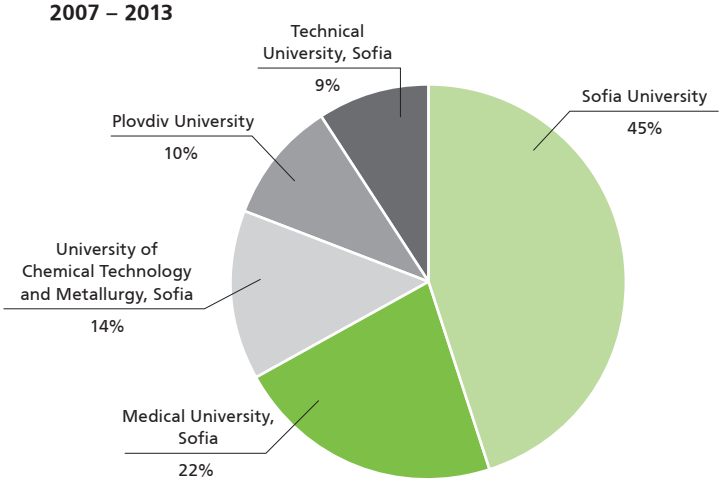
	Title	SJR[29]	H-index[30]
1	Applied Mathematical Sciences	0,466	19
2	Oxidation Communications	0,204	16
3	ZooKeys	0,48	15
4	Biotechnology and Biotechnological Equipment	0,216	13
5	Folia Medica	0,169	13
6	Revmatologiia	0,1	12
7	Biomedical Reviews	0,161	10
8	International Journal of Mathematical Analysis	0,221	10
9	Advanced Studies in Theoretical Physics	0,666	9
10	Journal of Environmental Protection and Ecology	0,21	9
11	Propagation of Ornamental Plants	0,23	8
12	Chemistry	0,2	7
13	Comptes Rendus de L'Academie Bulgare des Sciences	0,206	7
14	Akusherstvo i Ginekologiia	0,115	6
15	Bulgarian Journal of Agricultural Science	0,164	6

Source: SCImago (2007). SJR – SCImago Journal & Country Rank. Retrieved October 23, 2014, http://www.scimagojr.com

[29] The scientific measurement indicator SCImago Journal Rank (**SJR**) is used in the SCOPUS database. SJR is an indicator which, like GoogleRank, measures the prestige of reviewed scientific journals on the basis of citations for a period of three years.

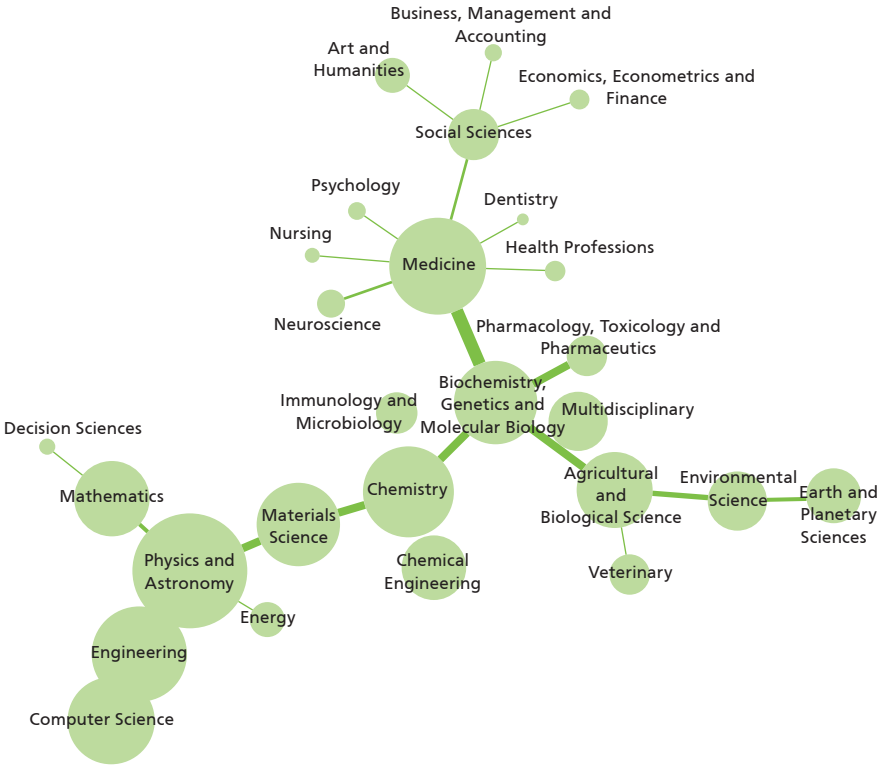
[30] The research impact indicator **h-index** is known as the Hirsch index after the name of the Californian physicist Jorge E. Hirsch, who suggested it in 2005. It measures both the productivity and citation impact of the published body of work of a scientist, group or institution. The value of the h-index is calculated on the basis of the most cited publications: counting those *h* in number among them which were cited at least *h* times. H-index is the only figure which corresponds to this definition. This can practically be done by recording in consecutively numbered lines the number of citations of every article in descending order – *h* is where the number of the line becomes larger than the figure written on that line.

Figure 19. SHARE OF UNIVERSITIES IN THE OVERALL NUMBER OF ARTICLES BY THE BULGARIAN HIGHER EDUCATION SECTOR IN SCOPUS, 2007 – 2013



Source: Scopus, 2014.

Figure 20. MULTIDISCIPLINARY RESEARCH PRODUCT WITH BULGARIAN PARTICIPATION IN SCOPUS, 2011 – 2012



Source: SCImago (2007). SJR – SCImago Journal & Country Rank. Retrieved October 23, 2014, http://www.scimagojr.com

Entrepreneurship and Innovation Networks

Entrepreneurship is one of the binding elements of the national innovation system. It is embodied in newly-established companies and is the means of interaction and exchange of information, know-how and technologies among stakeholders in the innovation economy. Entrepreneurship is crucial for both the robustness and adaptability of the national innovation system. A spirit of enterprise and a culture of innovation should underlie the objectives of national innovation policy.

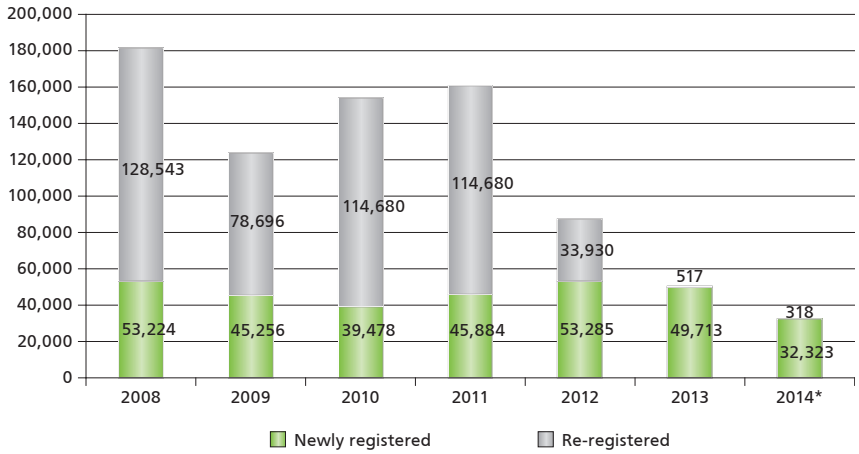
Entrepreneurship in Bulgaria

Compared to 2013, **in 2014 Bulgaria dropped by two positions – to 38th – in World Bank's Doing Business survey,** although it was in the company of many East European countries (Poland – 32, Slovakia – 37, the Czech Republic – 44, Romania – 48, Hungary – 54, Greece – 61), with positions better than the average for the region (Europe and Central Asia – 68).[31]

The lack of improvement in the business environment in all studied categories save for one ("trading across borders"), along with the positive changes and better business climate in the other countries included in the ranking, led to a comparative deterioration of Bulgaria's positions. **The downshift is most pronounced in the case of the procedures for starting a business**. The deterioration in the payment of taxes and getting credit categories is also considerable. The procedures related to getting electricity and dealing with construction permits – where Bulgaria ranks 125th and 101st respectively, out of a total of 189 countries – traditionally remain the most problematic.

Starting a business becoming more problematic is no surprise given the deteriorating business environment, the political instability of the last couple of years and the financial difficulties resulting from the economic crisis. **In 2013, there was nearly 7 % decline in the number of newly registered enterprises compared to 2012. The decline is expected to continue in 2014.** The large number of companies expunged from the commercial register in the last few years in most cases led to a decline of business activity and, to a lesser extent, to a shift of business to other economic sectors (although this shift failed to halt the declining number of newly-registered enterprises). This development combined with fewer employed persons after 2008 are a reflection of the general state of the country's troubled economy.

Figure 21. NUMBER OF LEGAL PERSONS REGISTERED IN THE COMMERCIAL REGISTER



* The data for 2014 cover the period to the end of August.

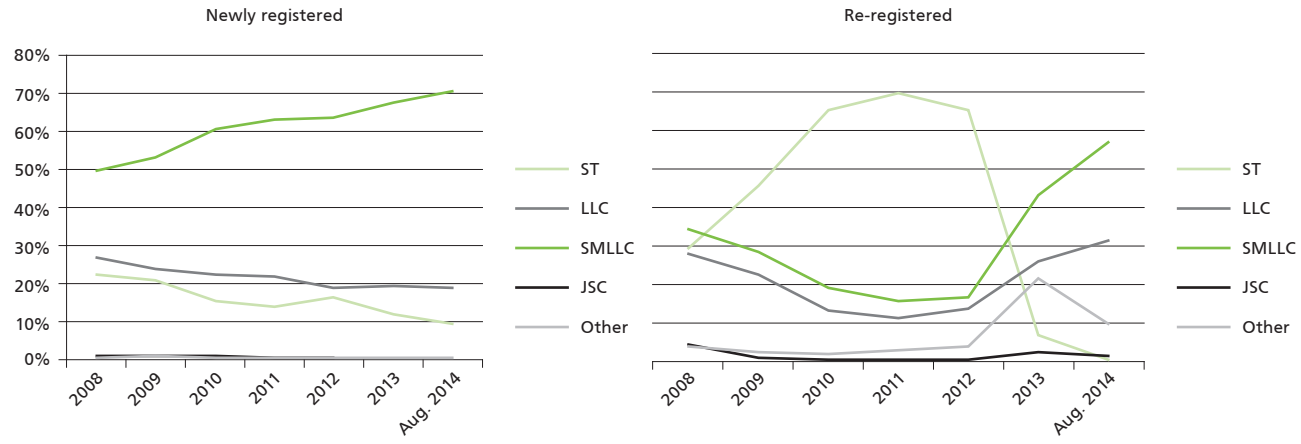
Source: Registry Agency, 2014.

Limited liability company is the preferred legal form for registration of new business, with a share reaching 89.5 % in 2014. In this category, there has been a growth of newly registered single-member limited liability companies (to 70.6 % in 2014, which is nearly 1.5 times that in 2008) and the stable share of new enterprises registered as limited liability companies at around 19 %.

In 2012, 92 % of the total of 372,036 legal persons were in the group of micro-enterprises with up to 9 employees and another 7 % were small enterprises with up to 49 employees. Their shares are prevalent (39 % and 28 % respectively) in the sector of "Trade; repair of motor vehicles and motorcycles". Medium-sized enterprises have a share of 1.22 %, the largest portion of them (38 %) being concentrated in the "Manufac-

[31] World Bank. 2014. *Doing Business 2015: Going Beyond Efficiency*. Washington, DC: World Bank Group. DOI: 10.1596/978-1-4648-0351-2. License: Creative Commons Attribution CC BY 3.0 IGO. *Doing Business* measures regulations affecting the life of business in ten categories: starting a business, dealing with construction permits, getting electricity, registering property, getting credit, protecting minority investors, paying taxes, trading across borders, enforcing contracts and resolving insolvency.

Figure 22. DYNAMICS OF LEGAL PERSONS REGISTERED IN THE COMMERCIAL REGISTER BY TYPE OF OWNERSHIP AND YEAR, % OF ALL LEGAL PERSONS FOR THE RELEVANT YEAR[32]



Source: Registry Agency, 2014.

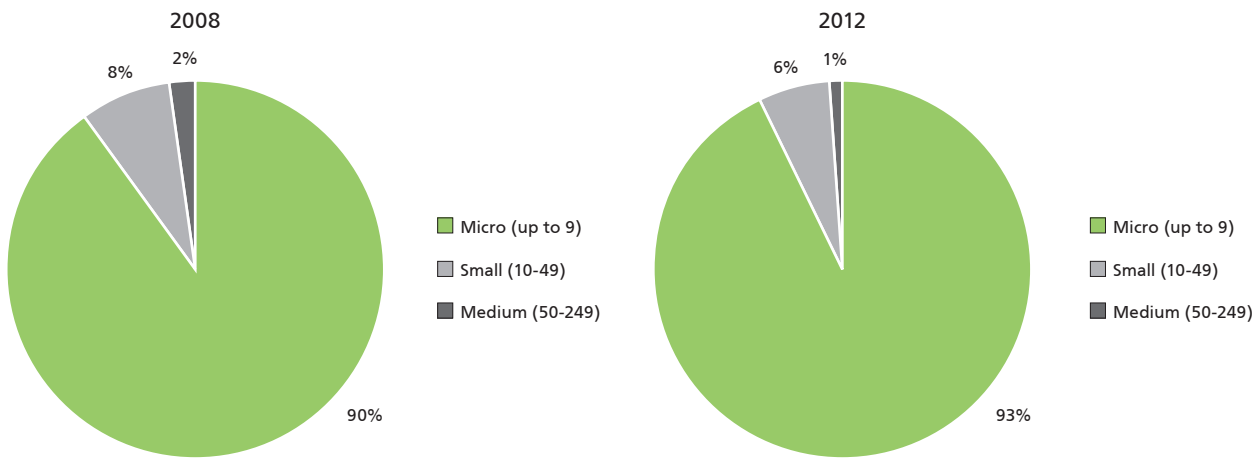
turing" sector. Only 0.2 % of the economic entities are large enterprises (over 250 employees), and nearly 40 % of these are in the "Manufacturing" sector.

With respect to newly-established enterprises, **the sectors of "Construction" and "Trade; repair of motor vehicles and motorcycles" continue to be of the greatest risk**. In their case, general economic conditions and the unfavourable business environment led to the fastest decline of the number of active enterprises. To a lesser degree, this is also valid for "Manufacturing" and "Transportation, storage and postal services".

Financial Tools in Support of Enterprise

Creative destruction – such is the result of the unprecedented development of information and communication technologies, and the resulting changes in lifestyle and business, arms-length globalisation, business and skills mobility, consumption-charged access to ideas and financing. In the end, no one is safe from the changes and there is no guaranteed success. Multi-national companies with long traditions compete with newly-fledged entrepreneurs to draw the attention of the spoilt consumer who is now more easily attracted to the new, the different, the unique instead of opting for the secure, the conservative and the boring.

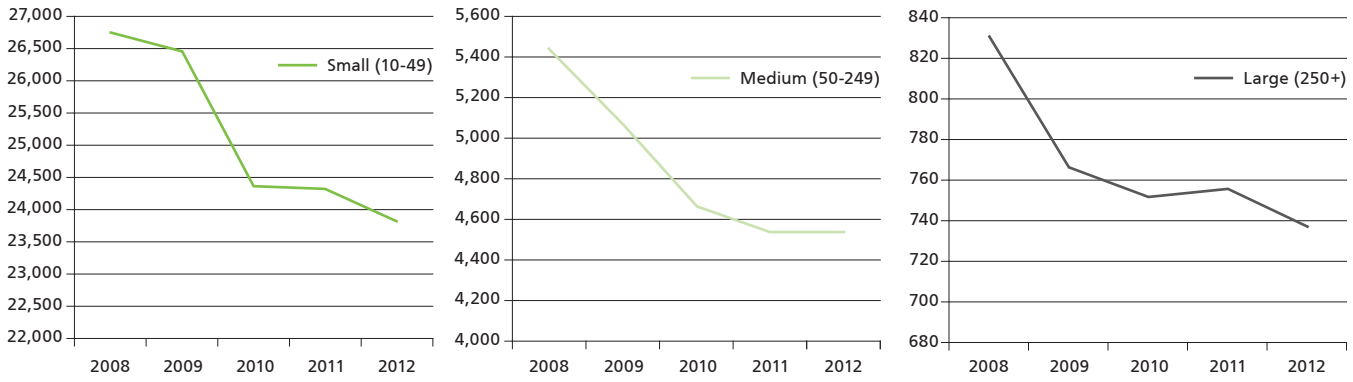
Figure 23. SME SECTOR STRUCTURE



Source: NSI, 2014.

[32] ST – sole trader; LLC – limited liability company; SMLLC – single-member limited liability company; JSC – joint-stock company.

Figure 24. CHANGE IN THE NUMBER OF SMALL, MEDIUM-SIZED AND LARGE ENTERPRISES



Source: NSI, 2014.

In the last few years, there have been indications that an entrepreneurial ecosystem which – if strategically supported by business, government and science – could contribute to the transformation of the Bulgarian economy is emerging in Bulgaria and particularly in the capital, Sofia. The two accelerators – Eleven and LAUNChub – which were financed by the government with venture capital funds under the European JEREMIE initiative, are in the centre of the ecosystem. In spite of the initial difficulties in finding private capital to complement the public funding from the EU in 2012, the two funds opened doors to start-up companies from Bulgaria and Europe. Their total budget of €21 million acts like a magnet for new entrepreneurs and placed Bulgaria's capital on the European start-up map in just a year.

It is still early to say whether and to what degree Bulgaria is approaching a turning point in the development of its entrepreneurial culture. This is mainly due to the relatively small number of supported start-up companies at the end of 2014, the early stage for evaluation of their future viability, as well as the still few examples of subsequently raised large foreign investments.

Even if the direct impact of the two funds remains limited in terms of return on investment or of overcoming the low innovativeness and productivity of the Bulgarian economy, the positive spillover effects of their existence are invaluable for the accelerated development of the entrepreneurial ecosystem in the country. As a result of the 15 rounds of selection of start-up companies completed by the end of 2014 (eight at Eleven and seven at LAUNChub) the two funds now have equity investments in over 100 companies, most of which are Bulgarian. At an average several hundred applications per round and average three partners in each applying team, this means that several thousand entrepreneurs prepared for the multi-stage selection procedure in an attempt to meet the requirements of a working business model developed on the basis of preliminary research, work with potential clients and, in some cases, a working prototype.

In addition to the considerable interest among entrepreneurs in the opportunity for start-up funding of business ideas, the two funds developed an active and extensive network of mentors among the leading experts and managers in local business who support the development of start-up companies in their relevant field free of charge (about 300 at Eleven and 200 at LAUNChub). Combined with the sustained media interest in the more successful companies, particularly in respect of additional funds raised outside Bulgaria, this leads to a higher profile and prestige of entrepreneurship.

The financed start-up companies are mainly in the field of IT applications and services. Support for technological product or process innovations in sectors significant for the Bulgarian economy, such as manufacture or mining and quarrying, transport and so on, is rare. To a certain extent, this distribution can be explained by:

- the small amount of funding for such projects (up to €200,000);
- the short deadlines for prototype creation and testing (usually about 3-12 months);
- the concentrated investment focus on faster increase of scope;
- the predominant interest is from entrepreneurs in the age bracket of students and young professionals who still have not acquired the necessary experience for developing high-tech products.

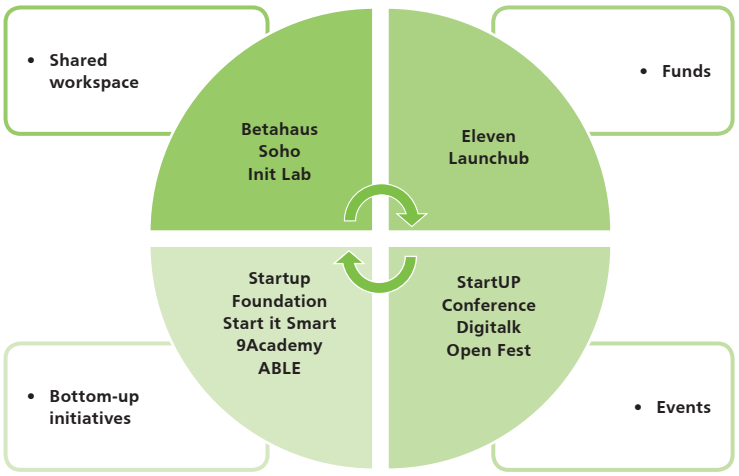
Numerous new initiatives related to entrepreneurship in the private, NGO and public sectors have appeared in the last few years, indicative of increasing interest in this field. Some of the main stakeholders in the entrepreneurial ecosystem in Sofia include shared workspaces (Betahaus, Soho,

Init Lab) and youth non-governmental organisations (Start-up Foundation, Association of Bulgarian Leaders and Entrepreneurs – ABLE, Start it Smart and others), which organise numerous events, training courses and competitions. An increasing number of large companies in Bulgaria are developing their own tools in support of enterprise – from competitions for business ideas with an option for partial funding or grants, through start-up and business idea implementation courses to an innovation, technology and science competition for journalists.

In 2014, the Ministry of Economy and Energy held a second round of TechnoStart, a project for grants promoting innovation ideas of students or young university graduates. The first round, in 2008, distributed BGN 220,000 (€113,000) on a competitive basis, while in the second round the grants under the project totalled BGN 440,000. In order to obtain funding each applicant, after approval of his business plan, must register a company at the Registry Agency and provide his own contribution of 10 % of the grant amount. The funds are extended only for projects in industry, information services and R&D.

In recent years, there has been a dynamic development in a section of the entrepreneurial ecosystem in the country that had suffered geographic, sectoral and demographic limitations. The main role the venture instruments under JEREMIE, as well as the new initiatives and organisations in support of enterprise, consists in attracting increased public and policy interest in entrepreneurship and innovation in general. Coordinated ef-

Figure 25. MAIN STAKEHOLDERS IN THE ENTREPRENEURIAL ECOSYSTEM IN SOFIA



Source: ARC Fund, 2014.

Table 9. SELECTED CORPORATE INITIATIVES IN SUPPORT OF ENTREPRENEURSHIP

	Initiative	Company	Period	Type	Budget/award	Eligibility
1	Innovation competition	Assarel-Medet	2013 – 2015	Competition for business ideas in industry	€200,000 equity investment	Individuals and legal persons
2	Chivas – The Venture	Chivas	2014 – 2015	Social entrepreneurship competition	$1 million, grant	Individuals from 14 countries, Bulgaria included
3	Zagorka Green Fund	Zagorka	2011 – 2014	Green Fund Competition	BGN 100,000, grant	NGO, implementation in Stara Zagora region
4	Academy Innovation in Action	Solvay Sodi	2012 – 2013	Green and social business ideas competition	Training	Students and young professionals
5	Mtel Innovation Lab	Mtel	2012 – to date	Product or service prototype competition	Training	Students at Technical University, Sofia
6	Mtel Media Masters	Mtel	2010 – to date	Journalist Award for Innovation, Technology and Science	Training or monetary award	Journalists

Source: ARC Fund, 2014.

forts in the following directions are needed in order to achieve a more significant impact of existing measures, networks and initiatives:

- promotion of interest and support for start-up enterprises outside the ICT sector;
- expanding the application of measures and the work of organisations beyond the capital city;
- encouraging established companies with experience and funding to participate in the entrepreneurial ecosystem;
- raising more private capital to complement and gradually replace public funds under JEREMIE;
- financial instruments along the chain to provide financing for companies of any size and experience;
- addressing the problems of the general business environment in the country.

The progress of entrepreneurship as a type of social innovation requires open-code type policies: free access to information and partnership platforms. In such an environment an entrepreneur would be free to choose the direction for development, the format of the business idea and support tools.

Investment and Financing for Innovation

Spending on research and innovation is a measure of the investment in the creation, use and dissemination of new knowledge in the public and business sectors. It is considered an indirect indicator of the innovation capacity of the national economies. A high ratio of R&D financing to GDP is a factor fostering dynamic economic growth and competitiveness.

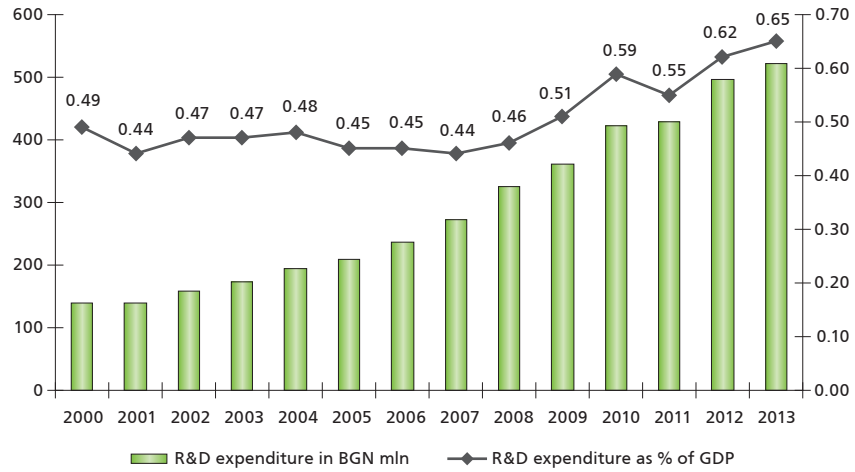
R&D Expenditure

Increased R&D expenditure in absolute and relative terms in the period 2000 – 2013 was combined with a significant improvement of the ratio among the institutional sectors. Thanks to the access to external financing (mainly through the European structural and cohesion funds) the share of business rose from 21 % to 61 %, which is mainly due to reduced public sector funds spent on R&D (a decline from 69 % to 30 %). There is almost no change in the sectors of education and non-governmental organisations.

There are no signs of improvement in the regional balance of expenditure. Despite the increased budget for R&D by planning region, the lead of the South-western region is indisputable. In practice, **the regional structure of R&D spending in 2013 almost exactly matches the structure in 2000.** The bulk of financing for R&D in the country continues to be strongly concentrated in one region, including the country's capital, thereby attracting human resources to research units located in it and undermining the proper use and development of the scientific and innovation potential of the other regions.

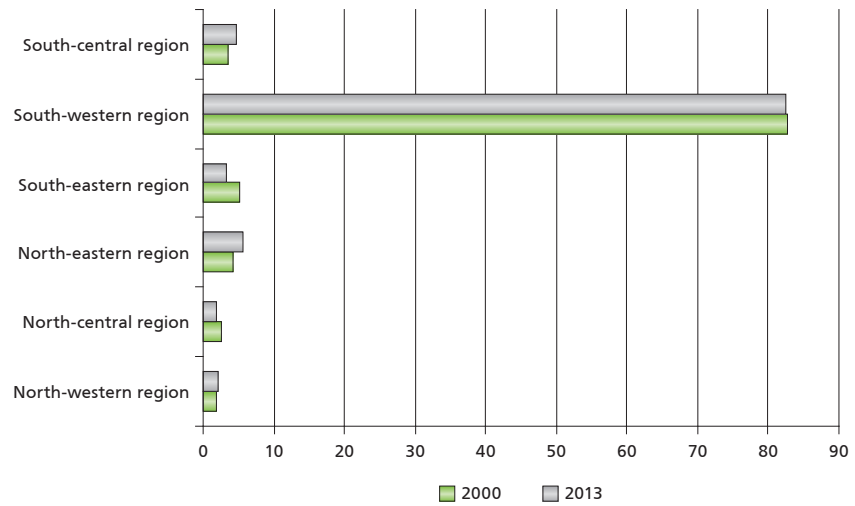
Half of the funds spent on R&D in Bulgaria (48 %) originate from abroad – an extremely high share which is a precondition for dependence in the implementation of research and development (an activity of huge public importance for the creation of new national knowledge and technologies) on access to and on the conditions for use of external financing. The slight decline in the preceding year of the funds which enterprises allocated for R&D was combined with a rise in public funds. NGOs and universities provided less than 1 % of funds for R&D in total funding. **For a second consecutive year, the non-governmental sector**

Figure 26. R&D EXPENDITURE IN BULGARIA, 2000 – 2013



Source: NSI, 2014.

Figure 27. SHARE OF PLANNING REGIONS IN R&D EXPENDITURE, %



Source: NSI, 2014.

financed R&D with a higher budget than the budget of the higher education sector.

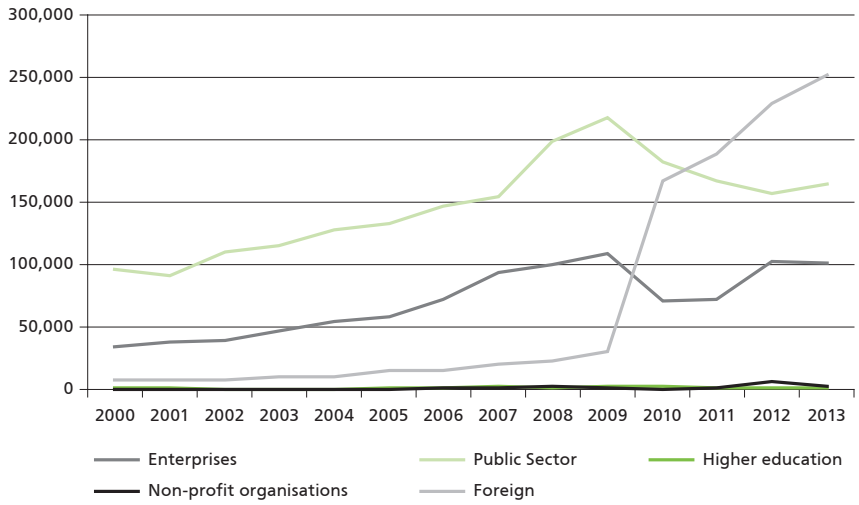
Approximately 86 % of the funds allocated by enterprises for R&D are invested in business research, comprising 27 % of the financing of the sector. Two-thirds are provided from European funds. **Much more capsulated is the public sector**: 80 % of public funds are spent on research financing within the public sector, accounting for 85 % of its budget; other 16 % support research in public universities and only **4 % of public resources leave the public sector and are allocated for R&D in the business and non-governmental sectors.**

In terms of R&D expenditure by science field, the highest dynamics occurred in the agricultural sciences, whose share declined from 30 % in 2000 to 7 % in 2013, and medical sciences, which received the largest share (43 %) of R&D expenditure and surpassed significantly technical sciences (24 %).

The allocation of government funds for R&D to the various social and economic sectors is extremely uneven, which contradicts many national priorities:

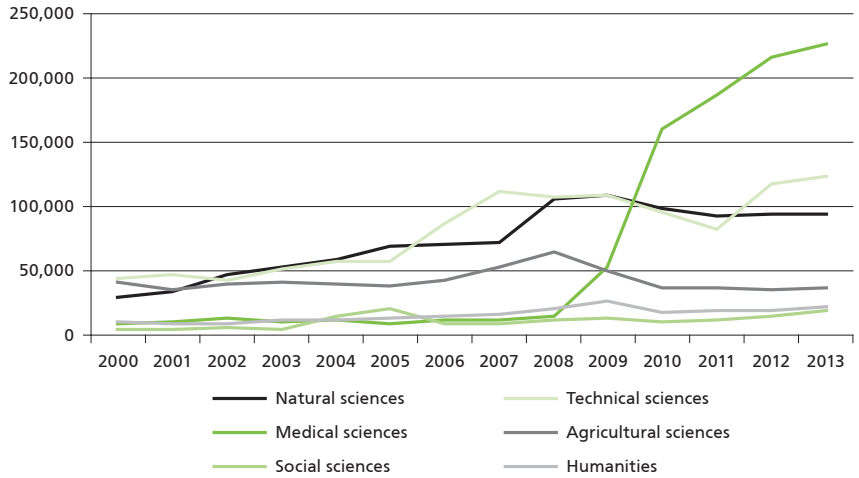
- although the country has set clear targets for increasing energy efficiency and reducing energy-intensity of the economy, public spending on R&D in energy production, storage distribution and use in 2013 was a mere 1.8 % of the funding of these activities in 2008;
- despite the discussions in recent years of reindustrialisation of the country, the funds for improvement of industrial production and technologies have contracted by over 30 %;
- drastic (by almost 60 %) reduction in expenditure for exploration and exploitation of the earth, water and air;

Figure 28. R&D EXPENDITURE BY FUNDING SOURCE, BGN THOUSANDS



Source: NSI, 2014.

Figure 29. EXPENDITURE FOR R&D BY SCIENCE FIELD, BGN THOUSANDS



Source: NSI, 2014.

- although infrastructure is among the top issues on the political agenda for enhancing the competitiveness of the national economy, R&D expenditure for the development of transport, telecommunications and other infrastructure has increased by only 3 %, relying on European funding to fully replace national funding, as in many other areas.

In contrast, the increase of funds for culture, recreation, religion and mass media has been 758 %; almost 300 % has been the growth in the defence sector. Despite some sharp fluctuations in the period, R&D expenditure on healthcare and education increased by 452 % and 324 % respectively, including increased funds for public universities allocated through institutional science funds (204 %).

Throughout the period under review, the share of funding from other sources for the general advancement of knowledge continued to be sig-

nificant (51 %). There was a reduction in half of the funds allocated for development of agriculture, forestry and fishery (20 %), followed by a 9 % share of expenditure for the general advancement of knowledge in the form of R&D financed from public university funds. Each of the remaining 11 areas has a insignificant share in the public financing of R&D.

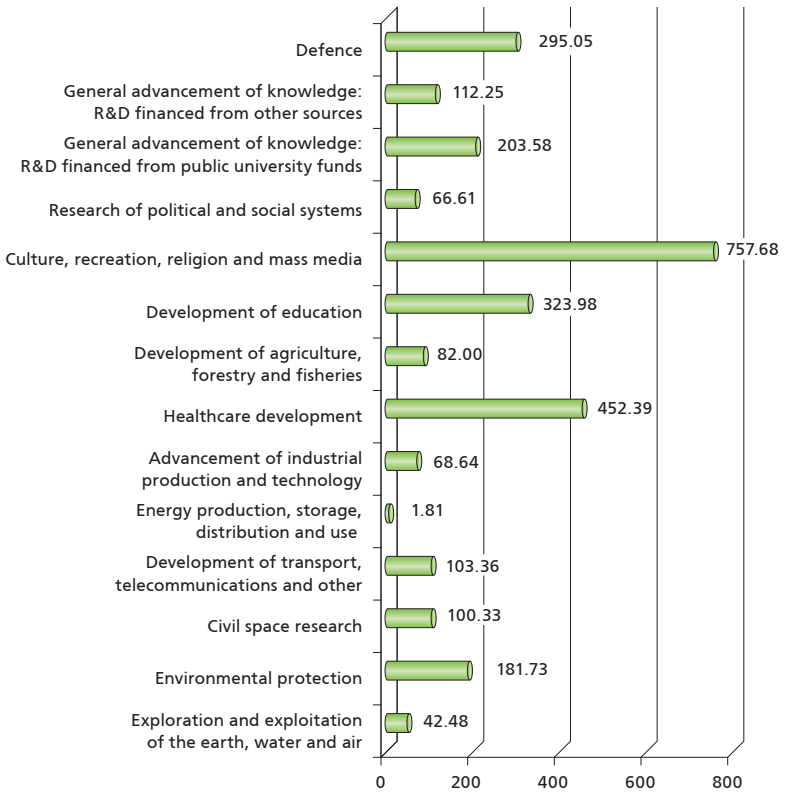
After a gap in 2013, the NIF held its seventh session with 152 applications from enterprises. Interest in the Fund's sessions was higher in 2007, when the number of applicants was 168. However, the record number of project proposals submitted was not combined with higher quality, whereby the session had **the lowest success rate of 34 %, being below the level of submitted projects during the first session of the Fund in 2005.**

Unlike in previous years, **allocation of the subsidy was not based on sector preferences**. The projects approved for funding were in machine-building, electronics and electrical engineering, pharmacy, food industry, ICT, creative industries, etc. The bulk of successful applicants coming from the South-western region was not surprising. **Over 88 % of approved projects are for financing research and development** and only 6 projects aim to explore the potential of already created innovative products for market entry.

Programming Period 2007 – 2013

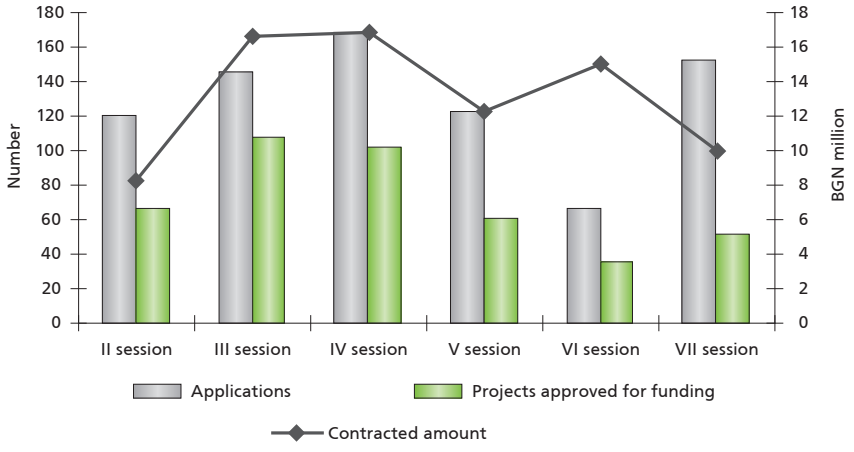
The beginning of the new EU programming period 2014 – 2020 is a suitable time for general assessment of the use of European structural and cohesion funds in the period 2007 – 2013, although the funding of projects under the operational programmes is not completed yet. Based on EC data, the funds paid by the Commission on the basis of requests

Figure 30. GROWTH IN THE GOVERNMENT BUDGET R&D APPROPRIATIONS BY SOCIO-ECONOMIC OBJECTIVES, 2008 – 2013, %



Source: NSI, 2014.

Figure 31. FUNDING BY THE NATIONAL INNOVATION FUND



Source: Bulgarian Small and Medium Enterprises Promotion Agency, 2014.

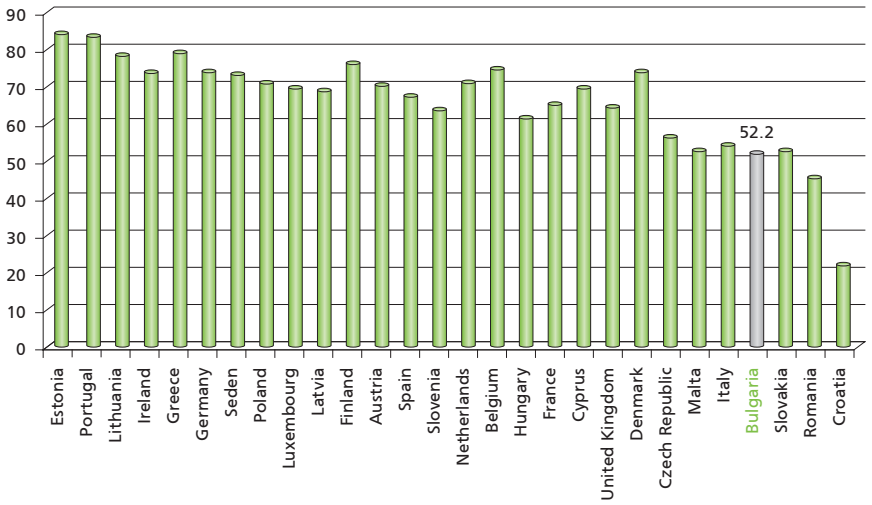
filed under operational programmes in Bulgaria as a share of total funding was slightly over 52 %, as was for Slovakia and Malta, ranking them on the last but one position only ahead of Romania (45 %). Leader in this indicator is Estonia with the highest ratio of absorbed to allocated funds (84.5 %).

Allocation of available funds by thematic areas in the EU shows that research, technological development, innovations and entrepreneurship

are not among the priorities for Bulgaria. Only 4.4 % of the funds utilised by beneficiaries in the country under the European Regional Development Fund, the Cohesion Fund and the European Social Fund are invested in these areas.

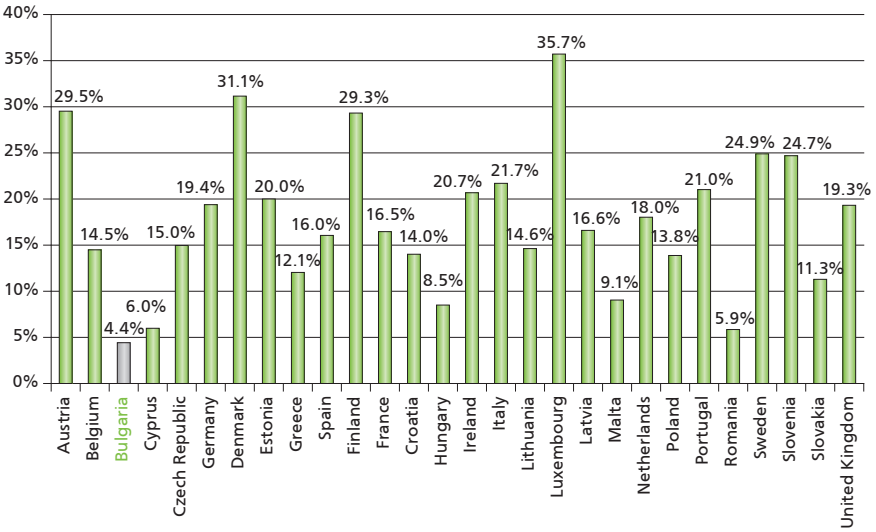
The share of funds channelled for building infrastructure projects and environmental protection has been significant – 52 % in total. These are followed by funding for technical assistance and administrative capacity building (nearly 10 %), whose importance is relevant for the period of the first 7 years of the country's EU membership. **However, areas deemed to be a source of competitive advantages at corporate and national level and therefore critical for ensuring a sustainable long-term growth of the national economy have been underfunded** – information society development (less than 1 %); R&D, innovations and entrepreneurship (4.4 %); human capital (6.6 %).

Figure 32. PERCENTAGE OF FUNDS ALLOCATED TO MEMBER STATES BY THE EUROPEAN COMMISSION, 2007 – 2013, EU-28[33]



Source: European Commission, EU cohesion funding – key statistics.

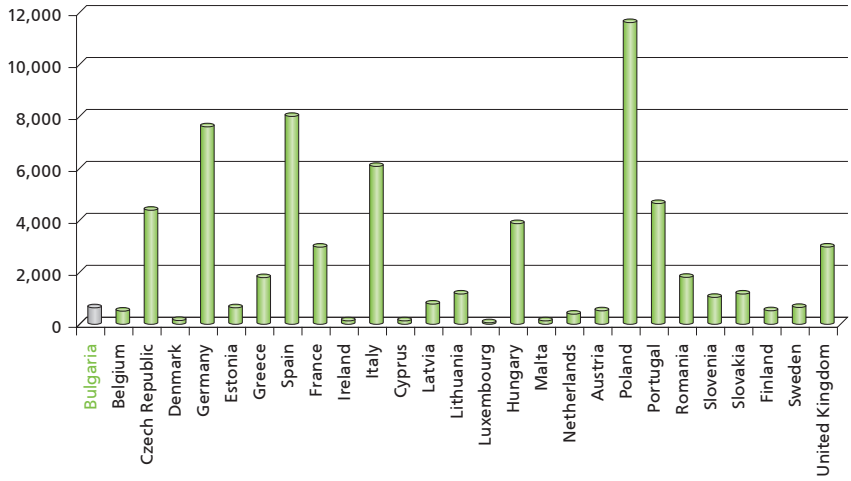
Figure 33. SHARE OF FUNDING FOR THEMATIC AREA "RESEARCH, TECHNOLOGICAL DEVELOPMENT, INNOVATION AND ENTREPRENEURSHIP" IN THE 2007 – 2013 OPERATIONAL PROGRAMMES, EU-28, %



Source: European Commission, EU cohesion funding – key statistics.

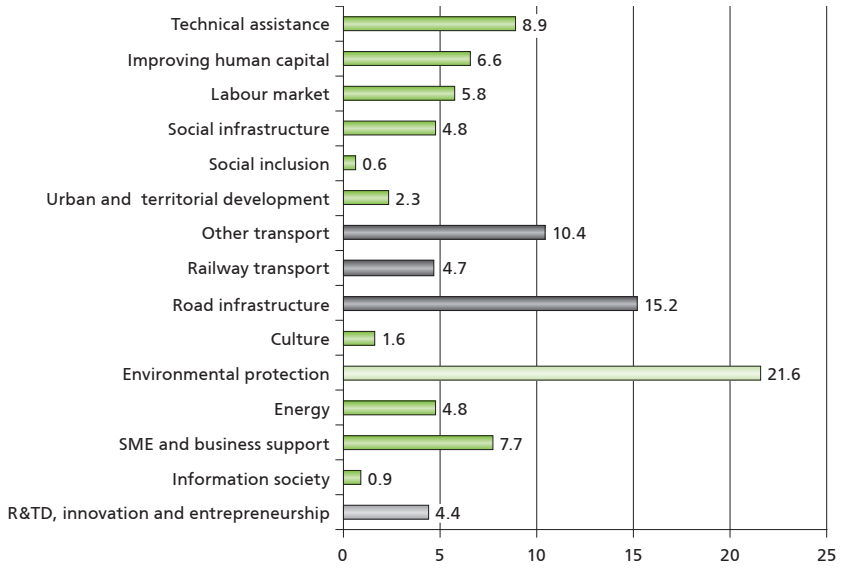
[33] Summarised data on the European Regional Development Fund, the Cohesion Fund and the European Social Fund.

Figure 34. LEVEL OF FUNDING OF THEMATIC AREA "RESEARCH, TECHNOLOGICAL DEVELOPMENT, INNOVATION AND ENTREPRENEURSHIP" UNDER THE 2007 – 2013 OPERATIONAL PROGRAMMES, EU-27, € MLN



Source: European Commission, EU cohesion funding – key statistics.

Figure 35. STRUCTURE OF UTILISED FUNDS FROM THE ERDF, CF AND ESF FOR BULGARIA BY THEMATIC AREA, 2007 – 2013, %



Source: European Commission, EU cohesion funding – key statistics.

Human Capital for Innovation

The share of people engaged in R&D, science and technology is indicative of the level of human resources available for the creation, application and dissemination of new knowledge in a society. Employment in high-tech sectors reveals a country's specialisation in areas with a high level of innovation.

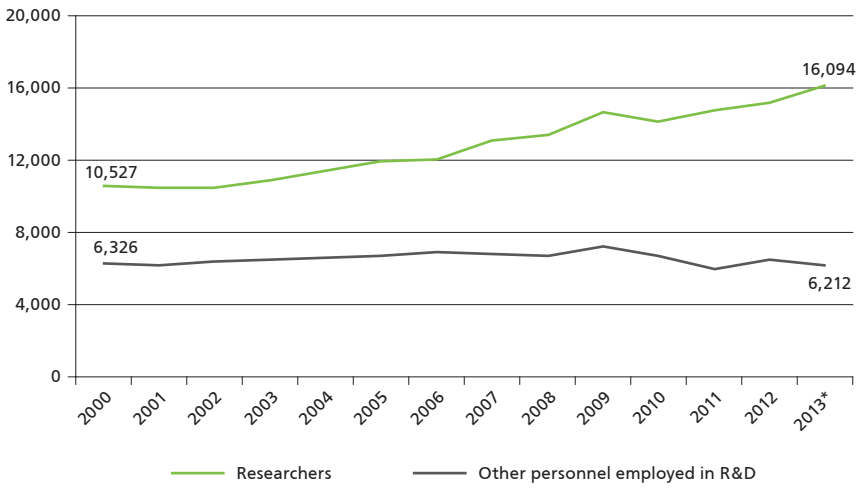
Human Resources in Research and Innovation

The number of personnel engaged in R&D has been increasing since 2000. By 2013, the total increase was slightly over 32 % (15 % in full-time equivalent), reflecting the two opposite trends of the increasing number of researchers (53 %; 29 % in full-time equivalent) and an insignificant decline of the number of technical and support staff (2 %; 9 % in full-time equivalent).

There were considerable changes among the institutional sectors in the period 2000 – 2013, the flow of researchers headed mainly towards higher education (an increase of 262 %), business enterprises (200 %) and the non-governmental sector (426 %) – a ratio which is approaching the structure of the staff employed in R&D for EU-28. The number of researchers in higher education is closest to the average 2011 European level (43 % for EU-28), while business still is not competitive enough according to this indicator (44 % for EU-28).

The increase of research staff in the business sector is accompanied by the development of a much more balanced distribution according to enterprise size. **However, along with the considerable increase of researchers in micro and small enterprises (13 and 5-fold respectively), their number in medium-sized enterprises and enterprises with staff over 500 decreased** by between 15 and 20 % – results which reflect the change in the number of enterprises in the respective categories.

Figure 36. NUMBER OF PERSONNEL EMPLOYED IN R&D, BY CATEGORY, 2000 – 2013[34]



* Preliminary data.

Source: NSI, 2014.

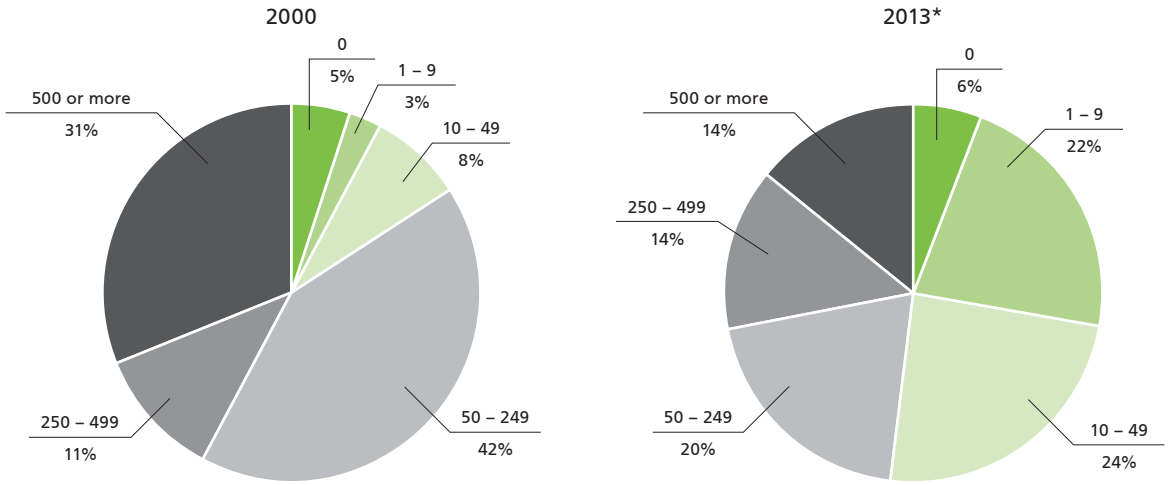
The public sector in Bulgaria retains an enormous share in the structure of staff employed in R&D, ranking the country first in EU-28 by this indicator. Second is Croatia, with a far smaller share of 28 %, followed by Romania (26 %) and Poland (20 %). In countries outside the EU – like Montenegro (31 %) and Serbia (28 %) – the public sector also employs a considerably smaller share of the national R&D staff than in Bulgaria. In Denmark, the United Kingdom and Ireland, which are leading in terms of innovation-based competitiveness, the government is the employer of research staff of slightly over 3 % of the total.

Changes in the number of R&D staff in the planning regions in Bulgaria have been dynamic and contradictory. Overall, **the number of researchers in all regions increased** over the period, the most considerable being in the South-central region (268 %), North-central (237 %) and North-eastern (204 %). By 2013, there was a much more balanced structure of R&D staff by regions, although the leading role was still for the South-western region – 63 % versus 76 % in 2000.

Yet another indicator – R&D personnel by science field – also had its ups and downs, although by 2013 the overall change was insignificant compared to the beginning of the analysed period. **A slight decline was observed in the technical and the agricultural sciences, but while in the first case levels of the peak 2009 were regained**

[34] In 2012, the two categories "Technical personnel" and „Support personnel" were combined in one – "Other personnel employed in R&D".

Figure 37. R&D PERSONNEL BY ENTERPRISE SIZE



* Preliminary data.

Source: NSI, 2014.

after an intermediate decline, in the second there is a persistent trend of declining number of researchers. Their number in the social sciences increased nearly threefold.

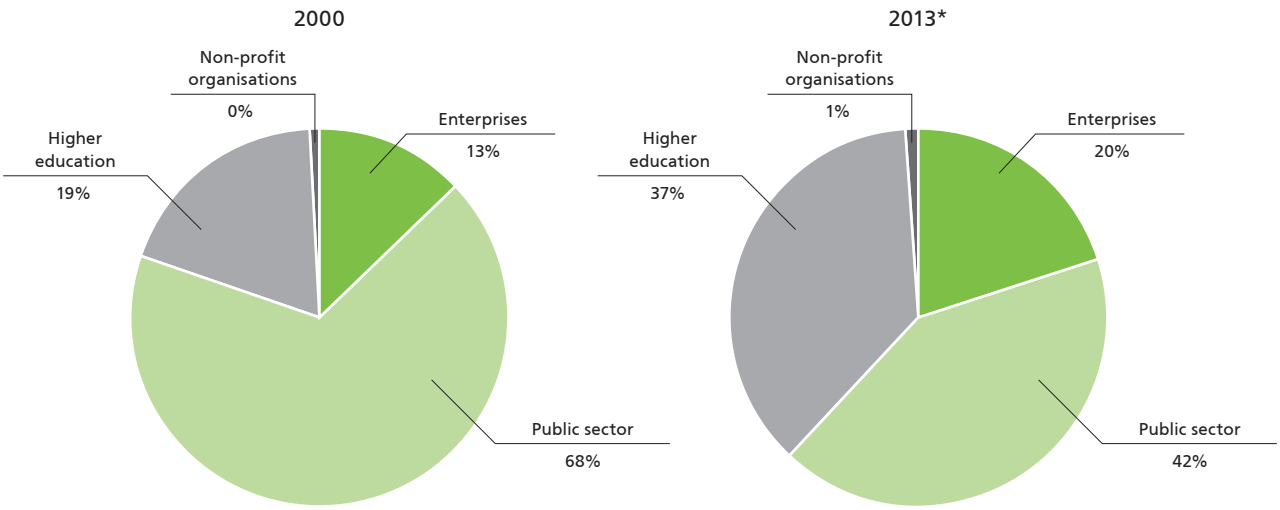
Mobility of Human Resources

After nearly 25 years of democratic changes, **Bulgaria continues to be a net contributor – to Europe and beyond – of highly qualified staff in the field of research and technological development**. Although outflow channels change, the snowballing negative effect on the competitiveness of the national economy remains.

- **In search of better professional qualifications**

According to the database of regulated professions of the EC, in 2007 – 2013 a total of 7,805 professionals who graduated in Bulgaria requested recognition of educational qualifications with the aim of finding permanent employment in other European countries. Their number before the country's EU membership was a mere 95. The main migration flow was towards the United Kingdom, and there was also interest in the labour markets of Germany, Cyprus, Greece, Italy and Belgium. For the same period the number of those who sought temporary employment

Figure 38. SHARE OF INSTITUTIONAL SECTORS IN OVERALL R&D PERSONNEL



* Preliminary data.

Source: NSI, 2014.

was 137, one-third of whom in Germany (57), followed by the United Kingdom (27).

Healthcare was the sector in which the highest mobility from Bulgaria to the other member states was registered – over 63 % of the total, or over 5,000 doctors, nurses, dentists, psychotherapists, veterinary doctors, midwives and pharmacists.

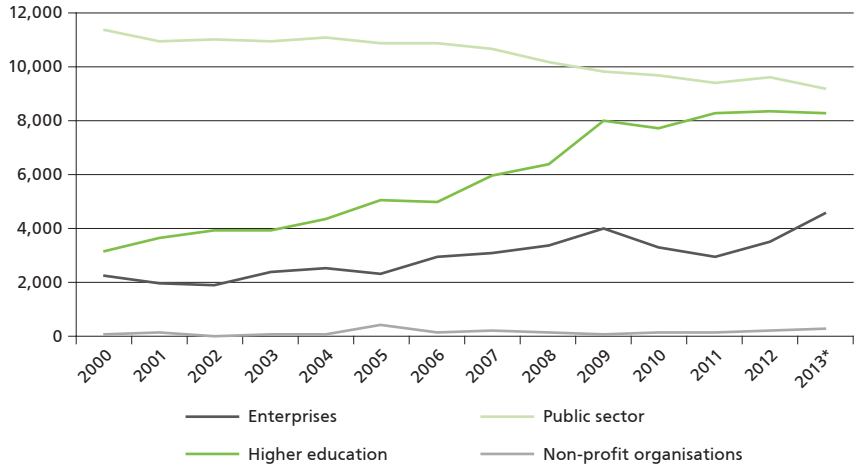
Such a move seems justified given Bulgaria's backwardness by a number of living standard indicators, including minimum wage. The minimum wage of €173.84 for the second half of 2014[35] ranks the country last in the EU, and also trailing countries like Serbia, Macedonia and Montenegro. Only Albania is at a lower level by this indicator.

- **Inequality in the framework programmes**

Compared to the large number of Bulgarian researchers who have chosen to work in other European countries, in 2013 there were only 7 researchers from other EU countries working in the public sector in the country, and another 24 in the higher education sector, without there being any essential changes by this indicator for the studied period.

Inequality in the participation of Bulgarians in the European framework programmes is a covert channel for relocating scientific and research potential from new member states to the developed European countries. This issue has been repeatedly raised by *Innovation.bg* and is confirmed by new studies.[36] These programmes are practically a one-way street for pumping out the academic potential from the periphery (including Bulgaria) to the centre. Bulgarian MEPs and the government should work for the introduction of the **principle of reverse discrimination which requires that under such programmes research-**

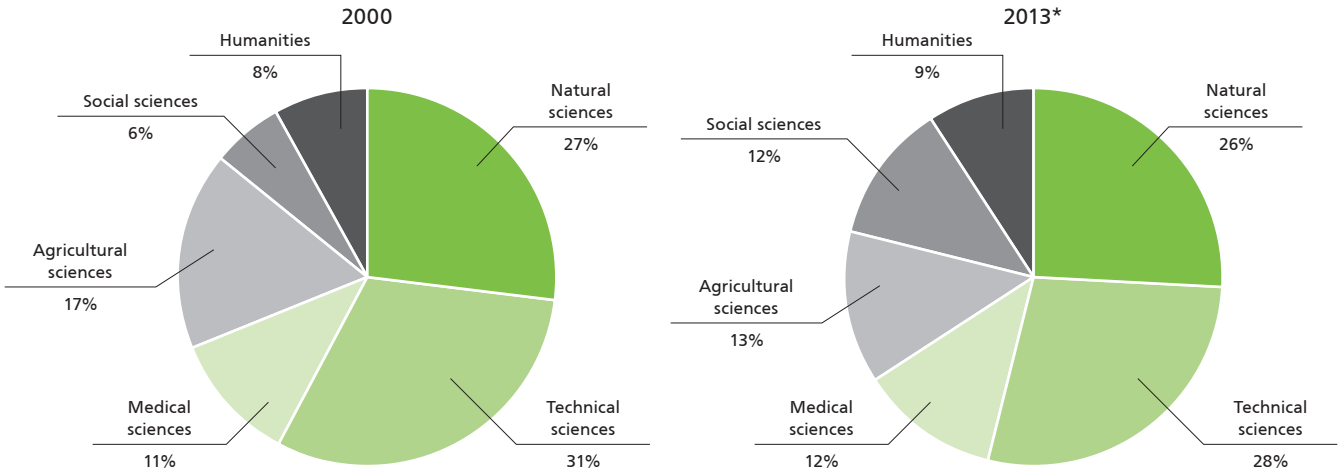
Figure 39. NUMBER OF R&D PERSONNEL BY INSTITUTIONAL SECTORS, 2000 – 2013



* Preliminary data.

Source: NSI, 2014.

Figure 40. R&D PERSONNEL BY SCIENCE FIELD



* Preliminary data.

Source: NSI, 2014.

[35] Eurostat, Earnings database.

[36] "European research funding: it's like Robin Hood in reverse", The Guardian, 7 November 2014.

ers from the peripheral countries receive higher remuneration than those in the centre.

- **Seeking opportunities for education in other countries**

The various sources of data concerning the number of Bulgarian students who have chosen to study abroad are contradictory. The newly-adopted strategy for the Development of Higher Education 2014 – 2020 just barely mentions the challenge that an increasing number of young people are leaving the country to receive education abroad as a first step to a career abroad. The lack of analysis of the problem by the government contrasts with the intentions declared by Bulgarian policy makers to undertake concrete measures for keeping talents in the country. This lack is also worrying given the policies by leading European countries to attract top students from countries like Bulgaria.

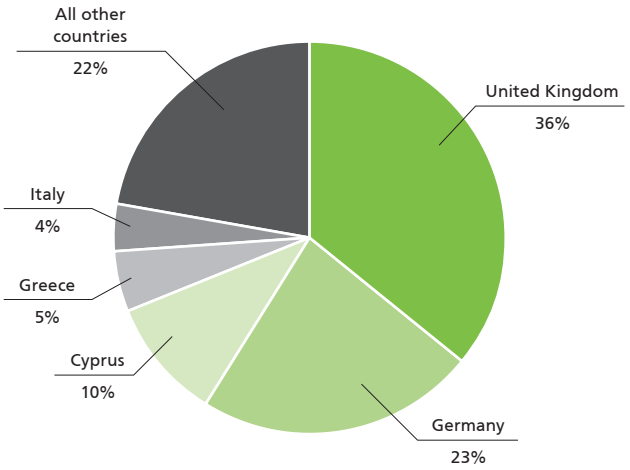
Similar trends are already evident in secondary education too, including in dual vocational training. Germany, where dual training is part of the country's educational system, is a good practice in this respect. In 2014, for a third year in a row, a total of 2,000 young people from EU wanting to begin dual training in Germany were recruited under the "The Job of my Life" (MobiPro-EU) programme.

- **Outflow of technological potential**

Within the EU there are considerable disparities in the flow of copyright on intangible assets, in which researchers from some countries generate technological knowledge that subsequently finds application and generates new jobs in the high value added sectors of other countries.

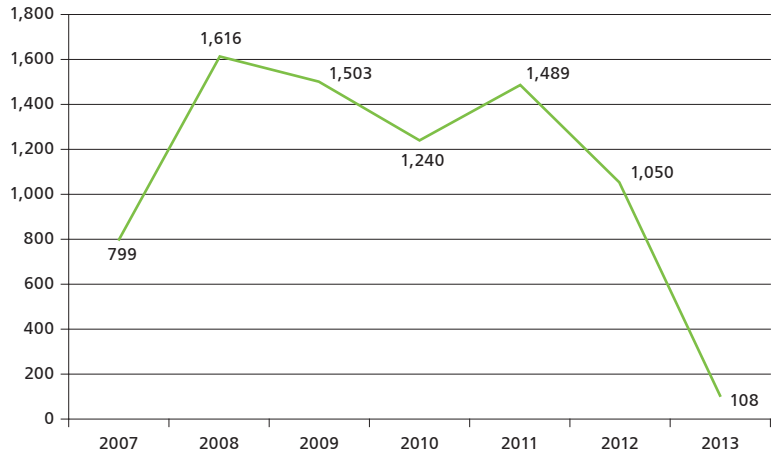
The most technologically developed in the Community is Germany, which "exports" through direct investments

Figure 41. TOP 5 COUNTRIES TO WHICH PROFESSIONALS EDUCATED IN BULGARIA MIGRATED, 2007 – 2013



Source: EC regulated professions database.

Figure 42. DYNAMICS OF THE MIGRATION OF PROFESSIONALS EDUCATED IN BULGARIA TO THE EU COUNTRIES, 2007 – 2013, NUMBER



Source: EC regulated professions database.

nearly 1.5 million jobs to other countries, or 28 % of the employment abroad in sectors with intensive use of intellectual property rights. The Czech Republic is the leader among Central and East European countries. Bulgarian technological companies have managed to open a little less than 1,300 jobs in the other member states – an indicator which ranks the country last in the EU. Nearly 18 % of the technological employment in Bulgaria has been generated by foreign companies operating on its territory, mainly in petroleum refining, telecommunications, automotive industry and pharmacy.

- **Demographic changes**

After 1990, the population of Bulgaria has been declining persistently, reaching 7,284,552 in 2013 (-17 %). By this indicator, the country ranks third in Europe after Latvia (-24 %) and Lithuania (-20 %). As a result of the migration processes and low birthrate, Bulgaria is also a "leader" in terms of ageing of the population.

Development of Human Potential

As a border category between education and research, doctoral studies unite the advancement of knowledge and the improvement of the methodology of research in a certain academic field. The attempts of a number of countries in recent years to increase the number of doctoral students by a variety of supportive measures (grants, subsidies)[37] for both individual doctoral students and universities offering doctoral degree courses are intended to improve national positions in the international educational rankings and boost the innovation potential of the economy. In practice, **an increasing number of doctoral graduates are looking for employment outside universities and research organisations, and seek careers in business, the public sector and other fields**.

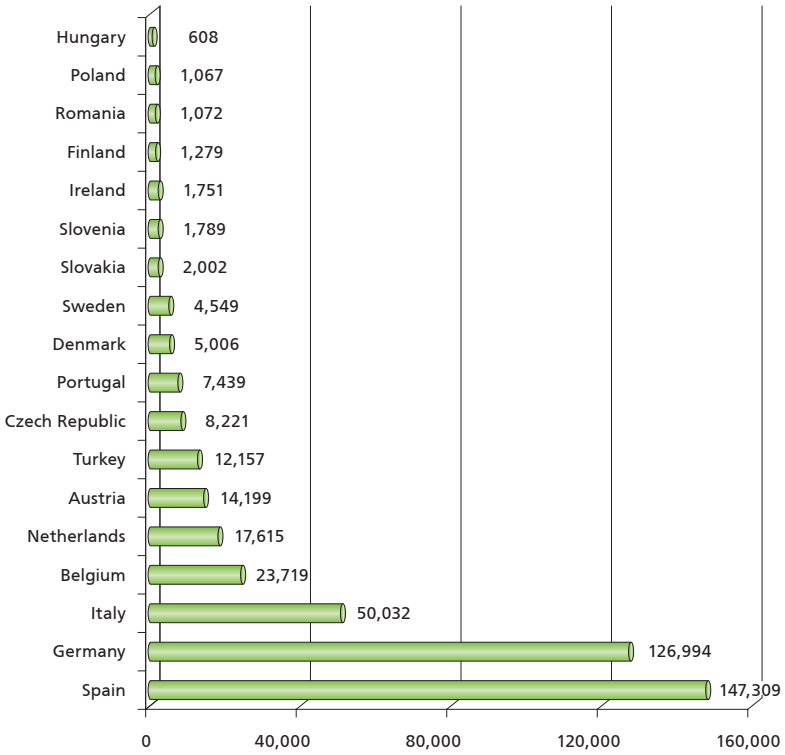
Bulgaria is no exception from this trend. **With some variation after 2000, the number of holders of doctoral degrees has been increasing constantly**, the most definitive being the increase in the last two years when the number of doctoral theses increased nearly twofold.

The experience of a number of developed countries is indicative of a direct link between innovation potential and the international competitiveness of the national economy, on the one hand, and the teaching and learning in the fields of science, technology, engineering, and mathematics (STEM), on the other. STEM skills themselves are dependent on government policies promoting these educational fields and increasing public interest in them.

One of the six indicators in the field of education by which progress on achieving the Lisbon Strategy objectives is evaluated, is education in STEM. **Among EU-28, Bulgaria is close to the average EU level regarding both the share of graduates in mathematics, computer and engineering sciences, physics and chemistry, as well as progress after 2000, which in its case is a slight decline of some 0.5** %. The EU decline is over 5 % and is serious grounds for concern for the future potential of innovation and knowledge-based development of the European economy. Tangible reduction in interest towards these

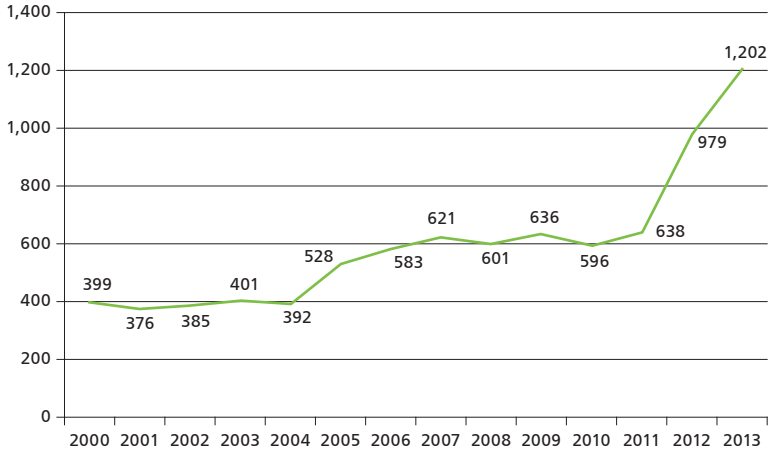
[37] "Education at a Glance 2014: OECD Indicators", OECD Publishing, 2014.

Figure 43. NUMBER OF BULGARIAN CITIZENS RESIDING IN OTHER EUROPEAN COUNTRIES, 2013



Source: Eurostat, 2014.

Figure 44. NUMBER OF DOCTORAL DEGREE HOLDERS



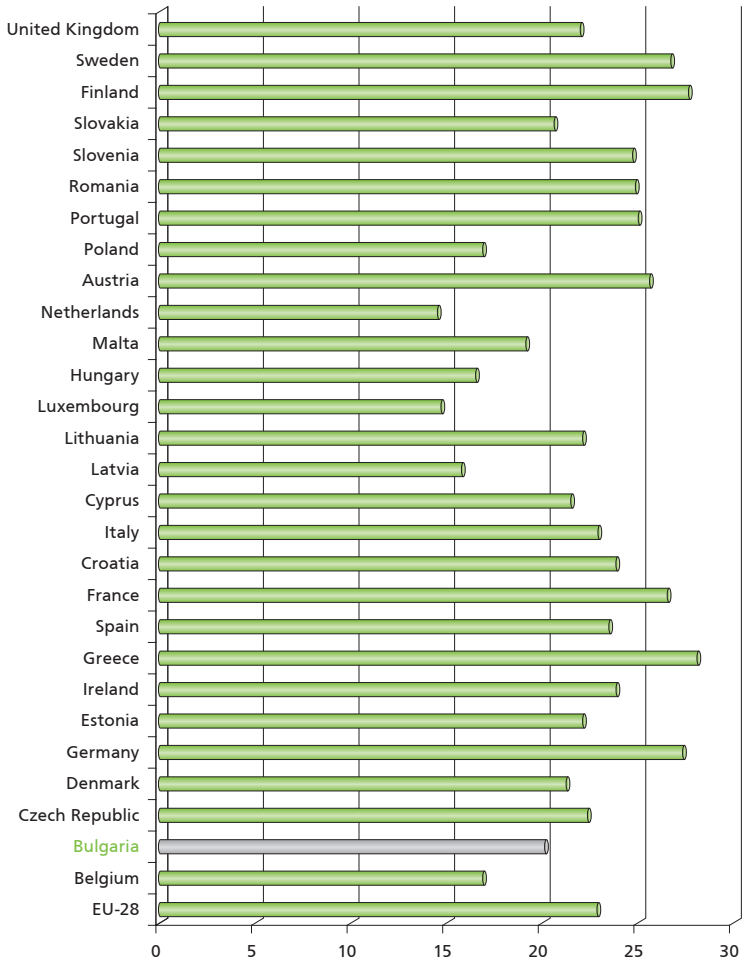
Source: NSI, 2014.

fields has also been registered in the most innovative countries on the continent – Ireland, Finland, Sweden and the United Kingdom.

The Europe 2020 Strategy and a number of strategic documents related to it address the rising unemployment in the EU,[38] including youth unemployment, and provide solutions. A large portion of these are sought in the field of educational policies, including:

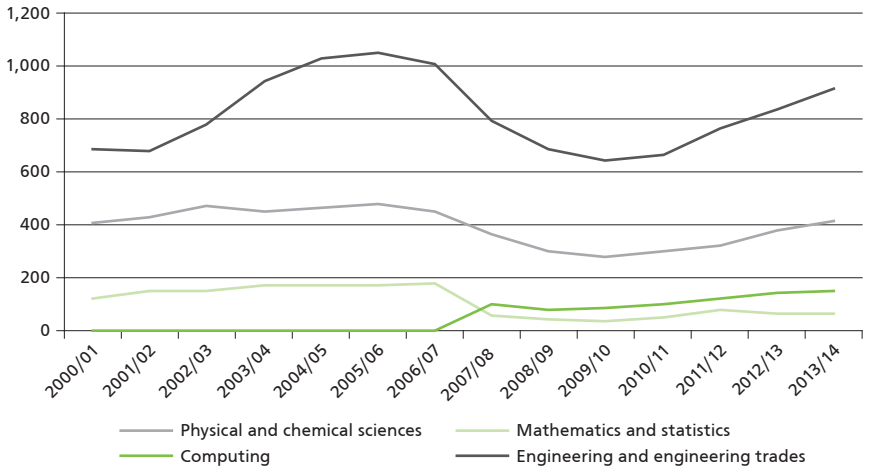
- Sustainable public funding for conservative social systems such as education which are critical to ensure a vital, innovative and competitive national economy is of essential importance. The application of austerity measures and putting off the resolution of existing problems in such systems is risky and undermines the achievement the sustainable development of a society. It is therefore urgent to acknowledge the need for the development of education, improve the quality of education services and link them to the requirements of the labour market. The same is valid for applying the good practices existing in the European education area and supporting them with the necessary funding.
- The educational system and business have common objectives in preparing people with good theoretical and practical training, relevant skills and readiness for improvement. Thus, it makes sense to unite the efforts of the two (education and business) to provide accessible conditions for learning in priority fields for the economy. There are a number of possible mechanisms to achieve this and their success depends on the introduction of the appropriate legislation and its ef-

Figure 45. UNIVERSITY GRADUATES IN STEM, % OF ALL GRADUATES, 2012



Source: Eurostat, 2014.

Figure 46. NUMBER OF DOCTORAL STUDENTS IN SELECTED EDUCATION FIELDS



Source: NSI, 2014.

[38] According to Eurostat data, between 2008 and 2013 the level of unemployment in EU-28 grew from 7 % to 10.8 % (a total of 26.4 million unemployed). In 2013, 23.5 % of the young people in EU-28 were out of jobs. In comparison, in 2013 the total level of unemployment in the United States was 7.4 % (15.5 % youth), and in Japan – 4 % (6.8 % youth). In Bulgaria, unemployment in 2013 reached 13 % (after its lowest level of 5.6 % in 2008 and subsequent constant increase), at 28.4 % unemployed young people.

fective implementation into practice.

- The negative effect of the declining number of school and university students due to demographic shifts and migration is enhanced by the deteriorating quality of education and its divorcing from the requirements of business. For reforms to become possible in a relatively short term, it is necessary to prioritise educational fields with a powerful innovation potential (engineering and computer sciences, physics and chemistry, mathematics), making them attractive even at the primary school stage and create opportunities for professional development.

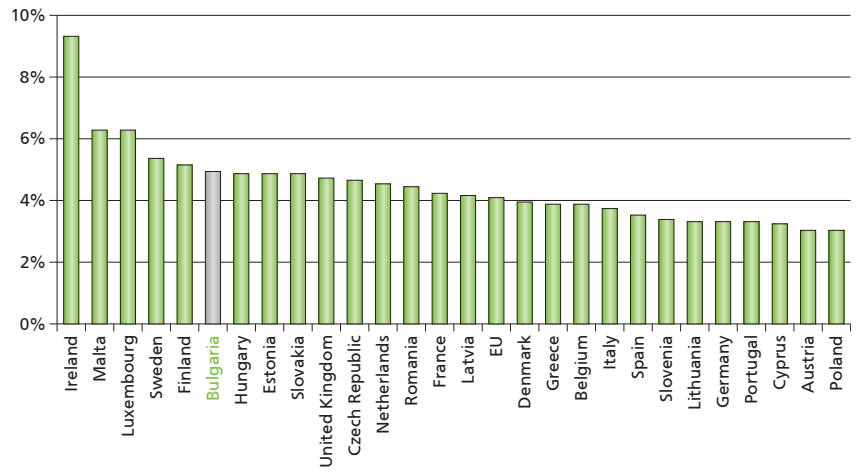
Information and Communication Technologies

The ICT sector[39] is a key factor for the competitiveness and innovativeness of the Bulgarian economy. In 2013, it already accounted for 9 % of total export of goods and 43 % of the export of business services, totalling over €2.5 billion. Although the sector makes up only 1 % of all employed persons in Bulgaria,[40] it provides employment to some 35 % of the persons with average monthly income of over BGN 2,000 (€1,025), thus generating a growing middle class. It not only enhances productivity in other sectors, but also contributes to development of other niche sectors (e.g. services with high value added for children) by increasing the purchasing power of its employees. Furthermore, the sector provides a favourable environment for serial technological entrepreneurship in Bulgaria, and even for export of management consulting.

The contribution of the ICT sector to GDP is one of the highest in the European Union. Bulgaria ranked 6th among the 28 Member States in 2010, lagging behind only Ireland (9.3 %), Malta and Luxembourg (6.3 %), Sweden (5.4 %) and Finland (5.2 %).[41] Value added of the ICT sector, though with some internal dynamics (higher share of services at the expense of industrial output), contributed to 5 % of GDP (2008, 2009 and 2010) versus 3 % in 2006 and 2007.

The products and services of the ICT sector created in Bulgaria have an impact on global markets and innovation. For example, Integrated Micro-Electronics Bulgaria is the biggest ICT manufacturing company in Bulgaria with a turnover of BGN 219 million (€112 mln) in 2013 (92nd position among all companies in Bulgaria by turnover), accounting for some 25 % of the total global turnover of the Philippine group IMI, which ranks 21st in the world by turnover among companies providing electronics manufacturing services.[42] After the purchase of the Botevgrad plants from the Belgian Epic Electronics, the Philippine company set up a R&D unit in Sofia (before the deal, R&D was concentrated only in Mexico). The Bulgarian production includes mainly automotive electronics for the European market and together with other companies (Sensor-Night, Melexis, ZMD Eastern Europe, Johnson Controls/Visteon, etc.) Bulgaria manufactures some 8 % of the European automotive electronics. Although the Bulgarian unit of Johnson Controls, which was renamed to Visteon Electronics in the summer of 2014 (the second biggest supplier of automotive electronics in the world), has 4 times smaller turnover than the IMI subsidiary (BGN 54 million), it is the second biggest unit of the Visteon Group after India. The Bulgarian office is a full product engineering centre (development plus innovation), with an option for expansion. There were, however, rumours in the beginning of the deal about a weakening importance of the centre in the group and even for its resale, which led to 6-10 % of its staff leaving in the period August 2013 – August 2014. Acquisition of the automotive electronics business of Johnson Controls by Visteon is also important for Bulgaria for another reason. The deal is about

Figure 47. CONTRIBUTION OF THE ICT SECTOR TO GDP, 2010



Source: Digital Agenda Scoreboard, 2014.

[39] The sector is understood here as covering the production of office and electronic computing equipment, electrical machines and apparatus, radio, television and telecommunication equipment and computer and other related activities, including communication services.

[40] Excluding employment in so-called centres for services of global ICT companies (like Hewlett Packard Global Delivery Centre), which actually is not ICT. However, they offer ICT intensive employment, which contributes to globalisation of the labour force, enhancing their quality and self-esteem as part of the middle class. If this share is included, along with employed persons in telecommunications, the total share of employed persons would reach 2 %.

[41] Digital Agenda Scoreboard 2014.

[42] Manufacturing Market Insider Top 50, 2014.

a global business ($265 million) and is practically the same as the acquisition price for Telerik by Progress Software ($262 million). Both acquisitions in 2014 are bound to increase interest towards investments and acquisitions in the Bulgarian ICT sector in 2015. Previous experience shows that even the acquisition of a key trading partner abroad by a company with strategic intentions could lead to significant growth (e.g. Bertelsmann and Datecs Mapping Services).

Another key segment of Bulgarian electronics is office equipment and computers, including different peripherals and automation of transactions (commerce). Leader in this segment is Datecs, which for a third consecutive year (2010 – 2013) generated turnover of over BGN 100 million (€51 mln) and is the second biggest company by turnover after IMI within the ICT sector (excluding the telecoms and ICT distributors). Datecs has been an innovator since its establishment as an academic spin-off firm in 1990 (with the first commercialisation of R&D – FlexType and laser printers with embedded fonts in Cyrillic) until it became a global leader in e-commerce automation for mobile devices (first Palm printer, first mobile printers, first smart phones turned into payment terminals).[43]

In fact, some in the United States (e.g. Forbes)[44] have referred to a revolution in retail sales through the mobile point-of-sale (POS) devices brought by the strategic partner of Datecs in U.S. sales – the company Internet Peripherals. The key products in this revolution are Linea pro 4, Linea-pro PIN and Infinea TAB of Datecs. A unique market for applications running on these devices was created, in which, however, there is no Bulgarian participation. In 2014, it became known that Apple had changed its exclusive supplier Infinity Peripherals with Verifone, one of the pioneers in the automation of transactions in the United States, and although the loss of this market (Apple stores) will hardly be a problem from a financial point of view, in terms of marketing it may have adverse effects in 2015 on the decisions of other clients regarding the products of Datecs in this segment. The fact that Datecs is only nominally present on the American market limits significantly its ability to understand and solve client problems by offering innovations, as the company has to pass through the filter of Infinity Peripherals.

Unfortunately, the Bulgarian retail market has not adopted the new technologies and lags far behind global innovations despite the presence of a key innovator in the country. To a great extent, the problem is also legal, arising from government regulations about fiscal memory devices, on the one hand, and the excessive conservatism of Bulgarian banks whose only innovation is the launch of contactless payment cards and terminals which are in very small use. The obsession with "security," the requirements for payment only with chip cards and even the requirement for signature on slips on which it is written that no signature is required are an additional impediment to enhanced efficiency (more transactions, less waste of time, at a more convenient location for the client).

Although Datecs has other direct competitors in the segment for manufacture of cash registers with fiscal memory and payment terminals in Bulgaria (Daisy, Tremol, Eltrade, Karat Electronics), making various efforts to gain positions on the international markets, it is unlikely that any of these companies could come closer to Dactecs. After the comparatively successful 2011 year for the competitors of Datecs, in 2013 these companies reported a decline in sales. In fact, the four companies combined could not reach the 2011 turnover of Daisy. Daisy Technology continues to stand out with a turnover of BGN 25 million (the turnover of the other three companies combined) for 2013.

However, the spin-off company of Daisy – MM Solutions (in which Texas Instruments acquired a little less than 20 %) grew significantly in the same period – from BGN 16 million (€8.2 mln) in 2011 to BGN 24.4 million (€12.5 mln) in 2013. MM Solutions took the niche for software libraries for mobile device cameras, which are used in over 250 million devices globally. The company provides a range of services for on-line processing of images, and participates in European research projects.

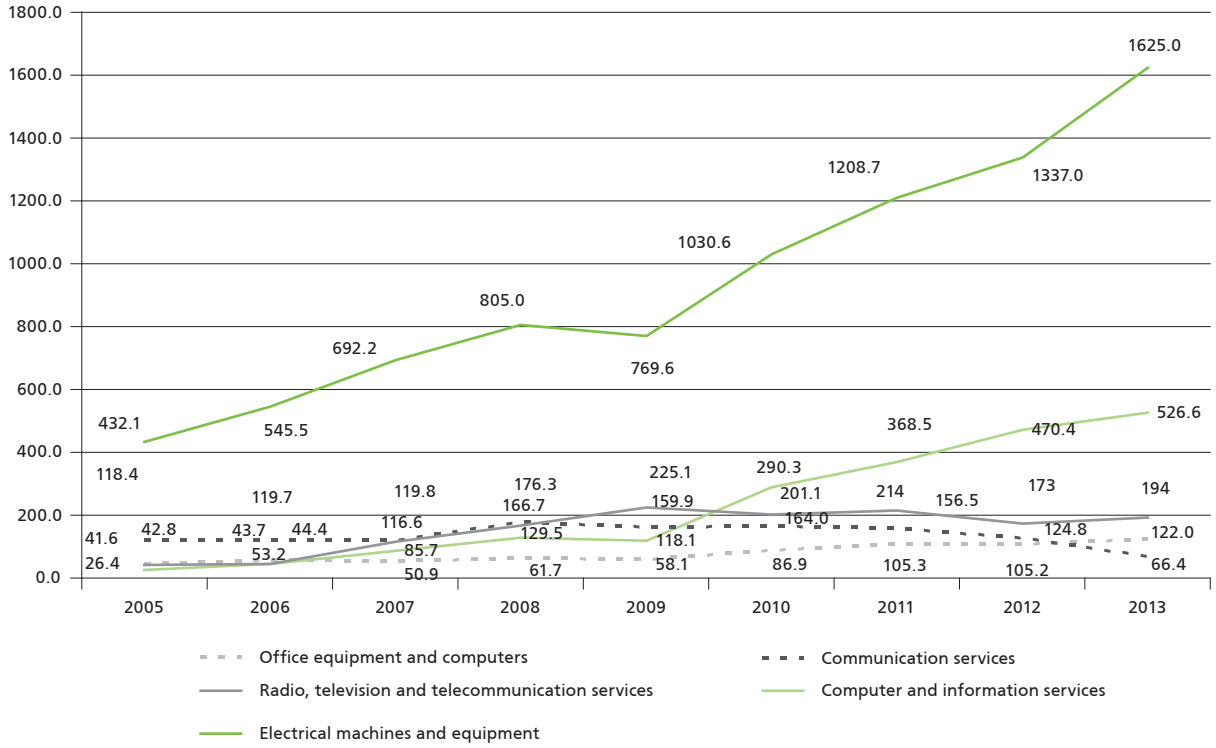
Bulgarian manufacturing ICT companies exported 20 % more products in 2013 versus 2012, which contributed to a total ICT export growth of 14.6 % (due to the relative decline in export of services). For the last 9 years, export of computer and information services has increased 20 times – from BGN 26 million (€13.3 mln) in 2005 to BGN 527 million (€270 mln) in 2014 – while communication services have declined twice (from BGN 118 million to BGN 66 million). The causes for this decline could be sought in the substitution of incoming expensive international telephone calls with free internet calls, on the one hand, and in Bulgaria being bypassed as an intermediary for communication (mainly internet) traffic from some countries (e.g. Georgia), on the other.

Preliminary data show that in 2014 revenues from the export of communication services would increase (17 % growth in the first 8 months of 2014 versus the first 8 months of 2013), whereas revenues from computer services would remain at the

[43] Изгряващи български мултинационални компании, Национален бюлетин „Наука & Бизнес", № 12, 2013, с. 10-14.

[44] Kelly Clay, "Nordstrom Sees Sales Boost From Mobile POS Devices", 4/06/2012, www.forbes.com

Figure 48. BULGARIAN ICT EXPORTS (2005 – 2013), € MILLION



Source: Foreign Trade Statistics; Eurostat; Balance of Payments, BNB, 2014.

same level as in 2013. There would probably be a slight decline of 2-3 % in the revenues from sale of ICT goods or the 2013 level would be maintained.

The fact that the business environment is growing increasingly ICT-intensive, coupled with the structural changes in consumer demand are the most important factors that determine the product, process, organisation and marketing innovations and redefine the requirements to workplaces and qualifications. For example, in job advertisements for electricians, stokers, cutters, embroiders, dress technologists, warehousemen, etc., computer literacy is required, and sometimes even skills for work with specialised software are required. In almost every niche 10 to 20 % of advertised jobs require computer literacy. ICT requirements differ across sectors and companies do not always have sufficient funds for investment or human capital to make the best use of them. High-tech both increases the requirements to low-tech professions, and allows the automation and spread of high-tech professions.

ICT skills in Bulgaria are not sufficiently developed. Only 24 % of employed persons use computers at their work place, and only 6 % of individuals have a website. Despite progress in the computerisation of schools, installed multimedia in many classrooms, the requirement for students to do their homework using online information and make multimedia presentations, as well as the use of various ICT devices by children and students outside school, there has been no breakthrough in education and the acquisition of ICT skills. Various initiatives for children's robotics (Robopartans and Roboworkshop, including with support of the "Success" software), programming for children (Telerik Academy, Coder Dojo of ARC Fund, Umnicheta Centre in Plovdiv, etc.) are sources of optimism that it is possible to catch up with countries where coding is becoming part of education.

ICT infrastructure enhances the positive effects of the connectedness of companies (through contracts, ownership, membership in associations, integrated business processes and information systems) and allows changes in industrial organisation and market concentration by creating opportunities for management, development, production and consumption of new products in new ways at lower transaction costs.

Even in the traditionally low-tech sector of textiles and clothing more firms introduce full ICT systems for business management – design, cutting, sewing, ironing, labelling and warehouse management with barcode systems. In 2013 and 2014, many projects for technological upgrading of textile plants provided higher energy effi-

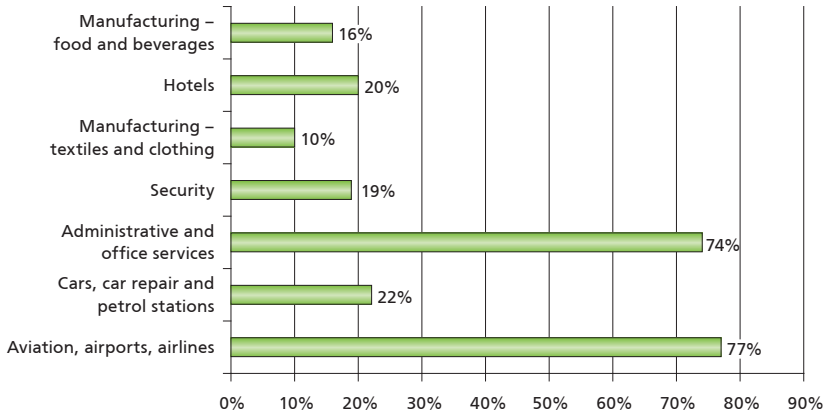
ciency and independence. The speed and accuracy of manufacturing small series of clothing is a key advantage of Bulgaria (and South-east Europe in general) over China, but it requires a greater use of ICT. Orders are received online in CAD-CAM systems and they have to be adequately labelled with a barcode containing the full information about the item (model, size, colour, etc.).

Among the e-business technologies taken into account when assessing progress towards the Digital Agenda objectives, the most widely used in Bulgaria is remote access to corporate IT systems (58 %), but the country is still below the average European level not only among its SMEs but also in large companies. There is no integration of internal processes and no systematic approach to customer relationship management. Only 11 % of the firms use CRM software, 19 % of the SMEs and 47 % of the large companies have ERP. The most significant lag behind average EU levels is in the use of office mobile devices (in fact, Bulgaria is worst in the entire Community), use of CRM (indicating that either concentration of clients is very high, or that when clients are scattered they have low contractual leverage) and use of websites. In contrast, electronic invoices are unexpectedly popular – 45 % send or receive e-invoices, which is above the average European level. This popularity can be explained by the elimination of the requirement for ink stamps on paper invoices and the acceptance of e-invoices without universal electronic signature as valid.

83 % of enterprises use some e-government services. While this is below the average European level, 79 % return completed forms (mainly to NRA), which is above the EU average European for this kind of government service. Although 10 % of enterprises claim to use electronic public procurement, probably the term is misunderstood because in practice there are no contracting authorities (apart from private ones) which use electronic tendering systems. Still, public procurement procedures below the threshold requiring at least three bids, and those by non-governmental contracting authorities (e.g. beneficiaries of structural funds programmes) are often purely electronic (e-mail calls for proposals); so are commodity exchange auctions which formally are not public procurement contracts.

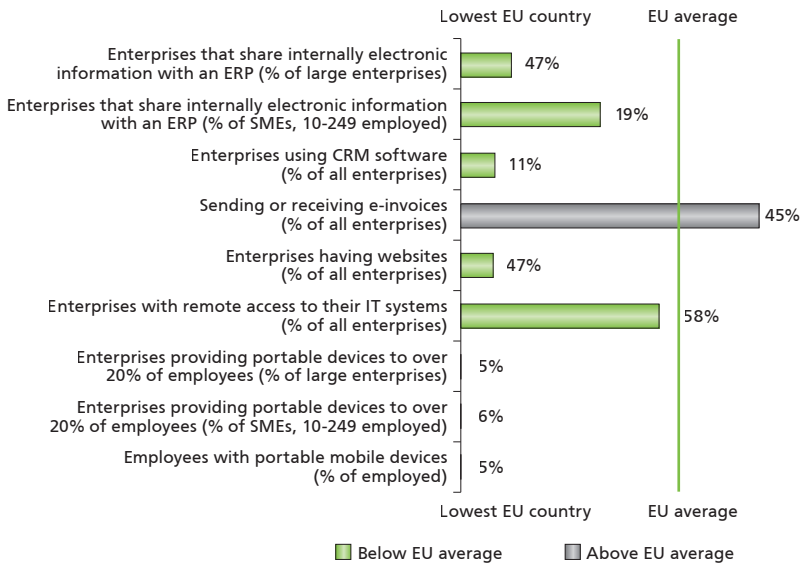
Although nearly half (47 %) of enterprises had websites in 2013, only 5 % of SMEs and 8 % of large enterprises made sales online, and even fewer bought online (3 % of SMEs and 4 % of large enterprises); the share of e-commerce in total turnover was marginal – 1 % (SMEs) and 4 % (large enterprises). In some niches (B2B), however, online orders were quite widespread. For example, most car repair services order new parts online, which are delivered within 15-30 minutes in big

Figure 49. JOBS REQUIRING COMPUTER SKILLS, BY SELECTED SECTORS



Source: jobs.bg, November, 2014.

Figure 50. E-BUSINESS PROFILE OF BULGARIAN ENTERPRISES



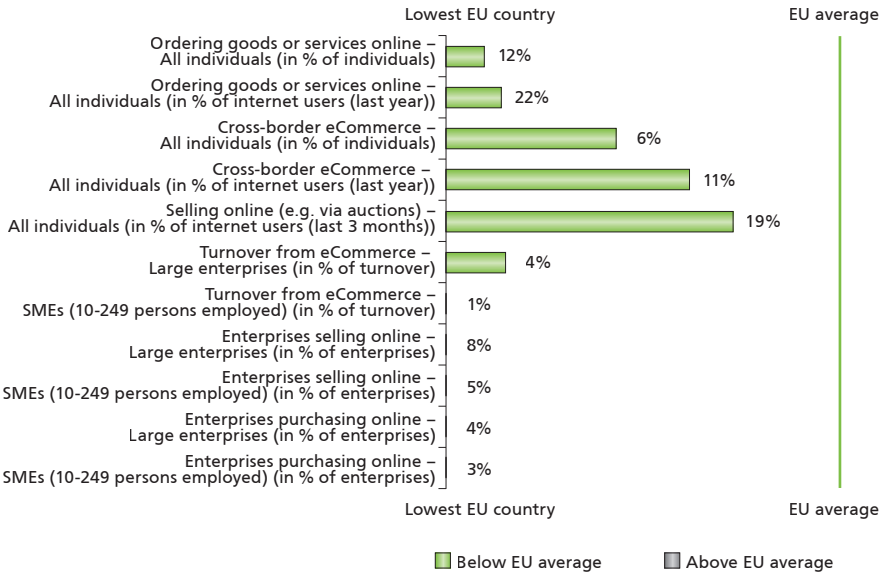
Source: Digital Agenda Scoreboard, 2014.

cities and the following day in small towns, and in exceptional cases within 48 hours (when deliveries are made by courier). Although there are online payment options, regular clients can use the option for deferred payment, which often is made at cash desks (as car repair shops deal mostly in cash). Small entrepreneurs use ICT and online commerce to position themselves against big players which dominate import and distribution (e.g. e-stores specialised in selling batteries, socks or custom made suits), the big chains which try to promote e-commerce in order to optimise costs for management of warehouse stocks. Some consumers use store facilities as showrooms for consultation and selection of a product, after which order online to save up to 5 % on the price.

At the end of June 2014,[45] there were 42,326 retailers in Bulgaria with 78,506 payment terminals (real and virtual). On an average annual basis, 35 million transactions were effected of an average value of BGN 70 (for the first half of 2014). About 1,600 of the retailers accept online payments via ePay. According to expert estimates, 700 to 1,000 retailers (some of which accept only payment on delivery) have integrated their online ordering with courier delivery firms and have special discounts from the standard delivery price. There is a seeming mismatch between "hard" and "soft" data which is due to the sample of sociological surveys only including companies with 10 and more employees, which comprise about 39,000 of the nearly half a million companies.

Actually, the B2C segment is more developed than B2B. 12 % of the country's population makes online purchases and 6 % makes orders from abroad. Most commonly purchased goods from abroad are electronics, spare parts and baby/infant products, which differ significantly in prices and quality in Bulgaria and abroad. Most regular internet users have made online sales. Although the original question was designed to assess the use of ebay type platforms, in the Bulgarian context it should be interpreted to mean that 19 % of internet users have made an online offer for sale, which ended with a deal (real estate, car, telephone handset, second-hand item, hobby product).

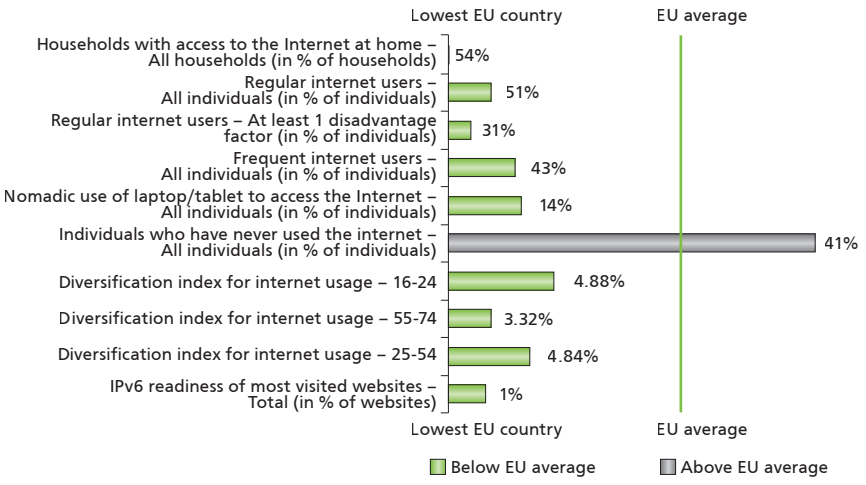
Figure 51. BULGARIA COUNTRY PROFILE BY E-COMMERCE INDICATORS



Source: Digital Agenda Scoreboard, 2014.

The penetration rate of internet in households, daily life and work places in Bulgaria has nearly reached its potential, although only 51 % of people use internet on a regular basis and 54 % of households have access to internet at home (the lowest rate in the European Union). A number of social and demographic factors play a role in this. First, 31 % of households in Bulgaria are single-member families, and 27 % of these live in rural

Figure 52. BULGARIA COUNTRY PROFILE BY INTERNET USAGE INDICATORS



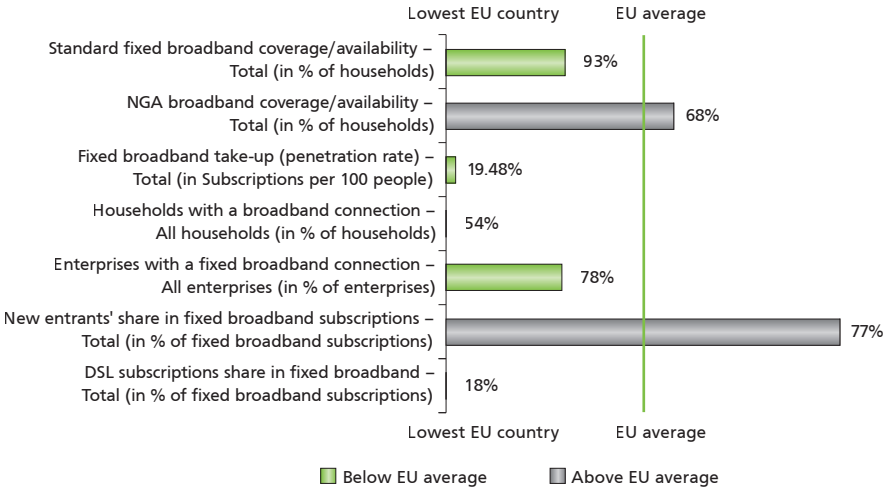
Source: Digital Agenda Scoreboard, 2014.

[45] Payment statistics, BNB, 2014.

areas; usually, these are elderly people and pensioners with low income. Second, 8-9 % are retired couples living in rural areas. Further, the Roma living in city slums and people living in abject poverty are socially excluded. 41 % of the population has never used internet. This indicator could be expected to improve owing to two trends – first, generational change (young people use internet more), and second, the trends in development of mobile technologies and declining prices of internet, resulting in more people without a computer and internet in the household but with a mobile internet access on their phone. In some countries, e.g. Kosovo, surveyed youths claim not to use internet but when asked about specific technologies (skype, facebook) they say they use them (probably on their phone, which they do not associate with internet).

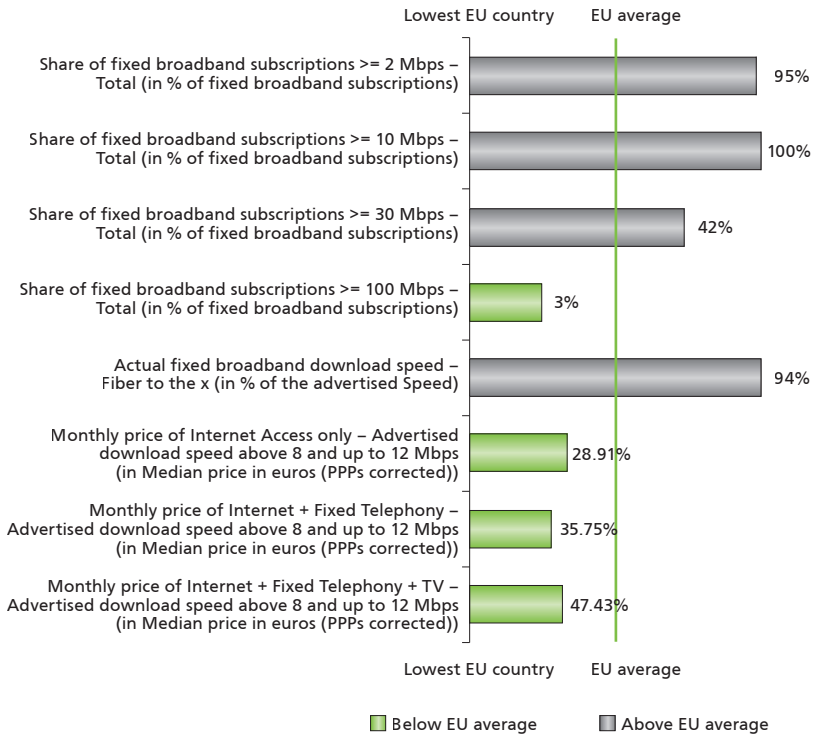
The diversification index for internet usage shows the various activities (among 12 options) people perform. Naturally, younger people use internet more diversely, including in terms of devices and places (always connected, often in more than one way – telephone and tablet/laptop). Bulgaria's position on this indicator differs significantly depending on the social group. Overall, the country is at the bottom only above Turkey and Romania, but if only youths aged up to 25 are considered, Bulgaria does better than Greece, Poland, Italy and Cyprus. In fact, the share of people not using internet (22.8 %) is very close to that in Italy, Portugal and Greece (19.7 %), if only economically active population is taken as a base. The difference is due to pensioners and long-term unemployed persons (78.1 %) against the average 47.9 % for the European Union. Similar is the situation with the poorest 25 % of the population (76.9 %) against the average 39.8 % in the EU. Lack of internet use by enterprises follows the same logic – micro and small enterprises do not see the need, whereas

Figure 53. BULGARIA COUNTRY PROFILE BY BROADBAND TAKE-UP AND COVERAGE INDICATORS



Source: Digital Agenda Scoreboard, 2014.

Figure 54. BULGARIA COUNTRY PROFILE BY BROADBAND SPEEDS AND PRICES INDICATORS



Source: Digital Agenda Scoreboard, 2014.

owners and managers have personal/home internet.

For many years European thinking on the internet penetration rate was dominated by expanding coverage (assuming that non-use of internet is due to lack of coverage) and in particular on digital subscriber lines. It was assumed that this

was the cheapest access, but data on Bulgaria for the last 4-5 years show that coverage is comparatively good – 93 % of households (according to Eurostat data) and over 96 % of the population (according to data of ARC Fund) live in places where they can use standard broadband internet at acceptable prices. In terms of the new generation of broadband internet Bulgaria's position is even better than the average European level (68 % of households are covered by next-generation access), and competition is well developed (probably among the best in EU) with 77 % market share of new providers (different from the old state-owned telecoms). In Bulgaria there is no other internet but broadband and almost all speeds exceed 10mbps. Only the speeds above 100 mbps are below the European level (3 % of households use such speeds) but this is because there is no demand for such speeds and Bulgaria ranks among the countries with the highest average actual speeds. Prices in nominal terms are also among the lowest in the EU, and if adjusted for purchasing power are below the average European prices.

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