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LIST OF ABBREVIATIONS

AI	– Artificial intelligence
BAS	– Bulgarian Academy of Sciences
BCCI	– Bulgarian Chamber of Commerce and Industry
BESCO	– Bulgarian Start-up Association
BSMEPA	– Bulgarian Agency for Promotion of Small and Medium-sized Enterprises
COSME	– Competitiveness of Enterprises and Small and Medium-sized Enterprises
EC	– European Commission
EIS	– European Innovation Scoreboard
EPO	– European Patent Office
EU	– European Union
GDP	– gross domestic product
GIS	– geographic information system
GEM	– Global Entrepreneurship Monitor
HR	– human resources
ICT	– information and communications technologies
IMD	– Institute for Management Development
IoT	– internet of things
IP	– intellectual property
MFF	– Multiannual Financial Framework
NCPR	– North Central Planning Region
NEPR	– North East Planning Region
NGO	– non-governmental organisation
NSI	– National Statistics Institute
NUTS	– Nomenclature des unites territoriales statistiques
NWPR	– North West Planning Region
OP	– operational programme
OP IC	– Operational Program Innovation and Competitiveness
OP SESG	– Operational Programme Science and Education for Smart Growth
PCT	– Patent Cooperation Treaty
PORB	– Patent Office of Republic of Bulgaria
R&D	– research and development
RII	– Regional Innovation Index
SEPR	– South East Planning Region
SIR	– Scimago Institutions Rankings
SME	– small and medium-sized enterprise
SWPR	– South West Planning Region
USA	– United States of America
WIPO	– World Intellectual Property Organisation

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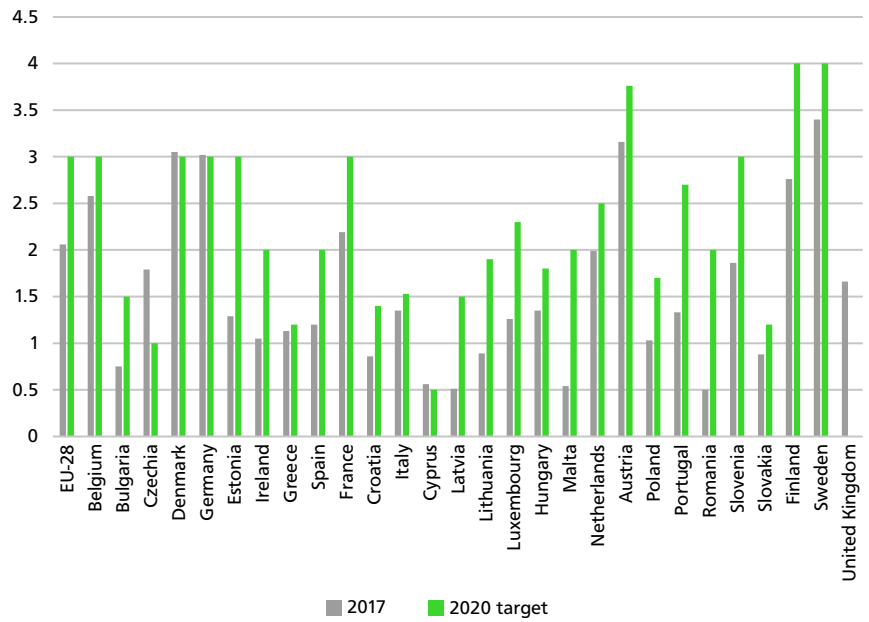
EXECUTIVE SUMMARY

By 2018, there were four EU countries that managed to exceed the Europe 2020 R&D spending target of 3% of the GDP. For Denmark and Germany, this also means exceeding the national target, which is the same as that of the EU-28. Austria, Finland and Sweden have the most ambitious targets to be reached by the end of the programming period, which is the reason why the three countries have not achieved them. **One year before the end of the programming period, Bulgaria is still part of the group of modest innovators, having reached only 50% of the national target** of 1.5% of R&D spending of the GDP.

Figure 1. R&D SPENDING AS SHARE OF GDP, EU-28



Source: Eurostat, 2019.

Business is the main institutional sector within the national innovation system, which continues to increase the spending on research and innovation. At the same time, enterprises in Bulgaria face significant challenges:

- Low degree of innovation activity of the Bulgarian enterprises as a result of the insufficient cooperation between business, science and higher education institutions. Bulgaria is last but one in the EU in terms of innovation performance and share of SMEs that have marketed new products or services.

Despite the progress made, **there has been backsliding in areas that are directly related to business innovation and performance:** a 15% decline since 2011 in the number of SMEs with their own innovation activity to a level of 13.8%, which is more than twice below the EU-28 average and only higher than Romania; a 16% drop in SMEs with technological (product and/or process) innovations; 5.6% decline in SMEs with non-technological (marketing and organisational) innovation; a decrease of 81% in the sales of new for the market and new for the company products as a share of turnover, which is an indication of the extremely low competitiveness of the Bulgarian enterprises.

- Difficult access to funding sources and low investment activity – just over 16% of Bulgarian SMEs have access to public financial aid, including guarantees.

There has been a 57% drop of expenditures on innovation (other than R&D spending), measured as a share of enterprise turnover. Usually, they are aimed at the purchase of intellectual property objects/rights and technological renovation of the production process, which in both cases is an indication of participation in technological transfer.

Additional issues include:

- a low degree of internationalisation of SMEs, as opposed to an internationalization of scientific structures, which is significantly higher;
- high level of resource and especially energy intensity of production, low level of implementation of new technologies.
- insufficient entrepreneurial activity and sectoral structure of the economy, which is significantly different from the structure in EU countries.

The main challenges related to **entrepreneurship are that it is not focused on by public institutions** and that the topic is not on the political agenda. Significant efforts are still to be made with regard to **entrepreneurship training,** both at the primary and secondary education stages (1.79, which is the lowest country score among all 12 indicators), as well as within higher education and the initiatives for vocational and dual training (2.44 and one of the last places in the EU-18).

The 2019 Regional Innovation Index confirms the convergence trend among European countries and regions in terms of their innovation potential – applicable, to be sure, to the groups of leading, strong and moderate innovators. Contrary to this trend, **modest innovators are at an increasing distance from the European average** – there has been a worsening of indicators in all regions of Romania and in most regions of Bulgaria.

In 2018, **patent activity in the country reached record levels for the last 20 years. Patents** granted to Bulgarian inventors amounted to 171 – a level that has not been reached since 1999. The growth compared to the previous year is

more than double. **Just over 12,000 patents are in force in the country.** Their number has been steadily increasing since 2008, reaching an overall increase of just over 2.4 times.

While the patent activity of enterprises is not hidden and can be easily traced over time through records and documentation included in patent databases, the situation with innovation activity is quite different. There are a large number of innovative Bulgarian enterprises, enterprises with public funding provided through a variety of instruments at national and European level and companies that increasingly rely on their own resources and define project work as time-consuming and highly frustrating, both from an administrative point of view and bureaucratic burden, and the inability to integrate it into company plans and strategies. The representatives of the latter group are not easily identified, although they are an extremely important player on the national innovation scene.

In addition, the problem of submitting data on enterprise research and innovation activity to the National Statistical Institute remains unsolved. Although this information is generated at European level and is the basis for the country's negative comparative results in studies of innovation potential, Bulgarian institutions do not seem interested in changing the situation. The position of both the Ministry of the Economy and the National Statistical Institute can be said to be passive when it comes to taking concrete steps to improve the collection of R&D and innovation related information.

There are reasons for optimism that **more transparency of innovative enterprises** could increase the innovation index of the national economy – **the value added of SMEs from the non-financial sector for the period 2008 – 2017 grew by 45.3%. Bulgaria ranks third in the EU-28 after Malta and Luxembourg** at an average of 14.3% for the EU-28 – a position achieved in the context of a 2.6% decline in employment in this sector compared to pre-crisis 2008 levels. It can thus be argued that since the number of employees is not a factor for the growth of the value added, the reasons should be sought in the increased productivity achieved mainly through production optimisation and technological upgrading of production capacity.

As in previous years, the *Innovation.bg* report highlights **the leading role of business in carrying out research and innovation.** In 2018, enterprises spent a total of BGN 594.8 million (11% annual growth) on R&D, equivalent to 0.54% of GDP. Compared to other institutional sectors, **only the increase in business sector R&D spending is able to outpace GDP growth** (current prices), thus **increasing its share.** Over 88% of R&D funding from foreign sources is channelled to businesses.

The business sector also plays a leading role in the growth of R&D staff. **Since 2015, enterprises have been providing more jobs for researchers than the public sector and higher education. In 2018, the share of business in the institutional structure by this indicator reached nearly 46%.**

The development of the strategic framework for the next programming period 2021-2027 is an opportune moment for public institutions to make clear commitments to science and innovation policies and take bold decisions. For example, R&D management and coordination and policy making on smart specialisation should be brought into a single public agency following international best practices such as Innovation Norway.

INTRODUCTION

Only a year from now, EU's Horizon 2020 research funding framework will be continued by Horizon Europe as part of the transition to the next EU Multiannual Financial Framework (MFF) for the period 2021-2027. The development of the European policy in the field of innovation and smart specialisation is already underway and the measures to be implemented reflect the lessons learned during the current programming period. There are several areas in which the changes will have a direct impact on the policy of smart specialisation in Bulgaria:

- Key priorities – five key policy objectives will concentrate the main financial resource: 1) a smarter Europe through innovation, digitalisation, economic renewal and support for small and medium-sized enterprises; 2) a greener Europe without carbon emissions and investments in energy transition, renewable energies, and the fight against climate change; 3) a more connected Europe with strategic transport and digital networks; 4) a more social Europe that promotes quality employment, education, skills, social inclusion and equal access to health; 5) Europe closer to the citizens through support for sustainable local and urban development strategies.
- The role of the regions – the five policy objectives will be implemented at national level in each member state and will not be binding at regional level. This gives greater flexibility to local authorities to generate policies that are tailored to the specific potential of the regional economy and address the unique challenges they face. This intention goes hand in hand with the idea that local authorities are involved in the management of programmes that develop on their territory, and at least in the selection of projects, by enhancing civic oversight.
- Financial support – the European funding policy through the operational programmes is changing. Due to the increased interest of business and public institutions in various financial instruments, grant schemes are no longer acting as the sole financial support instrument. Flexible financial instruments (financial engineering) and public-private partnerships (spin-off, spin-out, spin-in, lease agreements, utility contracts, concessions, joint ventures, etc.) will be increasingly used as one of the fastest ways for research

to reach the market. These, in conjunction with European funds, will take greater account of the economic sustainability of projects.

Given that the Bulgaria 2020 national target is reached only halfway, the actions taken so far can be defined as half-hearted. On this basis, no significant results can be expected in improving the business environment for innovation, support for enhancing the innovation potential of business and promoting the transfer of new technological knowledge.

The improved administrative capacity of central and local government in managing European programmes and in providing business services in recent years is indisputable. However, innovation is still underestimated as a factor for economic well-being, evidenced by the following:

- the lack of good collaboration among the various public institutions;
- the lack of complementarity among the individual tools for implementing innovation policy and the process of smart specialisation; insufficient transparency in the procedures for evaluation and selection of project proposals, monitoring and oversight of projects;
- lack of vision and shortening of the planning horizon for the financing of research, accompanied by significant fluctuations in the allocation of funds by science fields and failure to invest in research infrastructure;
- concentration of R&D funds in one region of the country, which deepens internal disparities and limits opportunities for smart specialisation on a regional and sectoral basis;
- an administrative burden, lack of transparency, and lack of procedures for monitoring and evaluating the allocation and use of public funds for science, technological development and innovation;
- insufficient authority at regional level to meet the objectives of smart specialisation, leading to a deepening imbalance in the innovative potential of individual planning regions.

Therefore, a very strong dialogue and coordination is needed between the main science and innovation institutions in the development of the innovation policy for smart specialisation, as well as with regional authorities to outline the priority areas for the next programming period.

The ***Innovation.bg*** **report provides an annual assessment of the innovation potential of the Bulgarian economy in Europe** and of the status and opportunities for development of the Bulgarian innovation system. It makes recommendations for improving public policy on innovation in Bulgaria and in the EU, drawing on the latest theoretical and empirical research and taking into account the specific economic, political, cultural and institutional framework within which the country's innovation system is developing. Over the last 15 years, *Innovation.bg* has made a number of concrete proposals for improving the innovation policy and practice in the country, which have been supported by the government, business, the scientific community and the European Commission. However, there has been no breakthrough in national innovation policy so far, and **institutional weaknesses in policy development and implementation in this area remain serious.**

Innovation.bg 2019 analyses the state and opportunities for development of the national innovation system on the basis of four groups of indicators:

- gross innovation product;
- entrepreneurship and innovation networks;

- investment and financing of innovation;
- human capital for innovation.

The leading theme of *Innovation.bg 2019* is the European science and innovation policy in the next programming period and the instruments envisaged to achieve the ambitious goals.

The concept of smart specialisation launched by the European Parliament and the Council has proven to be a successful tool for pursuing EU cohesion policy at regional level and will continue to play a key role in the next programming period. In this regard, the development of a transparent and effective innovation policy for the smart specialisation of Bulgaria for the programming period 2021-2027, which reflects and develops the national innovation potential and competitive advantages of the regional business communities, should focus the attention of the Bulgarian government in the next year.

European policy in the field of science and innovation – prospects and priorities

At the end of 2019, the European Union faces a number of challenges, some of which are inherited and deepening (disparities among member states and their regions, including in terms of innovation potential), while others have emerged in recent years (UK's exit from the European Union, the migration crisis). The 2019 edition of the European Innovation Scoreboard draws attention to the fact that the European economy is lagging behind other global innovation leaders (South Korea, Canada, Australia, Japan, United States, China) in terms of business R&D spending, the implementation of scientific output in practice, and the growth of start-ups.

Access to finance remains a problem for innovative SMEs in Europe. Although the amount of venture investment has tripled between 2012 – 2017, it is still only a fifth of that in the US. Clumsy bankruptcy legislation in some EU member states additionally acts as a barrier and increases risks for entrepreneurs. Gaps in the labour market and the disparities between the demand for and supply of knowledge, skills and competences also put innovative firms at a disadvantage.

In order to meet the challenges, the European Commission launched **the Multiannual Financial Framework (MFF) for the next programming period 2021 – 2027**, in which innovation is identified as one of the drivers of economic growth and productivity. Although it is understood that much of the existing problems need to be addressed at national level, the EU's main ambition is to support national governments by identifying structural weaknesses, coordinating research, technological development and innovation efforts, providing guarantees and resources, and improving quality by creating a competitive environment. As a result, the MFF for the next programming period includes the most ambitious research and innovation programme so far and a record innovation budget of around EUR 130 billion for the period 2021 – 2027.

The European Commission's proposal to create research and innovation programme Horizon Europe for 2021 – 2027, published in June 2018, sets an indicative budget of nearly EUR 100 billion for research and innovation (Horizon 2020

was allocated EUR 80 billion). The programme pursues three types of impact: **scientific impact** through the creation and dissemination of new knowledge, skills and technological solutions to global challenges; **societal impact** through increased synergies in research and innovation, and implementation of industry and society results to address global challenges; **economic impact** by encouraging all forms of innovation and strengthening the market for the demand and supply of innovative solutions.

Table 1. R&D SPENDING IN THE MULTIANNUAL FINANCIAL FRAMEWORK FOR THE PERIOD 2021 – 2017, DRAFT

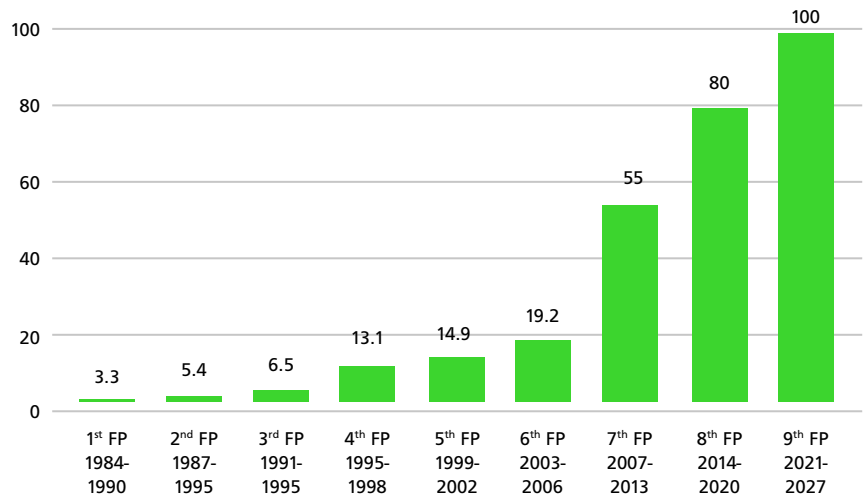
Programme	EUR billion (current prices)	Focus
Horizon Europe Successor of Horizon 2020	**96.5**	**Excellence in research and innovation**
Pillar I – Open science	**25.8**	**Research activity**
European Research Council	16.6	
Marie Sklodowska-Curie Scientific Programme	6.8	
Research infrastructure	2.4	
Pillar II - Global Challenges and Industrial Competitiveness	**52.7**	**Mission-based transdisciplinary research and innovation**
Cluster: Healthcare	7.7	
An inclusive and secure society	2.8	
Digitalisation and industry	15.0	
Climate, energy and mobility	15.0	
Food and natural resources	10.0	
Joint research centre (non-nuclear research)	2.2	
Pillar III – Open innovations	**13.5**	**Innovation activity**
European Innovation Council	10.5	
European Institute of Innovation and Technology	3.0	
European Research Area	2.1	
Shared excellence	1.7	
Reforming research and innovation systems	0.4	
Euroatom	2.4	
InvestEU (EUR 38 billion), Successor of the Juncker Plan Innovative section	**11.3**	**Business access to finance**
European Defence Fund (EUR 13 billion), Innovation section	**4.1**	**Defence research**
Digital Europe	**9.2**	**Digitalisation and dissemination of technology**
High-performance computing technology	2.7	
Artificial intellect	2.5	
Cybersecurity	2.0	
Modern digital skills	0.7	
Implementation and use of digital capacity and compatibility	1.3	
Connecting Europe Facility, Digital section	3.0	Digital infrastructure
International Thermonuclear Experimental Reactor	6.1	Nuclear fusion research and innovation
Overall budget for research and innovation	**130.2**	

Source: https://ec.europa.eu/info/horizon-europe-next-research-and-innovation-framework-programme_en

Structurally, Horizon Europe will be based on **three complementary and interconnected pillars aimed at developing fundamental science, addressing global challenges and fostering innovation.**

In addition, a limited number of **research missions**[1] **and institutionalised partnerships** (clusters) will be introduced. "Mission" is defined as a portfolio of research and innovation activities based on excellence and impact in different disciplines and sectors, designed to achieve a measurable goal within a specified time limit that could not be achieved through individual action; ensuring impact on society and policy-making through science and technology; and with an influence on a significant proportion of the European population and a wide range of European citizens.

Figure 2. EVOLUTION OF EU FRAMEWORK PROGRAMMES, 1984 – 2027, EUR BILLION



Source: https://ec.europa.eu/info/horizon-europe-next-research-and-innovation-framework-programme_en

The main areas to be supported by the European Regional Development Fund and the European Social Fund for the period 2021 – 2027, in line with the proposals for Commission regulations, will be grouped around five topics:

- a smarter Europe (SMEs growth and competitiveness, digital transformation, entrepreneurship, innovation, industrial sector challenges related to globalisation, the circular economy and climate change);
- a greener, low-carbon Europe (clean energy solutions, energy efficiency, transition to a low-carbon economy, renewable energy, innovative low-carbon technologies, support for green and blue investments, sustainable management of natural resources, a circular economy, adapting to climate change);
- a more connected Europe (mobility, energy and regional ICT connectivity, sustainable transport, smart energy networks, fast digital connections);
- a more social Europe (support for actions under the European pillar of social rights, in particular promotion of employment, lifelong learning and education, social inclusion and health, and social innovation);

[1] Mazzucato, M., Mission-Oriented Research & Innovation in the European Union, A problem-solving approach to fuel innovation-led growth, European Commission, Directorate-General for Research and Innovation, 2018.; Mazzucato, M., Governing Missions in the European Union, European Commission, Directorate-General for Research and Innovation, 2019.; Mazzucato, M., "Mission-oriented innovation policies: challenges and opportunities," Industrial and Corporate Change, 2018, Vol. 27, No. 5, 803–815.

- a Europe closer to citizens (promoting urban, rural and coastal development, and local initiatives).

Table 2. EC PROPOSAL FOR MULTIANNUAL FINANCIAL FRAMEWORK FOR THE PERIOD 2021 – 2027, SOURCES OF FINANCING

Source of funding	Targets
European Fund for Regional Development European Cohesion Fund	65-85% Smart and green growth
European Social Fund	Education, training, development of skills

Source https://ec.europa.eu/info/horizon-europe-next-research-and-innovation-framework-programme_en

The main purpose of the **Bulgarian smart specialisation policy** will be to match available resources and priorities of business and science with the development guidelines from the EU. On the one hand, the policy needs to achieve a stronger Bulgarian involvement in European instruments for innovation, technological development and science, such as Horizon Europe. On the other, all operational programmes need to be geared towards a transformation of the Bulgarian economy for higher growth and reduction of disparities within the country. This can be achieved by defining national priorities in the framework provided by the European ones and a considerable improvement of the horizontal ties and coordination among institutions managing European programmes. The latter would mean, for example, aligning operational programmes for environment, transport, regional development, human resources, rural development, etc., with those for innovation, competitiveness, science and education. Additionally, the **development of regions**, including that of the capital city of Sofia, should be provided with resources and made to correspond to national priorities.

Innovation Potential of the Bulgarian Economy

Gross Innovation Product

The gross innovation product, or the innovativeness of an economy, is assessed by the new products and services introduced, the new technologies created and the scientific outputs. It involves and 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.

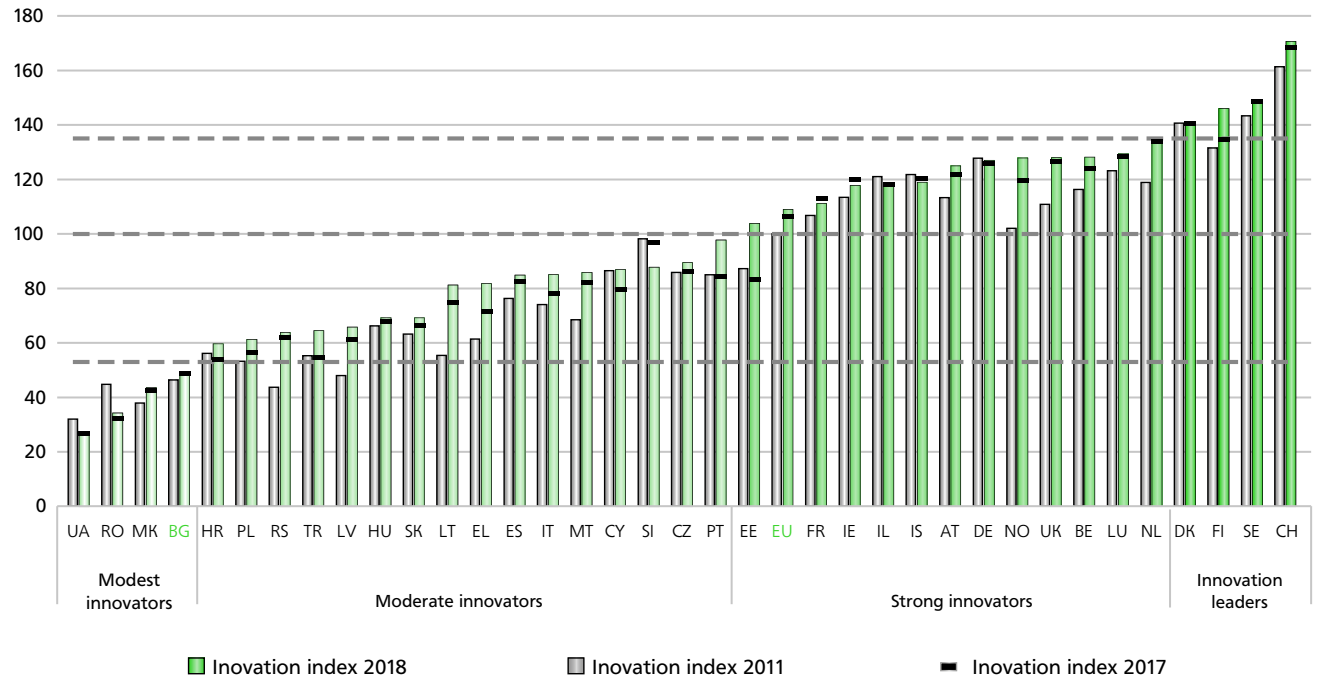
Innovation product

The innovation product results from innovation activity in the form of new and significantly improved processes, products and services based on new and/or adapted existing 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 the economy – its capacity to develop based on new knowledge.

Bulgaria's place on the international innovation map

In 2018, **the European economy showed an increasing innovation potential,** notably in terms of an innovation-friendly environment (9% compared to 2017 and 58% compared to 2011) and business spending on research and innovation (8% compared to 2017 and 19% compared to 2011).[2] Twenty-four member states had an improvement, with Estonia having the most pronounced (24% on a yearly basis and nearly 17% over the last eight years), followed by Portugal, Finland, and Greece. Although

Figure 3. EUROPEAN INNOVATION SCOREBOARD 2019*



* The coloured bars show the level of the member states in 2018 based on the latest data on the 27 indicators of the European Innovation Scoreboard compared to the EU average in 2011. The positions in black on them correspond to the same indicator, but for 2017. The grey bars show the state of the member states in 2011 compared to the average for the EU in 2011. The dashed lines show the thresholds between the groups of countries in 2018: innovation leaders – over 120% of the EU average; strong innovators – between 90% and 120% of the EU average; moderate innovators – between 50% and 90% of the EU average; modest innovators – below 50% of the EU average.

Source: European Innovation Scoreboard 2018, https://interactivetool.eu/EIS/index.html

[2] The European Innovation Scoreboard presents a comparative analysis of the innovation potential of EU member states, other European and neighbouring countries. It assesses the relative strengths and weaknesses of national innovation systems and helps the countries involved in the survey identify areas that need improvement. The first edition of the European Innovation Scoreboard was published in 2000 and covered 1999 data for 15 EU member states. The methodology for the preparation of the report has undergone a number of transformations in the period 2010 – 2015 and the name has been changed from „European Innovation Scoreboard" to „Innovation Union Scoreboard" for the period 2010 – 2015.

at a slower pace, the process of convergence between member states continues, as a result of the faster growth of less innovative economies against slower improvement by innovation leaders. As the data on the European Innovation Scoreboard show, **Bulgaria is not among the countries making progress.** Despite the low starting positions, the country continues to "move modestly" forward, which, in comparative terms, contributes to its "stable" falling behind.

In the 2019 issue of the European Innovation Scoreboard, **Bulgaria ranks second to last in the EU-28** with an Innovation Index of 0.235. This result, as well as the progress made since 2011, rank the country at the bottom of modest innovators, ahead only of Romania (0.165). The EU average index (0.525) is twice as high, while the index of innovation leader Sweden (0.713) is three times the result for Bulgaria.

There are, nevertheless, three areas in which Bulgaria has shown significant progress since 2011:

- Broadband internet coverage – 78% growth, which is however not enough to reach the EU-28 average. The indicator reflects the number of enterprises using broadband internet at over

Figure 4. INNOVATION POTENTIAL OF BULGARIA COMPARED TO THE EU-28 AVERAGE, %, 2018

Source: European Innovation Scoreboard 2018, https://interactivetool.eu/EIS/index.html

100 Mbps and is seen as an expression of the digital potential of business and a factor for the full use of ICT in the process of creating products and services, B2B and B2C interaction.

- New doctorate graduates – 71%, with a 2018 result 1/3 below the EU-28 level.
- Design applications – 70%, and 2018 level 20% above the EU-28 average.

Despite the uneven progress made on individual indicators, **there has been significant retreat in areas that are directly related to the innovation activity of business and its impact:**

- SMEs innovating in-house – a decrease of 15% compared to 2011 to the level of 13.8% of the SMEs, which is more than twice below the EU-28 average and above the Romanian result only;
- SMEs with technological (product and/or process) innovations – a decline of 16%;
- SMEs with non-technological (marketing and organizational) innovation – a decline of 5.6%;
- sale of new for the market and new for the company products as a share of the turnover – a decrease of 81%, which indicates an extremely low competitiveness of Bulgarian enterprises;
- expenditures on innovation (excluding R&D expenditure), measured as a share of the turnover – a decrease of 57%. They are usually aimed at the purchase of intellectual property objects/rights and technological upgrading of the production process, which in both cases is indicative of participation in technological transfer forms;
- enterprises with access to ICT training – a drop of 27%. ICT-related skills and competences are yet another factor neglected by business. The level reached in 2018 is below 40% of the EU-28 average.

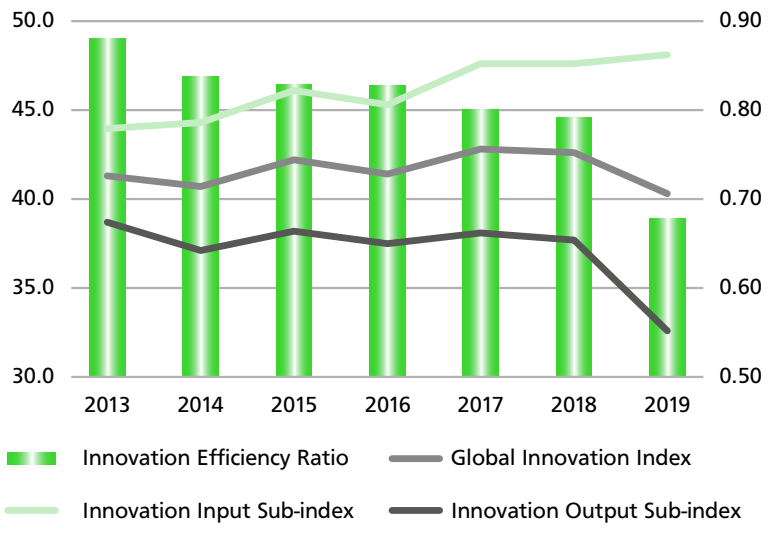
The low-tech and slow innovation activity of the economic agents in Bulgaria is a consequence of the poor research activity, applicable to both fundamental and applied research.

The assessment of the results of the functioning of the research system in Bulgaria, measured by indicators such as international scientific co-publications, publications with the highest number of citations, and foreign doctoral students, **is extremely negative. The attractiveness of our research system is five times below the EU-28 average.** Among the 36 countries included in the 2018 European Innovation Scoreboard, it is only above the level for Ukraine, remaining well below the scores of the neighbouring North Macedonia and Serbia, which are not EU members.

This is evident also in the country's results in the seven main areas covered by the Global Innovation Index[3] (five groups of factors covering the so-called innovation input and 2 groups of factors corresponding to the so-called innovation output) – **Bulgaria has the lowest result in the category "human capital and research,"** with a total score of 30.6, which puts the country in one of the lowest positions (62nd place) in the ranking among the 129 countries included in the survey.

In the ranking of the Global Innovation Index 2019 **Bulgaria has the 40th position, which is a retreat by three positions compared to the previous year.** Over the last year, minimal progress has been made only in the area of infrastructure (7%), with the situation in two of the areas (institutions and market environment) remaining unchanged. **As regards the other four pillars – which are directly related to the innovation potential of the national economy – the country had a decline, which was most significant in terms of innovation activity** (creativity -13.8%, and knowledge and technological results -13%). There was also a decrease, although minimal, as regards the business environment (-2.6%), and human capital and research (-1%). This performance has

Figure 5. GLOBAL INNOVATION INDEX 2013 – 2019, COMPARATIVE POSITION AND RESULTS FOR BULGARIA



Source: The Global Innovation Index (GII) 2019: Creating Healthy Lives—The Future of Medical Innovation https://www.globalinnovationindex.org/

[3] The Global Innovation Index was launched in 2007. The 2019 edition covers 129 countries and is based primarily on data for 2017 and 2018, grouped into 80 indicators, 21 sub-pillars, 7 pillars, 2 sub-indices and 1 summary index.

resulted in:

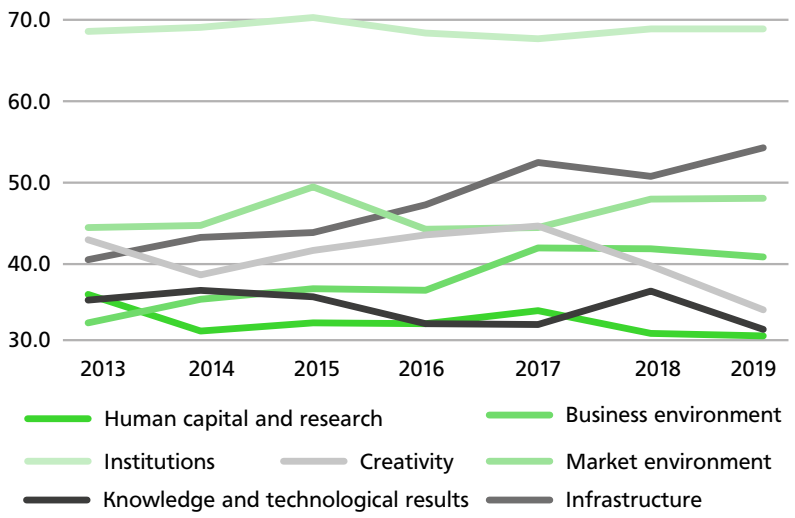
- Bulgaria's 45th place in the overall ranking and 26th place within the EU-28, only ahead of Croatia and Romania.
- Bulgaria's 38th position in the overall ranking and 23rd place within the EU-28, ahead only of Lithuania, Poland, Croatia, Romania and Greece.

The Global Innovation Index establishes for a consecutive year that there is a serious gap between the countries surveyed in terms of both investment in innovation and results achieved. The countries that devote the largest resources to innovation are primarily concentrated in the group of high income economies.

Of bigger interest is the group of countries that manage to the highest extent to capitalise on the investment made, i.e. to create conditions so that the investments can be multiplied and diversified in the results obtained. In innovation, this means a national innovation eco-system, which is a field for enhanced synergies and the subject of intelligent policy-making. **In the group of middle income economies, China, Bulgaria and Malaysia rank among the most effective innovators.** The latter should not be used as a source of pride, since in this group the only EU member states are Bulgaria and Romania; the rest are in the high income economies group.

And if the efforts made are a matter of potential, the cost (efficiency) of the results achieved is a matter of choice. This shifts the focus of policies from quantitative to qualitative indicators such as "the quality of university education," "internationalisation of patent activity" and "quality of scientific publications," which have been specifically addressed in the index.

Figure 6. GLOBAL INNOVATION INDEX 2013 – 2019, COMPARATIVE POSITION FOR BULGARIA BY MAIN GROUPS OF INDICATORS



Source: The Global Innovation Index (GII) 2019: Creating Healthy Lives—The Future of Medical Innovation https://www.globalinnovationindex.org/

Box 1. REGIONAL INNOVATION PROFILE OF BULGARIA 2019[4]

The 2019 Regional Innovation Index confirms the convergence trend among the European countries and regions in terms of their innovation potential; the trends apply however only to the groups of leading, strong and moderate innovators. Contrary to this trend, **modest innovators are at an increasing distance from the European average.** There is a worsening of indicators in all regions of Romania and most regions of Bulgaria.

The result for Bulgaria is an increasing gap between planning regions:

- T**he Southwest Planning Region** is the only representative of the country in the group of moderate innovators. The region had a growth of 2.5% compared to 2011. Due to the concentration of research and university units and high-tech business, the region is leading in terms of publication activity, educational level and R&D expenditure. The region had the highest values for 2018 in terms of marketing and organisational innovation.
- **The North Central Planning Region** is the second region in Bulgaria to grow over the study period, although by a modest 1%. In 2018, the region was a leader in patent activity.
- The innovation potential of the other four regions declined, the most serious being in **the Northwest Planning Region** (NWPR) (-3%). Interestingly, for the whole period after 2011, the NWPR has been leading by some of the most

[4] The Regional Innovation Scoreboard presents a comparative analysis of the innovation potential across regions in the EU. It is based on some of the European Innovation Scoreboard indicators for which regional data are available. The ninth edition of 2019 covers 238 regions of 23 member states. The other five member states (Estonia, Cyprus, Latvia, Luxembourg and Malta) are included at national level, as they have the same NUTS1 and NUTS2 levels. Data on Norway, Serbia and Switzerland are also included. The survey is conducted every two years.

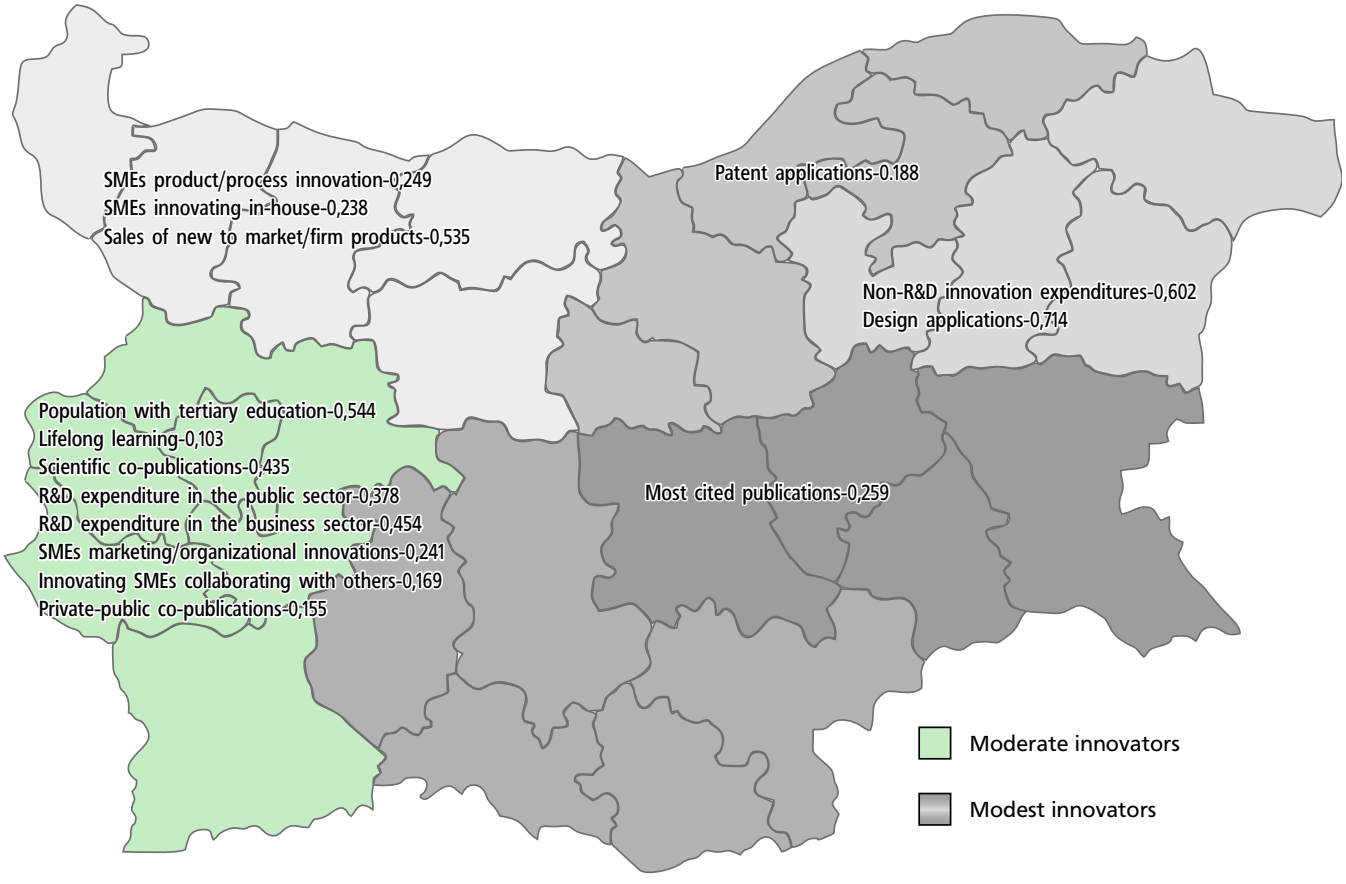
important indicators of innovation activity – product and process innovation, the share of innovative SMEs and the sale of new products. This can be accounted for by the preferential treatment extended to companies from this region in tenders under operational programmes (awarded extra points for coming from this region), especially under "Innovations and Competitiveness."

- The deterioration of the innovation potential of the **Northeast Planning Region** was -1.3%; for the **Southeast Planning Region** -1.5% and for the **South Central Planning Region** -0.9%. The latter does not show nationally leading results by the indicators of the Regional Innovation Scoreboard.

Based on inter-group differentiation, three sub-groups are distinguished in each of the major groups. The regions of the top one-third are marked with a positive sign (+) and the regions of the last one-third are marked with a negative sign (–). The balance for Bulgaria is:

NUTS	Region	RII	Position	Group	Change
BG31	NWPR	31.2	231	Modest innovators –	–3.0
BG32	NCPR	38.4	225	Modest innovators	+1.0
BG33	NEPR	37.3	227	Modest innovators	–1.3
BG34	SEPR	35.7	229	Modest innovators –	–1.5
BG41	**SWPR**	**54.2**	**192**	**Moderate innovators –**	**+2.5**
BG42	SCPR	37.6	226	Modest innovators	–0.9

Figure 7. TOP INDICATORS FOR THE REGIONAL INNOVATION INDEX 2019 BY REGION*



* The data show the normalised values for the indicators for innovation potential analysis

Source: Regional Innovation Scoreboard 2019, https://interactivetool.eu/RIS/index.html

The reasons for the lack of progress in terms of innovation activity (as well as entrepreneurship; see section Entrepreneurship and Innovation Network) are complex and must be sought in a wider range of factors that shape the macro and business environment and in this way determine the behaviour of economic agents and their tendency to innovate:

- Education

The Global Competitiveness Index 2018[5] gives extremely low marks to the quality of educational services in Bulgaria, measured by the set of knowledge and skills of graduating pupils / students – the country ranks between 81th and 118th by the various education degrees in the ranking of 140 countries. Adding to the low lifelong learning outcomes measured by on-the-job training (118th) and the quality of vocational education (99th), the 122nd place by the indicator of difficulties in finding staff with the required qualifications seems perfectly logical.

Even more telling is the assessment of Bulgaria's education system and its relevance to the requirements of a competitive economy, presented in a study by the **Institute of Management Development** (IMD, Switzerland),[6] which ranks the country 63rd among 63 countries.

- Institutions and policies

International studies find increasing bureaucracy, lack of vision and long term perspective, opacity of the political decision-making process and inefficiency in the implementation of government decisions. Thus, it seems that the public administration in Bulgaria has adopted the excessive bureaucracy of its counterpart in Brussels while failing to provide the same quality of service.

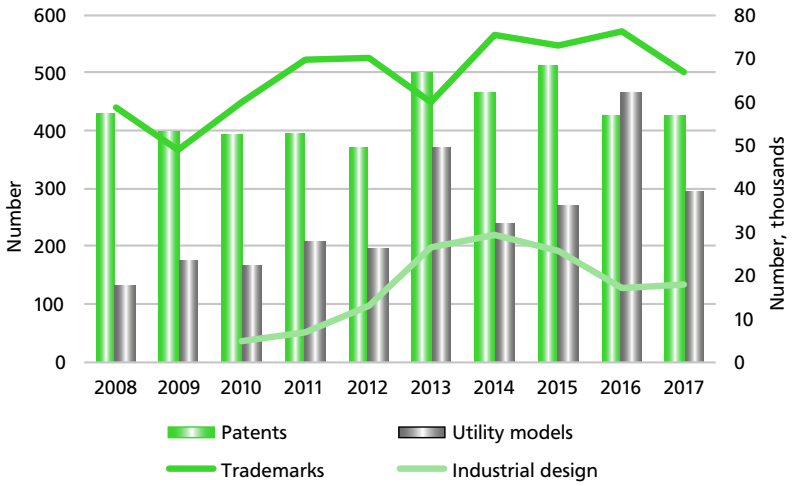
- Justice, safety and security

The assessments of these indicators, as measured by the **Global Competitiveness Index 2018,** rank the country in the backward group - 116th place for presence of organised crime, 99th place for law enforcement reliability, 95th place for independent judiciary, 91st place for media freedom, 118th place for the protection of property and protection of intellectual property.

Bulgaria ranks last within the EU and 77th (sliding down by six positions) in the world ranking of the **Corruption Perceptions Index 2018**,[7] where the country falls into the category of countries where democracy has been undermined.

In the ranking of the Forbes magazine[8] of countries with the best conditions for business, Bulgaria is ranked 46th (penultimate among the EU members) out of 161 countries. Administrative corruption, poor justice, opaque procurement procedures, organised crime are listed as the main barriers to a favourable business environment.

Figure 8. PATENT ACTIVITY OF BULGARIAN NATIONALS IN AND OUTSIDE THE COUNTRY



Source: WIPO IP Statistics Data Center, 2019.

Technological product

The technological product (protected and unprotected new technological knowledge) is the result of creative activities of various participants in the innovation process. It has unique characteristics and economic significance which make it attractive as an object of transfer. The analysis of application and patent activities, 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.

In 2018, patent activity in Bulgaria reached record levels of the last 20 years. Patents granted to Bulgarian inventors amounted to 171 – a level that has not been reached since 1999 and double the level of the preceding year. There is also an increase in foreign holders, albeit at a modest 2% on an annual basis.

During the period 2008 – 2017, **pat-**

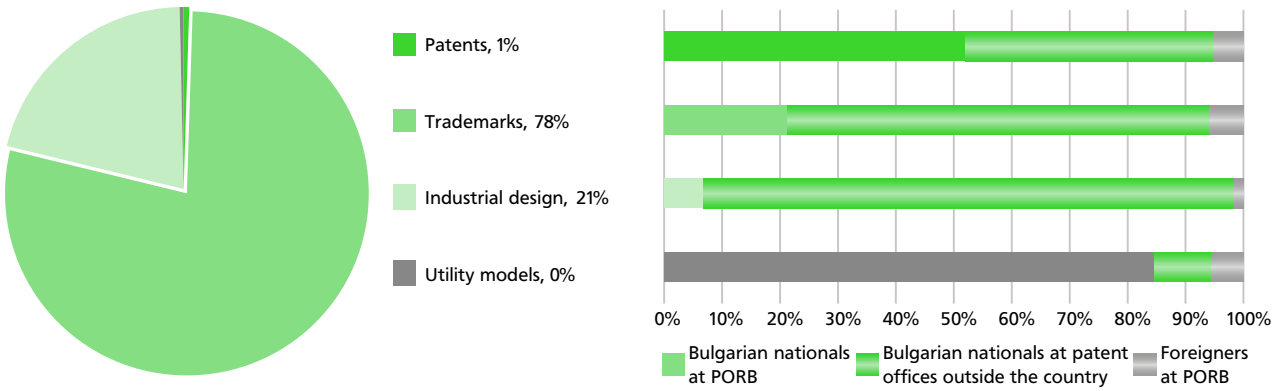
[5] The Global Competitiveness Report 2018, World Economic Forum, https://www.weforum.org/reports/the-global-competitveness-report-2018

[6] IMD World Competitiveness Ranking 2019, https://www.imd.org/wcc/world-competitiveness-center-rankings/world-competitiveness-ranking-2019/

[7] Corruption Perceptions Index 2018, Transparency International, www.transparency.org

[8] Best Countries for Business 2019, https://www.forbes.com/best-countries-for-business/list/

Figure 9. STRUCTURE OF THE APPLICATION ACTIVITY OF BULGARIAN NATIONALS, 2017, %



Source: WIPO IP Statistics Data Center, 2019.

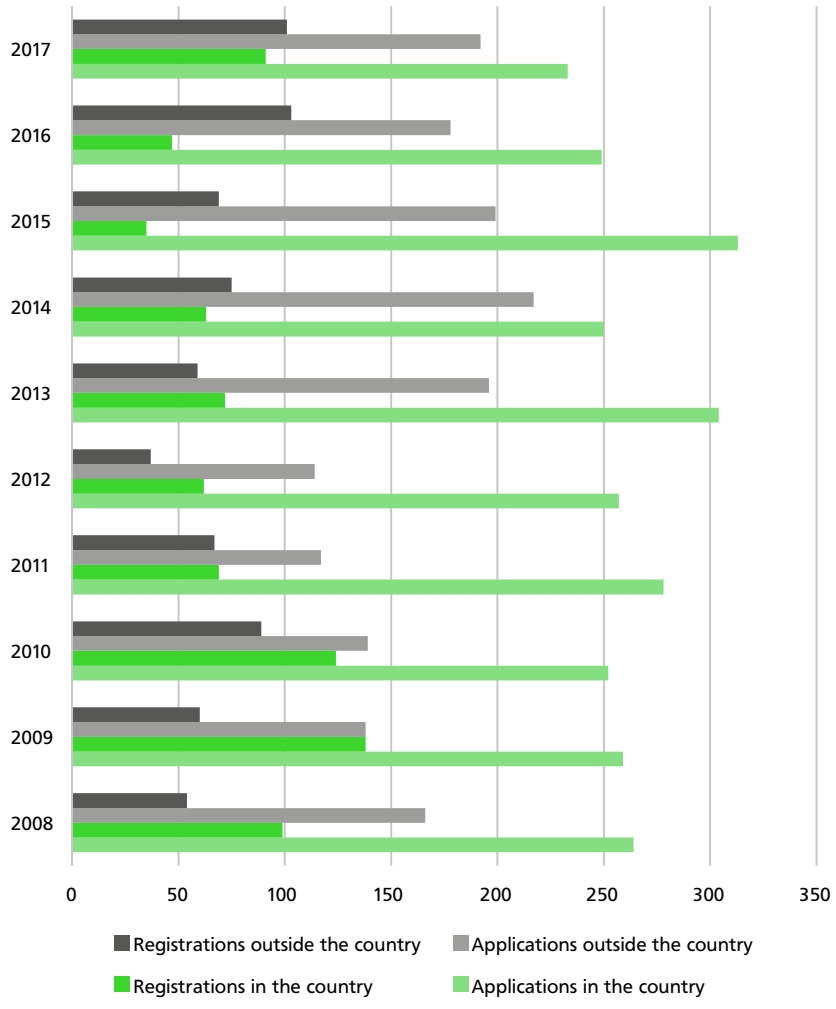
ent activity of Bulgarian inventors remained stable at the level of an average of 430 patent applications per year, filed both with the Patent Office of the Republic of Bulgaria (PORB) and with patent offices outside the country.

In 2017, just over 12,000 patents were in force in the country. Their numbers have been steadily increasing since 2008, growing just over 2.4 times. In addition to patents of Bulgarian origin, whose relative share is below 0.3%, the largest number of active patents in Bulgaria are the USA (22%), Germany (17%) and Switzerland (10%). The total number of patent holders on the territory of Bulgaria in 2017 was 72. The bulk of these patents are filed with the EPO and cover the entire EU. For example, in the same year, only 23 applications for foreign patents were filed nationally, that is, they have as priority the territory of the country.

In 2017, **Bulgarian patent holders maintained 705 active patents outside the country.** The major part of them, over 54%, are directed to the US market. With a much lower priority is Switzerland (5%), followed by France and China (3% each).

There is a growing interest from ap-

Figure 10. NUMBER OF PATENT APPLICATIONS AND REGISTERED PATENTS BY BULGARIAN INVENTORS IN BULGARIA AND OUTSIDE THE COUNTRY, 2008 – 2017



Source: WIPO IP Statistics Data Center, 2019.

plicants towards the so-called small inventions. **The number of utility model applications increased by nearly 80% as compared to the base year 2008.**

Trademark activity was the highest. The number of trademarks reached 75,522 in peak 2014 and, despite some fluctuations, has increased by over 14% for the period.

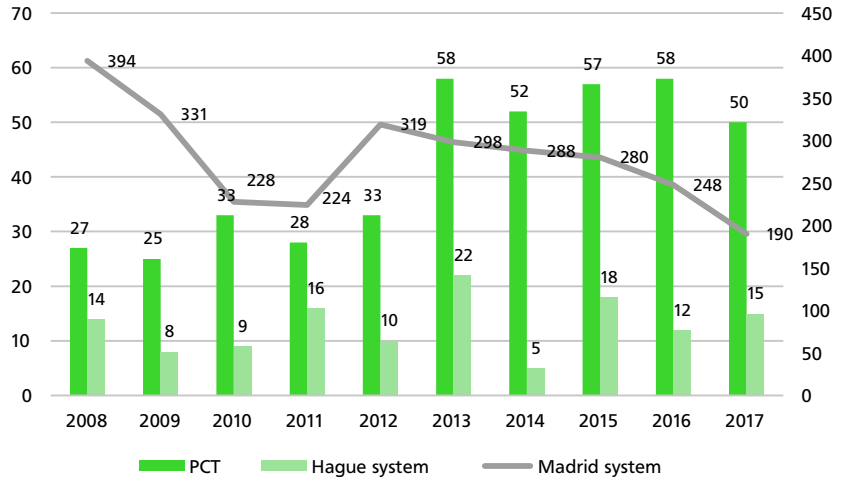
The highest growth was in the applications for industrial design, the number of which in 2017 (17,816) was almost five times higher than in base 2008. The high activity of trademark and industrial design activity is identified as the main comparative advantage of Bulgaria in the European Innovation Scoreboard (see section Innovation Product).

The success rate of patent applications by Bulgarian inventors in Bulgaria is different from that abroad. With a total of 2,659 applications filed with the PORB within the 10-year study period, the patents received for inventions were 800, or just under 31%. **Applications filed with patent offices outside the country have been much more competitive** – nearly 44% of the 1,656 applications were successful.

The international treaties administered by the World Intellectual Property Organization (WIPO) facilitate the acquisition of industrial property rights simultaneously on the territory of a large number of countries at the same time. The system simplifies the application process by eliminating the requirement to submit separate applications nationally on the territory of each country whose market is in the scope of interest of the respective applicant.

According to data from WIPO, nine Bulgarian enterprises filed international patent applications and benefited from the Patent Cooperation Treaty (PCT) in 2016 and 2017:

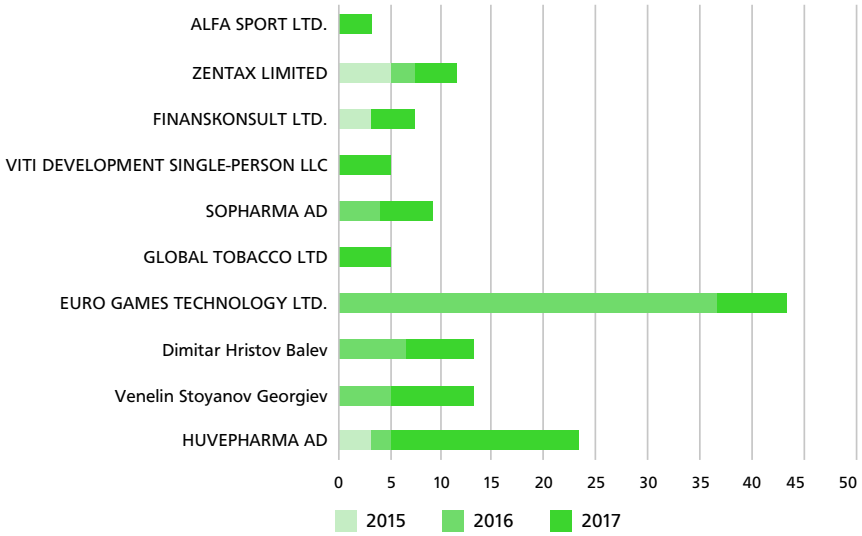
Figure 11. NUMBER OF INTERNATIONAL APPLICATIONS BY BULGARIAN NATIONALS SUBMITTED TO WIPO, 2008 – 2017*



* Patent Cooperation Treaty (PCT) for international protection of inventions; The Hague system for international registration of industrial designs; Madrid international trademark registration system

Source: WIPO IP Statistics Data Center, 2019.

Figure 12. TOP 10 BULGARIAN APPLICANTS FOR TRADEMARKS UNDER THE MADRID SYSTEM, 2015 – 2017, NUMBER



Source: WIPO IP Statistics Data Center, 2019.

- Demax – Holograms AD – 3;
- Huvepharma EOOD – 2;
- Keit LTD[9] – 2;
- Almott OOD – 1;
- Antigona - Art EOOD – 1;
- Bulteh - 2000 LTD[10] – 1;
- Check Point R and D LTD – 1;
- Comac Medical Limited[11] – 1;
- CPD LTD – 1;

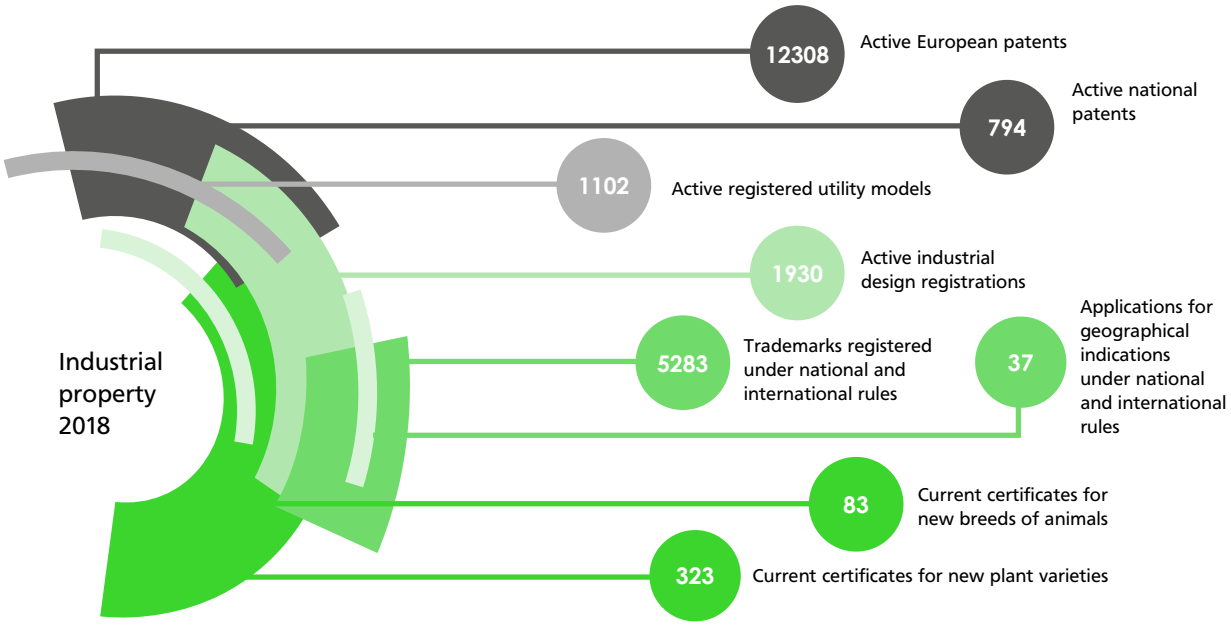
[9] In 2012, the company was award-winner in the category "Independent Life Cycle of the Innovation" in the Innovative Enterprise of the Year competition presented at the Eighth National Innovation Forum organised by ARC Fund.

[10] In 2015, the company was award-winner in the category "Innovative technologies in traditional sectors" in the Innovative Enterprise of the Year competition presented at the Eleventh National Innovation Forum „Development of the innovation eco-system for sustainable economic growth in Bulgaria" organised by ARC Fund..

[11] Milen Vrabevski, M.D., Founder and CEO of Comac Medical was a participant in the Eleventh National Innovation Forum „Development of the innovation eco-system for sustainable economic growth in Bulgaria" organised by ARC Fund in 2015.

Box 2. PORTFOLIO OF INDUSTRIAL PROPERTY IN BULGARIA, 2018

Industrial property objects active on the territory of Bulgaria



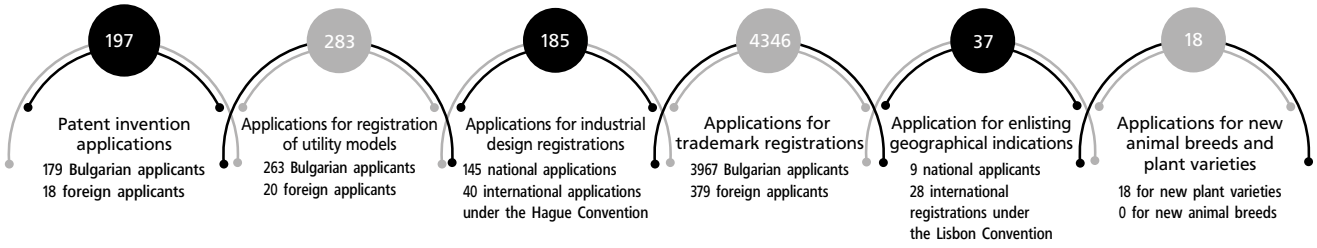
171 patents issued to Bulgarian patent holders

Business sector:
- Almot OOD, Stara Zagora – 4
- AMG Technology OOD, Botevgrad – 2
- ARD OOD, Plovdiv – 2
- Arsenal AD, Kazanluk – 2
- STOA OOD, Sofia -2
- Hyundai Heavy Industries Co. Bulgaria AD, Sofia – 2
- Other – 44

BAS Institutes
- Institute of System Engineering and Robotics - 16
- Institute of Electronics - 4
- ICT Institute - 4
- Space Research Institute - 3
- Institute of General and Organic Chemistry – 3
- Institute of Solid-State Physics – 2
- Institute of Electrochemistry and Energy Systems - 2
- Polymer Institute – 2
- Institute of Mechanics – 1
- Institute of Engineering Chemistry - 1
- Institute of Physical Chemistry – 1
- Institute of Organic Chemistry – 1
- Institute of Molecular Biology – 1

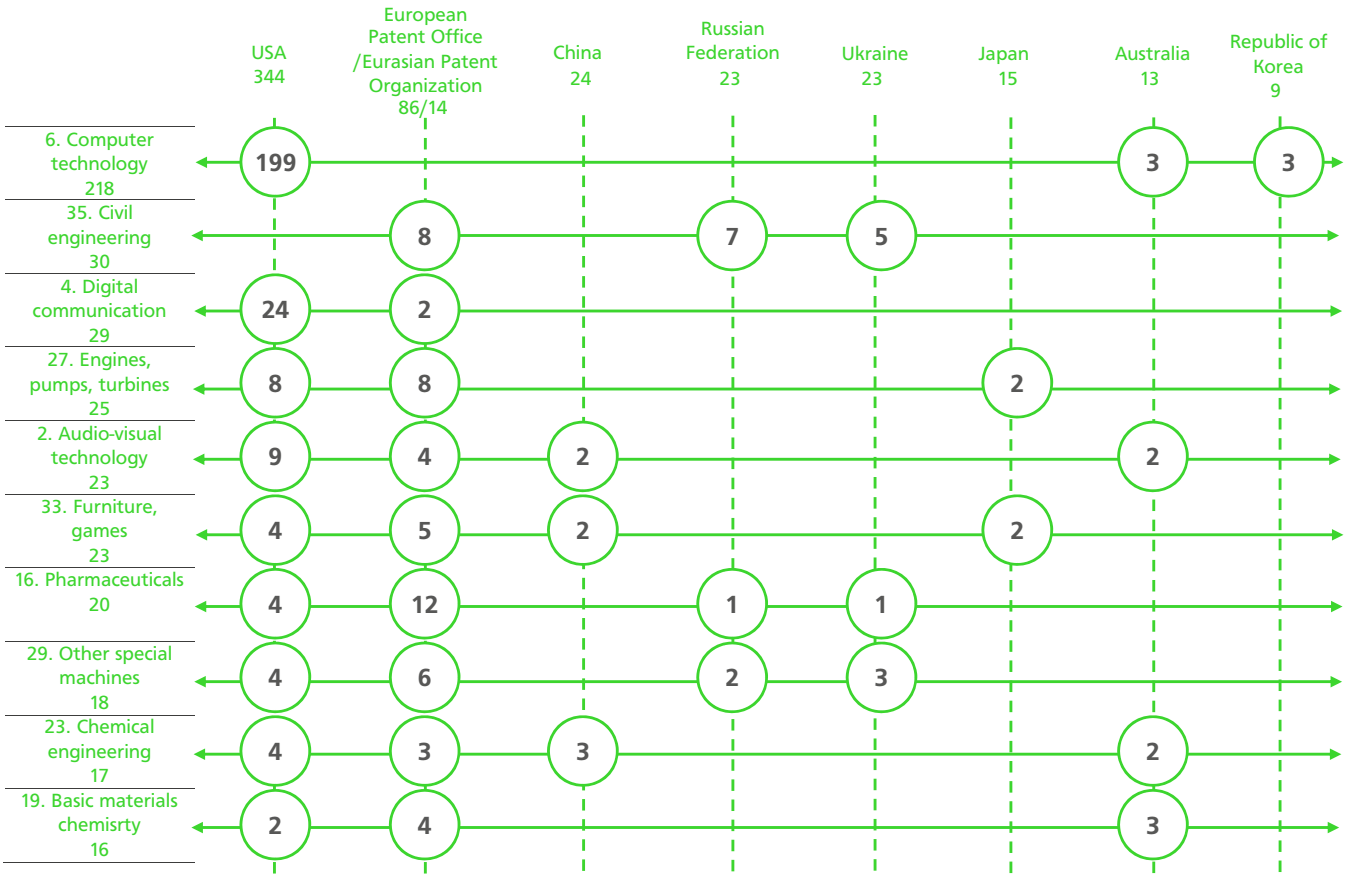
Higher education sector
- Technical University of Sofia – 3
- University of Rousse - 2
- Technical University of Varna – 1
- Sofia University – 1

Applicant activity



Source: bpo.bg

Figure 13. PATENT ACTIVITY OF BULGARIAN PATENT HOLDERS IN FOREIGN PATENT OFFICES, MAIN TECHNOLOGICAL AREAS, 2008 – 2017, NUMBER



Source: WIPO IP Statistics Data Center, 2019.

The main technological fields and target markets of patent activity by Bulgarian inventors changed over time following the processes of harmonisation of the Bulgarian patent legislation with that of the European Community, and with structural and legislative changes globally and in Europe. These changes include:

- **A considerable decline in patent activity** – from over 1,000 patents/copyrights awarded annually on the eve of the adoption of the Patents Act in 1993 to just over 100 patents in 2017.
- The reduction in the number of patents has been accompanied **by a curtailing of the technology portfolio** within which inventions are generated – from coverage of all of 35 areas monitored by WIPO and maintained until 2006 to about 20 technological areas in 2017.
- By 2019, **two major centres of interest have started to emerge** – the European Union through the single Community patent (due to a number of procedural facilitation and easing of the financial burden for patent holders) and the United States, mainly in the field of ICT (computer technology, digital communications, audio-visual technology, gaming).

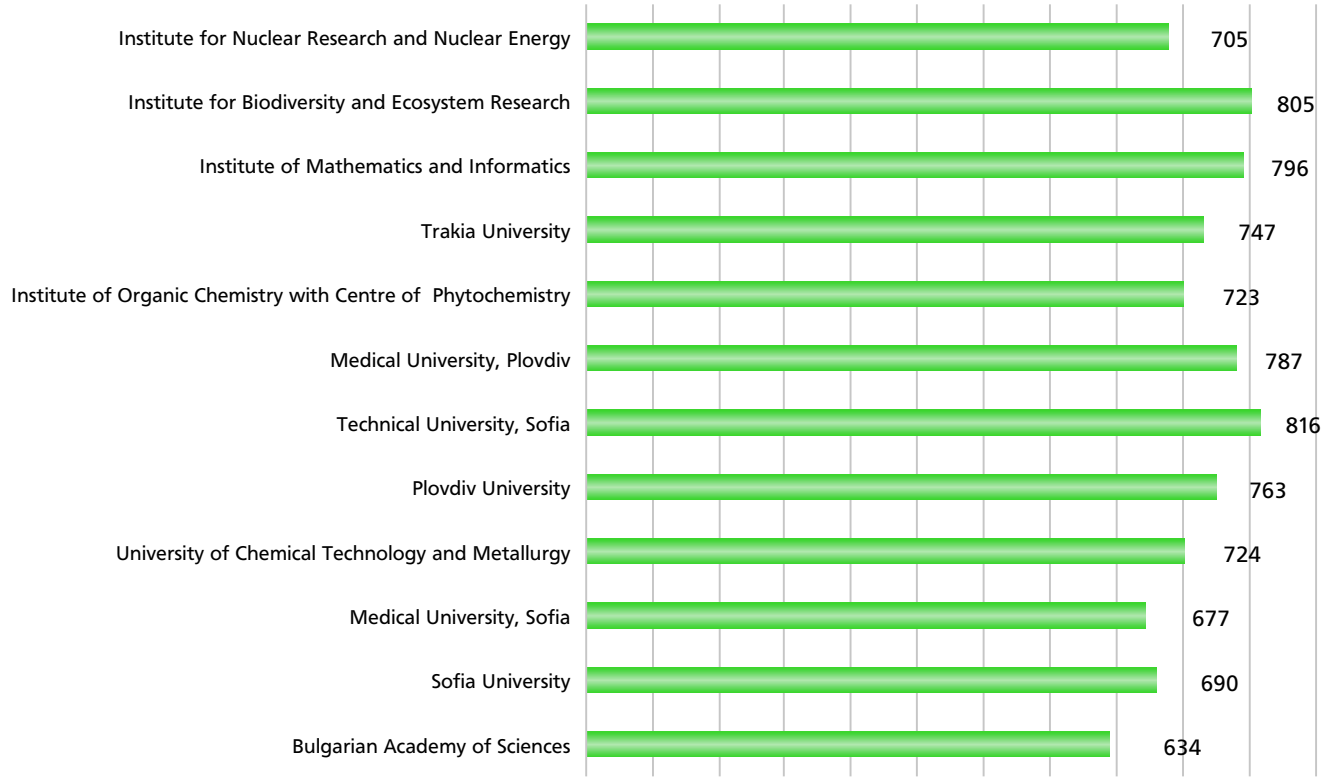
Following the adoption of the Bulgarian Patents Act (1993) and the transition from a European Patent to a Unitary Patent (2011 – 2016), the interests of inventors have shifted from seeking national protection, according to the procedural and financial requirements of each individual European country, to filing single patent application granting regional protection within the EU.[12]

Research product

New scientific knowledge is an important condition for enhanced innovation activity in the country. The analysis of the dynamics and structure of the process of research creation reveals the potential of Bulgaria to successfully fit in the global scientific networks, its comparative advantages in various fields of knowledge and its ability to compete on the market for intellectual products.

[12] With the exception of Spain, Italy and Croatia.

Figure 14. INSTITUTIONS RANKING SCIMAGO, BULGARIA, 2019.



Source: SCImago (2007). SJR – SCImago Journal & Country Rank. Retrieved October 31, 2018, from http://www.scimagojr.com

In 2019,[13] SCImago Institutions Ranking[14] included a total of 12 Bulgarian institutions, five more than in 2018. Despite efforts to avoid duplication and achieve a unique identity by which institutions are presented in the ranking, this has not been fully attained in the case of Bulgaria. The broad boundaries within which Bulgarian scholars define their institutional affiliation lead to a situation in which the Bulgarian Academy of Sciences is present in the 2019 ranking, along with four of its major units. Nevertheless, the fact is that there is an almost twice as good a result on an annual basis in terms of the ranking indicators.

The representatives of Bulgaria are situated in the middle of the second half of the ranking list among 6,459 institutions from around the world engaged in research and ranked at 862 positions. Although they cover both categories – academics and higher education – they are entirely state-owned.

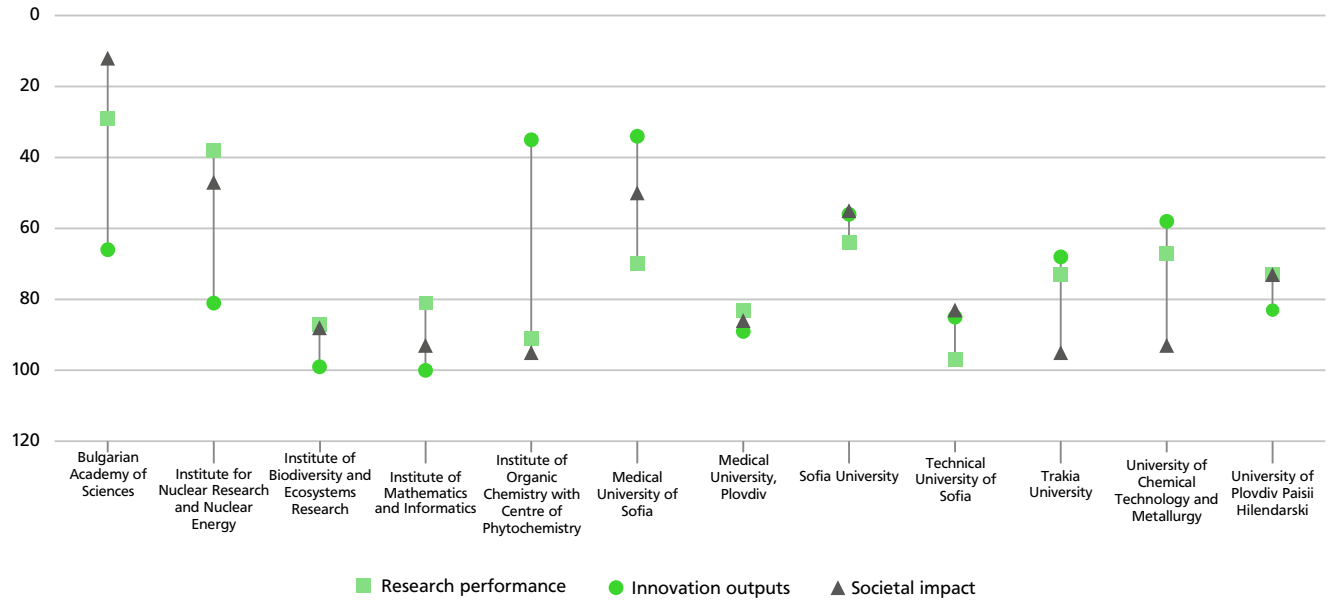
Traditionally, **the structures of the Bulgarian Academy of Sciences are primarily focused on fundamental science and, to a lesser extent, implement applied research** oriented towards concrete innovative results. **An exception is the Institute of Organic Chemistry, where the ratio of pure science to innovation is almost three times in favor of innovation. By this indicator, it ranks second in Bulgaria after the Sofia Medical University**. According to the SIR methodology, the innovation performance is determined by the number of patent applications and scientific articles cited in the patent documentation.

SCImago includes institutions from 133 countries, with the largest number being from the United States (937), China (769) and France (382). Over the last three years, China has been in the top spot in terms of both research achievements and innovation performance indicators. **Bulgaria is ranked 56th in the overall ranking and 20th place within the EU, being one of six new member states included in it.**

[13] For each indicated year, the ranking is based on a five-year period information with a two-year lag (for example, the 2019 data reflect the 2013-2017 period). The ranking includes institutions that have at least one hundred publications in the SCOPUS database during the last year of the surveyed period (in this case 2017).

[14] Scimago Institutions Rankings (SIR) lists research institutions, including higher education institutions, the business sector, NGOs, based on a composite index, which combines three different sets of indicators: research performance, innovation output and societal impact, measured through their web visibility. SIR is a product of Scimago Lab and uses data from the database SCOPUS.

Figure 15. PERFORMANCE BY THE INDICATORS OF RESEARCH EXCELLENCE BY INSTITUTION

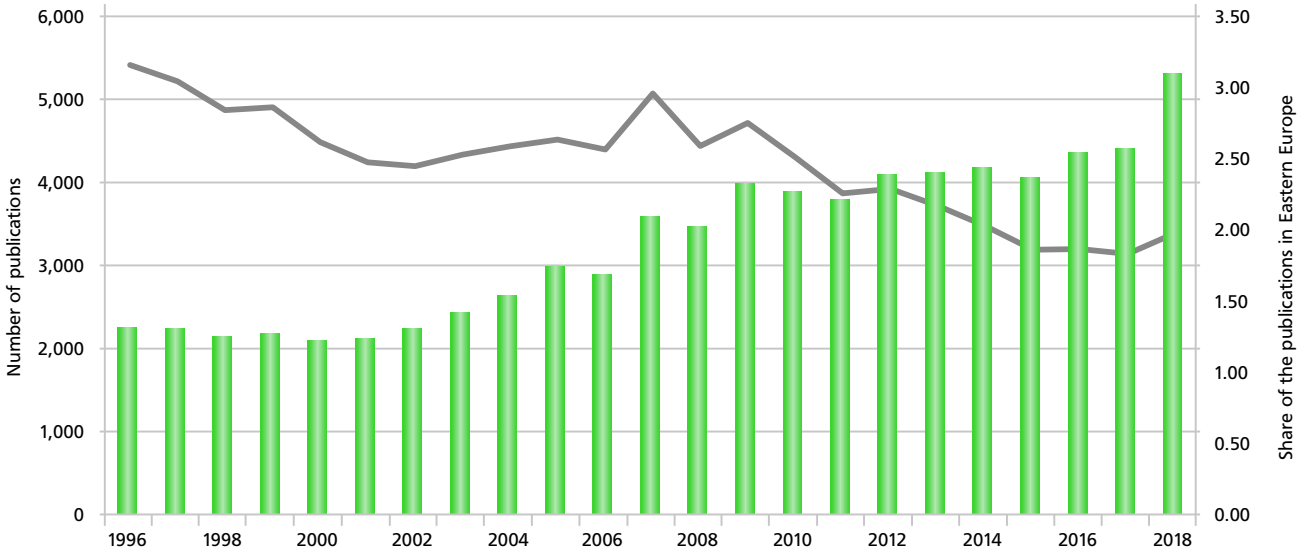


Source: SCImago (2007). SJR – SCImago Journal & Country Rank. Retrieved October 31, 2018, from http://www.scimagojr.com

With an increase of 20% on an annual basis, Bulgarian research units continue the trend of the last 20 years of an increase in the publication activity in the SCOPUS database. For the first time since 2009, this result also provides a greater share of the scientific results created in the country than the scientific product of the countries of the Central and Eastern Europe. Against the background of an average increase of 12% for the region as a whole, Albania registered a growth of over 30%.

The scientific output of the Russian Federation (11th in the world for 2018) and its satellite countries from the former Soviet Union is increasing at similar rates to those of Bulgaria (the highest in comparison with the rest of the EU member states from Central

Figure 16. PUBLICATION ACTIVITY IN THE SCOPUS DATABASE, BULGARIA WITHIN CENTRAL AND EASTERN EUROPE, 1996 - 2018



Source: SCImago (2007). SJR – SCImago Journal & Country Rank. Retrieved October 31, 2019, from http://www.scimagojr.com

and Eastern Europe). The difference is that the scientific communities in these countries are not supported by public funding through the European structural and investment funds, which have been operating in Bulgaria for over ten years.

The human resources capacity in the country remains inefficiently used in terms of the following indicators:

- **publication activity per thousand employed in the field of science and technology**, where Bulgaria (123) is far behind the regional leader Slovakia in the Slovak region (404);
- **the share of publications with international participation**, where after two years of restoring the positions of about 50%, a decrease by 3 percentage points is observed again in 2018;
- **number of international (non-EU) joint scientific publications per 1 million of the population**, considered an indicator of the quality of research. Within the EU, Bulgaria (324) is only ahead of Romania (257) and is three times below the EU-28 average (1070);
- **number of public-private joint publications per 1 million of the population**, in respect of which Bulgaria (16.5) shares the last place with Lithuania (16.4) – five times below the EU-28 average.

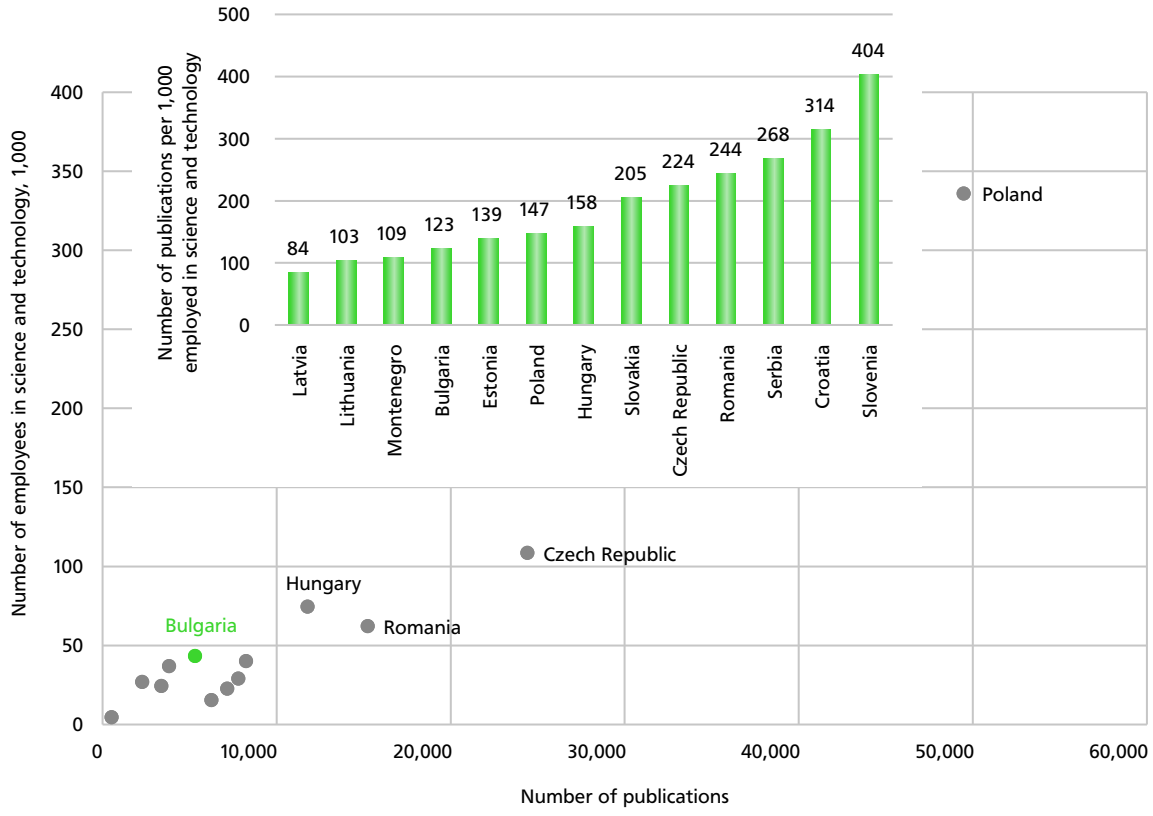
Denmark is the European leader in international scientific cooperation with 2,929 international scientific collaborative publications and 267.6 public-private collaborative publications per 1 million of the population, followed by Sweden on both indicators (2,464 and 251.4 respectively).

The following remain leading scientific areas in Bulgaria:

- **Physics and astronomy** with a total of 18,499 scientific publications for the period 1996-2018, H-index 143 and 14.34 citations per document;
- **Engineering sciences** with a total of 12,212 scientific publications for the period 1996-2018, H-index 95 and 6.76 citations per document;
- **Medicine** with a total of 17,599 scientific publications for the period 1996-2018, H-index 152 and 12.88 citations per document.

Within the period covered by SCOPUS (1996-2018), there is a trend of increasing scientific output in all three areas. However, in the fields of physics and astronomy and engineering, the weaknesses inherent in

Figure 17. PUBLICATION ACTIVITY IN THE SCOPUS DATABASE, CENTRAL AND EASTERN EUROPE, 2018



Source: SCImago (2007). SJR — SCImago Journal & Country Rank. Retrieved October 31, 2019, from http://www.scimagojr.com

the Bulgarian scientific ecosystem, as a whole, are present – a modest increase in the relative share on a regional basis, and a decline in international joint publications. The situation in the field of medicine is radically different – a significant decline in regional representation, accompanied by a clear trend of increase in international collaboration, resulting in an increase in the number of scientific publications with international participation.

Figure 18. NTERNATIONAL SCIENTIFIC CO–PUBLICATIONS PER MILLION POPULATION, NUMBER, 2018

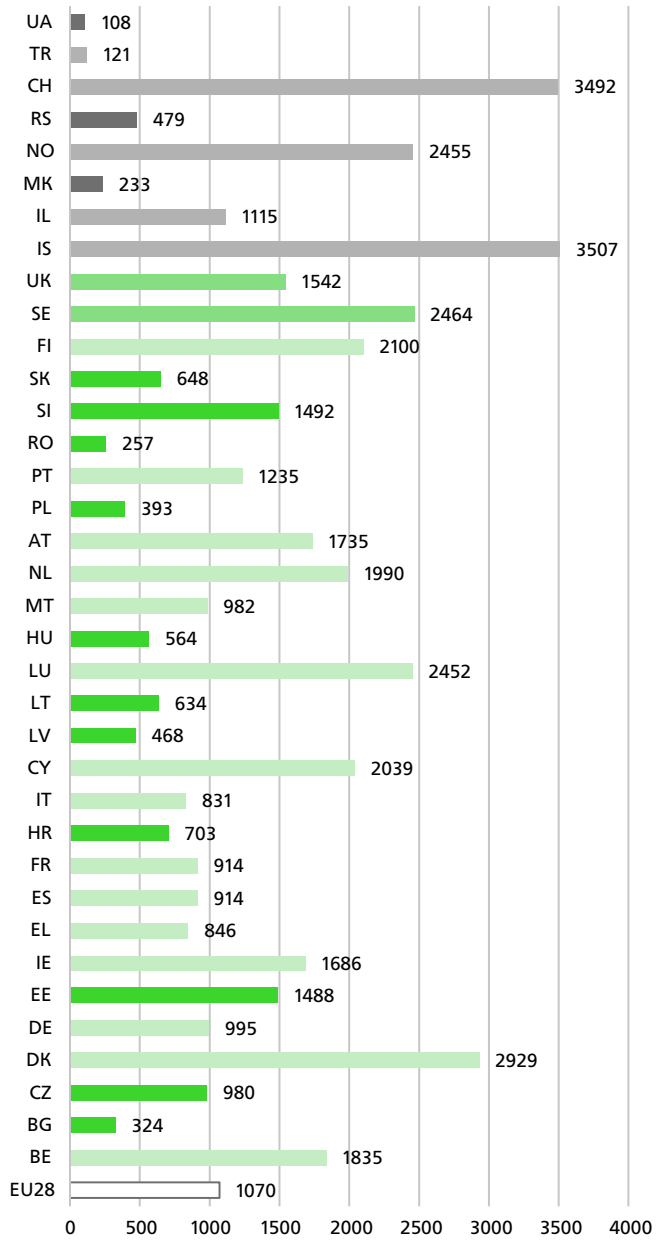
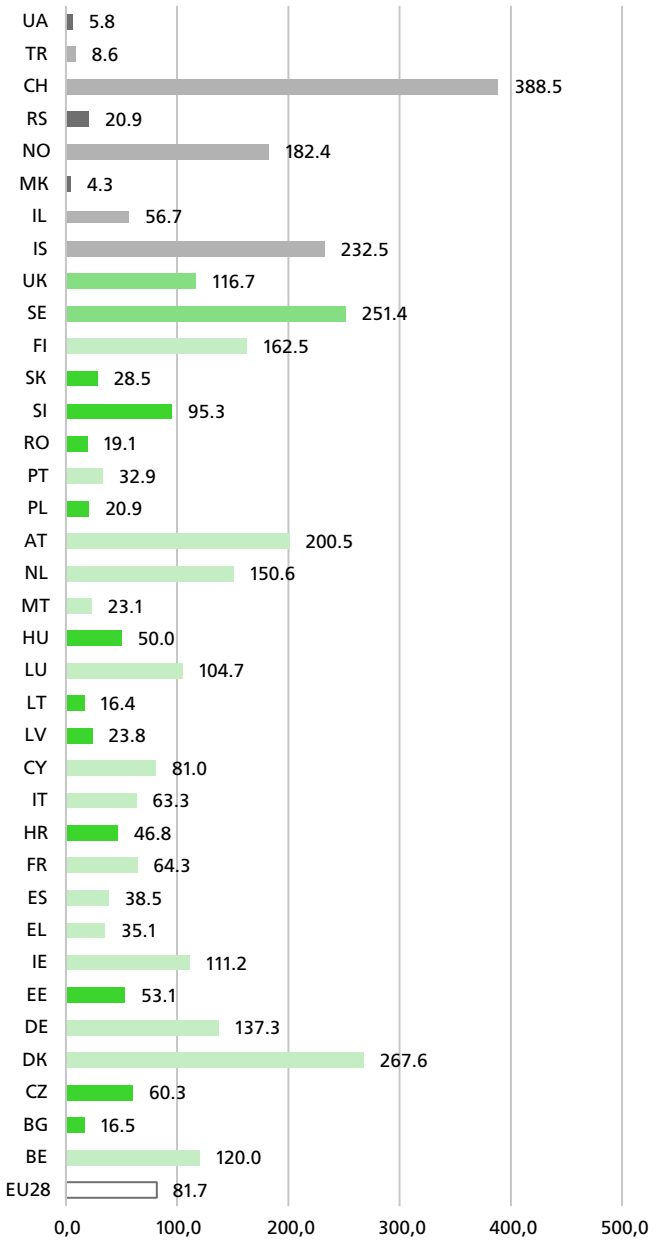


Figure 19. PUBLIC – PRIVATE SCIENTIFIC CO–PUBLICATIONS PER MILLION POPULATION, NUMBER, 2018



Source: European Innovation Scoreboard 2018, https://interactivetool.eu/EIS/index.html

Entrepreneurship and innovation networks

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

Entrepreneurial environment

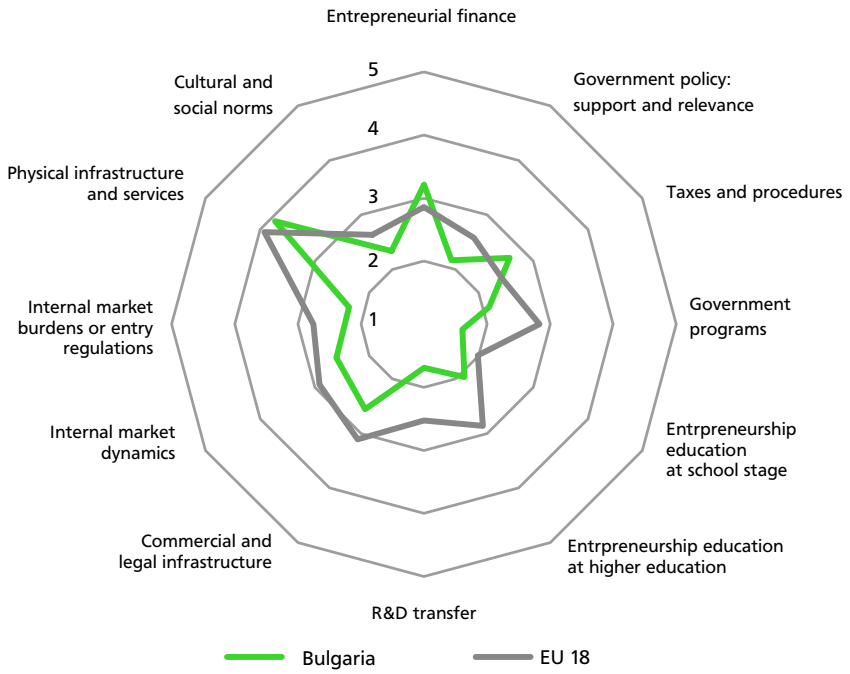
In the **National Entrepreneurship Context Index**[15] launched in 2019, **Bulgaria ranks 36th of the 54 countries** included in the Global Entrepreneurship Monitor (GEM). A score of 4.66 out of 10 places the country **14th among 18 EU countries**[16] (ahead of Italy, Greece, the Czech Republic and Croatia) and **8th in the group of 14 middle-income economies** where Bulgaria is the only EU member state.

After Qatar (6.7) and Indonesia (6.6), the Netherlands (6.5) is the first European economy with the most favourable impact of business environment factors on entrepreneurial culture and starting a business.

The index was calculated on the basis of 12 indicators reflecting different aspects of the entrepreneurial environment. **The highest rating for Bulgaria is in the access to physical infrastructure at a price that does not discriminate against SMEs** – a level of 4.07, which is slightly above the average for the 18 EU member states surveyed. Traditionally, the environment in the country in terms of tax burden and access to finance is comparatively better. **The main challenges are related to the following factors:**

- **the focus of government policy on entrepreneurship** and the presence of this topic on the political agenda of the government;
- **entrepreneurship training** at both the elementary and secondary education stages (1.79, which is the lowest country score among all 12 indicators) as well as in higher education and the initiatives for vocational and dual education (2.44 and one of the last places among the EU-18).

Figure 20. FRAMEWORK CONDITIONS FOR THE ENTREPRENEURIAL ECOSYSTEM, 2018



Source: The 2019 Global Entrepreneurship Monitor (GEM).

Ten years after the launch of the Small Business Act – the main European SME strategic document – the publication[17] tracks the progress of small and medium-sized enterprises and the extent to which they managed to recover their economic positions after the financial and economic crisis. **With a growth of 45.3% of the value added by non-financial SMEs for the period 2008 – 2017, Bulgaria ranks third in the EU-28 after Malta and Luxembourg**, while the EU-28 average is 14.3% and six member states have negative values: Italy (-0.8%),

[15] Global Entrepreneurship Monitor (GEM) 2018/2019, Global Entrepreneurship Research Association (GERA), 2018, ISBN: 978-1-9160178-0-1. https://www.gemconsortium.org/report/gem-2018-2019-global-report

[16] The 2018/2019 Global Entrepreneurship Monitor covers 18 EU member states: Austria, Bulgaria, Croatia, Cyprus, France, Germany, Greece, Ireland, Italy, Latvia, Luxembourg, the Netherlands, Poland, the Czech Republic, Slovenia, Spain, Sweden and the United Kingdom.

[17] Annual Report on European SMEs 2017/2018. The 10th anniversary of the Small Business Act. ISBN 978-92-79-96822-8, ISSN 2467-0162, DOI 10.2873/248745, European Union, 2018.

Figure 21. NUMBER OF EMPLOYEES IN THE SME SECTOR*

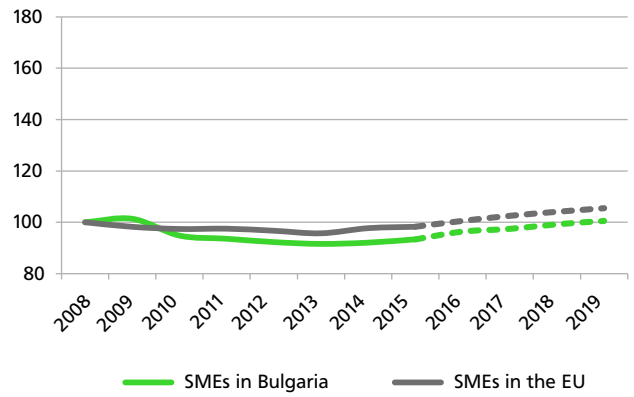
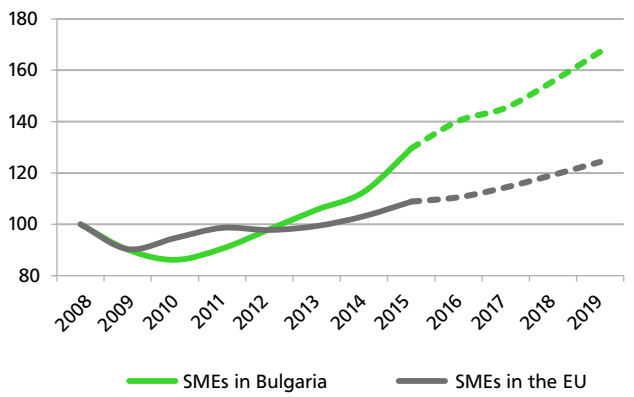


Figure 22. VALUE ADDED IN THE SME SECTOR*



* Index: 2008=100. Data for the period after 2016 inclusive are estimated.

Soiurce: 2017 – 2018 Small Business Act Database.

Portugal (-1.3%), Hungary (-1.5%), Cyprus (-15.1%), Spain (-17.1%) and Greece (-44.3%). This achievement is against the backdrop of a 2.6% decline in employment in this sector compared to pre-crisis 2008 levels. The growth of value added in the SME sector in Bulgaria is close to 68% of the growth recorded by all non-financial institutions, which ranks the country ninth in the EU-28.

In the SME group, micro-enterprises make the most significant contribution – 20.4% in terms of GDP growth and 45.9% in terms of productivity growth. In comparison, the contribution of small enterprises is 17% and 40.6% respectively, while for medium-sized enterprises it is 11.2% and 30.1% respectively.

Despite the positive impact on economic performance, **SMEs numbers in the country are declining at the highest rate among the EU-28** – minus 6.8 for the period 2012-2015. The main reason for winding up a business for 57.7% of entrepreneurs was the inability to achieve a positive financial result, while for the other 22.7% the main factor was a problem with financing.[18]

In terms of the implementation of the basic principles set out in the Small Business Act, **the factors with no progress and which are the main obstacle for SMEs include:**

- **administrative burdens**, primarily in relation to the time required to pay taxes (the highest value within the EU, measured in hours per year), the competences and efficiency of public administration in providing business services;
- **state aid and public procurement** – Bulgaria is far below the EU-28 average in terms of business participation in public procurement, with a declining trend from 24% in 2015 to 21% in 2017, compared to the EU average of 32%.

Notable against this background are actors who actively pursue a wide range of goals with the potential to improve the entrepreneurial environment as a whole. A case in point is the **Bulgarian Start-up Association** (BESCO), whose portfolio of initiatives includes:

- Legal regulation of **personal bankruptcy**

Existing regulations are aimed at treating and even prosecuting the insolvent individual. Bulgaria is the only EU member state where adequate second-chance mechanisms are not implemented. Under current legislation, the consequences of a bankruptcy are equally serious for both large enterprises and small entrepreneurial projects. Part of the problem is rooted in the fact that the public administration and business in Bulgaria exist in two different worlds, and the efforts are aimed at bridging the points of view and creating opportunities for future successful endeavours based on the experience gained.

- **Start-up visa**

A start-up visa is seen as a fast track for entrepreneurs from outside the EU who want to establish themselves in Bulgaria. Adequate legislation has already been adopted in 14 EU member states. Such a visa would shorten the start-up period for non-EU companies from two years to about two months.

- **A contractual joint-stock company**

Such a change in the *Commerce Act* creates a new type of company offers very great flexibility in terms of management: it allows the issuance

[18] Global Entrepreneurship Monitor (GEM) 2018/2019, Global Entrepreneurship Research Association (GERA), 2018, ISBN: 978-1-9160178-0-1. https://www.gemconsortium.org/report/gem-2018-2019-global-report.

Figure 23. NUMBER OF ENTERPRISES IN THE SME SECTOR

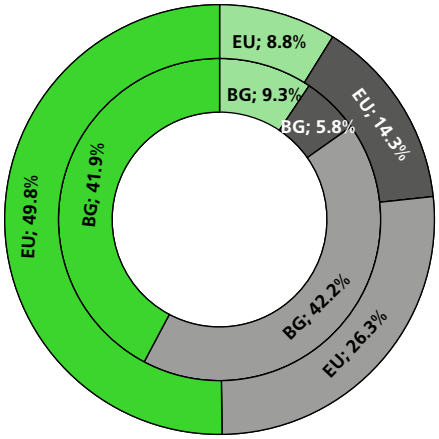
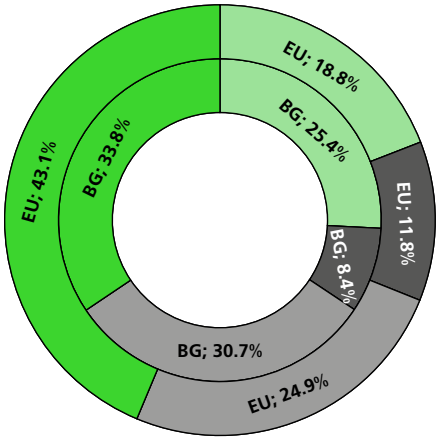


Figure 24. NUMBER OF EMPLOYEES IN THE SME SECTOR



Source: 2017-2018 Small Business Act Database.

of different classes of shares and bonds, enables the so-called option pools that allow employees to share in the ownership, once certain results have been achieved and requires low initial capital.

Other initiatives which contribute to the advancement of entrepreneurship are:

- **Youth Entrepreneurship Exchange**

The idea of supporting and encouraging youth entrepreneurship as a way of tackling many social challenges is part of the philosophy of the **Causes Foundation.** The result is the Youth Entrepreneurship Exchange which started in 2010. The Exchange matches social projects with potential investors. To this end, beginner entrepreneurs go through intensive training and personal consultations to validate ideas, develop a business plan, and improve their presentation skills. The Exchange uses the speed dating approach, in which each participant meets and presents his idea only to investors who have been previously evaluated as suitable. This is also the main criterion for the pre-selection of applications.

- **Teennovator program establishing of school clubs for entrepreneurship**

The organiser and facilitator of the Teennovator program in Bulgaria is the **Proznanie Foundation.** The program is approved by the Ministry of Education and Science and is implemented in schools. The inclusion of 10th or 11th grade students in start-up clubs is completely free and optional. The program is already implemented in 10 schools in Sofia, 4 in Varna and 2 in Vratsa. Teennovator works on the basis of weekly meetings between the students at the start-up club at the respective school and two mentors. From October to January, the team develops the so-called soft skills, and after a start-up weekend in January, work begins on a specific idea. The result is a new business project, ready for presentation to investors at a national competition in May. The purpose of the program is to stimulate creative thinking and self-confidence. It is important that the skills learned within the program are applied in the life and career of students after graduation.

- **Individual mentoring program**

ABLE Mentor was established in 2013 within the **Association of Bulgarian Leaders and Entrepreneurs - ABLE.** The initiative was developed as a tool to address several gaps in Bulgarian education: insufficient career and further education orientation in upper secondary schools; lack of confidence among graduates; lack of basic skills in planning, communication, teamwork, meeting deadlines and more. The idea of individual mentoring relies on bringing participants out of classrooms. After 6 years of running, the program has 12 successful seasons and over a thousand participants from 12 cities.

Entrepreneurial activity and entrepreneurial attitudes

The entrepreneur in Bulgaria is traditionally perceived as an abstract image considerably removed from real life. As a result, Bulgarians between the ages of 18 and 64 are ranked 47th (out of 49) in recognising business start-up opportunities, ranked 42nd by self-assessment as potential entrepreneurs, and ranked 47th by entrepreneurial intentions (only 3.9% showed such an intention).

At the same time, nearly 70% of the population between the ages of 18 and 64 associates entrepreneurship with high social status, and 63% identify it as a good career opportunity. The media in no way contribute to changing the status quo – Bulgaria is again **47th in GEM** in terms of media

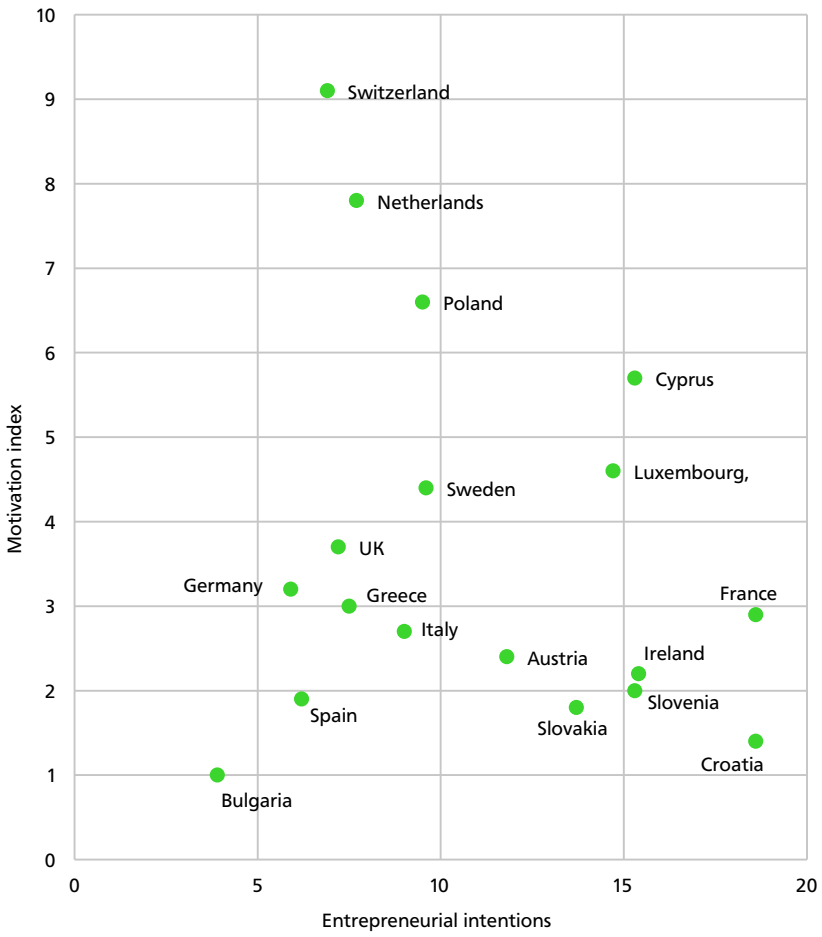
coverage of entrepreneurial activity.

The typical entrepreneur in Bulgaria is a man (6.4% of all men and 45th place) between the age of 25 and 34 (8% of the age group and 40th place) who started a business in wholesale/ retail (47.4 % of all new business ventures) in order to seize a specific opportunity and/or to achieve income growth (72% and 32nd place). In terms of women's entrepreneurship (5.6% of all women), Bulgaria occupies a higher position in the ranking (34th), although within both categories entrepreneurial activity is weak.

The impact of entrepreneurial activity on the three main aspects of sustainable development remains relatively low:

- **economic impact** – just under 15% of entrepreneurs state that the products and services they offer have unique properties and are new to the market; twice as low (7.4%) is the proportion of entrepreneurs who are willing to market their products on international markets;
- **social impact** – over 72% of entrepreneurs do not envisage job creation within a five-year perspective, ranking the country with the unenviable fourth place in the GEM ranking; only 2.5% are those who believe they can expand their business and thus employ six or more new employees;

Figure 25. ENTREPRENEURIAL ACTIVITY PROFILE, EUROPE, 2018



Source: The 2019 Global Entrepreneurship Monitor (GEM).

- **environmental impact** – Bulgaria is at the bottom of the European SME ranking by measures taken to improve resource efficiency in accordance with the priorities the Small Business Act. Entrepreneurs in the country diverge significantly from the average European levels both in terms of green products and services and in terms of public support for implementing initiatives in this regard.

Box 3. THE FIRST BULGARIAN HEALTH & LIFE SCIENCES CLUSTER INITIATES THE ESTABLISHMENT OF A NATIONAL BIOTECHNOLOGY PARK IN SOFIA

HEALTH & LIFE SCIENCES CLUSTER

The first Health & Life Sciences Cluster Bulgaria was established at the end of 2018 to develop the ecosystem, promote innovation in the sector and stimulate technology transfer.

More than 30 companies in the field of biotechnology and life sciences are founders and members of the cluster. Among them are Micar Innovation, Printivo, Bulbera, Institute for Medical Research (winners of the Innovative Enterprise of the Year awards), as well as NutriGen, Fidelis Research, CleanTech Bulgaria, Revita Labs, Massmedia Foundation, Savov & Partners law firm, National Representation of the Bulgarian Start-up Association (BESCO) and others. The companies work in the field of the discovery of new drug molecules, 3D printing of human tissues, genetic tests, clinical laboratories, clinics, factories for the production of med-

Box 3. THE FIRST BULGARIAN HEALTH & LIFE SCIENCES CLUSTER INITIATES THE ESTABLISHMENT OF A NATIONAL BIOTECHNOLOGY PARK IN SOFIA (CONTINUED)

icines and medical equipment, production of nutritional supplements and more. The organisation also includes patent law experts, financial experts, journalists and PR experts to support business development and innovation.
The mission of the organisation is to help Bulgaria establish itself as an international centre for biotechnology, health and life sciences. It promotes partnerships between academia, entrepreneurs, investors and public institutions. The cluster plans sector and cross-sector market analysis and mapping of high value-added industries and high-tech productions at national and regional levels. Among the plans of the cluster are the creation of a Media Centre to train and develop the competencies of journalists in the field, as well as hub for translational research ethics. Cross-cutting projects in the field of artificial intelligence and life sciences have been initiated.
The organisation runs projects with partners from South Korea, Italy and Austria. The cluster partners with Sofia Tech Park, Sofia Municipality, the ministries of education and of the economy, the Bulgarian Chamber of Commerce and Industry, the Small and Medium Enterprises Promotion Agency (BSMEPA), in developing and supporting the design of policies for the high value-added sectors in Bulgaria, as well as building the link between universities and scientific institutes with business. The organisation has started establishing a presence in the cities of Plovdiv, Varna and Pleven.
In 2020, the National Biotechnology Park in Sofia will launch a series of events, including a cluster conference with participants from over 40 countries. Bulgaria is also selected for the next stop at the European Biobank Week.

Source: Applied Research and Communications Fund

Box 4. STUDYHUB – THE FIRST SHARED LEARNING SPACE IN BULGARIA

StudyHub

StudyHub, the first shared learning space in Bulgaria, opened in Sofia in October 2019. Its initiator is the Students in Action Association – a team of young people from the Sofia University St. Kliment Ohridski and the New Bulgarian University. StudyHub is a 24/7 learning space where students can study, collaborate and advance on the path from university to professional fulfilment.
The Association started the project two years ago and participates with it in various business formats for project development and recruitment of associates and investors. It also organises crowdfunding campaigns and has found a private property that transforms into a learning space according to the philosophy of shared workspace – with self-study rooms and common areas where students can connect or attend events and lectures.
The Association has a library of specialised, scientific and fiction literature received through donations from individuals, companies and NGOs. Student access is provided through subscription cards, without restriction to the higher education institution in which they study.
The next step in the development of the project is the creation and management of a community of students, faculty, and employers to develop together an ecosystem for knowledge transfer and business skills. The Association organises soft skills training, communication and career orientation, so that students can successfully start their professional career. StudyHub follows the trend of adaptive and flexible non-formal education to meet the needs of new generations. This is the first step towards a change in higher education from the inside out to the practical sharing of knowledge. The next challenge for StudyHub is to ensure the economic sustainability of the project and to develop its added value towards creating and managing a whole social community.
StudyHub is located close to public transport stations, has 24/7 access, an environment adapted for disadvantaged persons, and constant security video surveillance.

Source: Applied Research and Communications Fund

Investment and Financing of 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.

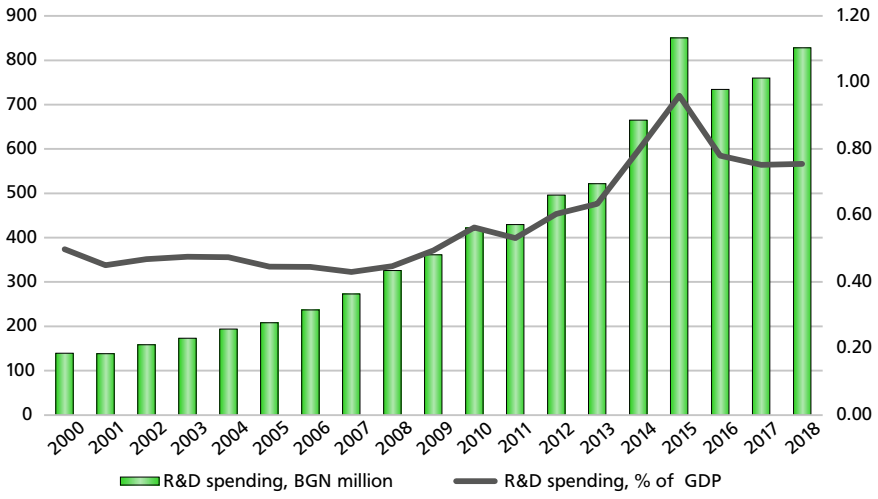
R&D spending

In 2018, R&D spending in Bulgaria in absolute terms reached BGN 827.621 million, which is an increase of just over 8% on an annual basis. However, as GDP growth amounts to the same value, **the share of R&D spending to GDP remains at the level of 0.75% as in 2017, or exactly half of the national 2020 target of 1.5%.**

For the third consecutive year, government spending on R&D as a share of GDP remains at 0.17%, the lowest level for the whole period after 2000. The government subsidy of BGN 182.841 million for R&D in absolute amount represents an annual growth of just under 4% and is again compensated by an increase in business sector R&D spending. In 2018, enterprises spent a total of BGN 594.800 million (11% annual growth) on R&D, equivalent to 0.54% of GDP. Compared to other institutional sectors, **only the increase in business sector R&D spending is able to outpace GDP growth and form an increasing relative share.**

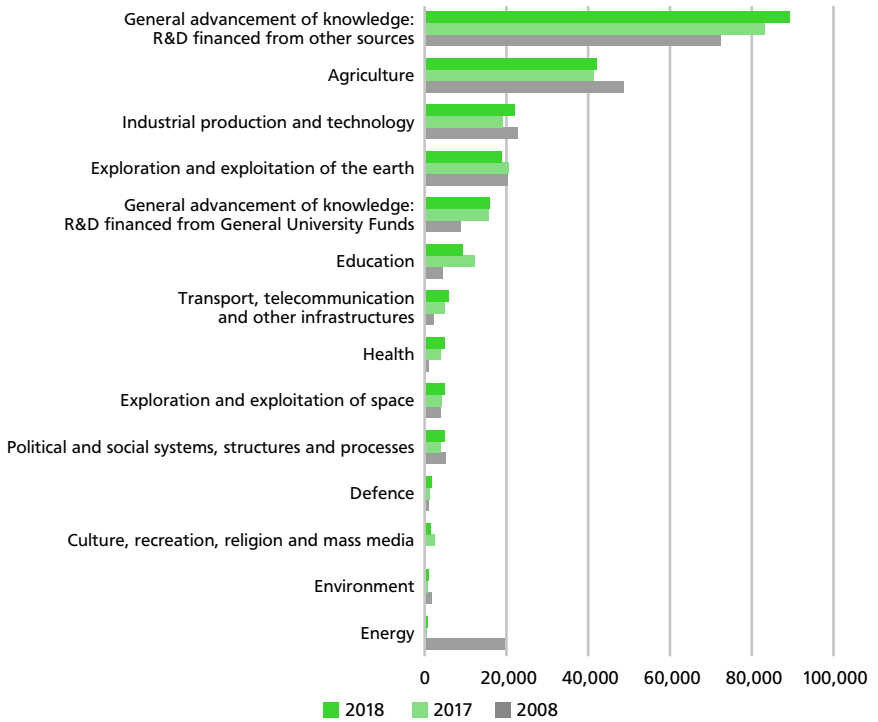
For the first time since 2007, **all institutional sectors – without exception – have increased research and development funding.** After Bulgaria's accession to the EU, the main driving force for business has been the ability to use European structural funding through operational programs. In fact, **over 88% of foreign-source R&D funding is allocated to enterprises.** Since the launch of the OP Science and Education for Smart Growth, this applies to universities and research units, which re-

Figure 26. R&D SPENDING IN BULGARIA, 2000 – 2018



Source: NSI, 2019.

Figure 27. PUBLIC SPENDING ON R&D BY SOCIO-ECONOMIC OBJECTIVES, BGN THOUSAND

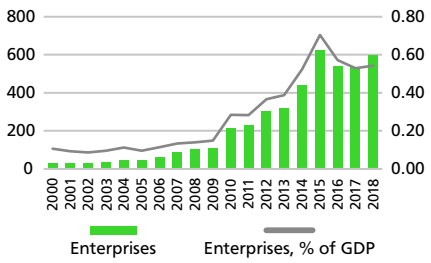


Source: NSI, 2019.

Box 5. STATE AND DYNAMICS OF R&D INVESTMENTS IN BULGARIA BY SECTOR

BUSINESS SECTOR

Dynamics of R&D expenditures, BGN million



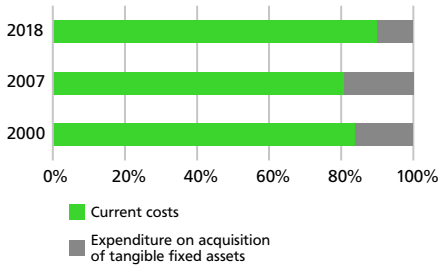
+11.37%

growth compared to the previous year of the funds spent

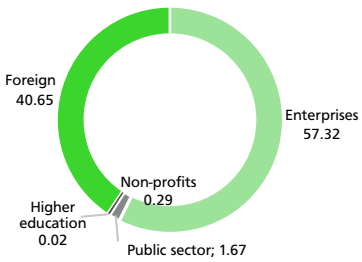
+8.40%

growth compared to the previous year as a source of funding

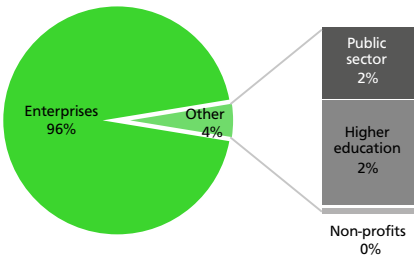
Types of R&D expenditures



R&D expenditures by source of funding



R&D expenditures by sector of investment

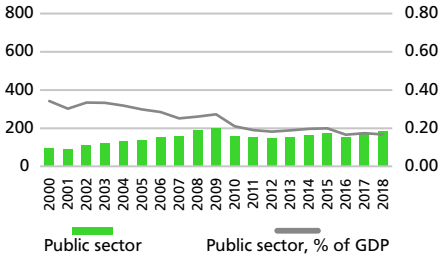


73.12%

technical sciences

PUBLIC SECTOR

Dynamics of R&D expenditures, BGN million



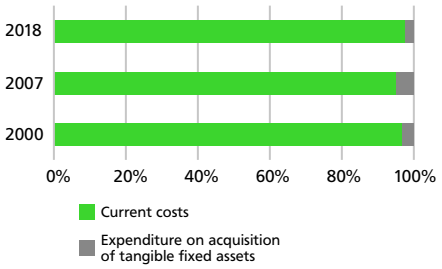
+3.73%

growth compared to the previous year of the funds spent

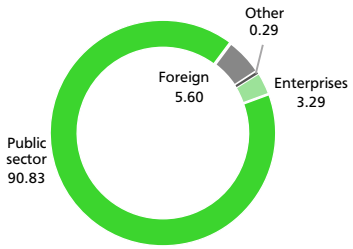
+4.88%

growth compared to the previous year as a source of funding

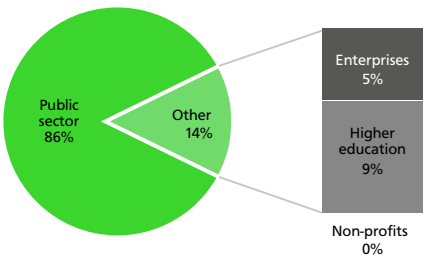
Types of R&D expenditures



R&D expenditures by source of funding



R&D expenditures by sector of investment

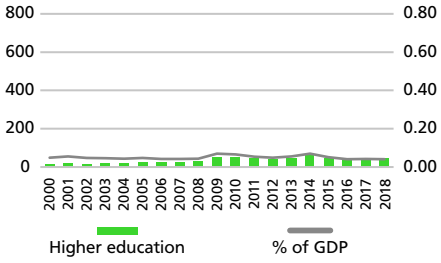


46.63%

natural sciences

HIGHER EDUCATION

Dynamics of R&D expenditures, BGN million



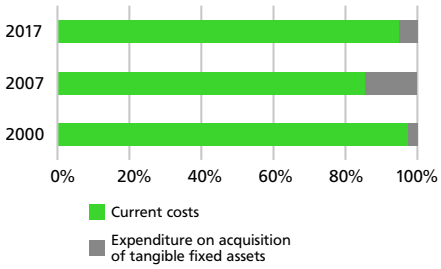
+3.91%

growth compared to the previous year of the funds spent

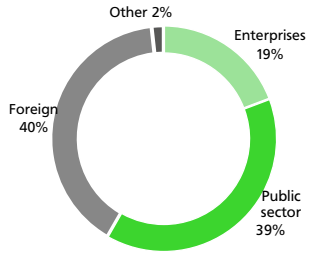
+76.65%

growth compared to the previous year as a source of funding

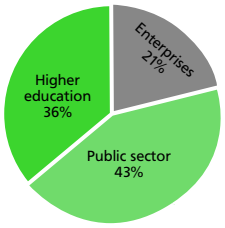
Types of R&D expenditures



R&D expenditures by source of funding



R&D expenditures by sector of investment



29.32%

natural sciences

Source: NSI, 2019

ceive respectively 6.6% and 3.7% of R&D funding from abroad.

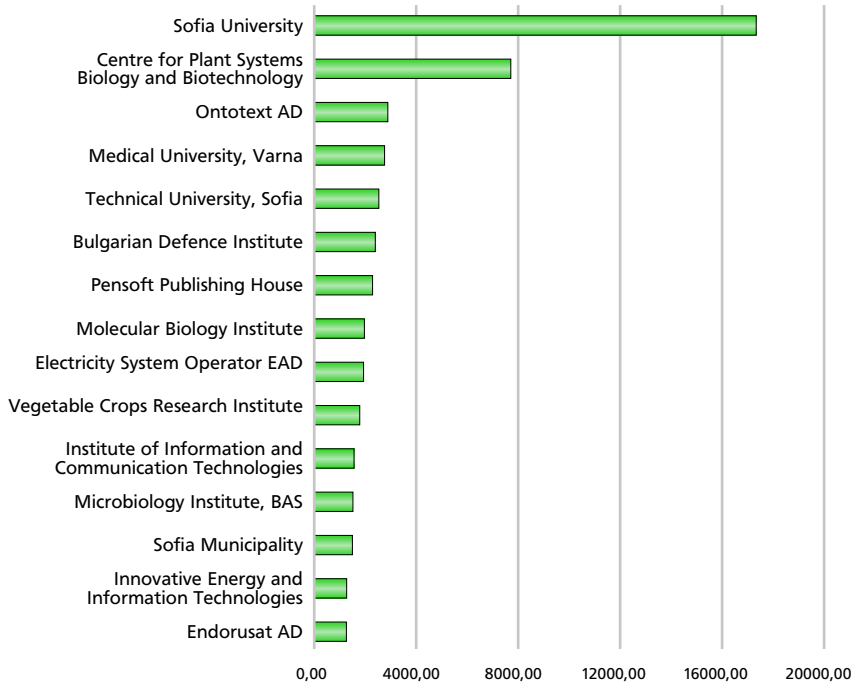
Within the business sector, only no-employee enterprises reported a 34% decrease in R&D spending. This does not have a significant impact on the sector as a whole, as self-employed entrepreneurs account for just over 1% of all business R&D expenditure. In all other categories of enterprises there is an increase in R&D funds. The increase is most pronounced for micro-enterprises – 37% with a 9% share in the general budget of the sector, followed by enterprises with between 250 and 499 employees – 20% growth and again 9% of all R&D expenditure of the sector. Large enterprises with staff of more than 500 people have increased their R&D budget by nearly 9% with a 40% share in the group.

In 2018, funds for the development of the technical (up to BGN 477 million), medical (BGN 144 million) and natural (BGN 116 million) sciences increase by 10 to 11%. Minimal increase – 1–2% – was registered for the humanities (BGN 30 million) and social sciences (BGN 25 million). The agricultural sciences are at a disadvantage, with financial support decreasing by more than 8% on an annual basis. Since 2013, the funding of institutions involved in the development of agricultural sciences has been cyclical on an annual basis, in the range of BGN 29 to 37 million.

Business is a major source of funding for the technical and medical sciences. Over 91% of the funds for the development of both technical and medical sciences are provided by enterprises, forming 73% and 22% respectively of the overall R&D budget of the business sector.

Public funding is primarily directed towards the development of natural sciences (up to 47% of the budget funding for science). Outside the technical and medical sciences, the public sector is leading in providing for the natural sciences (73%), agricultural (84%), social sciences (51%) and humanities (78%).

Figure 28. TOP-15 BULGARIAN BENEFICIARIES OF HORIZON 2020, CONTRACTED FUNDING, EUR THOUSAND



Source: EU open data portal, September 2019.

The regional imbalances in the allocation of R&D funding in the country continued to deepen in 2018. The region with the most significant positive growth in R&D spending is the North West Planning Region (NWPR) – 18% on an annual basis and four times compared to the beginning of this year (see Innovation Product section). However, the NWPR share of 4.5% in the regional structure by this indicator is rather insignificant and therefore unable to change the status quo. Still, **for the second year in a row, the NWPR ceded the last place in the regional ranking to the North Central Region.** This negative trend is compounded by a decline since 2017 in the relative share of the North East, South East and South Central Planning regions. In this sense, there is a **reverse convergence between the planning regions in Bulgaria towards merging the levels of those lagging behind.** This trend is offset by an increase of as much as 12% of the SWPR share to a level of almost 73%.

In 2019, the Ministry of the Economy, on the basis of the transfer of funds from OP SESG, started the procedure for financing the creation and development of Regional Innovation Centres.[19] The main objective, given the priority areas for the development of the planning regions, is to foster interaction between business, research units and local authorities and to create the conditions for accelerated innovation and the transfer of new technologies from science to practice. Such a large-scale procedure – given the range of beneficiaries, the scope of activities, the implementation pe-

[19] See Applied Research and Communications Fund. (2018). Innovation.bg 2018: Smart Policies for Innovation Growth, p. 58.

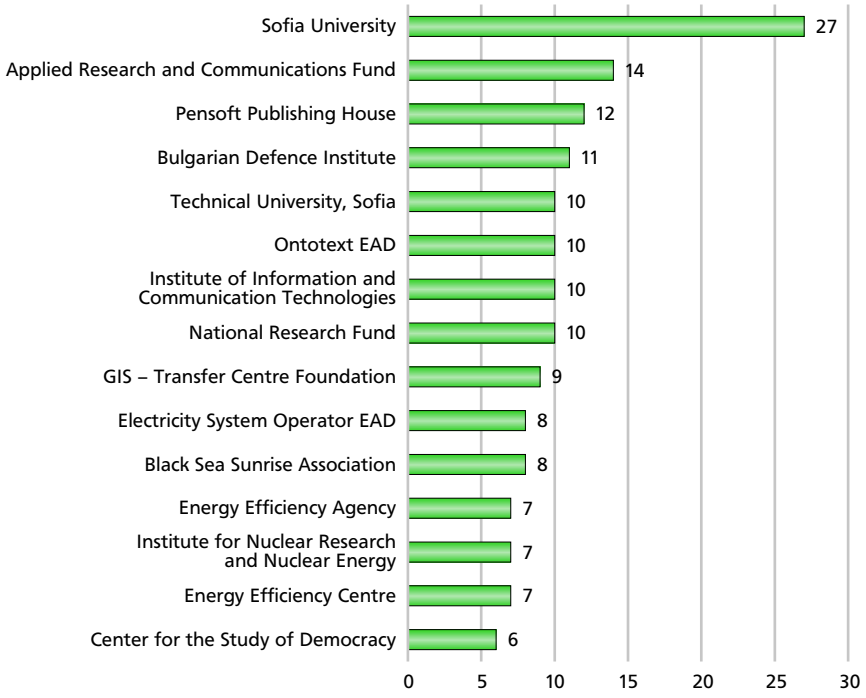
riod and level of funding (including public and private) – is an innovation in itself not only for Bulgaria but also at the European level. A successful completion of the nearly year-long public consultation and stakeholder process could become a factor in overcoming regional imbalances in R&D funding, especially given that potential beneficiaries from the Sofia-city district are not eligible.

Total 2018 budget expenditures for socio-economic R&D objectives according to the international nomenclature for analysis and comparison of scientific programmes and budgets (NABS 2007) **amounted to just over BGN 223.171 million, which was an annual growth of 4%.** The most significant growth was the subsidy for energy – nearly 61%, followed by environment (30%), transport, telecommunications and other infrastructures (26%) and defence (25%).

Traditionally, **the largest share in this budget is the research spending of BAS structures** funded under the heading "General knowledge development: R&D funded from other sources" – BGN 89.180 million. According to the NSI methodology, this category includes the annual membership contributions to the budget of international scientific organisations, as well as payments from the budget related to Bulgaria's participation in bilateral and multilateral research programmes. The amount allocated to the Agricultural Academy is twice as low – BGN 42.018 million. The increase on an annual basis is below 2% and again fails to reach the amount of the subsidy of the base year 2008.

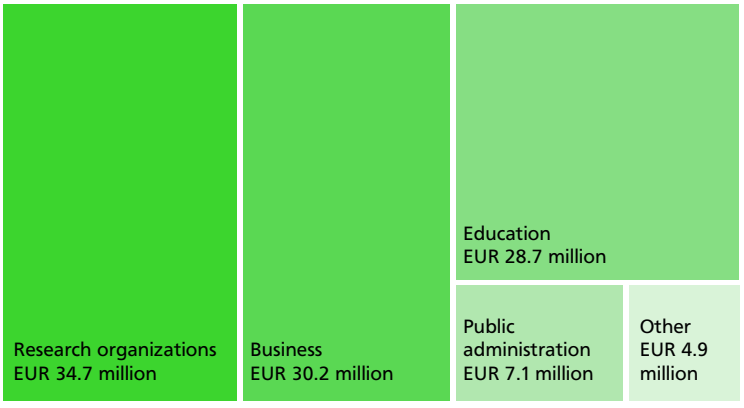
There has been a significant drop in R&D spending in the education sector. In 2018, education development funds accounted for only 76% of the figure of the previous 2017 and represent the second most significant decline after 2012 over the last ten years. Budget spending on R&D financed by general university funds remains almost unchanged (1% year-on-year growth).

Figure 29. TOP–15 BULGARIAN BENEFICIARIES OF HORIZON 2020, NUMBER OF PROJECTS



Source: EU open data portal, September 2019.

Figure 30. INSTITUTIONAL STRUCTURE OF THE BULGARIAN PARTICIPATION IN HORIZON 2020



Source: EU open data portal, September, 2019.

Bulgaria in the EU framework programs

Bulgaria's participation in Horizon 2020 by September 2019 includes 583 successful projects, for which EUR 106.4 million has been contracted (in comparison, the funding received under the Seventh Framework Program in the previous programming period was little below EUR 100 million). While the number of projects equals a share of 1.8% within the EU, the

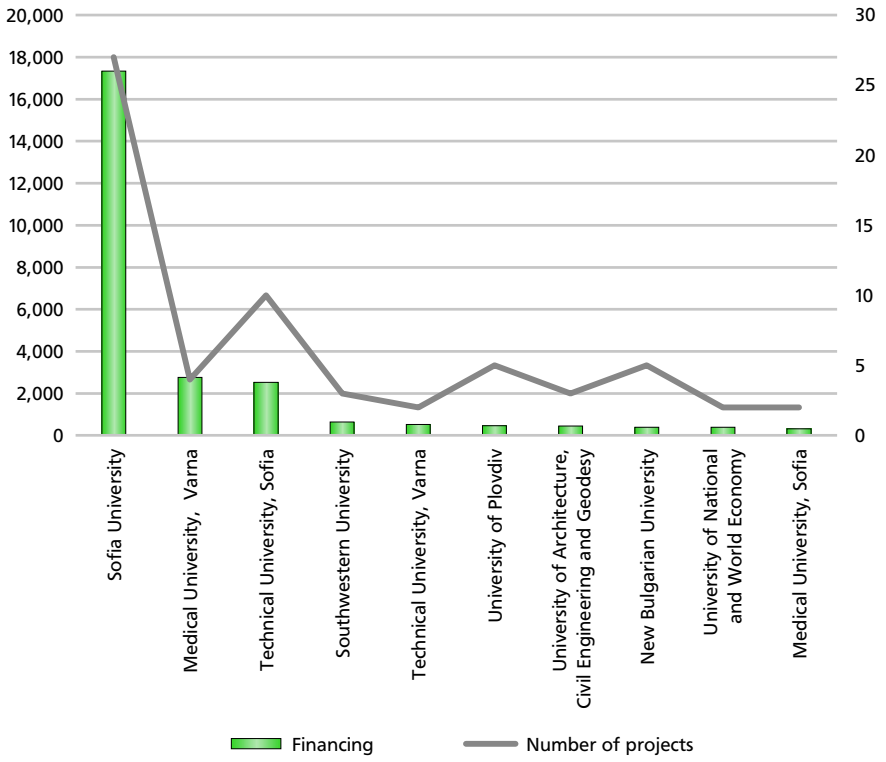
funding amounts to only 0.25% – a consequence mostly of the fact that Bulgarian organisations participate in research consortia for European projects mainly as partners and to a lesser extent have coordinating functions (the latter was the case for 49 projects, or 8% of the projects with Bulgarian participation). The success rate for Bulgaria is 10.24% of the project proposals that have passed the administrative threshold, which is close to the EU average of 11.98%.

Participants in projects funded under the Europe 2020 programme are distributed in **19 regions of the country.** The leader is Sofia-city district, which accounts for almost 78% of the beneficiaries and 75% of the received funding. Next is the Plovdiv region, where 7% of the beneficiaries are located with twice the share of the funds. With an equal share of 5% by both indicators, Varna is in third place.

Twenty-three higher education institutions in Bulgaria have received grant funding under Horizon 2020. **The sector leader is Sofia University** with 27 successful projects and over EUR 17.4 million contracted. The next position with 10 projects and over EUR 2.5 million received is the Technical University, Sofia. The Medical University–Varna, New Bulgarian University and Plovdiv University have participated in five projects each. Three other higher education institutions have three successful projects each – the University of Chemical Technology and Metallurgy, the Southwestern University and the University of Architecture, Civil Engineering and Geodesy.

Almost 20% of EU funding for Bulgaria was allocated to small and medium–sized enterprises. The total number of projects submitted on behalf of SMEs was 1,812, or nearly 39% of all project proposals. Of these, 133 have received financing of a total value of EUR 20.86 million, which is just under 20% of the total amount of funds for the country.

Figure 31. TOP 10 HIGHER EDUCATION INSTITUTIONS UNDER HORIZON 2020



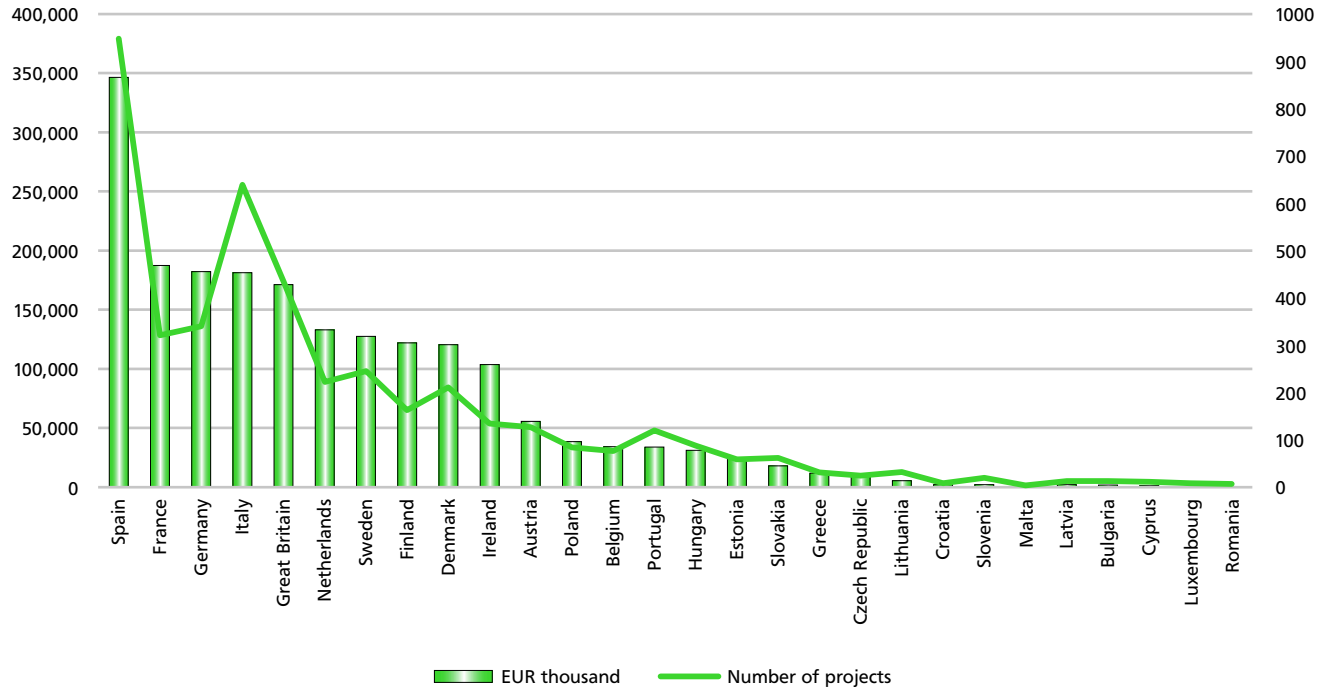
Source: EU open data portal, September, 2019.

In October 2015, the EC introduced the so-called Seal of Excellence – a quality label awarded to project proposals that apply for Horizon 2020 funding and which have successfully met all the requirements for the selection and allocation of funds, but were not funded due to budget constraints. Institutions that have received a Seal may apply under reduced assessment procedures for alternative financing under other European and national programmes and instruments supporting innovation. **In addition to the 133 projects funded under Horizon 2020, another 87 projects from Bulgaria have received a Seal of Excellence.**

Bulgaria has 13 successful projects in the SME Instrument, ranking the country 22nd by number of projects within the EU-28 and 25th in terms of funding received of EUR 1.81 million. Only one project has met the requirements of Phase 2 of the SME Instrument, which finances innovation development and innovation demonstration activities. The remaining 12 projects were submitted under Phase 1, aimed at evaluating the feasibility of an innovative project.

The breakdown by topic area is as follows: **ICT** – one project in Phase 2 with funding of EUR 1.21 million; **agriculture and fisheries** – two projects in Phase 1 with funding of EUR 100,000; **construction and transport** networks – two projects in Phase 1 with funding of EUR 100,000. In the areas of **biomarkers and diagnostic medical devices, consumer products and services, eco-innovation and raw materials, energy, food and drinks, health, nanotechnology and security,** one project in Phase 1 has been registered in each area, with a funding of EUR 50,000 per project.

Figure 32. SMEs INSTRUMENT, EU-28



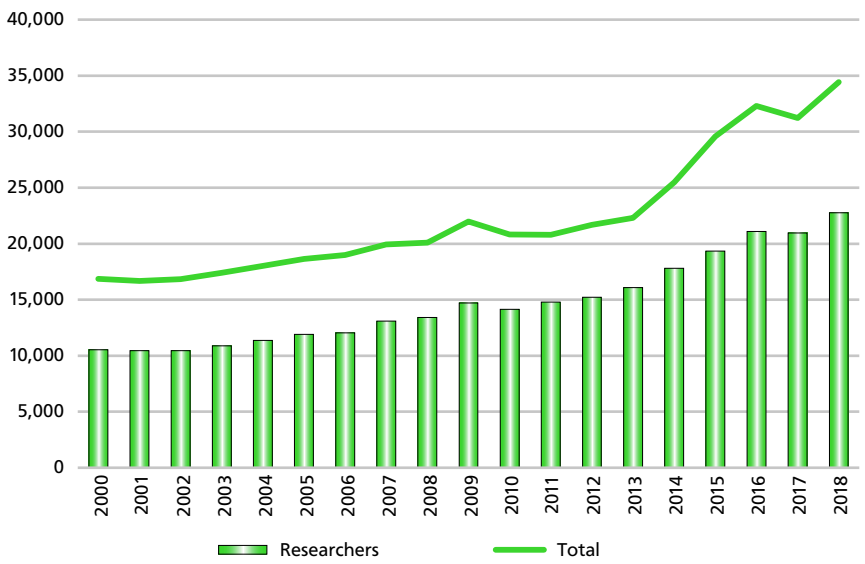
Source: http://sme.easme-web.eu

Human Capital for Innovation

Staff engaged in R&D together with those employed in scientific and technological activities comprise the human resources directly responsible for the creation, application and dissemination of new knowledge in the area of technologies. The indicator of employment in high-tech sectors characterizes the country's specialisation in sectors with a high level of innovation.

In 2018, the number of R&D employees in Bulgaria grew by over 10% on an annual basis. After the downturn in 2017, the indicator rebounded from the post-2014 increase to 34,436 employees. These include over 3,200 newly appointed R&D staff or individuals listed for the first time in the annual accounts of enterprises within the "R&D staff" category. The latter, together with the increase in the total number, is also a positive trend towards more transparency in the sector. It also shows a growing understanding by the enterprises of the importance of this type of reporting data and is one way for the country to climb higher in the comparative ranking for innovation activity within the EU.

Figure 33. R&D STAFF, 2000 – 2018, NUMBER



Source: NSI, 2019.

Just over two-thirds of R&D staff are researchers, professionals who carry out research, develop concepts, theories, models, design technical equipment, software and operational methods, and are engaged in creating new knowledge. Although their relative share is minimal (below 1% in the last year, at the expense of the share of technicians and support staff), the increase in absolute values is 8.5% and is also crucial for the growth of R&D staff, generally.

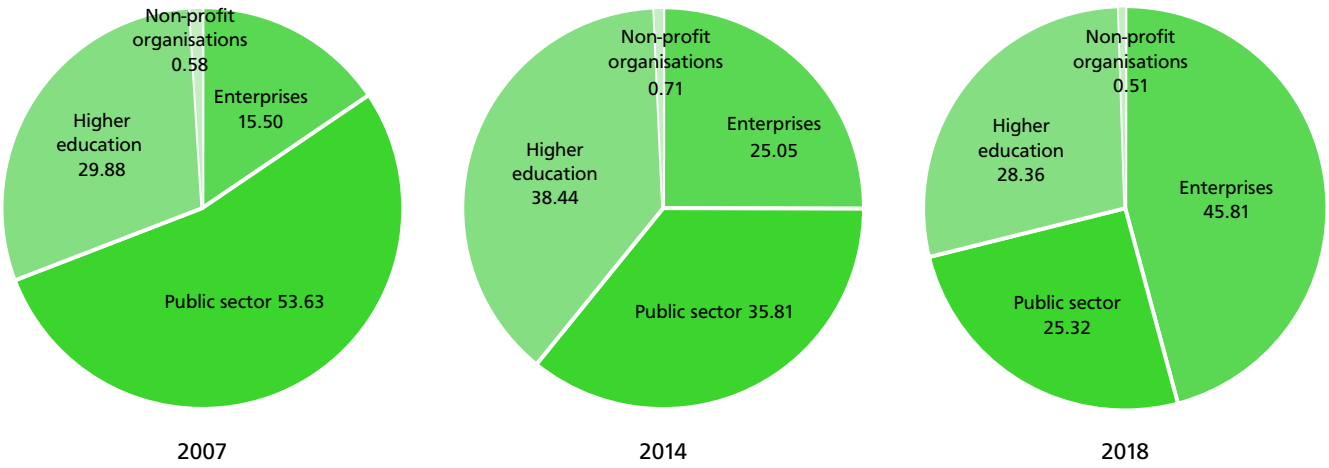
The business sector has a leading role in the growth of R&D staff. **Since 2015, enterprises have been providing more jobs for researchers than the public sector and higher education. In 2018, the share of business by this indicator reached nearly 46%.** Universities (28%) and publicly funded research units (25%) had almost equal positions.

The fact that over 57% of R&D funding is spent in support of the technical sciences, along with the dominant share of the business in R&D, are the two factors that determine the share of **42% of R&D staff, namely in the field of technical sciences.** In 2018, the technical sciences again registered the highest growth (18%) in the recruitment of research staff. Along with the increased innovation activity of the enterprises, including on a project basis with the support of the operational programmes, the research and development units of foreign companies in a number of high and medium high-tech activities in the country have an impact on this process.

The medical sciences have a share of 18% and an annual growth of 13%, followed by a 17% share by natural sciences and a growth of only 2%. The employed in the agricultural sciences had a significant increase of 14%, although this did not lead to a significant change in their share of 7.5% (having double that level in 2007). In the social sciences and humanities, there was a decrease in the number of staff employed by between 2 and 3%.

In 2018, R&D employed in the higher education sector reached 8,464 persons against 4,826 in the public sector. The age structure in both sectors is fairly evenly distributed between the ages of 35-44, 45-54 and 55-64, with younger persons, including up to 34 years of age, predominating in the structures of higher education. **In the public sector, the pyramid is**

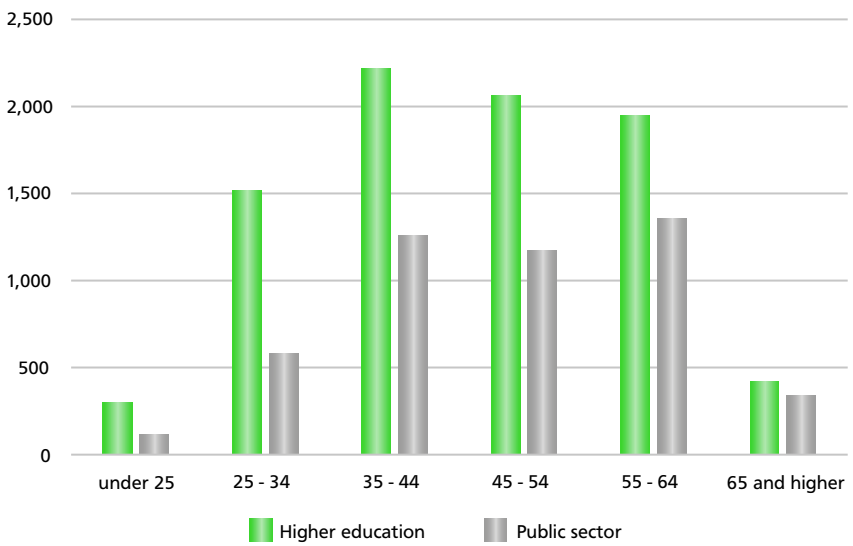
Fifure 34. R&D STAFF, INSTITUTIONAL STRUCTURE, %



Source: NSI, 2019.

reversed, with the relative share of employees increasing together with age. The situation in the public sector tends to worsen in the coming years. For 2018, **publicly funded research units (mainly BAS and the Agricultural Academy) registered growth only in R&D staff over 65 – nearly 20%. There was a decline in all other age categories, the most significant (-30%) among young researchers.** Higher education also saw a decline in the first two categories of staff, but was accompanied by a more significant increase in the age categories over 35.

Figure 35. AGE STRUCTURE OF R&D STAFF IN THE PUBLIC AND HIGHER EDUCATION SECTORS, 2018, NUMBER



Source: NSI, 2019.

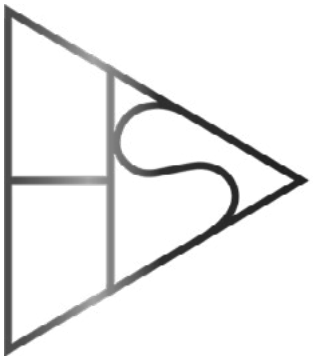
For a sixth consecutive year, the **Global Talent Competitiveness Index**[20] compares the status of 125 economies in terms of the factors that contribute most to the development of human capital, and hence to national competitiveness. In the 2019 ranking, Bulgaria ranks 54th in the world and 30th in Europe (37 countries on the continent included), with an index of 42.72, which is the best achievement for the country since 2013. Of the EU member states, only Croatia (55th place) and Romania (69th place) remain after Bulgaria.

There are four pillars as regards input into talent development:

- **Enable** – legislation and market components supporting businesses and entrepreneurs – 56th place for Bulgaria in the world and 27th in Europe, ahead of Romania, Greece and Croatia.
- **Attract** – measures the degree of attractiveness of the national business environment in terms of attracting foreign investors and highly qualified staff, as well as the opportunities for promising young people after school – 89th place for Bulgaria in the world and 30th place in Europe, ahead of Romania and Croatia;
- **Grow** – covers both the system

[20] INSEAD (2019): The Global Talent Competitiveness Index 2019, Fontainebleau, France.

Box 6. THE HEADSTARTER PLATFORM CONNECTS APPLICANT INTERNS AND EMPLOYERS



Headstarter is an online platform that connects pupils and students seeking internships with companies and employers. The project is driven by students from the Sofia High School of Mathematics, and is being implemented within the first season of the Student Innovation Programme Teennovator of the Proznanie Foundation.

Nadezhda, Alex, Radostina, Rangel, Ivana, Lazarina and Boris were provoked by their own difficulties in finding an internship or a temporary job in order to get a professional orientation. "In the summer of 2018, we were looking for a job or internship for a variety of reasons – to learn new things, to receive career orientation, or just to gain professional experience that will benefit us in the future. All the doors were closed because we were very young or inexperienced." The team works under the mentorship of Ms. Avgustina Pasheeva, Business Development Manager at Biodit, and with the Teennovator" programme team. Teennovator is setting up start-up clubs in Bulgarian schools and promoting entrepreneurship among students. Mentoring entrepreneurs from start-up and established companies in Bulgaria and with experience in various fields, help students in grades 10 and 11 to find their passion and turn it into a profitable business. Teennovator works with the Slovenian methodology of Ustvarjalnik / U.School for building entrepreneurial skills based on the practices of Stanford University. Since 2011, it has built a network of more than 200 school entrepreneurship clubs for high school students in Slovenia, Poland, Hungary, the United States and Mexico.

The most valuable aspect of the programme is learning through practice, according to Ms. Svetlana Savova, Program Director of the project. "Not every participant in the programme will become an entrepreneur, but the qualities and skills that young people acquire make them motivated and active citizens, ready for life after school."

The platform partners with the Bulgarian Chamber of Commerce, the Bulgarian Start-up Association, the Bulgarian Association for People Management and other business organisations and companies. Young people use LinkedIn to connect with HR professionals and employers' organisations. They participate in various career guidance events to meet representatives of companies willing to hire apprentices or students. Headstarter is looking for investors to expand into the Bulgarian and international markets.

The programme of the Prozanie Foundation is supported by the Ministry of Education and Science. During the 2018/2019 school year, 4 schools, 80 children (60 graduates) with 8 mentors and 10 projects participated in the project. Six of the ten start-up projects from the first year continue to grow as companies, and some of them already have investor funding. In the school year 2019/2020, 17 school clubs for entrepreneurship were established in Sofia, Varna and Vratsa, with 34 mentors and 250+ students.

Source: Applied Research and Communications Fund

of formal education and all forms of accumulation and development of knowledge and skills through non-formal and informal training – 62nd place for Bulgaria in the world and 30th place in Europe, only ahead of Romania;

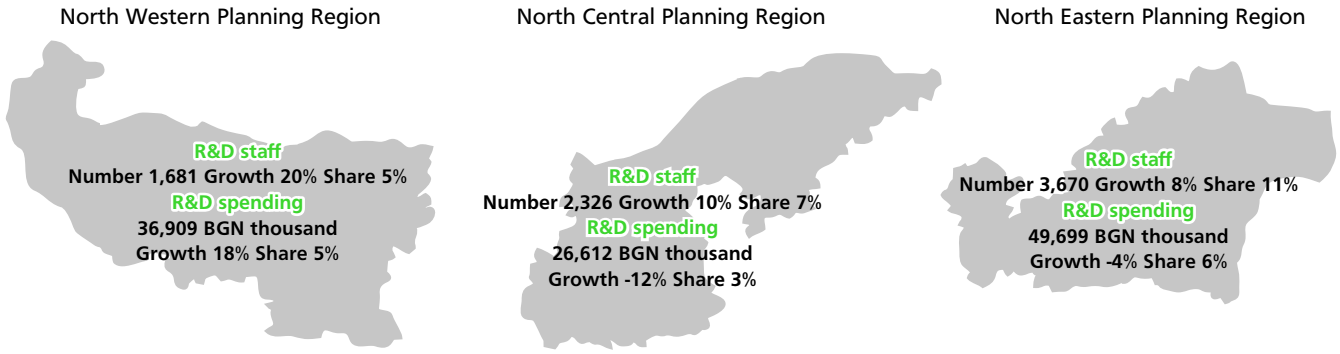
- **Retain** – measures the sustainability in implementing talent development policies including through quality of life – 47th place for Bulgaria in the world and 28th in Europe, ahead of Romania, Greece and Croatia.

In addition to the four input pillars in terms of the formation and use of a national talent pool, the index also distinguishes two levels of talent – mid-level and high-level skills:

- **Vocational and Technical Skills** - mid-level skills with an impact on employment and the correspondence between educational / qualification level and job requirements – 63rd place for Bulgaria in the world and 34th place in Europe, only ahead of Romania;
- **Global Knowledge Skills** – includes the capacity of high-level professional knowledge, creativity and problem-solving skills, with an impact on innovation potential and entrepreneurship, and with application in knowledge-intensive sectors – 41st place in Bulgaria in the world and 27th in Europe, ahead of Slovakia, Poland, Hungary, Croatia and Romania.

Despite the relatively high values of some of the 68 indicators included in the survey, Bulgaria does not have competitive advantages over EU member states or middle-income countries (the broader group in which the country is included). While examples of attracted foreign investment in high value-added sectors are not a rare occurrence for the country, much effort is still needed to position Bulgaria on the global talent migration map.

Figure 36. R&D CAPACITY BY PLANNING REGIONS, 2018



Source: NSI, 2019.

The results from the **World Talent Ranking**[21] study of the Institute for Management Development (IMD, Switzerland) are similar. According to the 2019 edition, Bulgaria occupies the 52nd position among 63 countries, which is the best achievement for the country so far. Within the EU, the country is again ahead of Romania and Croatia, with the Czech Republic surprisingly ranked last in the Community.

Evidence from Eurostat's experimental statistics[22] reveals more details regarding the so-called **vertical** (degree of correspondence between educational attainment levels and occupations) **and horizontal** (degree of correspondence between the educational field of the highest level of education attained and occupations) **discrepancies** in the labour market.

There are significant **vertical misalignments in Bulgaria, which have deepened over the last ten years**. It is a practice for companies to look for persons with qualifications that far exceed the requirements of the workplace. On the other hand, there are a significant number of higher education graduates with a bachelor's or master's degree who do not have a clear vision for their career paths and opportunities, and as a result agree to take positions below their level of education.

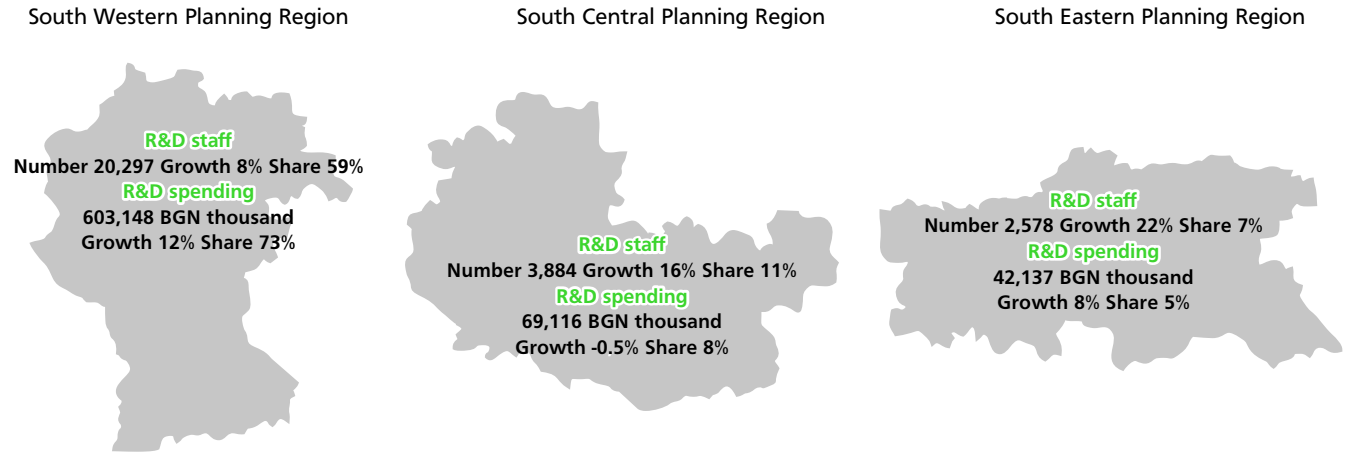
At the national level, the share of overqualified workers[23] was 23.6% in 2018, an increase of 3.4 percentage points over the last ten years. Seven EU countries (both old and new member states) had higher scores – Ireland, Spain, Greece, Cyprus, Austria, Slovakia and the United Kingdom. The most pronounced negative trend was observed in Slovakia (13.9 percentage points), Malta (12.1 per-

[21] World Talent Ranking 2019, IMD World Competitiveness Center, https://www.imd.org/wcc/world-competitiveness-center/

[22] Experimental statistics, Eurostat, https://ec.europa.eu/eurostat/web/experimental-statistics/skills

[23] According to the methodology of the survey, the indicator is calculated as the ratio between the persons with completed higher education employed in positions which do not require such in relation to the total number of employed persons with higher education.

Figure 37. RESEARCH CAPACITY BY PLANNING REGIONS, 2018 (CONTINUATION)



Source: NSI, 2019.

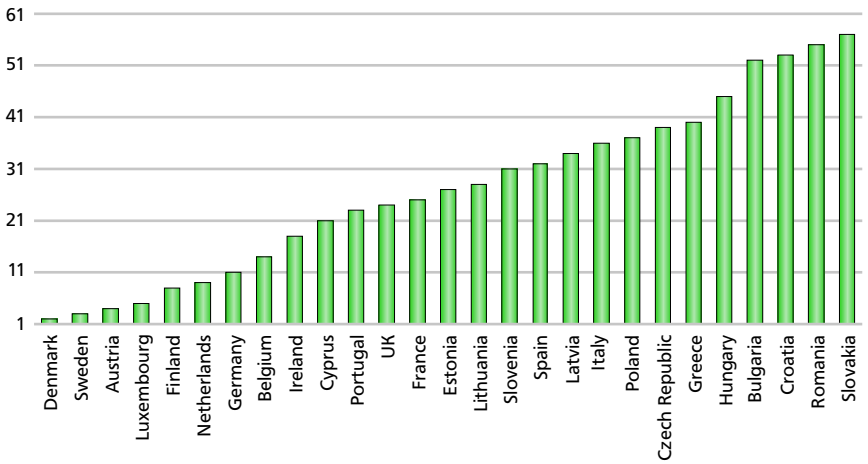
centage points) and Spain (11.7 percentage points).

Vertical disparities for Bulgaria are most pronounced in wholesale and retail, where nearly 49% of the university graduates are in positions that do not require such a level of educational attainment. There is also a significant imbalance between educational level and workplace requirements in manufacturing (36.6%), transport (36%), construction (25%) and public administration (19.5%). Improvement is observed in two sectors – construction (-5.1 percentage points) and transport (-1.9 percentage points).

Horizontal disparities in the labour market also have a negative impact, above all at the individual level, in terms of the inability to capitalise on the time and effort already invested during education, and higher levels of stress due to the lack of competencies suitable for the working place. In addition, they have negative effects for companies because of the higher costs of adapting employees to the work environment, and for the economy as a whole as a result of the asymmetry between the spending on educational services provided in some areas, the results of which are realised in others.

The highest levels of horizontal disparities for Bulgaria are observed in agriculture, where 73% of the employed have mismatched educational qualifications.[24] Within the EU, Bulgaria is ahead of Slovakia only by this indicator. There are also serious imbalances in the services sector – 55% with a tendency to worsen over the last five years. Compared to other European countries, the achievement of the graduates of social sciences (17% disparity), mathematics and computer sciences (40%), and humanities (45%), is relatively good. The average for the economy is 26.5%, which is close to the EU average of 27.8%.

Figure 38. WORLD TALENT RANKING 2019, EU-28*



* Malta is not included in the 2018 survey.

Source: Yearbook of Global Competitiveness 2019 (IMD, Switzerland).

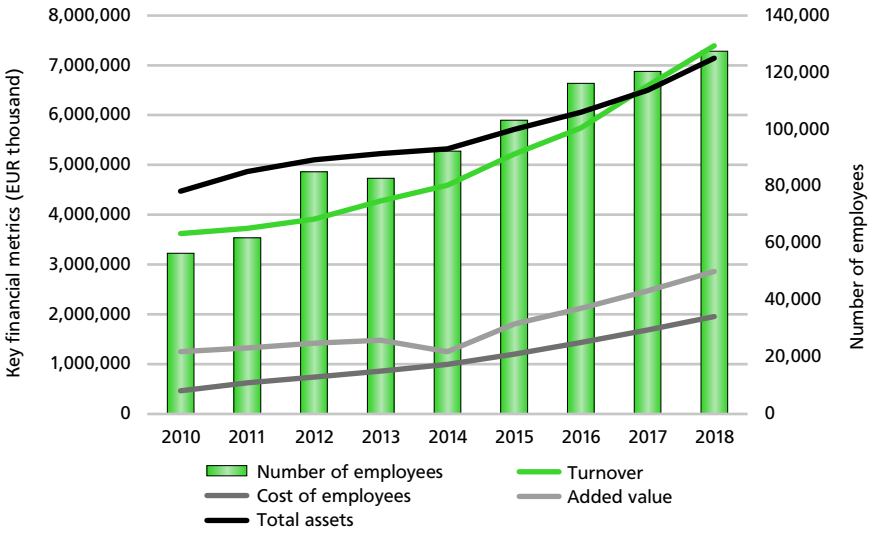
[24] Only data about employees between the ages of 15 and 34 are taken into account.

Information and Communication Technologies

Information and communication technologies (ICT) are one of the most important engines for innovation in enterprises and growth of economies. ICT enter enterprises as general purpose technologies (GPT) which are integrated in the new production and management processes. ICT also change the organizational boundaries and transform the models for adding value, competitiveness, and consumption. The effects of their use include decreased relative transaction costs, shortened product life cycles and structural changes in markets (convergence, concentration and power of bargaining). The expenditure for Research and Development, patent activity and risk financing in the ICT sector exceed substantially that in the other sectors in the OECD68 countries. R&D, focused on ICT, nanotechnologies and new materials, is among the most important driving forces leading to product innovations. The driving forces are connected to the health and leisure industries (including electronic games). The modern processes and marketing innovations cannot exist without ICT. The internet and web-based services have caused important social innovations, including such in the sphere of political processes and government. The ICT infrastructure is already considered an essential element of the critical infrastructure of each country, while the issues of digital security are of primary importance for the policy of each country or corporation.

The Bulgarian ICT sector[25] has experienced steady growth in the last twenty years. This trend sustained in 2018 too, when the sector accounted for 4.4% of the revenue and 4.6% of the employment in the Bulgarian economy.[26] In other words, **in 2018 the ICT sector generated EUR 7.4 billion annual revenue and provided more than 127 thousand mostly highly-qualified jobs.** This presents an increase by 204% in revenues and 226% in number of jobs as compared to 2010, and is much higher than the respective increase of the whole economy for the same period (by 178% and 145% respectively). However, for the same period, the added value per employee in the sector had a much modest increase (101%), which is due to two major factors. On one hand, in 2010 the shift in the sector from low-cost, low value-added outsourcing towards R&D intensive and high value-added production[27] had already been on the rise, and the added value per employee was already more than three times higher as compared to the figures for the whole economy. On the other hand, the sharp increase of the number of employees in the sector since 2010, almost twice faster than in the whole economy, has suppressed the growth of the added value, not least due to decreased quality of the formal education system and increased efforts and expenses of the companies for on-the-job training.

Figure 39. KEY FINANCIAL METRICS AND NUMBER OF EMPLOYEES IN THE ICT SECTOR 2010 – 2018



Source: Companies' financial data, Orbis Europe database, Bureau van Dijk, 2019.

For the whole period the **fastest growing ICT sub-sectors in terms of revenue have been "Computer programming, consultancy and other ICT service" and "Wholesale of computer, electronic and telecommunication equipment and software"**, with the former reaching EUR

[25] The analysis uses the OECD/Eurostat definition for the ICT sector, based on the NACE Rev.2 classification of the companies' main economic activities, with additionally added companies, included into class 822 "Activities of call centres". See Robledo, J.C. and M. Mas. 2013. ICT Sector Definition Transition from NACE Rev. 1.1 to NACE Rev. 2. IPTS/JRC, European Commission, online at https://op.europa.eu/en/publication-detail/-/publication/c0c59d1e-4ce0-40c0-9bff-4a54c80e04c9

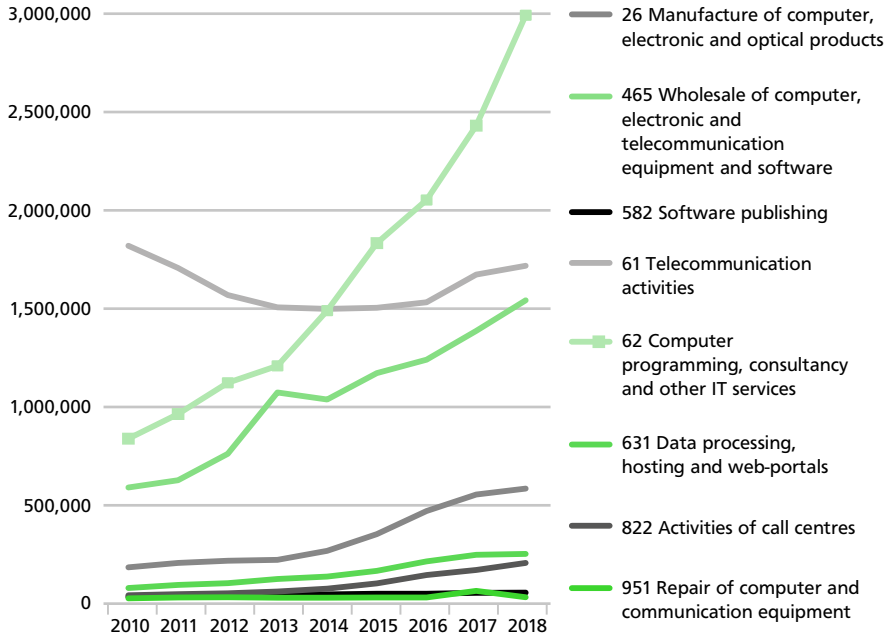
[26] Own calculations, based on companies' financial data, Orbis Europe database, Bureau van Dijk, 2019, https://www.bvdinfo.com/en-us/our-products/data/international/orbis

[27] See *Innovation.bg 2013*. The Innovation Potential of Bulgaria: Opportunities and Challenges. ARC Fund, Sofia, available at http://www.arcfund.net/arcartShow.php?id=16740

2.9 billion and the latter – EUR 1.5 billion annual revenue in 2018. The sub-sector of "Telecommunication activities", which has been the unquestionable leader for more than a decade since the beginning of 2000s, fell back from the first place in 2014 as a result of a downward trend (partially due to decreased cost of telecommunication services in the EU), and despite the slight growth which started the same year still cannot recover to the level of 2010. The almost tripled revenue of the "Manufacture of computer, electronic and optical products" sub-sector for the same period is a strong sign for the positive trend in the ICT, related to the recognition **of Bulgaria as a location for development of R&D-intensive and innovative technologies** not only in software but also in hardware. An example for the latter are local production and R&D facilities of multinational leaders in automotive microelectronics and parts (e.g. Visteon, Melexis, Integrated Micro-Electronics Bulgaria, Sensata Technologies, Festo Production, etc.) as well as the development of authentically Bulgarian companies in the areas of microelectronics, sensors, industrial automation, robotics, etc. (e.g. Datecs,[28] Samel-90, Optics, Daisy Technology, etc.). The same trend is even more visible in the area of software development, where since early 2000s multinational ICT leaders have established R&D centers in the country (e.g. VMWare Bulgaria, Software AG, SAP, Devexperts, Progress, Bosch Software Innovations Sofia, IDT Bulgaria[29], LeanPlum, etc.), in most cases based on acquisition of their long-term Bulgarian subcontractors, while authentic Bulgarian companies have affirmed themselves as innovative world-leaders in specific market niches (e.g. Chaos Software[30], Ontotext[31], Interconsult Bulgaria[32], Mobile System[33], Software Group Bulgaria, Sirma Medical Systems, etc.).

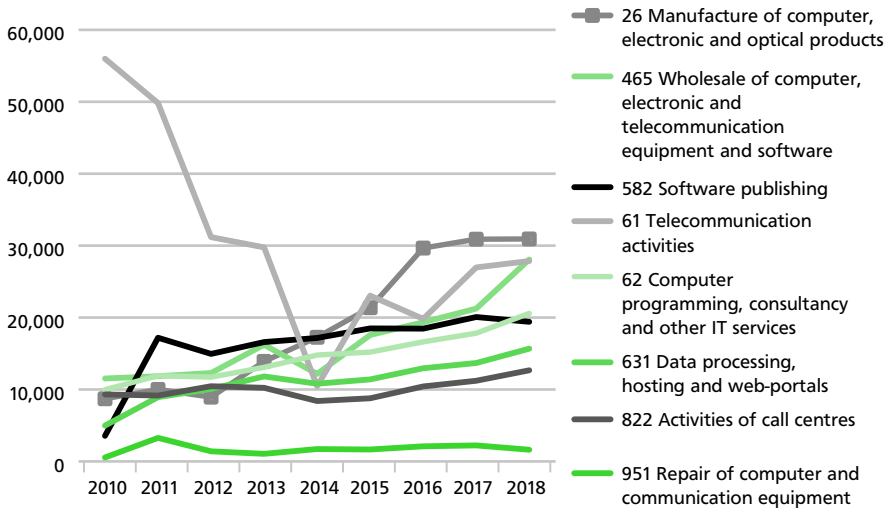
The sub-sector "Computer programming, consultancy and other ICT ser-

Figure 40. ANNUAL REVENUES IN THE ICT SECTOR, 2010 – 2018, EUR THOUSAND



Source: Companies' financial data, Orbis Europe database, Bureau van Dijk, 2019.

Figure 41. PRODUCTIVITY OF ICT SUB-SECTORS MEASURED AS PRODUCED ADDED VALUE PER EMPLOYEE 2010 – 2018 (EUR PER EMPLOYEE)



Source: Own calculation, based on companies' financial data, Orbis Europe database, Bureau van Dijk, 2019.

[28] Award-winner in the 6th National Contest Innovative Enterprise of the Year for 2010.

[29] Award-winner in the 8th National Contest Innovative Enterprise of the Year for 2012 (then under the name ZMD Eastern Europe).

[30] Award-winner in the 8th National Contest Innovative Enterprise of the Year for 2012.

[31] Award-winner in the 9th National Contest Innovative Enterprise of the Year for 2013.

[32] Award-winner in the 9th National Contest Innovative Enterprise of the Year for 2013.

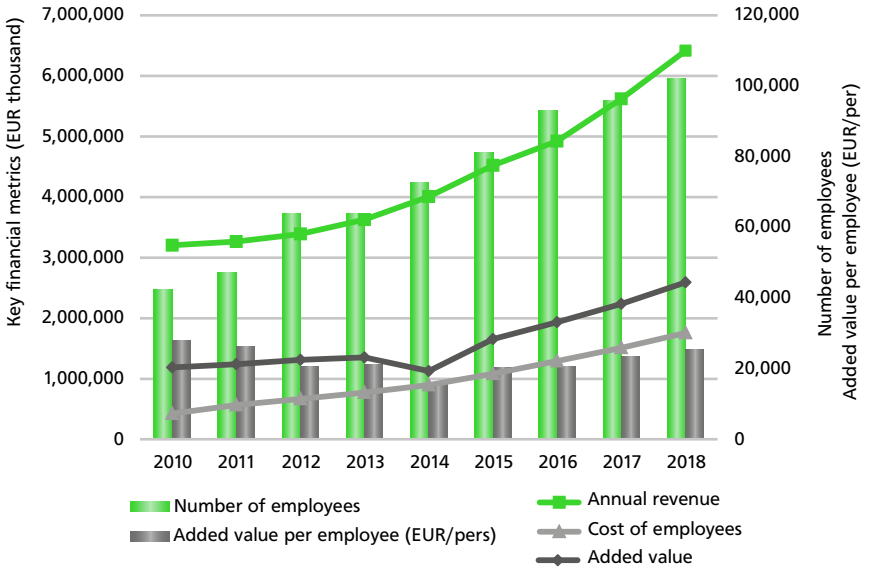
[33] Award-winner in the 11th National Contest Innovative Enterprise of the Year for 2015.

vice" is leading during the whole period in terms of created jobs, labour costs, and the produced added value, despite starting from the second place in terms of revenue. "Telecommunication activities" has remained second, even though the differences in the trends of jobs, labour costs and added value are much bigger throughout the period. However, when the productivity of the sub-sectors is considered, the picture changes considerably and "Manufacturing of computer, electronic and optical products" comes first, followed by telecommunications and wholesale. **The highest upward trend of the productivity in hardware manufacturing,** measured by the produced added value per employee, shows once again that the Bulgarian ICT sector has gradually shifted from software-based low value-added outsourcing and sub-contracting to production of high value-added products and integrated platforms. In other words, the Bulgarian companies have upgraded their position in the global value chains, working already directly with clients, instead of being predominantly sub-contractors to multinationals.

Geographically, the ICT sector is very unevenly spread throughout the country, with an over-concentration in the Sofia City district, which in 2018 had 87% of the revenues, 80% of the jobs, and 91% of the added value of the whole sector. The development of the sector in Sofia City shows stable upward trends in all aspects, albeit at varying growth rates. An exception is the measurement of productivity calculated as added value per employee, which shows a clear U-curve, with the highest value in 2010, followed by significant and constant decrease to 2014, when the upward trend started but in 2018 it still had not reached the level of 2010. This was caused by the presence of the major telecommunication companies, which are among the largest employers in the sector, and the significant growth in employment combined with the decrease of their revenues for the same period. Moreover, as mentioned above, the trend of the added value of the telecommunication services had the same U-curve for the period.

The biggest sub-sector in terms of revenues in Sofia City has been "Computer programming, consultancy and other IT services", which accounted for 40% of the revenues and 53% of the employment in 2018. Moreover, it had a stable growth throughout the whole period, from EUR 727 million annual revenue in 2010 to EUR 2.6 billion in 2018. Factors for the impressive growth of this sub-sector are three stable trends that could be observed in the whole ICT sector but are explicitly evident in Sofia District. The first one is the above-mentioned trend of establishing R&D intensive branches of leading multinational companies, in most

Figure 42. KEY PERFORMANCE METRICS OF ICT SECTOR IN SOFIA CITY DISTRICT 2010 – 2018



Source Own calculation, based on companies' financial data, Orbis Europe database, Bureau van Dijk, 2019.

of the cases based on buying up their former local subcontractors, or sometimes starting the local branch from scratch. In addition to the already mentioned companies, examples are also the establishment of Atscale Bulgaria, Nuvolo Technologies Bulgaria, Crayon Bulgaria, and LeanPlum, as well as the acquisition of Fadata by two British companies and of a part of the Smartcom AD team by GlobalFoundries, etc. The second trend, also mentioned above, is the continuing development of originally Bulgarian companies, mainly export oriented, which have become global innovative leaders even in narrow market niches. The third trend is the creation of new start-ups – mainly in fintech, the internet of things (IoT) and data analytics – which have had innovation-based and, sometimes, fast growth. Often, they are either corporate spin-offs of established ICT companies or their founders have gained their experience in leading Bulgarian and multinational companies (e.g. Payhawk, Connectedbin, Phyre, Sirma Medical Systems, Bizportal, ProDron Sys, Sensika Technologies, etc.). An important facilitating factor for the development of the strong innovation-based ICT sector in Sofia City is the work of several

training and education academies and other talent-developing initiatives of the leading companies, e.g. Mousala, Telerik Academy, SoftUni, LeanPlum, etc., concentrated also in the capital.

Beyond Sofia City, the next top-performing districts in the country with high concentration of ICT companies are Plovdiv, Varna, Bourgas, Gabrovo, Rousse, Sofia Province, Stara Zagora, Blagoevgrad, and Veliko Tarnovo. Unsurprisingly, the administrative centres of these districts are university cities, while some of them – Gabrovo, Stara Zagora, and Plovdiv – have been centres of the national computer and microelectronics industry under the communist regime and in the first half of 1990s. Each of the districts has its own mix of companies from different ICT sub-sectors. In many cases, however, specific clusters of firms working in a particular sub-sector have emerged, thereby allowing the district to be recognized as specialized in the given area and attract new companies. The most well-known example is Plovdiv (incl. Trakia Economic Zone and the nearby town of Asenovgrad), where three major groups of companies have established a dynamic and innovative eco-system. The biggest one in terms of revenues and employment is "Computer programming, consultancy and other IT services" (EUR 96 million annual revenue in 2018), followed by "Wholesale of computer, electronic and telecommunication equipment and software" (EUR 62 million revenue in 2018) and "Manufacture of electronic components and boards" (EUR 30 million revenue in 2018). Computer programming leads also in most of the other districts, except for Bourgas and Gabrovo, where "Wholesale of computer, electronic and telecommunication equipment and software" comes first (in Gabrovo, due to the fact that it hosts the headquarters of one of the largest wholesale traders in the country – Polycomp), while the manufacturing of hardware occupies third place, except for Sofia Province, where it made 44% of the revenues of the local ICT companies in 2018. Particularly in the latter case, this is due to the cluster of companies working mainly in the production of microelectronics in the town of Botevgrad – one of the centres of automotive microelectronics in the country, with production facilities of multinational companies such as Sensata Technologies and Integrated Microelectronics Bulgaria, and some authentic Bulgarian companies such as AMG Technology. Samel 90 – an innovative producer of original communications equipment, incl. for the military industry – also has a strong presence in the district.

One of the trends that is hard to see in the official financial and statistics data for the ICT sector is the emergence of R&D intensive and innovative companies, that sometimes do not formally belong to the ICT sector according to their main economic activity but in fact develop new ICT-based products and services. An example could be the emerging trend in IoT in agriculture, where one of the leading multinational companies Bosch Software Innovations established an R&D centre here, based on the acquisition of a department of Bulgarian-based German-owned company ProSyst, which has developed IoT in agriculture projects for Bosch global business for years. Another example is Pro Drone Sys – an authentic Bulgarian company, which develops IoT for precision farming, using unmanned aerial vehicles (known as drones) to monitor soil and plant vegetation and to offer variable rate application prescription map for fertilisation and other agricultural operations, based on originally developed automated AI-based analysis. Similar example is also the innovative start-up Power Drone, which offers aerial inspection of energy infrastructure, based on originally developed AI-based system for image recognition and GIS-positioning of power lines, sub-stations and other energy infrastructure.

Over the past ten years, the Bulgarian ICT sector has undergone a major internal transformation with diverse effects on the economy and socio-political processes. The export of ICT products and services has increased three times compared to 2010 and for the first time in 2019 it will exceed BGN 10 billion and will reach 17% of the total exports (goods and services[34]) from Bulgaria. The ICT sector contributed almost 6% of gross value added in 2017 and over 30% of business R&D spending in 2016. The largest exporters in the sector (Paysafe, Integrated Microelectronics, Datecs,[35] Progress, VMware, SAP Labs, Festo, Visteon Electronics, Melexis and others), as well as hundreds of other smaller foreign IT companies, have long had their own development centres in the country, in which global innovation is born. A sustainable model for the entry of foreign companies into Bulgaria is the acquisition of local R&D intensive companies, mainly because of the teams (the so-called acquihiring) or the niches they occupy.

In cases where the initial owners leave the companies, they turn into serial entrepreneurs. Increasing numbers of Bulgarian companies are establishing their brands as international and the sector is managing to recruit many foreigners.

The outsourcing industry has made the complex journey from offering common low-cost service (coding or calling) to developing unique mul-

[34] Balance of payments business services sector; the sectors of transport, travel, outsourcing and, maintenance and repair are not included.

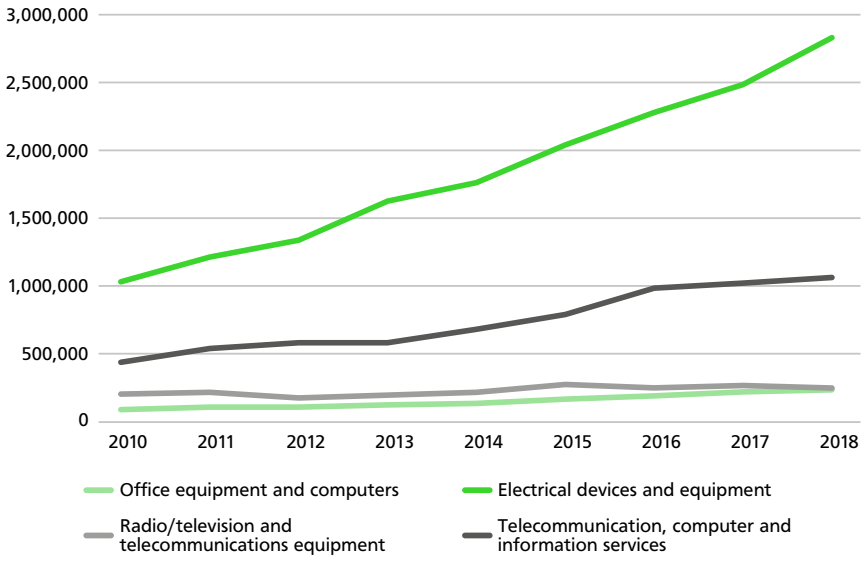
[35] Award-winner of the 2010 Innovative Enterprise Award.

ti-channel products/solutions (Figure 44). With the increased trust among partners, Bulgarian companies receive not only access to critical infrastructure but also a long planning horizon by participating in the strategic projects of their clients. Indicative of this trend is the change in the name of the Bulgarian Outsourcing Association to the Association for Innovation, Business Services and Technology[36]. Another example is Data Pro[37] – company that has been able to build its own niche in knowledge-intensive products and distinguish itself with its innovative management. The most important factor for the success of Bulgaria in this area is the excellent customer support (speed, accuracy, comprehensive service). Leaders in this field are companies such as Progress (former Telerik), ScaleFocus,[38] Tellus and Endeavor.

Factories producing automotive electronics and other parts have transformed some local communities, providing opportunities for professional careers for many Roma, whose children also attend school. Call centres evolved to outsourcing business processes,[39] and some of their employees became entrepreneurs and solved problems they identified during their work. The high income in these companies (on average over BGN 2,000) pull up the salaries in other sectors and retain many young people in the country. About 2% of all employed in Bulgaria work in the sourcing industry, which accounted for 8.5% of the total salary costs in Bulgaria for 2018.[40] Salaries and productivity in the ICT sector are relatively (compared to the national average) the best in Bulgaria (among EU countries).

About 5% of employees in the IT sector receive a monthly income of over BGN 9,000. Employee retaining policies include loyalty programmes such as free fitness, car rental costs up to a certain amount, massage at work, around-the-world travel, etc.

Figure 43. EXPORT OF ICT PRODUCTS AND SERVICES IN EUR THOUSAND



Source Comext and BNB, 2019

All of these measures aim to retain employees longer and increase their motivation, including through corporate social responsibility activities targeting their schools and universities by funding them to travel and talk about their work. In some companies, gamification elements are introduced in the reporting of employment hours, and even selection and evaluation through games[41] is implemented. An important recruitment tool are the academies, pioneered by the Telerik Academy and now expanding with the Software University and the academies of Scale Focus[42] and Musala. Unlike the first academies, which were centred in Sofia and the enrolment was based on assessment of hard skills, the new academies (also often free of charge) are targeting cities such as Bourgas, Varna and other cities with universities looking for additional soft skills, organizational values and culture.

Companies in the IT sector have increased by an average of 15% their costs per employee in 2018 compared to 2017, with only 5 of the 22 four NACE digital sectors declining slightly, which is usually due to job optimization. 77% of companies have increased their employee costs while in just one sector (optical instrument manufacturing) there are less than 70% of firms that have increased their average employee cost. In this sub-sector, there are problems in several small companies that are losing market positions. This growth is steady and high for years and enables pupils and students to plan their career development in Bulgaria.

[36] Association for Innovation, Business Excellence, Services and Technologies.

[37] Award-winner of the 2015 Innovative Enterprise Award.

[38] Award-winner of the 2016 Innovative Enterprise Award in the innovation management category.

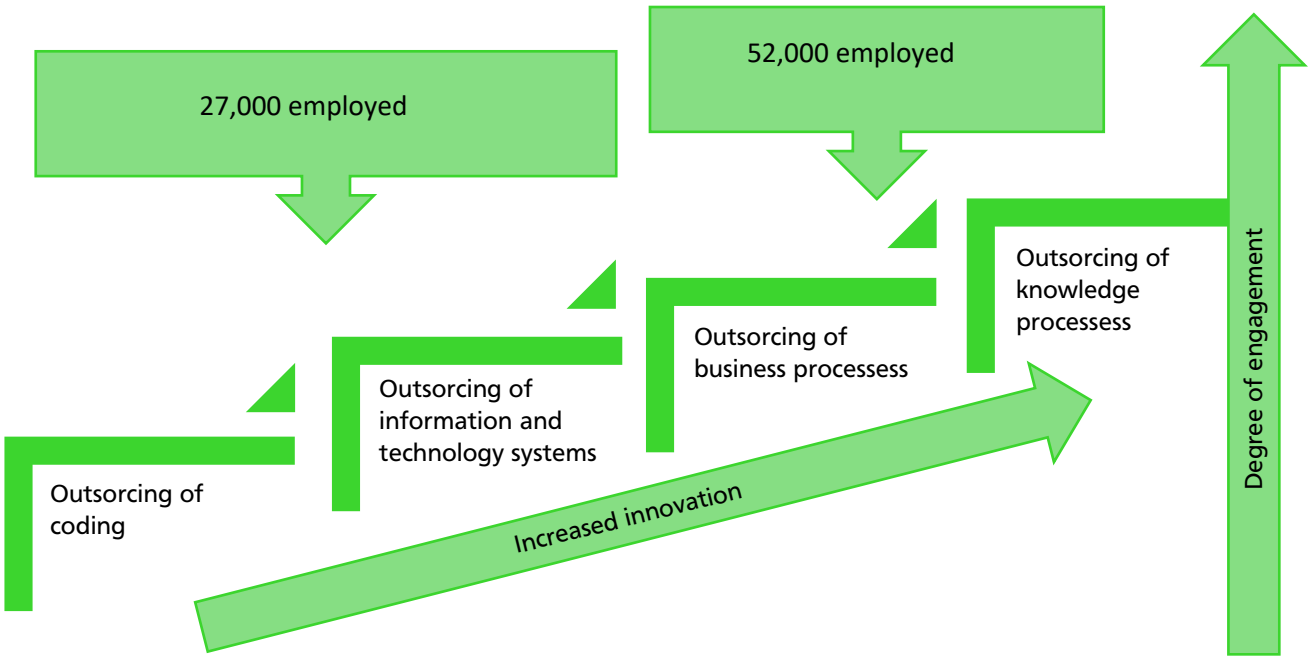
[39] The share of telephone services is only 16% (*2019 Annual Report,* Association for Innovation, Business Services and Technology).

[40] *2019 Annual Report*, Association for Innovation, Business Services and Technology.

[41] For example, through the SkyRise City product of the English company Arctic Shores, adapted and validated for Bulgaria by Prometrics.

[42] With the ambition to train 10,000 people within 5 years.

Figure 44. OUTSOURCING INDUSTRY DEVELOPMENT MODEL



Source

The IT sector employs around 120,000 people, 2/3 of which are in the outsourcing industry (information & technology and business processes). About half of those employed in the sector form about 1/3 of the country's growing middle class, estimated at around 200,000 people. Not only do they create technological innovations, but they are also often the basis of diverse social innovations - self-organising groups to address specific social problems, education, environmental and government initiatives (open big data, open applications) and even new political projects. Technology development facilitates the entry into the IT workplace and classic programming (code writing), systems administration and engineering give way (in terms of number of employees) to broader specialists who support diverse business information systems, do e-commerce or digital marketing. Many of these professionals are employed in other sectors of economic activity such as trade, manufacturing and a variety of services.

The IT sector attracts many new entrepreneurs and about 30% of the companies operating in 2018 were established after 2014. Almost ¾ of these new companies are in sector 62 "Information technology activities", which includes programming and consulting services related to the maintenance of computers and computer systems.

Of the new companies, about 30% are majority owned by a foreign company or a foreign national (both in sector 62 and in other segments). In some of these cases, however, the ultimate owner is again Bulgarian. Many of these new businesses are founded by IT professionals who have worked in the industry's top companies (classic software or outsourcing companies), having gained experience and contacts in some technological niche and customer service. One such company is Office Arendi, which was founded in 2015 and is already a global leader in its niche (coworking space management software).[43]

Others were founded by serial entrepreneurs. One example is SiteGround Hosting, which succeeded in becoming a global competitor with revenues of around EUR 50 million annually, with investments abroad and acquisition plans for other companies. The success of SiteGround is due to two major factors – that it is a software company which makes Wordpress a plugin that speeds up and optimizes its work and that it provides a reliable customer service to hosting services (similar to sourcing companies). A third type of new business is the example of corporate entrepreneurship of Bulgarian companies or the result of restructuring in acquisitions, as well as the entry of foreign companies.

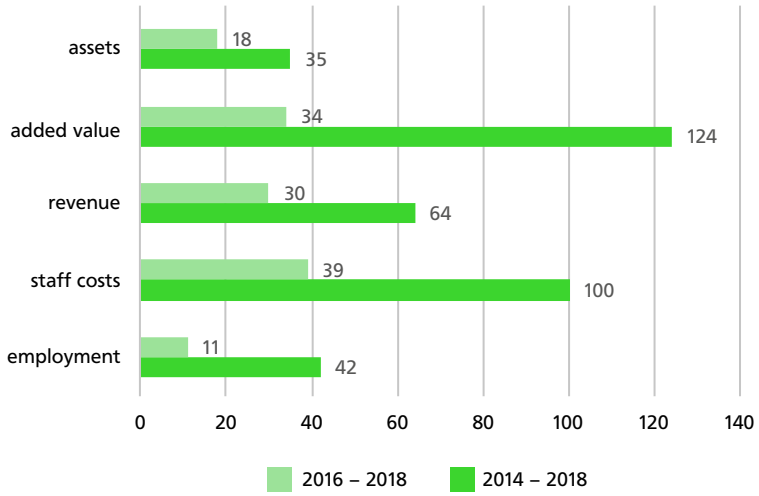
[43] https://www.coworkingresources.org/coworking-space-management-software

Table 3.

	Income (EUR thousand)			Employees (thousand)		
	2016	2017	2018	2016	2017	2018
ICT sector	4 851 346	5 544 021	6 288 853	107	111	119
Top 10	36%	33%	31%	27%	22%	20%
Top 20	43%	41%	40%	32%	29%	27%
Top 50	**55%**	**52%**	**50%**	**43%**	**39%**	**37%**
Top 100	64%	61%	59%	52%	48%	47%

The dynamics and competitiveness of the ICT sector is reflected not only in employment growth (42% over the last five years and 11% over the last three years), staff costs (100% over five years and 39% over three years), revenue (64% for the last five years and 30% for the last three years), value added (124% for the last five years and 34% for the last three years) and company assets (35% for the last 5 years and 18% for the last three years) but also in reducing the concentration measured by the share of the largest firms in employment and total revenues. The decrease in concentration is due to the combined effect of several factors: the entry of new firms into the market, the rapid growth of some existing firms and the relative decrease in the role of telecoms. There has also been growth in a number of other key financial indicators (e.g. profit before taxes and fees and return on equity), which enables ICT companies and their owners to play the role of business angels and investors in socially responsible activities. One of the most significant examples in this regard is the construction of TechnoMagicLand[44] – a children's science and technology centre fully funded by Technologica[45] and established through a public-private partnership with Sofia Tech Park. TechnoMagicLand is the only such centre in the world, which has included a gamification element in the overall visit (and not just at the exhibit level), so that even in such activities we see innovation.

Figure 45. GROWTH IN KEY ICT SECTOR INDICATORS



Source Comext and BNB, 2019

The ICT sector is a key partner in the implementation of diverse innovations in other industries. Any business that starts selling online or moving from a regular website to a payment functionality online store, with an integrated courier link module, or connects the store with ERP, or even with its warehouse programme, is truly innovative. Any business that starts doing digital marketing, even with the growing popularity of Google My Business (even suitable for businesses that do not have a website but only a physical entity[46]) is innovative. Furethermore, these digital innovations are perhaps one of the cheapest innovations that can be made and require constant retraining and experimentation with new technologies.

[44] www.technomagicland.com

[45] Award-winner of the 2007 Innovative Enterprise Award in the process innovation category.

[46] For which the entrepreneur, however, can easily get detailed statistics about the customers who have visited it by phones, geo-location included, their interest in his business, etc.

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APPLIED RESEARCH AND COMMUNICATIONS FUND

The Applied Research and Communications Fund is a Bulgarian research non-profit organization, registered in public benefit, established in 1991. Its mission is to support the development of innovation and the knowledge economy in Bulgaria through:

- advice and advocacy on establishing national, regional and local level policies and strategies for the country's successful integration into the global innovation economy;
- research and analyses of development trends and policy options for supporting innovation as well as information and communication technologies;
- public-private partnerships among businesses, public institutions, the academic community and civil society for addressing specific issues of ICT and innovation based competitiveness.

The Applied Research and Communications Fund has set up two functional units for the provision of IT and consulting services:

- European Innovation Centre – Bulgaria is part of the largest information and consultancy support network in Europe: Enterprise Europe Network, and coordinates its work in Bulgaria. The Network aims to assist small and medium-sized enterprises in their innovation potential development and to raise their awareness about the European Commission's business-oriented policies.
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