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RIO Country Report 2017: Bulgaria

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RIO Country Report 2017

The R&I Observatory country report 2017 provides a brief analysis of the R&I system covering the economic context, main actors, funding trends & human resources, policies to address R&I challenges, and R&I in national and regional smart specialisation strategies. Data are from Eurostat, unless otherwise referenced, and are correct as at January 2018. Data used from other international sources are also correct to that date. The report provides a state-of-play and analysis of the national level R&I system and its challenges, to support the European Semester.

Summary

Real GDP growth in 2017 in Bulgaria is estimated at 3.8%, driven by investment and consumption. GDP growth is forecast to remain robust at 3.7% in 2018 and 3.5% in 2019. The main engine of growth will continue to be strong domestic demand, while the external sector's contribution is expected to turn positive only in 2019¹. EU funds are set to further boost public investment in 2018, following the acceleration in absorption under the 2014-2020 programming period. Increases in wages should continue to stimulate private consumption.

The main impediments to growth, especially growth of private investment, are the limited foreign direct investment (FDI) inflows and the high corporate sector debt, both of which are expected to continue in the forthcoming years. These phenomena are further affected by the labour market trends, namely, high share of long-term unemployed in total unemployment and a high inactivity rate, limited inclusion of young people in the labour market and skills shortages and mismatches.

Bulgaria is categorized as 'modest' innovator by the Innovation Union Scoreboard (IUS) 2017², followed only by Romania from the EU, and lagging behind Serbia and Turkey from the non-members group. In the Global Innovation Index 2017³ Bulgaria is ranked 36th, following 38th in 2016. The relative strengths of the innovation system are in Intellectual Assets, Employment Impacts, and Human Resources. Relative weaknesses are in Innovators, Finance and Support, and Attractive Research Systems. The funding approached 1% of GDP in 2015 (GERD=0.96%), especially due to the growing private R&D expenditure (BERD=0.70%). However, in 2016 the rates fell back to respectively 0.78% and 0.57%, which shows that the growing trend is not stable and policy effort is still needed. The overall level of funding is still below the target of 1.5% of GDP, and thus the public expenditure needs to grow substantially by 2020.

Challenges for R&I policy-making in Bulgaria

Devoting targeted efforts to implementation and capacity building. The delayed implementation of the policy and budget arrangements leads to the perception of lack of financial support to the whole R&D&I system. What is highly needed is speeding-up of project implementation for beneficiaries in the public sector and providing institutional support for both public and private sectors with respect to EU-level programme participation, esp. Horizon 2020. The new Implementation Agency for Operational Programme "Science and Education for Intelligent Growth" set up on 18 October 2017 is expected to contribute to the improved functioning of the system.

Directing the reforms towards rewarding quality and excellence. There is slow progress in increasing the attractiveness of the national R&D&I system for national and international scientists and researchers. The initiated differentiation of the higher education institutions (HEIs) and the changes in the model for financing public research organizations (PROs) constitute positive developments in this direction. However, the differentiation needs to be additionally improved, so that research-performing universities and other PROs are rewarded for R&D performance, while the other universities and colleges are funded for labour market contributions and workforce training results. The forthcoming Centres of Excellence (CoE) and Competence Centres (CC) in 2018 can play the key role in this process.

Capitalizing on smart specialization, EU-level research infrastructures and initiatives. There is a strong need to further support the integration and Europeanization of the Bulgarian science, research and innovation. The system deficiencies so far stem from both insufficient national public resources allocated to R&I and inadequate participation and success of national actors in EU framework and other programmes and

¹ European Economic Forecast, Winter 2018

² http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en

³ http://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2017.pdf

initiatives. Although evaluating the impact of RIS3 and ESFRI participation of Bulgaria cannot be currently substantiated by quantitative evidence, it has become clear that those have led to improved coordination and cooperation in three important ways: among different levels of governance and also among administrative spheres; among government, industry, education and research institutions, as well as citizens; and among national and EU players. The Presidency of the EU of Bulgaria in 2018, as part of the Troika with Estonia and Austria, provides an additional stimulus for increased EU visibility of the Bulgarian R&D&I system.

Main R&I developments in 2017

- **[Mapping of Research Infrastructures and Research Equipment in Bulgaria](#)**: In 2017 the Mapping of Research Infrastructures and Research Equipment in Bulgaria classifies the leading 161 research infrastructures, facilities and equipment into: physical, material science and engineering (57); medical and agro-bio sciences field (61); social science and humanities (29); and e-infrastructure for multidisciplinary research field (14).
- **[National Research Infrastructure Roadmap 2017-2023 \(update\)](#)**: On the basis of the mapping exercise and in line with the ESFRI process, the updated Roadmap is approved by Decision 354/29.06.2017 of the Council of Ministers.
- **[National Strategy for Development of Scientific Research 2017-2030 "Better Science for a Better Bulgaria"](#)**: Following consultations with relevant stakeholders at national and regional levels, long-term vision for science and R&D has been elaborated. The Strategy covers priority themes, institutional and performance-based funding, infrastructure, international partnerships, as well as the improvement of human resources. The Strategy, approved by the Parliament in June 2017 is supported by a multi-annual financial framework that combines EU and national resources.
- **[Strategy for Smart Specialization \(update\)](#)**: The Innovation Strategy for Smart Specialization 2014-2020 is revised by Decision 384/13.07.2017 of the Council of Ministers to reflect the new strategic developments and the results from the continuous Entrepreneurship Discovery Process (EDP).

Smart specialisation

The Innovation Strategy for Smart Specialization 2014-2020⁴ stipulates a qualitative leap for Bulgaria by 2020 in its innovation performance. This vision is expressed in practical terms in the strategic goal: by 2020, Bulgaria to move from the group of "modest innovators" into the group of "moderate innovators" by focusing on the 'smart' thematic areas (ICT, Mechatronics and CleanTech, Industry for Healthy Lifestyle and BioTech and CCI)⁵, and horizontal support improving resource efficiency and application of ICT in the industry (EU Digital Agenda⁶). As per the RIS3 Action Plan, further EDP events in the period April-June 2017 were organized: two regional discussions in each NUTS II region and four thematic stakeholder events focusing on the priority themes.

Following the adoption by Council of Ministers of the updated National Research Infrastructure Roadmap 2017-2023, on 28 June 2017, and of the revised Strategy for Smart Specialization for Bulgaria on 12 July 2017, the Commission assessed the ex-ante conditionality 1.1 (Research and Innovation) and 1.2 (Research and Innovation Infrastructure) as fulfilled on 31 July 2017.

⁴ Directly concerning two Operational Programmes, OP "Innovation and Competitiveness" (OPIC) 2014-2020 and OP "Science and Education for Intelligent Growth" (OPSEIG) 2014-2020, Priority Axis 1

⁵ http://ec.europa.eu/regional_policy/sources/docgener/guides/smart_spec/strength_innov_bg_en.pdf

⁶ <https://ec.europa.eu/digital-single-market/en>

Foreword

The R&I Observatory country report 2017 provides a brief analysis of the R&I system covering the economic context, main actors, funding trends & human resources, policies to address R&I challenges, and R&I in national and regional smart specialisation strategies. Data are from Eurostat, unless otherwise referenced and are correct as at January 2018. Data used from other international sources are also correct to that date. The report provides a state-of-play and analysis of the national level R&I system and its challenges, to support the European Semester.

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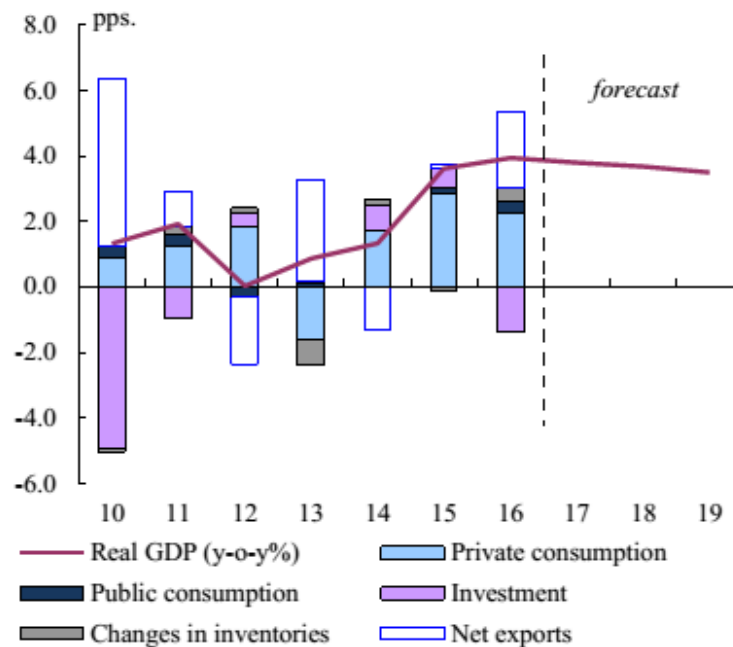
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1 Economic context for R&I

According to the European Economic Forecast (Winter 2018⁷) **in 2017 GDP growth in Bulgaria is 3.8%**, driven by investment and consumption. GDP growth is forecast to remain robust at 3.7% in 2018 and 3.5% in 2019. The main engine of growth will continue to be strong domestic demand, while the external sector's contribution is expected to turn positive only in 2019. EU funds are set to further boost public investment in 2018, following the acceleration in absorption under the 2014-2020 programming period. Increases in wages should continue to stimulate private consumption.

Given the openness of the economy, low level of Foreign Direct Investment (FDI) and weak import demand from the main trading partners, especially in Europe, combined with further outflow of skilled labour could pose external downside risks⁸. On the upside, stronger-than-expected consumer confidence and faster progress with reforms could lift real growth rates.

Graph 1: Real GDP Growth and Contributions



Source: European Commission

Overall, on the basis of the 2017 Country Specific Recommendations⁹, **Bulgaria is currently in the preventive arm of the Stability and Growth Pact**. In its 2017 Convergence Programme, the Government, starting from a balanced budgetary position in 2016, has planned a headline deficit of 0.6 % of GDP in 2017. The headline deficit is projected to slightly improve to 0.5 % of GDP in 2018 and turn into a small surplus thereafter. However, despite the efforts to improve tax collection, tax compliance remains a challenge, as well as the enforcement of measures to reduce the informal economy, in particular undeclared work. The shadow economy (Schneider 2015; IMF

⁷ https://ec.europa.eu/info/sites/info/files/economy-finance/ecfin_forecast_winter_0718_bg_en.pdf

⁸ see also Country Note, Bulgaria 2017, available at:

http://fiscalcouncil.bg/uploads//stanovishta/BG_Country_note.pdf

⁹ <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32017H0809%2802%29>

2018¹⁰) and undeclared work¹¹ remain high. Other measures to reduce regulatory and administrative burden appear to have produced limited results.

The Bulgarian authorities, in consultation and cooperation with the relevant European bodies, conducted since 2015 **asset quality reviews and stress tests of the banking and insurance sectors, and a review of private pension funds' assets**. While the results confirmed the robustness of the sectors on aggregate, pockets of vulnerabilities remain. Furthermore, issues, such as valuing illiquid financial instruments and assets as well as related-party exposures, were not fully tackled by the three reviews. Outstanding issues in the insurance sector also include the treatment of reinsurance contracts, some insurance receivables and group-level supervision.

The main impediments to growth, especially growth of private investment, are **the limited FDI inflows and the high corporate sector debt**, both of which are expected to continue in the forthcoming years. Declining FDIs reflect continuing deleveraging in the economy and low profit expectations, recently also deficiencies in human capital. FDI into the country slowed to 1.5% of GDP in 2016¹². The private sector debt remains considerably higher than in comparable economies. Deflationary pressures and low nominal growth put further pressure on private sector debt going forward with a negative impact on investment. There is also limited demand for credit, mainly due to weaknesses in the business environment, e.g. need for administrative reform and e-government.

Recent labour market developments have shown positive signs, but overall the two main structural problems remain. **One, the labour force continues to shrink because of population ageing combined with emigration. Two, there is unused labour potential and a high share of youth NEET ("Not in Education, Employment or Training")**. Currently, the labour market is characterised by a high share of long-term unemployed in total unemployment and a high inactivity rate, limited inclusion of young people in the labour market and skills shortages and mismatches. The expected duration of working life is 32.1 years in Bulgaria, which is the second lowest in the EU-28 after Italy (30.7 years) and close to that of Greece (32.3 years)¹³. In the face of these challenges, active labour market policies are insufficiently targeted towards disadvantaged groups and their needs, which further hinders their employability.

According to the In-Depth Review on the prevention and correction of macroeconomic imbalances¹⁴, Bulgaria's **labour productivity and labour costs remain the lowest in the EU**. Income convergence prospects are not optimistic due to the high levels of skills shortages and mismatches which hinder the adjustment of the labour market. Only stronger productivity growth would allow Bulgaria to close the income gap with the EU-28 average and to alleviate the structural problems in its labour market, reflected in its high long-term and youth unemployment. At least additional one percentage point per year until 2040 is needed, in order to allow income convergence to, for example, Portuguese levels (the lowest of the original euro area members) (Mitra and Pouvelle, 2012).

Table 1: Labour Productivity Index (2010=100), Bulgaria

2010	2011	2012	2013	2014	2015	2016
100	104.3	106.9	108.3	109.4	112.9	116.9

Source: European Commission

¹⁰ Shadow Economies Around the World: What Did We Learn Over the Last 20 Years? (WP/18/17)

¹¹ European Semester Thematic Fiche on Undeclared Work, available at: http://ec.europa.eu/europe2020/pdf/themes/2016/undeclared_work_201605.pdf

¹² Bulgarian National Bank, February 2017

¹³ Eurostat, 222/2016 – 14 November 2016

¹⁴ http://ec.europa.eu/europe2020/pdf/csr2016/cr2016_bulgaria_en.pdf

On the positive side, from the eight countries assessed in the Lagging Regions Report¹⁵, Bulgaria is considered the only one with relatively small rigidities in the labour market with respect to wage setting, employment protection, labour market segmentation and flexibility of employment, which should be serving in support of enterprise competitiveness.

1.1 Structure of the economy

According to the Economic Challenges of Lagging Regions Report¹⁶, the sectoral composition of Bulgaria's lagging regions differs from the EU28 average. It is over-represented in agriculture, industry and wholesale & retail, and under-represented in services activities, most notably in public services and knowledge services. There is **evidence of convergence towards the EU average largely confined to Sofia** and its immediate surroundings in contrast with the **low skill, low wage spiral of other regions**.

Services present the highest and growing share of employment, 55.71% in 2015 and 56.67% in 2016, as well as of value added: 67.34% and 66.99% respectively. Based upon the Country Report¹⁷, the share of employment in high-technology sectors is smaller in Bulgaria than the EU average and it is even smaller in all the lagging regions (only around half the national average). Equally, both the share of employment in R&D activities and R&D expenditure relative to GDP in Bulgaria are only around half the EU average and in lagging regions even smaller. Accordingly, both the regulations in place and the limited availability of research expertise and R&D facilities are likely to discourage investment in Bulgaria, especially in the areas with most growth potential (in knowledge-intensive sectors) and in the lagging regions in particular.

The Bulgarian economy has traditionally been specialized in low-tech production and the exports are still biased towards primary products, instead of knowledge-intensive services and high value-added products. The country's list of main exports in 2016 includes electronic equipment, fuels, clothing, plastics, basic metals and fabricated metal products¹⁸. The fastest growing Bulgarian exports are arms and ammunitions, chemical goods and animal-origin products¹⁹. In 2015 there is a slight upward tendency related to higher value-added exports such as machinery and equipment; car parts and components; computer and electronic equipment; pharmaceuticals²⁰, which continues into 2016. Compared to 2015, **Bulgaria is improving its rank among global exporters** in 2016 as measured by the World Trade Organization (WTO)²¹:

Table 2: World Trade Ranking 2016, Bulgaria

Rank in world trade, 2016	Exports	Imports
Merchandise	60	62
Commercial services	60	74

¹⁵ Competitiveness in Low-Income and Low-Growth Regions, European Commission SWD(2017) 132 final

¹⁶ http://ec.europa.eu/regional_policy/en/information/publications/reports/2017/economic-challenges-of-lagging-regions

¹⁷ Economic Challenges of Lagging Regions Report, Annex 2 – Task 2 Country report BULGARIA

¹⁸ e.g. <http://www.worldsrichestcountries.com/top-bulgaria-exports.html>

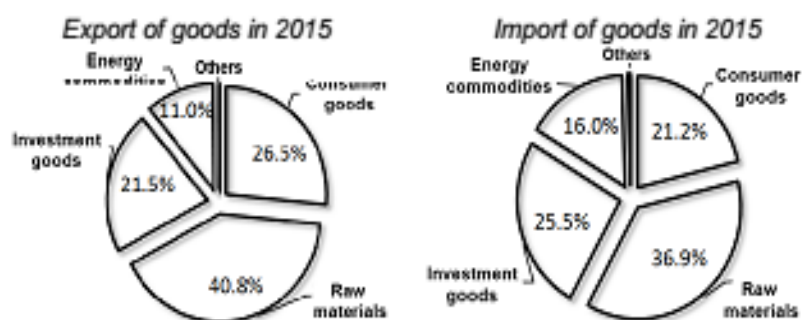
¹⁹ ibid.

²⁰ Analysis of the Bulgarian Industrial Association (<http://www.bia-bg.com/analyses/view/22322/>), July 2016

²¹ <http://stat.wto.org>, Trade profiles, Country Profile Bulgaria 2016

Nonetheless, the export data for 2015 demonstrates the continued skewed export structure, whereby the raw materials outweigh finished products.

Graph 2: Structure of Export and Import of Goods by End-Use



Source: Bulgarian National Bank, 2016

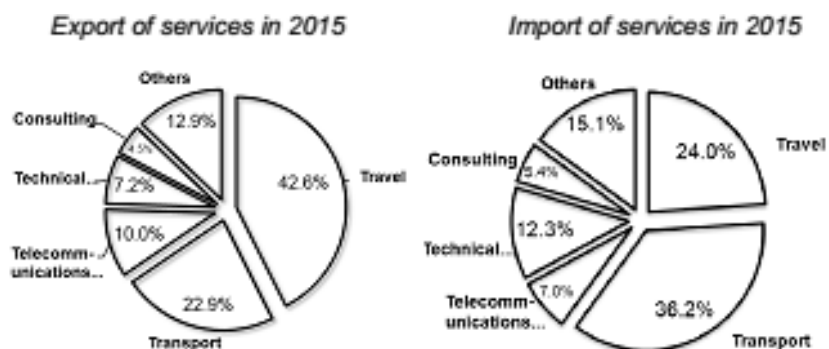
Based on the import structure, the Economic Research Institute of the Bulgarian Academy of Sciences (BAS) draws the following conclusions in the Annual Economic Development Report 2016:²²

- To a large extent the Bulgarian economy is dependent on imported raw materials, energy resources and investment goods (nearly 80% of all imports);
- There is import of goods for renovation and expansion of Bulgaria's production, which potentially can lead to an expansion of the export production;
- The high share of imported consumer goods reveals insufficient local production of consumer goods that cannot meet the needs of the internal market.

The BAS Annual Report 2016 focuses on agriculture and the needed shift of its model towards the so called "Mediterranean diet" in order to increase the value added and the sustainability, as well as the contribution of the **agricultural sector** in Bulgaria to GDP growth.

The services structure shows an interesting trend of growing "Other services":

Graph 3: Structure of Export and Import of Goods by End-Use



Source: Bulgarian National Bank, 2016

Foreign Direct Investment (FDI), net inflows, is 2.4% of GDP in 2016 compared to the peak in 2007 (Bulgaria's EU entry) of 31%²³. There is no statistical evidence that FDI is being attracted by innovation-related incentive schemes or the existing science base,

²² <http://www.iki.bas.bg/>

²³ <http://data.worldbank.org>

except for possibly ICT-related and outsourcing services. FDI presence seems to be linked to the **affordable labour force (esp. with foreign language skills) and the low flat level of corporate tax (10%)**.

According to the Invest Bulgaria Agency data²⁴, the four key sectors of the economy on the basis of the FDI inflows in the period 1996-2014 are real estate, finance, manufacturing and trade, while the key investment support sectors are: Machine Building; Information Technology; Business Process Outsourcing; Chemistry; Balneology; Electrical Engineering and Electronics; Food and Agriculture; Healthcare and Medical Tourism; and Logistics.

Business networks (e.g. Todeva 2006), global business clusters (e.g. Porter 1998) and global value chains (GVCs) increasingly matter worldwide and offer to countries in need of 'catch-up' growth rates such as Bulgaria ways to accelerate FDI, exports and the "servicification" of the economy. GVCs could lead to economic development, but in Bulgaria it is hampered especially by shortage of skilled labour and administrative obstacles for exporters. This issue hints the importance of, on the one hand, formulating national GVC policies, and, on the other, the need to **embed national GVC policies into a broader strategy** aimed at upgrading skills, physical and regulatory infrastructure, and enhancing social cohesion. In addition, the GVA policies hardly interfere with smart specialization, and the two could mutually reinforce each other (Brennan and Rakhmatullin 2015).

Bulgaria exhibits **low to medium level of structural integration in GVCs**, which is slightly higher on the buying side. Bulgaria's increasing GVC integration is correlated with value-added gains. Eight specific GVCs could be identified (actually or potentially) in Bulgaria. The GVCs include (1) agriculture; (2) food and beverages; (3) textiles, leather, and footwear; (4) chemicals and non-metallic mineral products; (5) basic metals and fabricated metal products; (6) machinery and equipment not elsewhere classified; (7) electrical and optical equipment; and (8) transport equipment. This selection of potentially important sectors for global value chains (GVCs) is based on three quantitative analyses – sector's revealed comparative advantage, assessment of total forward and backward GVC participation measures, and the composition of the top 50 to 100 export and import products (which usually account for roughly 50% to 70% of countries' total exports and imports). Although Bulgaria's involvement in the automotive GVC is still small, the country intends to expand its GVC participation in that area.

1.2 Business environment

In Global Competitiveness Index (GCI) 2016-2017 Bulgaria is country 50/138²⁵ with lowest performance of Institutions (97th place, including 115th and 116th place for property rights and IPR respectively), Infrastructure (70th place), Innovation and Market size (both 65th place). GCI 2017-2018 is overall improving (49/137), but with persistent lowest rank for **Institutions** (98th place). The investment climate in the country has recently been analysed in additional detail²⁶. According to the EU Regional Competitiveness Index²⁷, Bulgarian regions perform least adequately in quality of institutions and basic education, two factors that are crucial in attaining high levels of productivity and competitiveness.

The business environment improves only scarcely and volatily in recent years. The public administration is less tangibly supportive of SMEs in comparison with the rest of

²⁴ <http://investbg.government.bg/en/pages/economic-structure-111.html>

²⁵ http://www3.weforum.org/docs/GCR2016-2017/05FullReport/TheGlobalCompetitivenessReport2016-2017_FINAL.pdf

²⁶ Investment Climate in Bulgaria, 2016, available at:

<https://assets.kpmg.com/content/dam/kpmg/pdf/2016/06/2016-KPMG-Investment-in-Bulgaria.pdf>

²⁷ http://ec.europa.eu/regional_policy/en/information/maps/regional_competitiveness/

the EU. The Sustainable Governance Indicators (SGI) 2017²⁸ shows implementation of important policies is varying, as the policy performance index is 5.24 (ranking 33 among OECD and EU countries). The strengths are exhibited in environmental policy, and the weaknesses in economic²⁹ and social policies³⁰.

The **Country-Specific Recommendations** (CSR) for Bulgaria in 2016³¹ underline the importance of fiscal adjustment, tax collection issues, banking and non-banking supervision, social assistance and insolvency procedures and procurement. The recommendations in 2017³² also focus on tax collection and tax compliance, addressing shadow economy and undeclared work, follow-up measures on financial sector reviews, social systems (education, health) and implementation of 2014-2020 National Public Procurement Strategy.

Table 3: Main Business Environment Indicators, Bulgaria

	2010	2014	2015
Country position in Doing Business WB	44	36	38 39 (2016, 2017) 50 (2018)
Product market regulation (OECD)		(2013)	
Rank		20	
Score		1.57	
Ease of access to loans (WB GII)	(2013)		
Rank		22	27 29 (2016)
Score		70	70 70 (2016)
Survey on the Access to Finance of Enterprises (SAFE) Share of companies which identified access to finance as one of the most important conditions	0.08 (2015) 0.10 (2016)		
Venture capital indicators (EVCA)			
Venture capital investment as % of GDP	0.004 (2013)	0.003	0.002
Innovative enterprises as a share of total number of enterprises CIS data	27.4 (2012) 26.1 (2014)		
EC Digital Economy & Society Index rank (DESI)	27 (2014)	27 (2015)	27 (2016, 2017)

Sources: ESTAT 2016, OECD, World Bank, EVCA

According to the World Bank's 'Doing Business'³³ Report in 2016, Bulgaria ranks 38th in ease-of-doing business (compared to 36th in the 2015 report) based upon comparable business indicators across 189 economies. The weakest performance is demonstrated in the areas of 'getting electricity', 'paying taxes', 'starting a business' and also 'registering

²⁸ Policy Performance and Governance Capacities in the OECD and EU, SGI 2017, Bertelsmann Stiftung

²⁹ Economy; Labour Market; Taxes; Budgets; Research and Innovation; Global Financial Markets

³⁰ Education; Social Inclusion; Health; Families; Pensions; Integration; Safe Living; Global Social Inequalities

³¹ <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:C:2016:299:TOC>

³² <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:C:2017:261:TOC>

³³ <http://www.doingbusiness.org>

property', 'resolving insolvency' and 'enforcing contracts'. Doing Business 2017³⁴ adjusts the 2016 ranking to 37th and places the country 39th out of 190. Doing Business 2018³⁵ positions Bulgaria 50th with similar issues to be resolved as in previous rankings. The World Justice Index³⁶ positions Bulgaria at 53rd place (among 113) with performance causing concern related to **Constraints on Government Powers** and Absence of Corruption. Corruption is also assessed as the most problematic factor for doing business in Bulgaria by the World Economic Forum (WEF)³⁷.

Significant barriers in Bulgaria persist in the areas of regulatory and administrative burden. Procedures are complex, lengthy and relatively costly, in particular for enforcing contracts, trading across borders and dealing with utilities. The **frequently changing regulatory framework** creates uncertainty to the business environment, even though Bulgaria ranks higher than previous years in two 2017 index editions – The Heritage Foundation's Economic Freedom Index and Best Countries for Business by Forbes. Bulgaria ranked 47th in Economic Freedom Index (up from 60th place) in 2016, and 38th (up from 45th) in Forbes. Concerns about the independence, quality and efficiency of the judicial system, including inconsistent rulings, affect negatively foreign and domestic propensity to invest.

³⁴ <http://www.doingbusiness.org/data/exploreeconomies/bulgaria/>

³⁵ <http://www.doingbusiness.org/~media/WBG/DoingBusiness/Documents/Profiles/Country/BGR.pdf>

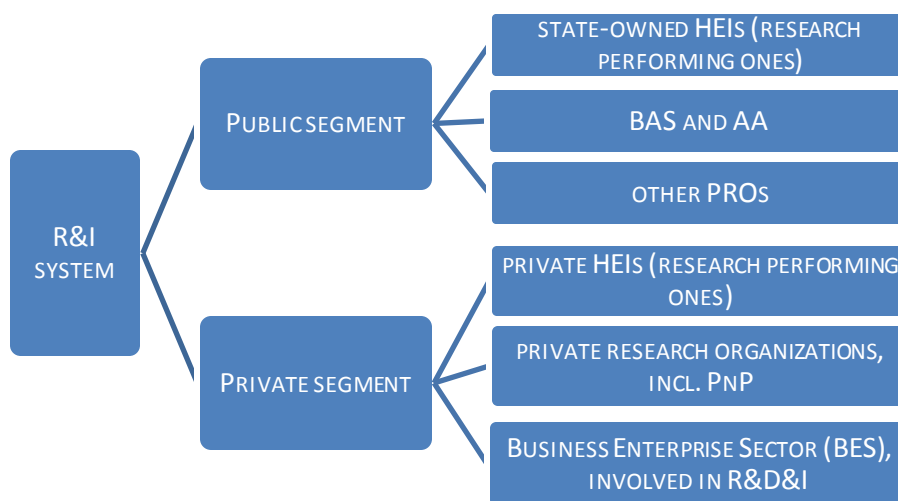
³⁶ http://worldjusticeproject.org/sites/default/files/media/wjp_rule_of_law_index_2016.pdf

³⁷ Global Competitiveness Report 2016-2017 and 2017-2018

2 Main R&I actors

The Bulgarian R&I system is composed of **(non-integrated) public and private segments** (Figure 1). The public segment comprises of the state-owned higher (or tertiary) educational institutions (i.e. universities, whose system can be described as unitary, but transforming into dual with the new Law on Higher Education³⁸), public research organizations (mainly the two leading academies - Bulgarian Academy of Sciences (BAS)³⁹ and the Agricultural Academy (AA)⁴⁰, both guided by separate laws) and other public research institutes (centres/labs) under different sectoral ministries or agencies. The private segment covers private performers, which could be higher institutions (i.e. private universities), private research organizations (including registered as non-profit NGOs) or enterprises, involved in R&D&I.

Figure 1: R&D&I System Segments, Bulgaria



Source: Authors' Own Data

The system is highly centralised in terms of regulation and control, and the regions (NUTS II), the districts (NUTS III) and the municipalities have limited responsibilities in the area of higher education, R&D and innovation policy. The competences have been clearly divided between the Ministry of Education and Science (oriented towards the public segment) and the Ministry of Economy (dealing with the private sector).

Similarly, policies are devised and implemented separately, whilst funding and support primarily depend on the type of beneficiary, not the R&I field or the opportunities for joint projects and initiatives. The most serious challenge for the country's R&I system thus is the continuous **lack of integrated policy instruments**, including shared R&I infrastructures, which play an increasingly important role in the advancement of knowledge and technology. They are the key instrument to stimulate public-private partnerships and also to create and stimulate markets.

As parliamentary republic, Bulgaria is governed by **National Assembly** (National Parliament)⁴¹, which is the highest policy-making body. The Parliament exercises its power mainly through the state budget and its distribution. Related to the themes of research and innovation, there are Standing Committees on Economic Policy and

³⁸ <http://dv.parliament.bg/DVWeb/showMaterialDV.jsp?idMat=101233>

³⁹ <http://www.bas.bg/>

⁴⁰ <http://www.agriacad.bg/>

⁴¹ <http://www.parliament.bg/>

Tourism, on Education and Science, and on European Affairs and Oversight of European Funds. Since 2012 the Parliament has also controlled the research output of the Bulgarian Academy of Sciences (BAS). The Parliament also approved in December 2015 the Law on the Management of the Financing from the European Structural and Investment Funds⁴². In June 2017 it launched the National Strategy for Development of Scientific Research 2017-2030 "Better Science for a Better Bulgaria".

The **Council of Ministers** (CM)⁴³ endorses the most important strategic documents. The Council of Ministers Administration encompasses the Central Coordination Unit of all EU financial support. The **Ministry of Economy** (ME)⁴⁴ defines the national innovation policy and provides (national) funding predominantly to private enterprises for applied research through the National Innovation Fund (NIF), implemented by the Bulgarian SME agency (BSMEPA)⁴⁵. At the start of the 2007-2013 programming period the Agency also performed the functions of Operational Programmes Intermediate Body, which was abolished in 2012. The General Directorate "European Funds for Competitiveness" of the Ministry of Economy is the Managing Authority of Operational Programme (OP) "Development of the Competitiveness of the Bulgarian Economy", co-financed by ERDF during programming period 2007-2013 and of Operational Programme "Innovation and Competitiveness" for 2014-2020 programming period (and OP SME Initiative 2014-2020).

The **Ministry of Education and Science** (MES)⁴⁶ primarily functions as a regulator of the national education system⁴⁷. MES also designs and carries out national science and scientific research policy and oversees the functioning of the main public research funding instrument – the National Science Fund (NSF). MES also hosts the National Contact Point (NCP) for the EU framework programmes and Horizon 2020 (within the Directorate "Science")⁴⁸. During 2007-2013 period MES contained Intermediate Body under Operational Programme "Human Resources Development", co-financed by ESF and managed by the Ministry of Labour and Social Policy. For 2014-2020 programming period until 2017 the Directorate "Structural Funds and International Educational Programmes" performed the functions of a Managing Authority of Operational Programme "Science and Education for Intelligent Growth" with dual funding from ESF and ERDF. Starting from 1 November 2017, the new Implementation Agency for OP "Science and Education for Intelligent Growth" (set up on 18 October 2017) is becoming the Managing Authority.

Other ministries participate in policy-making and R&I activities depending on their specific competences. The Ministry of Agriculture and Food is responsible e.g. for the Agricultural Academy, for the National Plant Protection Service, as well as for the Food Safety Agency and the entities in the field of veterinary medicine. The Ministry of Health oversees the National Centre for Public Health Protection and the public HEIs structures in the field of medicine. The Ministry of Transport, Information Technology and Communications is responsible for the Digital Agenda and e-government, especially through its Executive Agency "Electronic Communication Networks and Information Systems" (EA ECNIS), the successor of which since 2016 has been the State e-Government Agency (SEGA). The Ministry of Interior supports institutes in psychology and criminalistics, as well as criminology.

The **largest research performing institutions** in Bulgaria are the Bulgarian Academy of Sciences (BAS), the Agricultural Academy (AA) and key Bulgarian universities (i.e.

⁴² <https://www.eufunds.bg/images/ZUSESIF.pdf>

⁴³ <http://www.government.bg/>

⁴⁴ <http://www.mi.government.bg/>

⁴⁵ The Agency was proposed to be merged with the Invest Bulgaria Agency into an Economic Development Agency (EDA) on the basis of the draft Law on Innovation, published for public consultation in May 2016. The merger was subsequently discussed to happen through amendments in the Law on Promotion of Investments, as the draft Law on Innovation has not entered the Council of Ministers. The EDA is expected to be involved in RIS3 monitoring. Yet, the viability of this proposal is difficult to assess currently.

⁴⁶ <http://mon.bg/>

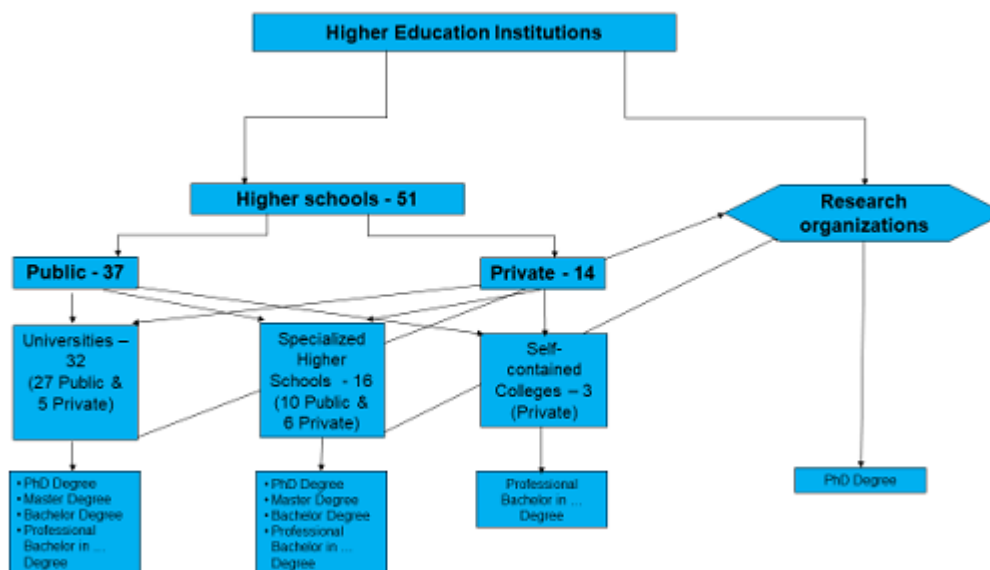
⁴⁷ e.g. The Structure of the European Education Systems 2015/16, available at:

⁴⁷ <https://webgate.ec.europa.eu/fpfis/mwikis/eurydice/images/0/05/192EN.pdf>

⁴⁸ <http://horizon2020.mon.bg/>

HEIs such as Sofia University⁴⁹, Sofia Medical University⁵⁰, Plovdiv University⁵¹ and the Technical University in Sofia⁵²). Overall, the tertiary education system in Bulgaria consists of 51 HEIs (Figure 2).

Figure 2: Overview of Higher Education Institutions in Bulgaria



Source: Ministry of Education and Science

The **private non-profit sector** is relatively weak, but applied research is increasingly carried out in smaller private sector organizations – private universities and private research institutions. The funding of the non-profit institutions is most often directed towards research-related activities, not R&D per se.

Although a relatively new phenomenon (mainly due to Operational Programme “Development of the Competitiveness of the Bulgarian Economy”, co-financed by ERDF during programming period 2007-2013), **clusters, Technology Transfer Offices (TTOs), networks and platforms** in Bulgaria disseminate information and research results as well as facilitate the search for partners in Bulgaria and EU for joint innovative projects, promote cooperation and the development of scientific, technological and business collaborations.

The new cluster scheme was launched in 2016 under OP Innovation and Competitiveness, introducing cluster differentiation into starting, developing and developed with indicative budget of €20m. Phase 2 of **Sofia Tech Park**⁵³ (with budget of €6.39m in 2016) is also ongoing. The park has been established with the aim to strengthen the competitiveness of science and entrepreneurship in Bulgaria, to improve the exchange of knowledge between academia and the business community, to become a platform for the development of start-up companies, and to accelerate the process of commercialization of research.

⁴⁹ <http://www.uni-sofia.bg/>

⁵⁰ <http://www.mu-sofia.bg/>

⁵¹ <http://www.uni-plovdiv.bg/>

⁵² <http://www.tu-sofia.bg/>

⁵³ <http://sofiatech.bg/>

3 R&I policies, funding trends and human resources

Main R&I policy developments in 2017

Table 4: Main Policy Developments 2017, Bulgaria

Relevant document	Short description
<p><u>Mapping of Research Infrastructures and Research Equipment in Bulgaria</u> 27.04.2017</p>	<p>The mapping exercise identifies and classifies the existing leading research infrastructures, facilities and equipment in terms of geographic coverage, technological level/usability and thematic orientation, related to the RIS3 process (physical, material science and engineering; medical and agro-bio sciences field; social science and humanities; and e-infrastructure for multidisciplinary research fields).</p>
<p><u>National Research Infrastructure Roadmap 2017-2023 (update)</u> Decision 354/29.06.2017 of the Council of Ministers</p>	<p>On the basis of the mapping exercise and in line with the ESFRI process, the existing Roadmap is updated to provide the long-term vision for the priority investments with respect to the R&D&I landscape.</p>
<p><u>National Strategy for Development of Scientific Research 2017-2030</u> Decision 282/19.05.2017 r. of the Council of Ministers Approved by the National Assembly on 07.06.2017</p>	<p>The Strategy covers priority themes, infrastructure, international partnerships, as well as the improvement of human resources and especially career opportunities for scientists and researchers. The Strategy is supported by a multi-annual financial framework, combining EU and national funding.</p>
<p><u>Innovation Strategy for Smart Specialization 2014-2020 (update)</u> Decision 384/13.07.2017 of the Council of Ministers</p>	<p>RIS3 is revised to reflect the new strategic developments and the results from the continuous Entrepreneurship Discovery Process (EDP). It also encompasses the improved governance and monitoring mechanisms.</p>

Source: Authors' Own Data

Mapping of Research Infrastructures and Research Equipment in Bulgaria: In the period December 2015 – February 2017 MES undertook a full scale mapping and review of research infrastructures and equipment per field and per region. Independent experts verified the information provided by institutions - the existing research infrastructures, human resources, exploitation life of the research equipment, project financing and the availability of key partners. As a result, **161 research infrastructures**, facilities and equipment were identified: 57 in the Physical, Material Science and Engineering; 61 in the medical and agro-bio sciences field; 29 in the social sciences and humanities, and 14 infrastructures in the E-infrastructure for multidisciplinary research fields.

National Research Infrastructure Roadmap 2017-2023 (update): The previous Roadmap versions from 2010 and 2014 prioritized 10+4 projects at national and European level,

involving Bulgarian partners in the consortia. The update process started in 2015 with the involvement of external expertise for project review and business planning. On the basis of the larger 2016-2017 mapping exercise and in line with the renewed ESFRI process, the updated Roadmap received approval by the Council of Ministers (Decision 354/29.06.2017).

National Strategy for Development of Scientific Research 2017-2030 "Better Science for a Better Bulgaria": Following consultations with relevant stakeholders at national and regional levels, long-term vision for science and R&D was elaborated. The Strategy, received Parliament approval in June 2017, proposed a multi-annual financial framework and contributed to the process of smart specialization.

Innovation Strategy for Smart Specialization 2014-2020 (update): The Ministry of Economy and the Ministry of Education and Science integrated the results from the Mapping of Research Infrastructures and Research Equipment in Bulgaria into the RIS3. According to the Action Plan, in the period April-June 2017 two regional stakeholder events were organized in each of the six regions. In June 2017 four thematic discussions took place, covering the strategy implementation, monitoring and evaluation per priority theme. The Innovation Strategy for Smart Specialization 2014-2020 was revised by the Council of Ministers (Decision 384/13.07.2017) also in view of the newly adopted National Strategy for Development of Scientific Research.

In addition, the Managing Authority(MA) of OP "Science and Education for Intelligent Growth" (OPSEIG), formerly the Directorate "Structural Funds and International Educational Programmes" in MES, was transformed on 18 October 2017 into a new Implementation Agency MA OPSEIG, starting from 1 November 2017, following recommendations to improve the administrative and absorptive capacity in the field of science and education.

In February 2017, after a request from the Ministry of Education and Science of Bulgaria, within the H2020 Policy Support Facility (PSF), specific support to Bulgaria was launched building up on the results of the first peer review of the Bulgarian R&I system (March-October, 2015) within the same PSF. The objectives of the PSF project⁵⁴ are to support the Bulgarian authorities in the development of: 1) a research performance-based funding system, inspired by Member States best practices; and 2) a model for the evaluation and assessment of the public research institutions performance. The team includes independent experts, representatives of the Directorate-General Research and Innovation (DG RTD) of the European Commission, and Technopolis.

R&I funding trends

The gross domestic expenditure on R&D (GERD) (as % of GDP, 0.96% in 2015 and 0.78% in 2016) is currently below both target and EU-28 average. Nonetheless, the intensity of the business enterprise expenditure on R&D (BERD) has been on the rise since 2009. The funding from abroad is the main driver of the growth of the Bulgarian BERD intensity. Services and manufacturing together account for more than 95% of the BERD expenditure in the period 2009-2016. There is a growing trend in 2009-2016 in the manufacture of machinery and equipment. The pharmaceutical industry is another leading manufacture sector in Bulgaria, and so is (although at lower levels of BERD expenditure) the manufacture in electronics.

⁵⁴ <https://rio.jrc.ec.europa.eu/en/policy-support-facility/specific-support-bulgaria>

Table 5: Main R&D Indicators 2017, Bulgaria

	2010	2011	2012	2013	2014	2015	2016
GERD (as % of GDP)	0.56	0.53	0.6	0.63	0.79	0.96	0.78
GERD in national currency (million units)	421,612	429,566	496,176	521,682	664,829	850,457	734,047
R&D funded by abroad (as % of GDP)	0.22	0.23	0.28	0.31	0.4	0.42	
R&D funded by EC (% of GDP)	0.02	0.02	0.02	0.03	0.06	0.05	

Source: European Commission

3.1 Public allocation of R&D and R&D expenditure

There are three main sources of R&D funding: the business sector (with a share of growing 20%), the government (diminishing 20%), and foreign funding (approx. 50%). The total GERD follows an upward trend from 2005 onwards, with possibly one year of stagnation in 2011. On the other hand, starting in 2010, the direct support from the government declines. Support from EC remains almost stable in size, with variations due to implementation.

Table 6: Main R&D Indicators (government and academia) 2017, Bulgaria

	2010	2011	2012	2013	2014	2015	2016
GBAORD (million units of national currency)	195,018	188,58	197,817	200,423	206,584	212,47	187,465
GBAORD (as % of GDP)	0.26	0.23	0.24	0.24	0.25	0.24	0.2
R&D funded by GOV (% of GDP)	0.24	0.21	0.19	0.2	0.21	0.2	
R&D performed by GOV (% of GDP)	0.21	0.19	0.18	0.19	0.2	0.2	0.17
R&D performed by HES (% of GDP)	0.07	0.05	0.05	0.05	0.07	0.05	0.04
R&D performed by HES and funded by public (GOV) (% of GDP)	0.04	0.03	0.02	0.03	0.03	0.02	
R&D performed by HES and funded by private (BES and PNP) (% of GDP)	0.01	0.01	0.01	0.01	0.01	0.01	
Number of international scientific co-publications per million population	157.78	167.86	174.01	181.48	176.11	179.81	202.41
Percentage of scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	4.04	4.44	3.27	3.43	3.78		
Research excellence composite indicator (Rank)	21	22	22	26	26		

Source: European Commission

The public sector is almost exclusively the recipient of government funded GERD. The share of direct public funding going into the business sector is negligible. Bulgaria offers very basic R&D tax incentives, and their scope is limited⁵⁵. In most cases the publicly performed R&D is eligible for tax incentives. The local stakeholders are hardly aware of systematic targeting by sector (outside the scope of the smart specialization process currently ongoing as ex ante conditionality for ESIF 2014-2020), although individual ministries introduce specific sectoral policy measures, e.g. the Ministry of Tourism, the Ministry of Energy.

Although the results from impact evaluations are not yet available, preliminary assessment of project implementation shows insufficient uses of EU best practices. The focus is on publicly performed R&D or company support, without collaboration requirements or direct partnership support instruments (e.g. vouchers). The latter are planned in 2018 under OPIC 2014-2020.

3.2 Private R&D expenditure

In Bulgaria, the intensity of the business enterprise expenditure on R&D (BERD) has been on the rise since 2010. The rise is most probably related to the increased role of financing inflows from abroad. However, restricted data availability due to confidentiality limits any detailed analysis of the degree of internationalisation or inward R&D penetration. Services and manufacture together account for more than 95% of the BERD expenditure in the period under scrutiny.

Table 7: Main R&D Indicators (business) 2017, Bulgaria

	2010	2011	2012	2013	2014	2015	2016
R&D funded by BES (% of GDP)	0.09	0.09	0.13	0.12	0.18	0.34	
BERD (% of GDP)	0.28	0.28	0.37	0.39	0.52	0.7	0.57
BERD funded by the government		0	0	0.01	0.01	0.01	
Turnover from innovation as % of total turnover (Eurostat)	7.6		4.2				
SMEs introducing product or process innovations as % of SMEs			21.4		23		
World Share of PCT applications	0.02	0.02	0.02	0.03	0.03	0.02	

Source: European Commission

The business expenditure on R&D in the top manufacture sectors in Bulgaria experienced strong fluctuations in the period 2006-2016. Despite the fluctuations, there is a growing trend in 2009-2017 in the manufacture of machinery and equipment. The pharmaceutical industry is another leading manufacture sector in Bulgaria, and so is (although at lower levels of BERD expenditure) the manufacture in electronics. As for the services sector, the driving force behind the growth of the BERD intensity are the professional, technical and scientific services.

⁵⁵ A study on R&D tax incentives. Annex: Country fiches. Final Report, TAXUD/2013/DE/315, FWC No. TAXUD/2010/CC/104

In order to improve overall competitiveness, enterprises need to further strengthen their export and innovation orientation (e.g. by performing more R&I locally or jointly with innovation leaders) and start reaping the benefits by climbing up the value ladder. To offer insight into the business reality in Bulgaria behind the macro-indicators, the Centre for Economic Strategies and Competitiveness⁵⁶ has conducted a micro-economic analysis incorporating data for over 300,000 Bulgarian companies⁵⁷. The counter-factual analysis suggests that if financing through loans and EU subsidies stops, Bulgaria would lose 25% of its economy. On the other hand, if the average productivity of the companies with export potential rises to the levels of each sector's top performing 10% companies, Bulgaria would have positive and sustained economic growth without relying on loans and EU subsidies.

3.3 Supply of R&I human resources

The PSF in 2015 acknowledges the **key role of human resources** and recommends that the country takes 'rapid action to rebuild incentives for research careers at all stages and to retain and attract young talent from Bulgaria and from abroad into science and innovation'⁵⁸. The scientific and research collaboration with Bulgarian diaspora has unexplored potential and thus is an obvious element of this action. A new MES initiative started in December 2016 with "Bulgarians into World Science" Forum⁵⁹ at Sofia Tech Park aiming to re-connect scientists at home and abroad. Yet, the overall attractiveness of the higher educational and R&I systems needs to be quickly and substantially improved.

Table 8: Supply of Human Resources 2017, Bulgaria

	2010	2011	2012	2013	2014	2015	2016
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	0.26	0.26	0.34	0.42	0.45	0.55	0.60
New graduates in science, maths, computing, engineering, manufacturing, construction per 1000 population	1.62	1.66	1.76	1.89	1.8	1.81	1.66
Number of researchers per thousand of population		2.01	2.08	2.21	2.46	2.69	
Public expenditure on education (% GDP)	3.6	3.4	3.3	3.7	4.1	4	3.4
Public expenditure on tertiary education (% GDP)	0.8	0.8	0.7	0.8	0.9	0.8	0.7
Population age 25-34 having completed tertiary education (ISCED 5-8) (%)	27.5	27.2	27.2	29.6	31.3	31.8	32.8
Employment rates of population age 25-64, having completed tertiary education (%)	83.2	81.8	81.8	81.4	82.7	84.9	85.1
Share of employees age 25-64 having completed tertiary education (%)	28.8	29.3	29.6	31	32.5	33.1	32.9
Share of scientists and engineers in the age group 25-64 as % of active population (%)	3.3	5.1	5.1	5.1	5.8	6.1	6.1

⁵⁶ <http://economicstrategy.org/>

⁵⁷ <http://move.bg/more-competitive-or-poorer>

⁵⁸ <https://rio.irc.ec.europa.eu/en/library/horizon-2020-policy-support-facility-peer-review-bulgarian-research-and-innovation-system/> or <http://www.horizon2020.mon.bg/>

⁵⁹ <http://horizon2020.mon.bg/?go=news&p=detail&newsId=79>

Share of female researchers	48.59	49.07	48.61	49.7	49.47	47.93	
Share of tertiary degree mobile graduates from abroad (%)				3.4	3.2	3.1	

Source: European Commission

The statistics related to the supply of human resources contains negative trends. According to the IMD World Talent Report 2017⁶⁰, all the four most discouraging spheres relate to human resources – management education (63rd), university education, labour force growth and brain drain (all 61st). Similarly, although the overall position of Bulgaria in the Global Talent Competitiveness Index 2015-2016⁶¹ is 44/109, the variables with most unsatisfactory rankings relate to human resources and could negatively affect the future competitiveness prospects: brain drain (106th place), brain gain (104th), social mobility (103rd) and employee development (101st). The figures from GTCI 2018 for Bulgaria are 47/119, with least developed pillar being the ability to attract talent (71).

The share of population aged 25-34 having completed tertiary education (ISCED 5-8) is 32.8% in 2016 in Bulgaria, which is still below the EU-28 average of 38.2%. The positive sign is however the employment rates of the population aged 25-64, having completed tertiary education, which is 85.1%, compared to 84.8% for EU-28. The share of employees aged 25-64 having completed tertiary education (32.9%) and the share of scientists and engineers in the age group 25-64 (6.1%) can be towards 35.4% and 7.4% respectively for EU-28.

Statistics on science and technology personnel are key indicators for measuring the knowledge-based economy and its positive impact on growth levels. The share in Bulgaria is 6.1% of active population in 2016, following a clear upward trend since 2010. The total number of researchers in full-time equivalents (FTE) is 14,224. R&D personnel from all sectors together amounts to 0.68% of the labour force in 2015, compared with an average of 1.2% (EU-28). The structure of R&D personnel in the country is skewed compared to EU-28, whereby the government (GOV) sector exceeds EU-28 average (0.25 to 0.16), while the business enterprise (BES) and the higher education (HES) shares lag behind substantially (0.29 to 0.65 and 0.14 to 0.38 respectively). In other words, if the supply of R&I human resources does not double and its composition does not improve in favour of business and HEIs, the R&I performance will be hampered, weighing against 'leapfrog' development.

⁶⁰ <http://www.imd.org>

⁶¹ http://global-indices.insead.edu/qtci/documents/INSEAD_2015-16_Full_Book_Ebook.pdf

4 Policies to address innovation challenges

4.1 Challenge 1: Devoting targeted efforts to implementation and capacity building

Description

Before RIS3, the R&D&I sector in Bulgaria had not had the chance to receive high-level political commitment, quality administrative support (including external) and sufficient funding sources, together with the implementation capacity that goes along with them. The non-integrated policies for science and business, the budget deficiencies and the low level of success under framework programmes has led to the perception of lack of financial support to the whole R&D&I system. Bulgaria has the lowest participation and success rate related to H2020 in the EU⁶².

The funding from OP "Innovation and Competitiveness" 2014-2020, Priority 1, is already available to innovative business beneficiaries and Sofia Tech Park. However, the budget of €179m from OP "Science and Education for Intelligent Growth" 2014-2020, under Priority 1, for Centres of Excellence (CoE) and Competence Centres (CC) is absolutely necessary for the survival of the system, yet already delayed and under risk. International evaluation is on-going, and is due towards the end of February 2018. What is highly needed is speeding-up of project implementation for beneficiaries in the public sector and providing institutional support for both public and private sectors with respect to EU-level programme participation, esp. H2020.

Policy response

In 2017 the completion of the mapping of research infrastructures and research equipment unlocked the evolution of other strategic processes. It provided review and verification of 161 research infrastructures, facilities and equipment, classified as follows: 57 in Physical, Material Science and Engineering; 61 in Medical and agro-bio sciences field; 29 in Social science and humanities; and 14 in E-infrastructure for multidisciplinary research fields. These efforts, along with the National Strategy for Development of Scientific Research 2017-2030, approved by Parliament, complemented the collaboration and coordination mechanisms required for the completion of the RIS3 ex ante conditionality for the 2014-2020 programming period, Thematic Objective 1: "Strengthening research, technological development and innovation" of the EU Common Strategic Framework (CSF). The overall RIS3 process managed to ensure priority fields, financial framework and other system developments promoting R&D&I in the country. The new Implementation Agency for OP "Science and Education for Intelligent Growth" set up on 18 October 2017 is also expected to contribute to the improved functioning of the system.

Assessment

Following the adoption by Council of Ministers of the updated National Research Infrastructure Roadmap 2017-2023, on 28 June 2017, and of the revised Strategy for Smart Specialization for Bulgaria on 12 July 2017, the Commission assessed the ex-ante conditionality 1.1 (Research and Innovation) and 1.2 (Research and Innovation Infrastructure) as fulfilled on 31 July 2017.

Although this direction of transformations is positive, the policy response is not yet fully in line with the Policy Support Facility (PSF) recommendations from 2015. The new Implementation Agency responsible for science and education funding serves only as Managing Authority for the OP "Science and Education for Intelligent Growth" 2014-2020. The Promotion Agency for Research and Innovation (PARI), proposed by the PSF, means integrating other national and EU instruments in the area of R&D&I. It is not clear how

⁶² Horizon 2020: Two Years On, 2016

the National Science Fund (NSF)⁶³ and the National Innovation Fund (NIF)⁶⁴ will improve their functioning after the current institutional reform. In addition, the H2020 network itself awaits improvement in motivating its participants to be more active in raising the low participation and success rate of Bulgaria in H2020.

4.2 Challenge 2: Directing reforms towards rewarding quality and excellence

Description

The total stock of researchers per 1000 active labour force needs to double in order to reach EU-28 average, while the number of new doctoral graduates per 1000 population (aged 25-34) has to triple. Increasing the system's attractiveness for scientists and researchers however involves additional reforms towards rewarding quality and excellence at institutional, project and individual level. The 2015 PSF Peer Review of the Bulgarian R&I system identifies the human resource issue as critical for the Bulgarian R&I system, as well as the need to further develop the model of performance-based funding (PBF). The Stairway to Excellence Project⁶⁵ stresses that the national R&I system in Bulgaria cannot be strengthened without improvements in the governance of the public research organisations (PROs) which currently underestimate quality due to the financial allocation model.

According to the World Bank 3S Report⁶⁶ for Bulgaria, 'the current funding environment does not encourage sufficiently researchers and research organisations to increase the quality and impact of their research'. The lack of quality and impact bring about low levels of public appreciation of scientific research and low salaries.

The insufficient national level focus on quality and excellence is also related with the lower participation in H2020 and below-average success rate of Bulgarian projects⁶⁷. Thus, the system enters into a vicious circle without emphasis on the future supply of human resources and incentives for excellence and internationalisation.

Policy response

In Bulgaria the HEI reform started in 2015 with the amendments to the Law on Higher Education entering into force from March 2016. The HEIs are divided into four categories (formally non-existent before): university, research-performing university, specialized HEI, and independent college. The differentiation between research-oriented HEIs and HEIs focused on tuition is fundamental for the quality improvement.

The underlying principles are presented in the new Ordinance⁶⁸ regulating the state subsidies for HEIs specific activities⁶⁹, in line with Article 91a (2) of the Law for Higher Education. From 1 January 2017 the Ordinance replaces Ordinance No. 3/27.11.2015 on the conditions and procedure for the planning, distribution and spending of the subsidies from the state budget allocated for the specific scientific research or artistic activities of the state higher education institutions⁷⁰. The financing depends on the results from the application of scientific performance indicators (e.g. publications) according to the metrics in the Regulation for monitoring and evaluation of the scientific research activity, conducted by the HEIs, research organizations, as well as the National Science Fund⁷¹.

⁶³ In 2015 the Bulgarian National Audit Office (NAO) published a Report on the Implementation of the National Strategy for Scientific Research 2011-2014, concluding that SRF has not been governed effectively and for the benefit of science and business development.

⁶⁴ There is a gap between 2014 (Seventh NIF Session) and 2016 (Eighth NIF Session) without any NIF calls and activities.

⁶⁵ <http://s3platform.jrc.ec.europa.eu/stairway-to-excellence>

⁶⁶ "Input for Bulgaria's Research and Innovation Strategies for Smart Specialization" (February 2013)

⁶⁷ S2E Country Report, Bulgaria, 2015

⁶⁸ State Gazette, Issue 73 from 16.09.2016 (www.dv.parliament.bg)

⁶⁹ <http://www.mon.bg/>

⁷⁰ State Gazette, Issue 94 from 04.12.2015 (www.dv.parliament.bg)

⁷¹ State Gazette, Issue 72 from 18.09.2015 (www.dv.parliament.bg)

As indicated above, in February 2017 the Ministry of Education and Science of Bulgaria, within the framework of H2020 Policy Support Facility (PSF) requested further specific support to Bulgaria as a follow-up to the first peer review of the Bulgarian R&I system (March-October 2015).

Assessment

The approved National Strategy for the Development of Scientific Research 2017-2030 contains strong commitment to human resources development, including through revision and update of the Law on Academic Staff in line with EU level policies and proper career development. Yet, there is slow progress in increasing the attractiveness of the national R&D&I system for national and international scientists and researchers. The initiated HEI differentiation and the changes in the model for financing public research organizations (PROs) constitute positive developments in this direction.

4.3 Challenge 3: Capitalizing on smart specialization, EU-level research infrastructures and initiatives

Description

There is a strong need to further support the integration of the Bulgarian scientific research and innovation. The underfunding so far stems from both insufficient national public resources allocated to R&I and inadequate participation of national actors in EU framework and other programmes and initiatives. The general view has been that Bulgaria has been pulling out of co-operations (e.g. European Research Infrastructure Consortium (ERIC) projects) rather than engaging in new European scale co-operations, due to a lack of national funding priority. This has been gradually overcome, yet the financing is not yet 'injected' in the system, as none of the projects from the National Research Infrastructure (NRI) Roadmap, created for the first time in 2010⁷² and amended in 2012 and in 2014⁷³, is completed.

The smart specialization process has been on-going in Bulgaria since 2012 with the World Bank assistance to the Ministry of Economy in Bulgaria for the initiation of the country's research and innovation strategy for smart specialization, based on international best practices. Through the Smart Specialisation Platform⁷⁴, Bulgaria has also benefited from the 16th Peer Review, conducted in Dublin, Ireland, in July 2014. Bulgaria has received additional technical support from the European Commission to strengthen the entrepreneurial discovery process (EDP) and later the monitoring mechanisms.

Policy response

In 2017 the National Research Infrastructure (NRI) Roadmap 2017-2023 in Bulgaria was approved by the Council of Ministers, benefitting from external expertise and the completion of the Mapping of Research Infrastructures and Research Equipment exercise in Bulgaria. The new roadmap ensures a stronger co-alignment with European infrastructure consortia and national partners, policy coordination and an overall financial commitment. RIS3 update in 2017 has integrated all processes – the mapping exercise, the roadmap update, the National Strategy for Development of Scientific Research 2017-2030 and the EDP.

The Science Directorate in the MES has also been active in the preparation of the Troika programme of Estonia, Bulgaria and Austria for the period 01 July 2017 to 31 December 2018. The Bulgarian presidency programme January – June 2018 in the field of science and research⁷⁵ shows that along the overarching priorities⁷⁶ like

⁷² http://www.nrri-bg.com/sites/default/files/docs/National_Roadmap_EN.pdf

⁷³ <http://www.mon.bg/bg/143>

⁷⁴ <http://s3platform.jrc.ec.europa.eu/>

⁷⁵ <http://horizon2020.mon.bg/?qo=page&pageId=275>

⁷⁶ <https://eu2018bg.bg/en/>

- The Future of Europe and the Young People – Economic Growth and Social Cohesion
- European Perspective and Connectivity of the Western Balkans
- Security and Stability in a Strong and United Europe
- Digital Economy and Skills needed for the Future,

Bulgaria has set five priorities related to EU-level R&D&I objectives:

1. Accelerating the transfer of knowledge, data and research results in support of a new generation of innovators and researchers;
2. Maximizing sustainability of Research Infrastructures and opening to the industry and the society;
3. Progressing the revision of the legal base for the European Institute of Innovation and Technology (EIT);
4. Ensuring implementation of the Euratom programme for research and training during 2018-2020;
5. Research and Innovation for Food and Nutrition Security and Quality Empowerment.

Assessment

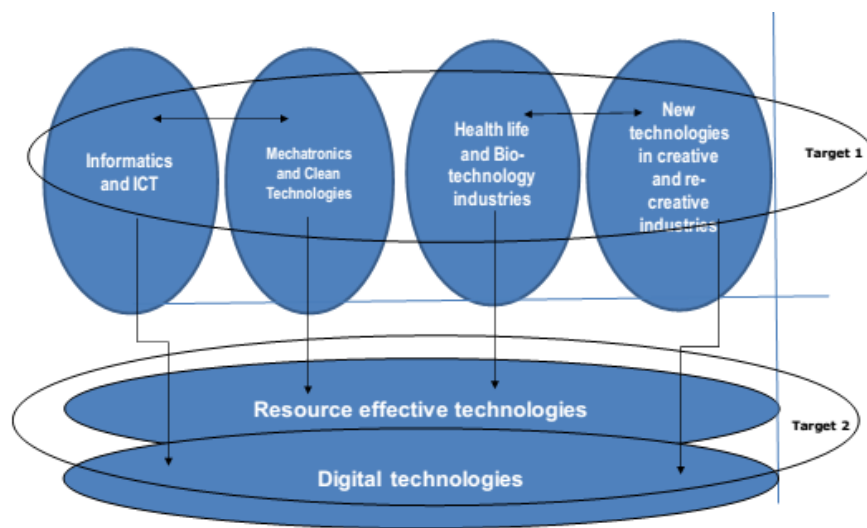
In sum, the already consensual and functioning smart specialization and the National Research Infrastructure (NRI) Roadmap in line with ESFRI present a tremendous novel opportunity for the country to improve its stance and inter-connections in the EU R&D&I landscape. Although the impact of RIS3 and ESFRI participation of Bulgaria cannot be currently substantiated by quantitative evidence, it has become clear that those have led to improved coordination and cooperation in three important ways: among different levels of governance and also among administrative spheres; among government, industry, education and research institutions, as well as citizens; and among national and EU players. The Presidency of the EU of Bulgaria in 2018, as part of the Troika with Estonia and Austria, provides an additional stimulus for increased EU visibility of the Bulgarian R&D&I system.

5 Focus on R&I in National and Regional Smart Specialisation Strategies

The RIS3⁷⁷ has a vision for Bulgaria by 2020 to make a qualitative leap in its innovation performance. This vision is expressed in practical terms in the strategic goal: by 2020, Bulgaria to move from the group of “modest innovators” into the group of “moderate innovators” by:

- focus in the ‘smart’ thematic areas;
- horizontal support improving resource efficiency and application of ICT in industry (EU Digital Agenda).

Figure 3: Smart Thematic Priority Areas and Horizontal Policies, Bulgaria



Source: RIS3, Bulgaria

The traditions of Bulgarian agriculture and medicine are combined with achievements in ICT and automation, recognizing that ‘the industries of the twenty-first century will depend increasingly on the generation of knowledge through creativity and innovation’⁷⁸. The Entrepreneurial Discovery Process (EDP) has allowed for deepening the ‘smart’ areas and identifying specific niches (33 in number), where Bulgaria possesses potential for break-through achievements: in Informatics and ICT – 8 sub-thematic areas (STAs); in Mechatronics and CleanTech – 11 STAs; in the Industry for a Healthy lifestyle and BioTech – 10 STAs; and in the Creative and Re-creative industries – 4 STAs.

Given the high centralization of governance and administration in Bulgaria, the country has chosen a national approach to smart specialization for the 2007-2013 programming period. However, pilot initiatives exist at regional level in the North Central Region, thanks to the JRC RIS3 Support to Lagging Regions project⁷⁹, and at the level of the Capital City of Sofia - Innovation Strategy for Smart Specialization of Sofia (ISSSS)⁸⁰ with the support of the S3 Platform⁸¹. Sofia is also starting a ‘smart city’ strategy⁸².

⁷⁷ Directly concerning two Operational Programmes, OP “Innovation and Competitiveness” and OP “Science and Education for Intelligent Growth” 2014-2020, Priority Axis 1

⁷⁸ Landry, Charles; Bianchini, Franco (1995), *The Creative City*; see also Florida, Richard, *The Creative Class*.

⁷⁹ <http://s3platform.jrc.ec.europa.eu/ris3-in-lagging-regions>

⁸⁰ <http://www.sofia-da.eu/en/strategic-documents/innovation-strategy-for-smart-specialization-of-sofia.html>

⁸¹ <http://s3platform.jrc.ec.europa.eu/>

⁸² e.g. <http://sofiaconference.bg/en/#about>

Macro-regional initiatives such as the support for Knowledge Society in the EU Strategy for the Danube Region⁸³ also exist including Bulgarian partners.

New policy developments

The RIS3 Action Plan was gradually implemented in 2016, also with EC technical support in monitoring and evaluation. Technology roadmaps per each RIS3 thematic area have been elaborated.⁸⁴ The Council for Smart Growth is functioning, allowing for policy coordination and high-level oversight. Administrative and regional networks support the everyday functioning of the process. The extensive entrepreneurial discovery process continued with twelve regional events (two in each of the six NUTS II regions in different cities and towns) that have taken place to discuss and promote the smart specialization process and calibrate the thematic areas and sub-areas.

In the period December 2015 and February 2017 MES undertook a full scale mapping of research infrastructures, equipment and apparatus per field (in four broad research fields) and per region (in the six NUTS II level regions in Bulgaria). Independent experts verified the information provided by the institutions themselves - the existing research infrastructures, human resources, exploitation life of the research equipment, project financing and the availability of key partners.

As pointed out above, in 2017 The Mapping of Research Infrastructures and Research Equipment in Bulgaria took place. MES also updated the National Research Infrastructure Roadmap in 2016-2017 by using external expertise. It confirmed priority on the set of 10+4 projects defined in the process (in 2014), which were assessed individually in economic and financial terms. In 2017 the National Research Infrastructure Roadmap 2017-2023 was extended and fully updated on the basis of the mapping exercise and in line with the ESFRI process. Thus, it was approved by Decision 354/29.06.2017 of the Council of Ministers. Following the adoption by Council of Ministers of the updated National Research Infrastructure Roadmap 2017-2023, on 28 June 2017, and of the revised Strategy for Smart Specialization for Bulgaria on 12 July 2017, the Commission assessed the ex-ante conditionality 1.1 (Research and Innovation) and 1.2 (Research and Innovation Infrastructure) as fulfilled on 31 July 2017.

Progress on implementation

As per the RIS3 Action Plan, events in the period April-June 2017 were organized, two regional discussions in each of the six NUTS II regions and four thematic stakeholder events focusing on the priority themes.

The share of funding allocated to Thematic Objective 1 is 6.9% of the total EU budget for ESIF 2014-2020 in Bulgaria, exceeding only those of Greece and Romania⁸⁵. The funding schemes under OPIC 2014-2020 in the sphere of technological development and innovation are in implementation phase (151 contracts for innovation in established enterprises - €60m, and 82 for innovation in start-ups - €15m, in addition to support for Sofia Tech Park and National Patent Office). Another OPIC scheme under Priority Axis 1 is launched in 2017 – development of product and process innovation in enterprises (€35m). The evaluation of the scheme for Centres of Excellence and Competence Centres under OPSEIG 2014-2020 with an indicative budget of €179m is ongoing⁸⁶ and is expected to be completed in February 2018. There is also ongoing evaluation of the second call for local development strategies with multi-fund financing (after the first call ended with the approval of the 16 strategies for Community-Led Local Development⁸⁷),

⁸³ http://ec.europa.eu/regional_policy/sources/cooperate/danube/factsheet_eusdr_en.pdf

⁸⁴ http://www.mi.government.bg/files/useruploads/files/innovations/trms_3rev_final_bg.pdf

⁸⁵ <https://ec.azure-westeuropa-prod.socrata.com/en/dataset/Thematic-Objective-1-Research-and-innovation-by-Co/it2g-dbb7>

⁸⁶ performed by the winner of the tender for international evaluators

⁸⁷ <http://opcompetitiveness.bg/news.php?id=1105>

whereby interest for OPSEIG and OPIC is high. The 8th session of the National Innovation Fund (NIF) has published the list of 78 top projects, out of which around 18 are expected to be contracted within the framework of 2017 €5m budget⁸⁸.

Monitoring mechanisms and the feedback loop

A multi-level governance model, combining the national and regional levels, is established to monitor the development of RIS3 implementation. It is based on institutional cooperation and coordination.

At the macro-level, Council for Smart Growth was established⁸⁹ with reputable representatives from the science and the business communities under the chairmanship of the Deputy Prime Minister. The intention is to ensure high-level political commitment. At mezzo-level two networks function as integrative facilities for innovation policies: 1) inter-ministerial structure covering the thematic and sectoral issues (the so called administrative network); 2) a regional network for a place-based approach to RIS3, bringing the 28 NUTS III regions together. At micro-level, the two operational programmes in the programming period 2014-2020 with priorities within the scope of thematic objective 1 "Strengthening research, technological development and innovation" of the Common Strategic Framework (OPIC and OPSEIG) synchronize their efforts within a Coordination Group under the Chairmanship of the Central Coordination Unit in the Council of Ministers. The Group contains both policy-making directorates within the Ministry of Economy and MES, as well as Managing Authorities of Operational Programmes, responsible for policy implementation. The Ministry of Agriculture is also invited.

Bulgaria has received technical assistance from the European Commission in order to develop a more robust monitoring and evaluation mechanism for its RIS3 which is both evidence-based and integrated with the achievements (and indicator system) of the Operational Programmes 2014-2020. The work of the mixture-of-experts at Directorate "Economic Policies for Promotion", the Managing Authorities of the Ops, and Prof. Slavo Radošević have driven substantial improvements in the RIS3 process in 2016, which are reflected in the update of the RIS3 in July 2017.

Evidence of impact

The stage of implementation of relevant operational programmes does not allow reliable data on impact of RIS3. Nonetheless, the 12 regional and the four thematic events organized jointly by the Ministry of Economy and MES in 2017 summarized the key conclusions that can be drawn so far from RIS3 implementation in terms of budget and in terms of coordination along the axes of the knowledge triangle⁹⁰.

The first interesting results come from the OPIC schemes launched before Priority 1 schemes (i.e. whereby RIS3 themes are not compulsory, but provide bonus points per project). The early-stage available evidence suggests an increase in business interest in RIS3 sub-themes and additional efforts to synchronize science and business strengths. It is perceived that there are emerging possibilities not only for enterprises in the high-tech segment, but also for those in the medium- and low-tech segments, using RIS3 to increase value added.

⁸⁸ Data as of 1 December 2017

⁸⁹ By Council of Ministers Decree No 116/12.05.2015

⁹⁰ See presentations per thematic priority, available at:

<http://www.mi.government.bg/bg/themes/inovacionna-strategiya-za-inteligentna-specializacija-na-republika-balgariya-2014-2020-g-i-proces-na-i-1470-287.html>

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Abbreviations

Abbreviation	Full name in English	Full name in Bulgarian
BSMEPA	Bulgarian SME Promotion Agency	Изпълнителна агенция за насърчаване на МСП
CSR	Country Specific Recommendations	Специфични препоръки за страната
DG	Directorate General	Генерална дирекция
EC	European Commission	Европейска комисия
EFSI	European Fund for Strategic Investments	Европейски фонд за стратегически инвестиции
EIF	European Investment Fund	Европейски инвестиционен фонд
ERA	European Research Area	Европейско изследователско пространство
ESF	European Social Fund	Европейски социален фонд
ESFRI	European Strategy Forum on Research Infrastructures	Европейски стратегически форум за изследователски инфраструктури
ESIF	European Structural and Investment Funds	Европейски структурни и инвестиционни фондове
EU	European Union	Европейски съюз
FDI	Foreign Direct Investments	Преки чуждестранни инвестиции
FP	Framework Programme	Рамкова програма
GBAORD	Government Budget Appropriations or Outlays for Research and Development	Публичните бюджетни средства или разходи за научноизследователска и развойна дейност
GDP	Gross Domestic Product	Брутен вътрешен продукт
GVC	Global Value Chain	Глобална верига на стойността
ICT	Information and Communication Technologies	Информационни и комуникационни технологии
IP	Intellectual Property	Интелектуална собственост
JEREMIE	Joint European Resources for Micro to Medium Enterprises	Съвместни европейски ресурси за микро-, малки и средни предприятия
KETs	Key Enabling Technologies	Ключови (базови) технологии
ME	Ministry of Economy	Министерство на икономиката

MES	Ministry of Education and Science	Министерство на образованието и науката
MF	Ministry of Finance	Министерство на финансите
MIP	Macroeconomic Imbalance Procedure	Процедура за макроикономически дисбаланси
NCP	National Contact Point	Национална контактна точка
NIF	National Innovation Fund	Национален иновационен фонд
NSF	National Science Fund	Фонд научни изследвания
NSI	National Statistical Institute	Национален статистически институт
OP	Operational Programme	Оперативна програма
R&D	Research and Development	Научни изследвания и развитие
R&I	Research and Innovation	Научни изследвания и иновации
R&TD	Research and Technology Development	Научни изследвания и технологично развитие
RI	Research Infrastructures	Инфраструктура за научни изследвания
RIS3	Research and Innovation Strategy for Smart Specialisation	Иновационна стратегия за интелигентна специализация
S3	Smart Specialisation	Интелигентна специализация
SMEs	Small and Medium-sized Enterprises	Малки и средни предприятия
TTOs	Technology Transfer Offices	Офиси за технологичен трансфер
UMIS	Information System for Management and Monitoring of the Structural Instruments of the EU in Bulgaria	Информационна система за управление и мониторинг на структурните инструменти на ЕС в България

Factsheet

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
GDP per capita (euro per capita)	4900	5100	5600	5700	5800	5900	6300	6800		
Value added of services as share of the total value added (% of total)	64.72	67.84	65.46	65.84	67.08	67.6	67.34	66.99		
Value added of manufacturing as share of the total value added (%)	14.69	13.47	15.68	15.79	14.68	15.19	15.76	16.8		
Employment in manufacturing as share of total employment (%)	17.65	17.33	17.47	17.57	17.08	17.1	17.44	17.57		
Employment in services as share of total employment (%)	52.48	54.06	54.58	55.34	55.69	55.56	55.71	56.67		
Share of Foreign controlled enterprises in the total nb of enterprises (%)	4.4	4.26	4.13	3.91	3.84	3.53	3.69			
Labour productivity (Index, 2010=100)	94.8	100	104.3	106.9	108.3	109.4	112.9	116.9		
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	0.29	0.26	0.26	0.34	0.42	0.45	0.55	0.6		
Summary Innovation Index (rank)	28	28	27	28	27	27	27	27		
Innovative enterprises as a share of total number of enterprises (CIS data) (%)				27.4		26.1				
Innovation output indicator (Rank, Intra-EU Comparison)			27	27	26	26				
Turnover from innovation as % of total turnover (Eurostat)		7.6		4.2						
Country position in Doing Business (Ease of doing business index WB)(1=most business-friendly regulations)						36	38	39	39	50
Ease of getting credit (WB GII) (Rank)						22	27	29		
Venture capital investment as % of GDP (seed, start-up and later stage)	0.017	0.009	0	0	0.004	0.003	0.002			
EC Digital Economy & Society Index (DESI) (Rank)						27	27	27	27	
E-Government Development Index Rank		44		60		73		52		
Online availability of public services - Percentage of individuals having interactions with public authorities via Internet (last 12 months)	11	24	25	27	23	21	18	19	21	
GERD (as % of GDP)	0.49	0.56	0.53	0.6	0.63	0.79	0.96	0.78		
GBAORD (as % of GDP)	0.32	0.26	0.23	0.24	0.24	0.25	0.24	0.2		
R&D funded by GOV (% of GDP)	0.3	0.24	0.21	0.19	0.2	0.21	0.2			
BERD (% of GDP)	0.15	0.28	0.28	0.37	0.39	0.52	0.7	0.57		
Research excellence composite indicator (Rank)	21	21	22	22	26	26				
Percentage of scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country		4.05	4.11	3.2	3.55	3.62				
Public-private co-publications per million population	4.02	2.96	4.48	3	2.06	2.35	1.11			
World Share of PCT applications	0.02	0.02	0.02	0.02	0.03	0.03	0.02			
Global Innovation Index				41	44	39	38	36		

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