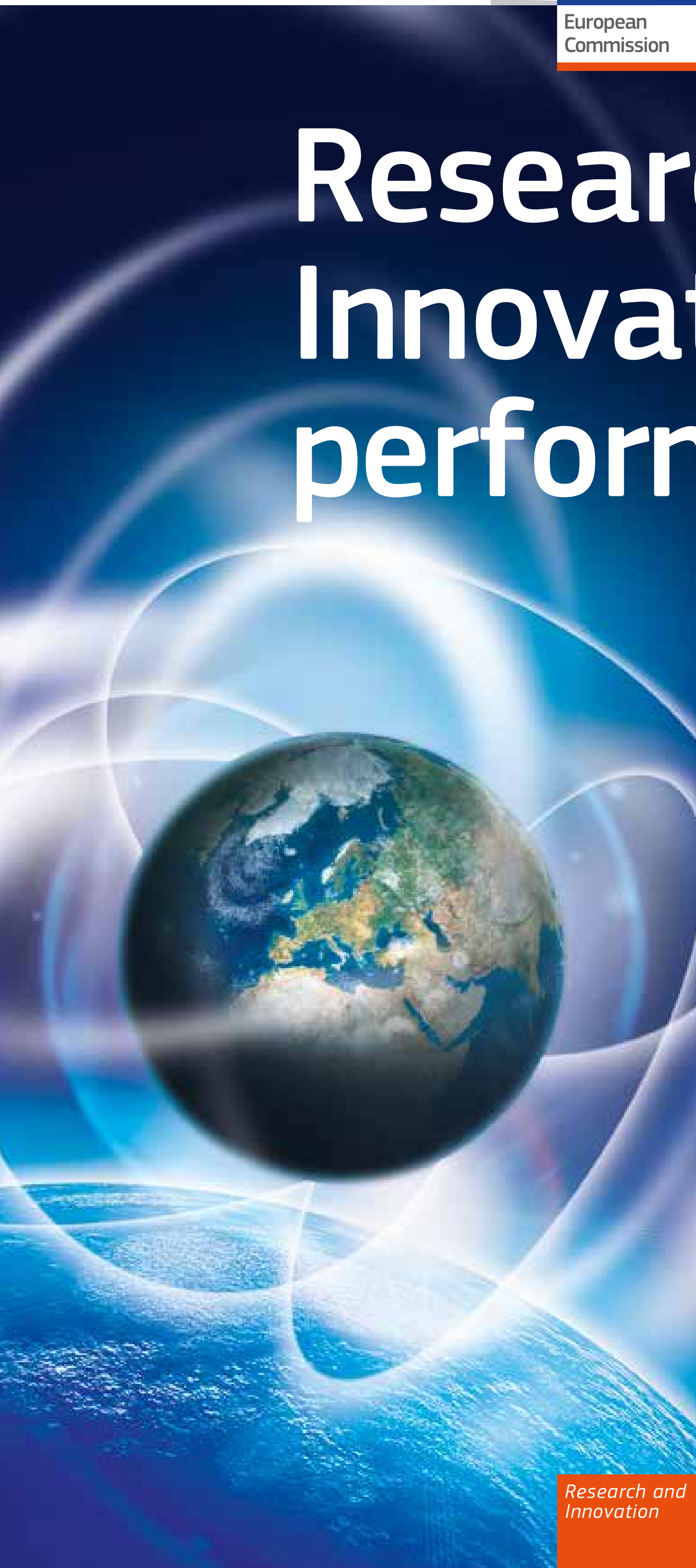
European Commission

Research and Innovation performance in

Bulgaria

Country Profile

2014



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Bulgaria

Seizing the economic growth potential of innovation – policy coordination and strategic planning

Summary: Performance in research and innovation

The indicators in the table below present a synthesis of research and innovation (R&I) performance in Bulgaria. They relate knowledge investment and input to performance and economic output throughout the innovation cycle. They show thematic strengths in key technologies and also the high-tech and medium-tech contribution to the trade balance. The indicator on excellence in science and technology takes into consideration the quality of scientific production as well as technological development. The Innovation Output Indicator covers technological innovation, skills in knowledge-intensive activities, the competitiveness of knowledge-intensive goods and services, and the innovativeness of fast-growing enterprises, focusing on innovation output. The indicator on the knowledge-intensity of the economy focuses on the economy's sectoral composition and specialisation and shows the evolution of the weight of knowledge-intensive sectors and products.

Key indicators of research and innovation performance			
R&D intensity		***Excellence in S&T***[1]	
2012: **0.64 %**	(EU: 2.07 %; US: 2.79 %)	2012: **24.5**	(EU: 47.8; US: 58.1)
2007-2012: **+7.1 %**	(EU: 2.4 %; US: 1.2 %)	2007-2012: **+0.3 %**	(EU: +2.9 %; US: -0.2)
Innovation output indicator		***Knowledge-intensity of the economy***[2]	
2012: **65.3**	(EU: 101.6)	2012: **33.5**	(EU: 51.2; US: 59.9)
		2007-2012: **+2.8 %**	(EU: +1.0 %; US: +0.5 %)
Areas of marked S&T specialisation:		***HT + MT contribution to the trade balance***	
Food and agriculture, biotechnology, energy,		2012: **-5.2 %**	(EU: 4.23 %; US: 1.02 %)
construction, environment, and ICT		2007-2012: **n.a.**	(EU: +4.8 %; US: -32.3 %)

R&D intensity in Bulgaria increased from 0.45 % in 2007 to 0.64 % in 2012, which is still far below the national Europe 2020 target of 1.5 % and the EU average of 2.07 % in 2012. While public R&D intensity fell to 0.24 % in 2012 (the lowest value in the EU), business R&D intensity rose to 0.39 %. The knowledge-intensity of the economy increased slightly between 2007 and 2012. Starting from a very low level, the economy has been catching up in terms of high- and medium-high-technology sectors. The level of excellence in science and technology has slightly improved, but at a much slower rate than the EU average. Bulgaria is the lowest performer in the Innovation Union Scoreboard 2014 and the third lowest EU performer in the innovation output indicator.

Bulgaria's research and innovation systems face serious challenges. Inefficiencies and fragmentation in the allocation of funds for R&I, coupled with insufficient and falling public funding, impede any build-up of R&I capacities in Bulgaria. Low salary levels and outdated research infrastructures fail to retain young and qualified domestic researchers and to attract foreign ones, leading to a continuous brain drain and an ageing R&D staff. In February 2014, the government launched a public consultation in order to update the 'National strategy for development of research 2020' and the Rules of Procedure of the National Science Fund. Furthermore, it announced its intention to put in place a system of regular international evaluation of the scientific activity at public research organisations. A Strategy on Higher Education to better align education outcomes to labour-market needs was published for public consultation in 2013. However, Bulgaria still lacks a national strategy integrating education, science and innovation aspects and focusing on well-defined priorities.

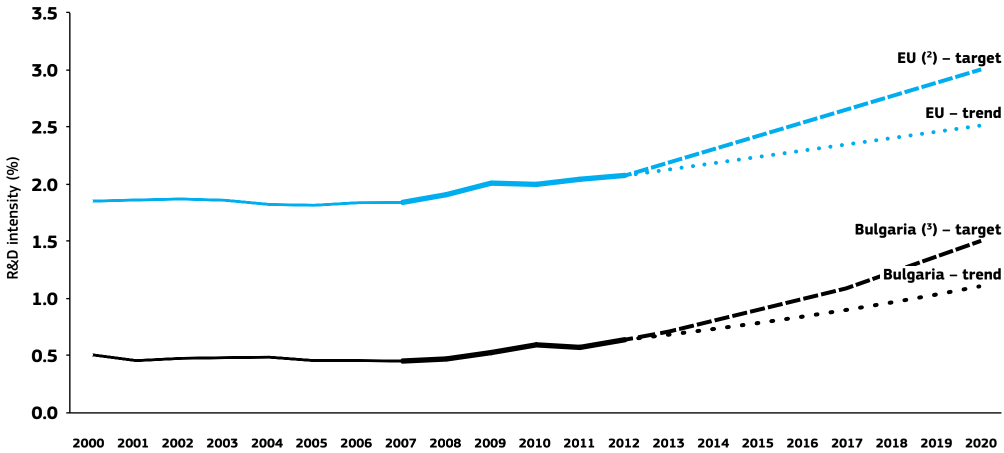
Commercialisation of research is another major weakness within Bulgaria's research system. There are only very limited frameworks for supporting collaboration between public research establishments, universities and the private sector. Sharing and support systems are insufficiently developed to facilitate knowledge transfer and the creation of university spin-offs and to attract (venture) capital and business angels. Public policies are not fostering enough long-term sustainable partnerships among innovation actors.

1 Composite indicator that includes PCT per population, ERC grants per public R&D, top universities and research institutes per GERD and highly cited publications per total publications.

2 Composite indicator that includes R&D, skills, sectoral specialization, international specialization and internationalization sub-indicators.

Investing in knowledge

Bulgaria – R&D intensity projections: 2000–2020 (¹)



Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: DG Research and Innovation, Eurostat, Member State
Notes: (¹) The R&D intensity projections based on trends are derived from the average annual growth in R&D intensity for 2007–2012.
(²) EU: The projection is based on the R&D intensity target of 3.0 % for 2020.
(³) BG: The projection is based on a tentative R&D intensity target of 1.5 % for 2020.

In June 2010, the Bulgarian government adopted a national R&D investment target of 1.5 % of GDP by 2020. R&D intensity increased from 0.45 % in 2007 to 0.64 % in 2012. A further strong increase is required if Bulgaria is to reach its 2020 R&D intensity target. The public sector has historically been the main research funder and performer, but a strong decline can be observed over the last decade: in 2000, it provided 71.1 % of total R&D funding, in 2007 57.7 % and in 2011 only 39 %.

Public R&D expenditure in 2012 was the lowest in the EU. It decreased from 0.40 % of GDP in 2000 to 0.31 % in 2007. In 2009, it increased to 0.37 % but, due to the effects of the economic crisis, it fell sharply to 0.24 % in 2012, which is the lowest value among EU Member States. Total GBAORD shows a similar pattern: it decreased from 0.42 % of GDP (201.98 million in PPS at 2005 prices) in 2000 to 0.26 % (186.06 million) in 2007. In 2009, it increased to 0.34 % (243.55 million) then fell sharply to 0.26 % (189.67 million) in 2012. In 2013, the National Science Fund did not distribute funds because of suspicions of irregularities, which impacted negatively on the sustainability of the public research system.

Business R&D expenditure increased slowly from 0.11 % of GDP in 2000 to 0.14 % in 2007 then surged to 0.39 % in 2012, mainly because of investments by foreign pharmaceutical companies in clinical trials, but also due to technical accounting modifications. In nominal terms, business expenditure on R&D increased from EUR 43.5 million in 2007 to EUR 153.4 million in 2012, surpassing total public expenditure on R&D, which amounted to EUR 96.5 million in 2012.

The share of R&D financed from abroad, which ranged from 5-8 % for the 2000-2009 period, increased to 43.9 % in 2011. Structural Funds are an important source of funding for research and innovation activities. However, of the EUR 6.7 billion of Structural Funds allocated to Bulgaria over the 2007-2013 programming period, only EUR 293 million (4.4 % of the total, which is the lowest share in the EU) relate to RTDI[1].

The level of Bulgarian participation in EU Framework Programmes is low. Both the applicant success rate of 16.4 % and the EC financial contribution success rate of 10.5 % are much lower than the EU averages (21.9 % and 19.7 % respectively). As of October 2013, Bulgaria received a total of EUR 95.1 million in FP7 funding.

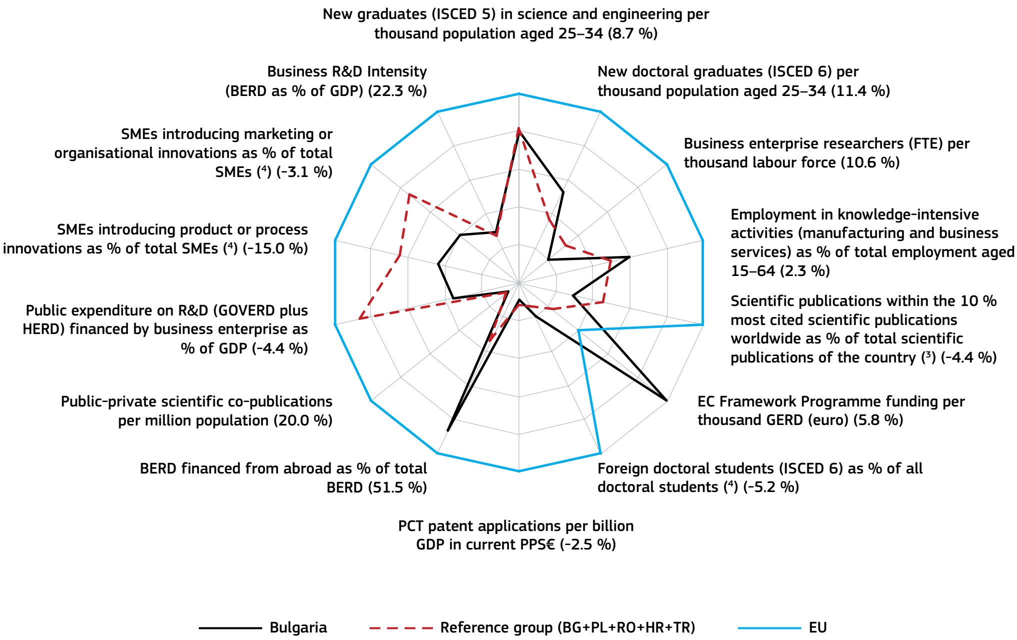
3 RTDI includes the following sectors: (01) RTD activities in research centres, (02) RTD infrastructures and centres of competence, (03) Technology transfer and improvement of cooperation of networks, (04) Assistance to RTD, particularly in SMEs (and RTD services in research centres), (06) Assistance to SMEs for the promotion of environmentally friendly products and processes, (07) Investment in firms directly linked to research and innovation, (09) Other methods to stimulate research and innovation and entrepreneurship in SMEs, and (74) Developing human potential in the field of research and innovation.

An effective research and innovation system building on the European Research Area

The graph below illustrates the strengths and weaknesses of Bulgaria's R&I system. Reading clockwise, it provides information on human resources, scientific production, technology valorisation and innovation. Average annual growth rates from 2007 to the latest available year are given in brackets.

Bulgaria, 2012 (1)

In brackets: average annual growth for Bulgaria, 2007–2012 (2)



Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: DG Research and Innovation, Eurostat, OECD, Science-Metrix/Scopus (Elsevier), Innovation Union Scoreboard.
Notes: (1) The values refer to 2012 or to the latest available year.
(2) Growth rates which do not refer to 2007–2012 refer to growth between the earliest available year and the latest available year for which comparable data are available over the period 2007–2012.
(3) Fractional counting method.
(4) EU does not include EL.

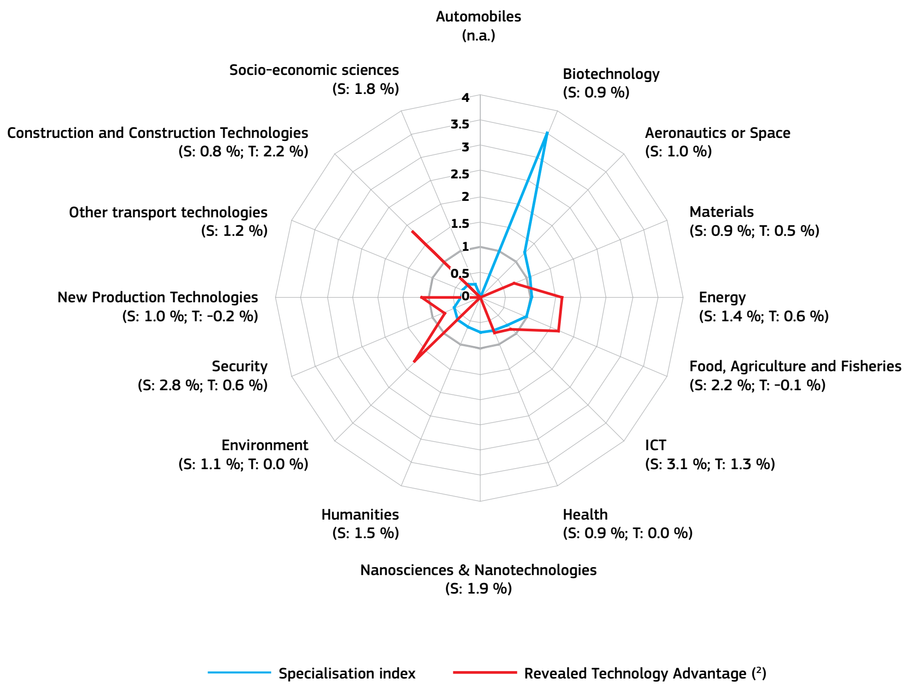
As the graph above shows, Bulgaria's R&I system is underperforming, with most indicators significantly lower than the EU average, except for EU Framework Programme funding and foreign business expenditure on R&D. In addition to these two indicators, compared to the reference group of countries, Bulgaria performs relatively well on employment in knowledge-intensive activities, new doctoral graduates and foreign doctoral students. With regard to new graduates in science and engineering, the country's performance is close to the reference group average. Of particular concern, and below the average level of the reference group, are: the low and falling level of public expenditure on R&D financed by business enterprise; the low and declining share of small and medium-sized enterprises (SMEs) introducing product or process innovations, as well as marketing or organisational innovations; the low and declining share of scientific publications within the 10 % most-cited scientific publications worldwide; and the small number of business enterprise researchers. As regards business R&D intensity (average annual growth of 22.3 %), public-private scientific co-publications (average annual growth of 20 %) and PCT patent applications, Bulgaria scores close to the average reference group level which is well below the EU average. Overall, as in most post-communist countries, patenting activity in Bulgaria is very low. While PCT patent applications show a declining trend, licence and patent revenues from abroad as a percentage of GDP increased between 2007 and 2012.

One positive development in Bulgaria is the fact that, as in the reference group, the share of graduates in science and engineering is slowly catching up with EU average levels. However, Bulgaria has been experiencing massive outflows of highly skilled people, including researchers. In the WEF Global Competitiveness Report 2013-2014, it ranks among the countries with the lowest capacity to retain (142nd out of 148) and to attract (144th) talent.

Bulgaria's scientific and technological strengths

The graph below illustrates the areas, based on the Framework Programme (FP) thematic priorities, where Bulgaria shows potential in science and technology areas in a European context. Both the specialisation index (SI) and the revealed technological advantage (RTA) measure the country's scientific and technological capacity compared to that at the world level. For each specialisation field it provides information on growth rate in the number of publications and patents.

Bulgaria – S&T National Specialisation ([1]) in thematic priorities, 2000–2010
in brackets: growth rate in number of publications ([3]) (S) and in number of patents ([4]) (T)



Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: Science-Metrix Canada; Bocconi University, Italy
Notes: ([1]) Values over 1 show specialisation; values under 1 show a lack of specialisation.
([2]) The Revealed Technology Advantage (RTA) is calculated based on the data corresponding to the WIPO-PCT number of patent applications by country of inventors. For the thematic priorities with fewer than 5 patent applications over 2000–2010, the RTA is not taken into account. Patent applications in 'Aeronautics or Space' refer only to 'Aeronautics' data.
([3]) The growth rate index of the publications (S) refers to the periods 2000–2004 and 2005–2009.
([4]) The growth rate in number of patents (T) refers to the periods 2000–2002 and 2003–2006.

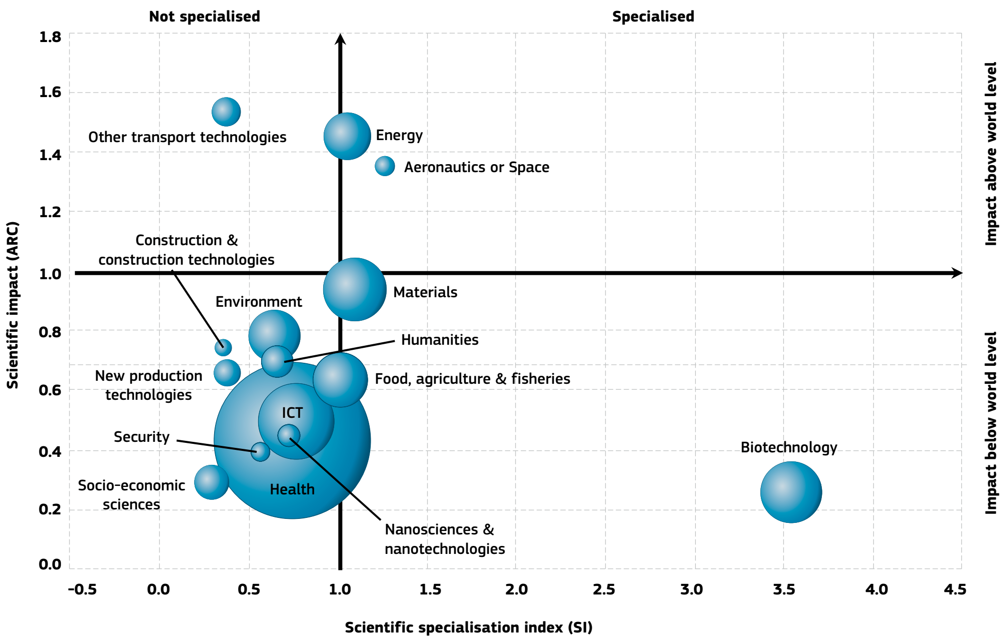
According to the RTA definition and the FP thematic classification, Bulgaria demonstrates RTA in construction and construction technologies; environment (highest participation rate of national researchers/companies in FP7); new production technologies; food, agriculture and fisheries; energy; and ICT, with only the last three having some scientific specialisation, close to or slightly below the world level. Although not visible on the graph, relative growth in patents can be observed in the field of automobiles. It should be noted that certain fields, such as textiles, which play an important role in Bulgaria, are not directly related to any FP thematic priority.

A strong scientific specialisation in Bulgaria can be found in biotechnology, which is a research priority in the National strategy for development of research 2020, but without a corresponding RTA. Aeronautics is another area where Bulgaria shows scientific specialisation but no RTA. Hence, a greater concentration of scarce resources and a better alignment of research priorities and RTA could improve the country's innovation performance. Scientific performance can be strengthened in the fields with RTA and positive growth, such as construction and construction technologies, with a view to improving knowledge transfer and economic impact of a given industry. Sectors where there is a co-specialisation in both science and technology are good candidates to start the smart specialisation process.

Based on an analysis of scientific strengths and patenting activity, as well as exports, employment generation and FDI, the World Bank input for Bulgaria's Research and Innovation Strategy for Smart Specialisation identifies five economic sectors as having a potential for growth: food processing, machine building and electrical equipment, pharmaceuticals, ICT, and cultural and creative industries. The identified sectors encounter both sector-specific and cross-cutting obstacles to realising their innovation potential. Addressing these problems is expected to impact on a number of industries, with a multiplying effect on economic growth.

The graph below illustrates the positional analysis of Bulgarian publications showing the country's situation in terms of scientific specialisation and scientific impact over the period 2000-2010. The scientific production of the country is reflected by the size of bubbles, which corresponds to the share of scientific publications from a science field in the country's total publications.

Bulgaria – Positional analysis of publications in Scopus (specialisation versus impact), 2000–2010



Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: Science-Metrix Canada, based on Scopus
Note: Scientific specialisation includes 2000–2010 data; the impact is calculated for publications of 2000–2006, citation window 2007–2009.

The graph shows that only a few sectors (transport, energy, aeronautics) demonstrate some scientific impact, with either no corresponding or only limited scientific specialisation. The graph also shows that the sector ranking highest on the science specialisation index – biotechnology – is lacking scientific impact above the world level. Similarly, sectors identified in the Smart Specialisation Strategy, such as food, ICT, and health, do not demonstrate scientific impact above the world level. Publications in the area of materials demonstrate scientific specialisation and scientific impact close to that at world level. Overall, scientific performance in Bulgaria is low, as reflected in a number of indicators. For example, in 2009, only 3.2 % of all scientific publications in the country featured in the 10 % most-cited scientific publications worldwide, the third lowest value in the EU. On the composite indicator of research excellence, Bulgaria ranks 21st in the EU, a trend which is improving slightly.

Bulgarian researchers cooperate with researchers from 144 countries worldwide. Cooperation with academics in Germany is most intensive. The scientific fields of mutual interest are: physics and astronomy, chemistry, materials sciences, biochemistry, genetics and molecular biology, and medicine. Among the top 10 countries of origin of research partners (as measured by the number of co-publications) are also the USA, France, Italy, United Kingdom, Russia, Spain, Belgium, Poland and Switzerland.

Policies and reforms for research and innovation

The latest policy developments in the area of R&I are reflected in the drafts of the operational programmes (OP) 'Science and Education for Smart Growth 2014-2020' and 'Innovation and Competitiveness' and in the 'Innovation Strategy for Smart Specialisation'. All those programmes aim to promote research and innovation in the country, but they do not address the problem of fragmentation in Bulgarian R&I administrations, policies and performers. The cooperation between the two national funding instruments (the Innovation Fund and the Science Fund) remains inefficient. The previously envisaged National Innovation Board, which was expected to coordinate the funding priorities of the two funds, has not been established. The Law on Innovation announced in the National Reform Programme 2013 has not been adopted. A Strategy on Higher Education to better align education outcomes to labour-market needs was published for public consultation in November 2013. Following its expected finalisation by March 2014, it must be sent to the National Assembly for approval. However, Bulgaria still lacks a national strategy integrating education, science and innovation aspects and focusing on well-defined priorities.

The public research funding system faces significant inefficiencies. Incentives for research excellence and internationalisation are lacking and the part of public funding which is allocated competitively, transparently and based on merit is low. Due to suspicions of irregularities, the National Science Fund did not distribute funds in 2013, which had negative consequences for the sustainability of the public research system. In February 2014, the government launched a public consultation in order to update the National strategy for development of research 2020 and the Rules of Procedure of the National Science Fund. Furthermore, it also announced its intention to put in place a system of regular international evaluation of scientific activity within public research organisations.

Currently, performance-based funding of public research organisations and individual researchers is underdeveloped. The ranking of universities (launched in 2010) provides the government with a tool for performance-based allocations, but the share of funds allocated according to this ranking is comparatively small and does not prioritise R&I. Publishing and patenting activities vary significantly across the comparatively high number of 51 public universities in Bulgaria. For example, only eight universities registered patents between 2001 and 2012, and only 17 have published articles and scientific reports in the Scopus database. Notwithstanding the existence of a National Roadmap for Research Infrastructure, which is currently under revision, specific R&I cross-border or regional programmes and support schemes have been limited to date, as have plans for involvement in any ESFRI projects.

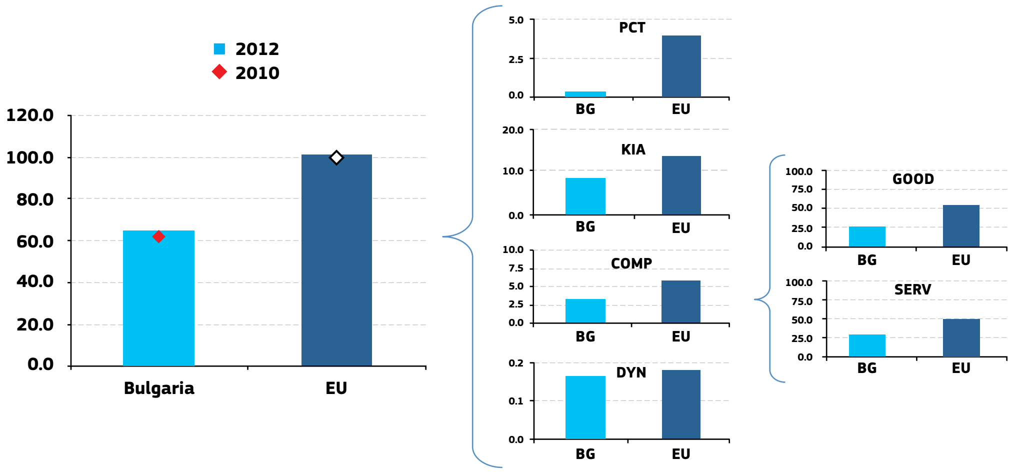
With regard to the 2013 Country Specific Recommendations on R&I, progress in Bulgaria has been very limited. There are only very few frameworks for supporting collaboration between research establishments, universities and the private sector. Research and innovation collaborative platforms, such as technology transfer offices, technology parks and clusters, remain underdeveloped. There are currently only a few technology transfer centres, most of which have been created with Structural Funds support. The first science and technology park in Sofia, co-financed by the European Regional Development Fund, would benefit from stronger political support to grow into a core R&I hub. Sharing and support systems are insufficiently developed to facilitate knowledge transfer and the creation of university spin-offs and to attract (venture) capital and business angels. Public policies are not fostering enough long-term sustainable partnerships between innovation actors.

Bulgarian legislation on intellectual property is in line with EU directives, but it has failed to spur indigenous innovative activity due to problems with enforcement and the capacity of the judiciary. According to the World Economic Forum Global Competitiveness Report 2013-2014, Bulgaria scores very poorly in terms of intellectual property protection (104th out of 148) and university-industry collaboration in R&D (117th). In order to promote private investment in R&I, the state should further develop and implement instruments such as start-up funding schemes, support for clusters, and technology centres for the commercialisation of patents, while financial engineering instruments, guarantees and venture capital should be further enhanced.

Innovation Output Indicator

The Innovation Output Indicator, launched by the European Commission in 2013, was developed at the request of the European Council to benchmark national innovation policies and to monitor the EU's performance against its main trading partners. It measures the extent to which ideas stemming from innovative sectors are capable of reaching the market, providing better jobs and making Europe more competitive. The indicator focuses on four policy axes: growth via technology – (patents); jobs (knowledge-intensive employment); long-term global competitiveness (trade in mid/high-tech commodities); and future business opportunities (jobs in innovative fast-growing firms). The graph below enables a comprehensive comparison of Bulgaria's position regarding the indicator's different components:

Bulgaria – Innovation Output Indicator



Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: Eurostat, OECD, Innovation Union Scoreboard 2014, DG JRC
Notes: All data refer to 2012 except PCT data, which refer to 2010.
PCT = Number of PCT patent applications per billion GDP, PPS.
KIA = Employment in knowledge-intensive activities in business industries as % of total employment.
DYN = Innovativeness of high-growth enterprises (employment-weighted average).
COMP = Combination of sub-components GOOD and SERV, using equal weights.
GOOD = High-tech and medium-high-tech products exports as % total exports. EU value refers to EU-28 average (extra-EU = 59.7 %).
SERV = Knowledge-intensive services exports as % of total service exports. EU value refers to EU-28 average (extra-EU = 56 %).

Bulgaria is the third lowest EU performer in the innovation output indicator[2]. In the period 2010-2012, the country's performance has improved slightly. Bulgaria's performance is particularly low on PCT patent applications. There are several explanations for this: first, it is linked to the country's economic structure, with a specialisation in less-knowledge-intensive sectors, the lack of large Bulgarian multinational manufacturing companies and the division of work within international companies, which have production facilities in Bulgaria but tend to do research and patenting in the headquarter country. Secondly, commercialisation of research in Bulgaria is underdeveloped, and patent literacy and patenting activity in Bulgarian universities is extremely low. Furthermore, some Bulgarian inventors prefer to maintain their secrecy as a method of preserving their intellectual assets, due to a lack of confidence in the official intellectual property protection system. In addition, it is common practice that innovative products developed by Bulgarian researchers are ordered by foreign multinational companies, and then patented and commercialised in a foreign market.

The reason for the relatively low performance in employment in knowledge-intensive activities is the importance of employment in wholesale and retail trade (16 % of total employment), agriculture, forestry and fishery (6.7 %) and accommodation, food and beverage service activities (5.1 %) in the Bulgarian economy. Bulgaria's manufacturing industry is oriented towards low-tech goods.

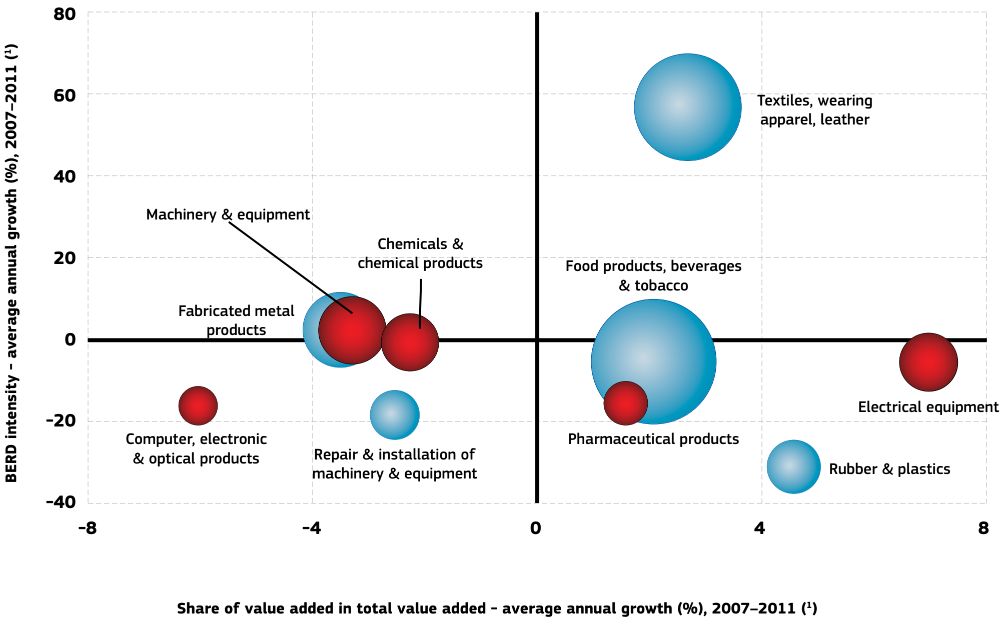
[4] As regards other IPR-related innovation outputs, such as Community trademarks and designs, Bulgaria performs near the EU average, if measured per unit of GDP, and at about half the EU level, if measured on a per-capita basis.

This explains the low performance as regards the share of medium/high-tech goods in total goods exports. A relatively strong tourism and road transport sector (both not classified as knowledge intensive) partly explains the low share of knowledge-intensive service exports. Bulgaria is performing near the EU-average as regards the innovativeness of high-growth enterprises. A strong contribution from the information and communication (software) sector compensates somewhat for the high share of low-tech manufacturing in fast-growing enterprises.

Upgrading the manufacturing sector through research and technologies

The graph below illustrates the upgrading of knowledge in different manufacturing industries. The position on the horizontal axis illustrates the changing weight of each industry sector in value added over the period 2007-2011. The general trend to the left-hand side reflects a decrease in manufacturing in the overall economy. The sectors above the x-axis are those where research intensity has increased over time. The size of the bubble represents the sector share (in value added) in manufacturing (for all sectors presented on the graph). The red sectors are high-tech or medium-high-tech sectors.

Bulgaria – Share of value added versus BERD intensity: average annual growth, 2007–2011 (1)



Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: Eurostat
Notes: (1) 'Electrical equipment', 'Textiles, wearing apparel, leather and related products': 2008–2010; 'Rubber and plastic products': 2009–2011.
(2) High-tech and medium-high-tech sectors (NACE Rev. 2 – two-digit level) are shown in red.

Bulgaria, together with Romania, Turkey, Croatia and Poland, is classified as a low knowledge-capacity system with a specialisation in low knowledge-intensive sectors[5]. Its economic specialisation has been based on low costs and a cheap labour force. The share of industry (except construction) in Bulgaria (25.2 % in 2013) is higher than the EU average (19 %). The graph above demonstrates the large relative weights of two sectors – food products, beverages, tobacco; and textiles, wearing apparel, and leather – as well as their growing share of value added in total value added. Whereas two high-tech (HT) and medium-high-tech (MT) sectors, namely electrical equipment and pharmaceutical products, demonstrate an increase in their shares of value added in total value added (although their weights remain relatively small), three HT

[5] Source: Innovation Union Competitiveness report 2013.

and MT sectors demonstrate a decrease in value added: computer, electronic and optical products; machinery and equipment; and chemicals and chemical products. All HT and MT sectors could benefit from an increase in BERD intensity, which either stagnated or declined between 2007 and 2011. The recent increase in BERD in the pharmaceutical sector is not reflected in the graph. Only one sector, namely textiles, wearing apparel and leather, demonstrates an increase in value added and BERD intensity, simultaneously.

Overall, there are only minor positive trends in the evolution of Bulgaria's economic structure and capacity to address societal challenges, such as health or environment-related challenges. The composite indicator on structural change reflects this by showing a minor improvement over time. While some improvements can be seen regarding patent applications in health-related technologies and employment in knowledge-intensive activities, the share of SMEs introducing product or process innovation has decreased considerably.

Key indicators for Bulgaria

BULGARIA	2000	2005	2006	2007	2008	2009	2010	2011	2012	Average annual growth 2007–2012 (1) (%)	EU average (2)	Rank within EU
ENABLERS												
Investment in knowledge												
New doctoral graduates (ISCED 6) per thousand population aged 25–34	0.35	0.46	0.51	0.56	0.55	0.59	0.57	0.62	0.97	11.4	*1.81*	22
Performance in mathematics of 15-year-old students: mean score (PISA study)	:	:	413	:	:	428	:	:	439	25.3 (3)	495 (4)	26 (4)
Business enterprise expenditure on R&D (BERD) as % of GDP	0.11	0.10	0.12	0.14	0.15	0.16	0.30	0.30	*0.39*	*22.3*	1.31	20
Public expenditure on R&D (GOVERD + HERD) as % of GDP	0.40	0.35	0.34	0.31	0.32	0.37	0.29	0.26	*0.24*	*-4.7*	*0.74*	28
Venture capital as % of GDP	:	:	:	0.13	0.04	0.02	0.01	0.03	0.16	5.2	0.29 (5)	9 (5)
S&T excellence and cooperation												
Composite indicator on research excellence	:	:	:	24.2	:	:	:	:	24.5	0.3	47.8	21
Scientific publications within the 10% most cited scientific publications worldwide as % of total scientific publications of the country	:	4.1	4.8	3.5	2.5	3.2	:	:	:	-4.4	11.0	26
International scientific co-publications per million population	:	177	180	213	205	226	217	213	213	0.0	343	26
Public–private scientific co-publications per million population	:	:	:	2.0	2.7	3.6	3.5	4.1	:	20.0	53	27
FIRM ACTIVITIES AND IMPACT												
Innovation contributing to international competitiveness												
PCT patent applications per billion GDP in current PPS (EUR)	0.5	0.5	0.5	0.4	0.3	0.4	0.4	:	:	-2.5	3.9	26
License and patent revenues from abroad as % of GDP	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.04	12.0	0.59	22
Community trademark (CTM) applications per million population	0.7	7	9	33	35	36	49	58	69	16.3	152	21
Community design (CD) applications per million population	:	0	1	6	5	7	7	8	14	20.1	29	21
Sales of new-to-market and new-to-firm innovations as % of turnover	:	:	10.3	:	14.2	:	7.6	:	:	-27.0	14.4	24
Knowledge-intensive services exports as % total service exports	:	15.0	16.7	20.5	22.5	21.9	25.2	25.5	:	5.6	45.3	21
Contribution of high-tech and medium-tech products to the trade balance as % of total exports plus imports of products	-8.42	-9.89	-9.31	-7.83	-7.43	-5.99	-4.84	-4.78	-5.23	-	4.23 (6)	27
Growth of total factor productivity (total economy): 2007 = 100	85	98	99	100	100	92	93	94	95	-5 (7)	97	18
Factors for structural change and addressing societal challenges												
Composite indicator on structural change	:	:	:	29.1	:	:	:	:	33.5	2.8	51.2	24
Employment in knowledge-intensive activities (manufacturing and business services) as % of total employment aged 15–64	:	:	:	:	8.2	8.6	8.6	8.7 (8)	8.3	2.3	13.9	27
SMEs introducing product or process innovations as % of SMEs	:	:	17.8	:	20.7	:	15.0	:	:	-15.0	33.8	24
Environment-related technologies: patent applications to the EPO per billion GDP in current PPS (EUR)	0.02	0.05	0.02	0.00	0.04	0.04	:	:	:	-4.5 (9)	0.44	23
Health-related technologies: patent applications to the EPO per billion GDP in current PPS (EUR)	0.02	0.06	0.06	0.02	0.04	0.03	:	:	:	24.4	0.53	25
EUROPE 2020 OBJECTIVES FOR GROWTH, JOBS AND SOCIETAL CHALLENGES												
Employment rate of the population aged 20–64 (%)	55.3	61.9	65.1	68.4	70.7	68.8	65.4	62.9 (10)	63.0	-1.5	68.4	23
R&D intensity (GERD as % of GDP)	0.51	0.46	0.46	0.45	0.47	0.53	0.60	0.57	*0.64*	*7.1*	*2.07*	26
Greenhouse gas emissions: 1990 = 100	54	58	59	63	61	53	55	60	:	-2 (11)	83	5 (12)
Share of renewable energy in gross final energy consumption (%)	:	9.2	9.4	9.0	9.5	11.7	13.7	13.8	:	11.3	13.0	13
Share of population aged 30–34 who have successfully completed tertiary education (%)	19.5	24.9	25.3	26.0	27.1	27.9	27.7	27.3	26.9	0.7	35.7	21
Share of population aged 18–24 with at most lower secondary education and not in further education or training (%)	:	20.4	17.3	14.9	14.8	14.7	13.9	11.8	12.5	-3.5	12.7	22 (12)
Share of population at risk of poverty or social exclusion (%)	:	:	61.3	60.7	44.8 (13)	46.2	49.2	49.1	49.3	2.4	24.8	28 (12)

Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: Eurostat, DG JRC – Ispra, DG ECFIN, OECD, Science Metrix / Scopus (Elsevier), Innovation Union Scoreboard
Notes: (1) Average annual growth refers to growth between the earliest available year and the latest available year for which compatible data are available over the period 2007–2012.
(2) EU average for the latest available year.
(3) The value is the difference between 2012 and 2006.
(4) PISA (Programme for Internatonal Student Assessment) score for EU does not include CY and MT. These Member States were not included in the EU ranking.
(5) Venture capital: EU does not include EE, HR, CY, LV, LT, MT, SI and SK. These Member States were not included in the EU ranking.
(6) EU is the weighted average of the values for the Member States.
(7) The value is the difference between 2012 and 2007.
(8) Break in series between 2011 and the previous years. Average annual growth refers to 2008–2010.
(9) Average annual growth refers to 2008–2009.
(10) Break in series between 2011 and the previous years. Average annual growth refers to 2007–2010.
(11) The value is the difference between 2011 and 2007. A negative value means lower emissions.
(12) The values for this indicator were ranked from lowest to highest.
(13) Break in series between 2008 and the previous years. Average annual growth refers to 2008–2011.
(14) Values in italics are estimated or provisional.

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