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Research and Innovation performance in

Belgium

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Belgium

The challenge of fostering innovation-based competitiveness

Summary: Performance in research and innovation

The indicators in the table below present a synthesis of research and innovation (R&I) performance in Belgium. 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 2012: **2.24 %** (EU: 2.07 %; US: 2.79 %) 2007-2012: **+3.4 %** (EU: +2.4 %; US: 1.2 %)	***Excellence in S&T***[1] 2012: **61.1** (EU: 47.8; US: 58.1) 2007-2012: **+3.2 %** (EU: +2.9 %; US: -0.2)
Innovation Output Indicator 2012: **94.8** (EU: 101.6)	***Knowledge-intensity of the economy***[2] 2012: **60.8** (EU: 51.2; US: 59.9) 2007-2012: **+0.7 %** (EU: +1.0 %; US: +0.5 %)
Areas of marked S&T specialisations: Biotechnology, food and agriculture	***HT + MT contribution to the trade balance*** 2012: **2.3 %** (EU: 4.23 %; US: 1.02 %) 2007-2012: **+7.0 %** (EU: +4.8 %; US: -32.3 %)

Belgium has a very high-quality research system, as reflected by its high score on the S&T excellence index. It has been able to exploit this strength to its economic advantage in several sectors, thanks in particular to a relatively good matching of the specialisations of its science base with its economy. Businesses have many opportunities to cooperate with universities and public research organisations and, since 2005, have significantly increased their R&D investment in Belgium. In the same period, the contribution of high-tech and medium-tech (HT & MT) products to the trade balance has also increased. A particularly good performance is clearly visible in the bio-pharmaceutical sector, where high scientific quality, business investment, product innovation and trade performance reinforce each other. But beyond the key role of this sector, a more generalised knowledge intensification within the economy and, to some extent, a broadening of the innovation base seem to have developed in recent years in Belgium, although this is still too limited.

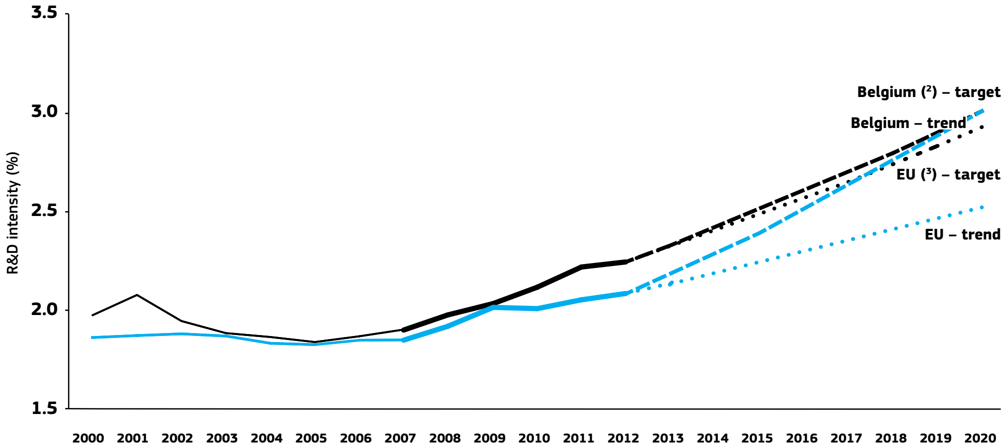
In order to better translate the strengths of its research and innovation system into general economic performance, Belgium needs to accelerate the renewal of its economic fabric: it needs more firms able to grow in innovative and knowledge-intensive sectors. The country's weaknesses in terms of entrepreneurship and company dynamics are slowing this necessary renewal. One specific issue to be watched is the shortage of skilled professionals, notably in sciences and engineering, which could become a major barrier to further improving the Belgian economy's innovation performance.

There is a consensus in Belgium about the critical importance of fostering the innovation-based competiveness of Belgian businesses. This has been reflected by all political entities in the development of sophisticated and comprehensive policy mixes at national and regional levels and in significant budgetary efforts in favour of R&D. At federal level, tax incentives for R&D are an important tool. In the Walloon Region, the focus has been on supporting a limited number of competitiveness poles (a cluster approach). In the Flemish Region, the willingness to address some specific societal challenges through innovation is a main driver of research and innovation policy. In the Brussels Capital Region, the updated innovation strategy includes a 'smart specialisation' approach.

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

Belgium – 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) BE: The projection is based on a tentative R&D intensity target of 3.0% for 2020.
(3) EU: The projection is based on the R&D intensity target of 3.0 % for 2020.

Belgium seems broadly on track to reach its R&D intensity target of 3 % for 2020. R&D intensity has increased continuously since 2005, thanks to growth in both public (from 0.56 % in 2005 to 0.7 % in 2012) and business R&D (from 1.24 % to 1.52 %) intensities.

With reference to the breakdown of business R&D expenditure (BERD) by product fields, the increase in Belgian business R&D intensity since 2005 has been driven by the very strong growth of R&D expenditure related to pharmaceuticals (accounting for 31 % of BERD in 2011 vs. 25 % in 2005) and to services (21 % of BERD in 2011 vs. 17 % in 2005, with telecommunication services and computer-related services each accounting for 5 % of BERD). On the contrary, there was a very rapid decrease in R&D expenditure in the manufacturing sector 'Computer, electronic and optical products', reducing its share in BERD from 17 % in 2005 to 8 % in 2011. As regards chemicals and chemical products (excluding pharmaceuticals), the reduction in share from 13 % in 2005 to 10 % in 2011 corresponds to similar volumes of expenditure in 2005 and 2011 in real terms; although there was actually a trend reversal in 2007: a decrease until 2007, then an increase from 2007.

Belgium has been very successful in the Seventh Framework Programme (FP7). Almost 5600 Belgian participants have been partners in a FP7 project (success rate of 27 %), well above the EU average of 22 %), with a total EC financial contribution of EUR 1.75 billion. Structural Funds are another important source of funding for research and innovation activities. Of the EUR 2 billion of Structural Funds allocated to Belgium over the 2007-2013 programming period, around EUR 88 million (14 % of the total) relate to RTDI[1].

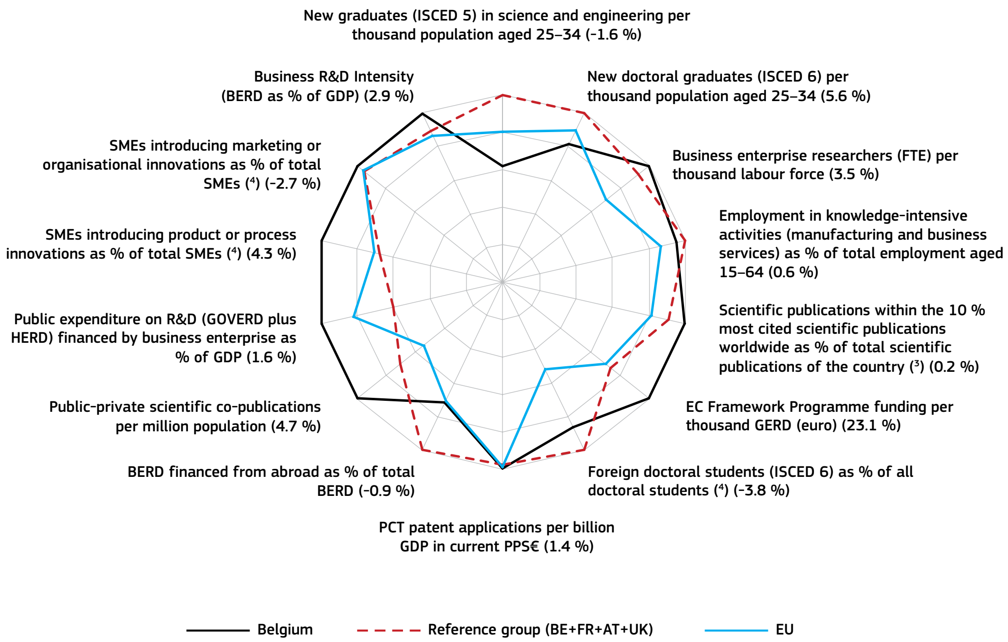
3 RTDI includes the following sectors: (01) RTD activities in research centres, (02) RTD infrastructures and centres of competence, (03) Technology transfer and improvement of cooperation of networks, (04) Assistance to RTD, particularly in SMEs (and RTD services in research centres), (06) Assistance 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 Belgium'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.

Belgium, 2012 (1)

In brackets: average annual growth for Belgium, 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.

The overall shape of the graph highlights the strong performance of the Belgian research and innovation system. Belgium scores higher than the EU average for the vast majority of the indicators. In particular, it has a high-quality public research and higher education system, characterised by a strong international openness. The quality of the Belgian research system is evidenced by the high share of its scientific publications within the top 10 % most-cited scientific publications worldwide[2], the country's strong position in the context of the EU R&D Framework Programmes, as well as its attractiveness for foreign doctoral students. Its international openness is further highlighted by the highest 'Collaboration Index'[3] of all the EU Member States (1.33). Belgium also performs well above the EU average for the two indicators on cooperation between public research institutions and firms (co-publications and business funding of public R&D), confirming the quality of the public scientific and technological base and highlighting its relevance for businesses.

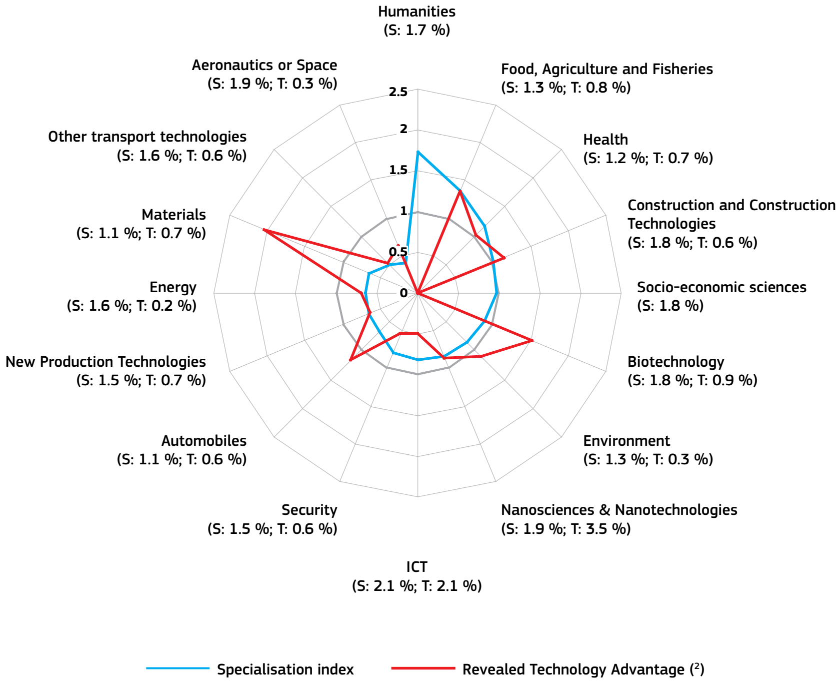
As shown on the graph, a weak point in the Belgian research system is the share of science and engineering graduates in the 25-34 years age group which is lower than the EU average: this raises the question of whether in future Belgium will be able to ensure the availability of a pool of highly skilled human resources necessary to keep an innovation-based economy up to speed.

4 13.4 %, well above the EU average of 10.9 % – this is the third best EU performance.
5 Index calculated by Science-Metrix, based on the number of co-publications while taking into account the size of national scientific output.

Belgium's scientific and technological strengths

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

Belgium – 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)



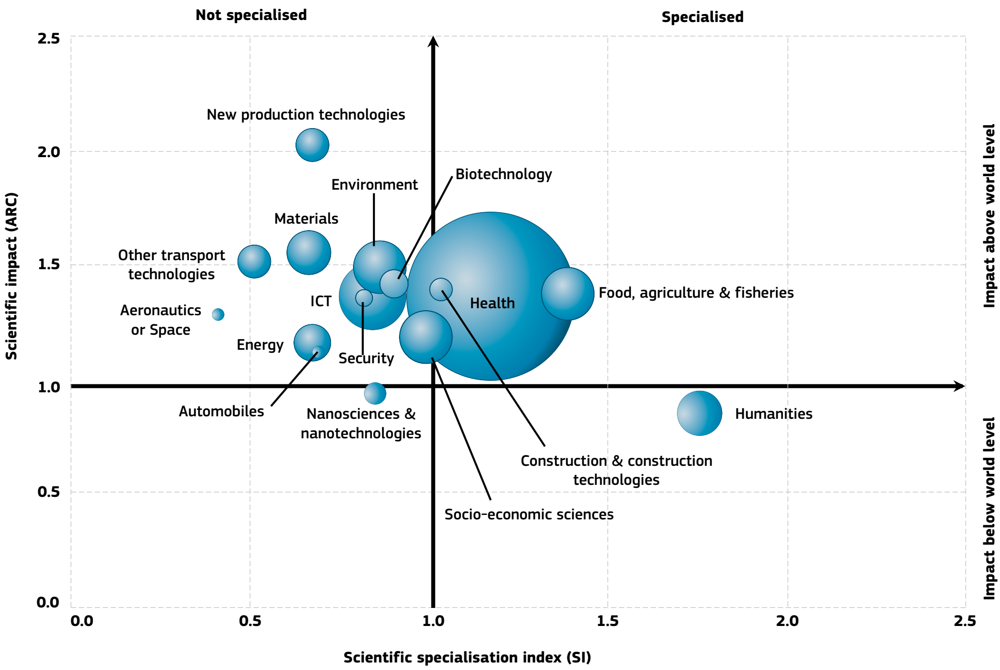
Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: Science-Metrix Canada; Bocconi University, Italy
Notes: (1) Values over 1 show specialisation; values under 1 show a lack of specialisation.
(2) The Revealed Technology Advantage (RTA) is calculated 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.

The graph above shows Belgium's strong technological specialisations (as measured by the number of patents) in materials, biotechnology[4] and food, agriculture and fisheries, as well as less prominent specialisations in construction, automobiles, environment and health. While in most of these areas the graph indicates a co-specialisation of the science base, based on the number of publications, revealing clear synergies between scientific activities and technological innovativeness, a striking exception is materials and, to a lesser extent, automobiles, where the volumes of scientific production are relatively limited.

The graph below illustrates the positional analysis of Belgian 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.

6 Based on patenting activities, Belgium is in fact the most specialised EU Member State in materials and the second most specialised (after Denmark) in biotechnology.

Belgium – 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 above shows that the excellence of the Belgian science base as measured through citations is consistent across nearly all fields – only two areas have an ARC[5] below 1: nanosciences and nanotechnologies and humanities.

A joint reading of the two graphs above indicates that in many areas the very high quality of the science base supports technological innovativeness: this is the case in materials, biotech, construction, food, agriculture and fisheries, and the environment. However, this appears less so in new production technologies, where there is a very high ARC in the absence of any specialisation: it might be interesting to reflect on how to best exploit this scientific strength.

Materials-related sciences present a particular situation which deserves to be highlighted. The spider graph shows a very strong technological specialisation which is not matched by a corresponding science-base specialisation. The bubble graph indicates that scientific production in materials has a high scientific impact: taking into account both its excellence and its high relevance for the Belgian industry, it might be interesting to consider 'thickening' the science base in materials by increasing its volume of funding and activities.

Policies and reforms for research and innovation

In Belgium, policies and funding for research and innovation are mainly in the hands of the regions and communities, although the federal authorities still play an important role in some specific areas (e.g. space) as well as through tax instruments. The country's broad consensus on the critical importance of further fostering the innovation-based competitiveness of businesses is reflected in the development of sophisticated and comprehensive policy mixes by each Belgian region.

7 The ARC (Average of Relative Citations) is an indicator of the scientific impact of papers produced by a given entity relative to the world average (i.e. the expected number of citations).

The **Flanders Region** STI policy includes a "challenge-driven innovation policy" with six thematic "innovation hubs" for addressing societal challenges. In 2013, various efforts were made to target a broadening of the Flemish innovation base, notably with the launch of the SPRINT projects for companies with low R&D intensities and the new 'VIS-trajectories' for innovation followers. Extra budgets were allocated for the SOFI fund which aims to set up spin-off companies from research results from universities and public research organisations (PROs). Thanks to the reinforced orientation towards small and medium-sized enterprises by the IWT (the Flemish agency for innovation through science and technology), 40 % of its innovation support now goes to SMEs. The campaign 'ik innoveer' (I innovate) was launched to increase the innovation capacity of Flemish SMEs. Other demand-driven initiatives include (new) living laboratories for social innovation or construction renovation, as well as some pilot projects on innovative procurement. The 'New industrial policy' developed since 2011 and supported by the TINA fund[6] will lead to a more cluster-driven policy. A key instrument for such a targeted cluster policy will be the development of strategic roadmaps for each spearhead cluster. Flanders is also continuing its policy of developing public research organisations able to provide high-quality service to businesses, with the establishment of a similar organisation in the field of advanced manufacturing. In addition, the STEM action plan aims to attract more students in scientific and technological fields.

Since the launch of the first Walloon 'Marshall Plan' in 2004, the **Walloon Region** has adopted a strategic approach to its economic redeployment which integrates R&I as a key tool and focuses on supporting a limited number of "competitiveness poles" (a cluster approach). In the context of the on-going version of the Plan (Marshall Plan 2.Vert of 2009), the most recent developments relating to the competitiveness poles have been the launch of trans-sectorial innovation platforms and new tools specifically targeted at SMEs, with a particular focus on their integration in international value chains. The competitiveness poles approach is further strengthened in the new Marshall Plan 2022, which also integrates educational aspects as well as several actions targeting entrepreneurship. The implementation of both the Research Strategy 2011-2015, with a particular focus on SMEs (transfer of knowledge, collaboration with research centres, green fund for young innovative enterprises, etc.) and the 'Creative Wallonia' Plan have been pursued. New approaches have been developed under this Plan, such as in the field of support to market take-up for new products and services (technologically based or otherwise), creativity and innovation awareness and training, support for start-ups, and promotion of the creative economy.

The **Brussels Capital Region** is continuing the implementation of its innovation strategy which was updated in 2012 and includes a 'smart specialisation' approach. In 2013, Brussels managed EUR 40 million in RDI funding for enterprises and universities within the region, and EUR 8.2 million of which was devoted to setting up the strategic platform programme ICT4 Health. This strategic platform programme concept, in which collaborative university projects are designed to meet the needs of industry and the public authorities, will continue to be pursued. In 2014, two other strategic platform programmes – Data Security and Smart City and Mobility – will also be set up.

While budgetary efforts by all federated entities to support R&D led to an increase of GBAORD (government budget appropriations for research and development) of 23 % in real terms between 2005 and 2008, Belgian's GBAORD has stagnated since then (-4.5 % in real terms between 2008 and 2012). However, this has to be seen in the context of the development of powerful R&D tax incentives[7] with, at federal level in particular, a payroll tax exemption for researchers (which was increased to 80 % as of 1 July 2013) and a tax deduction amounting to 80 % of patent income. This has led to a situation where revenues foregone due to R&D tax incentives now represent around double the amount of direct public funding of business R&D. Taking into account both forms of support, public support for business R&D in Belgium represents a higher share of GDP (0.27 %) than in most other EU Member States. The way in which the public funding of research is organised by the various authorities funding research contributes to the very high efficiency, openness and quality of the Belgian research system. About half of the public funding is allocated through project-based competition (representing one of the highest rates in the EU) and Belgium is also committed to many transnationally coordinated funding systems[8].

8 An investment fund with EUR 200 million at its disposal to help reform the Flemish economy through innovation.

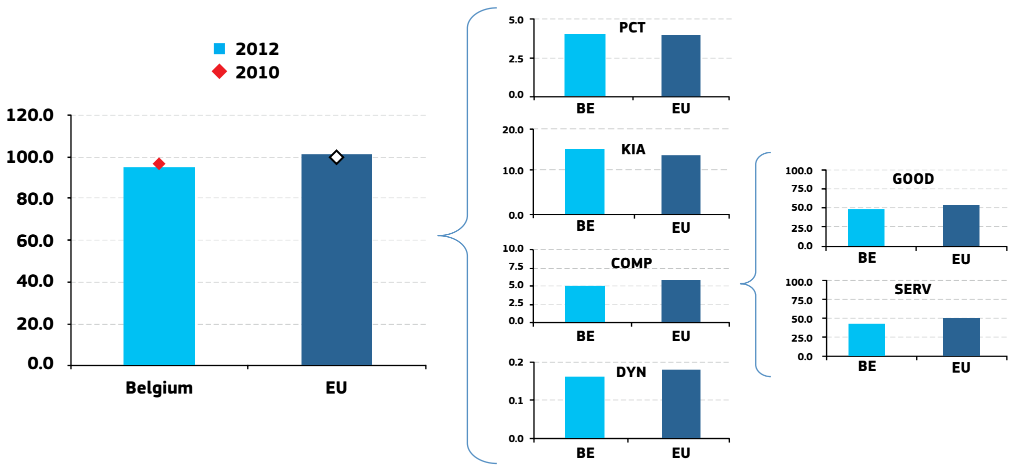
9 Foregone tax revenues due to such incentives are not included in GBAORD.

10 In particular, through participation in Europe-wide actions such as ESA, Article 185 initiatives, Joint Technology Initiatives with national funding, ERA-NET joint calls and projects from the ESFRI roadmap.

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 Belgium's position regarding the indicator's different components:

Belgium – 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 %).

Belgium is a medium performer in the innovation indicator. While its scores on most components are close to the EU average, it is performing markedly better with respect to employment in knowledge-intensive activities.

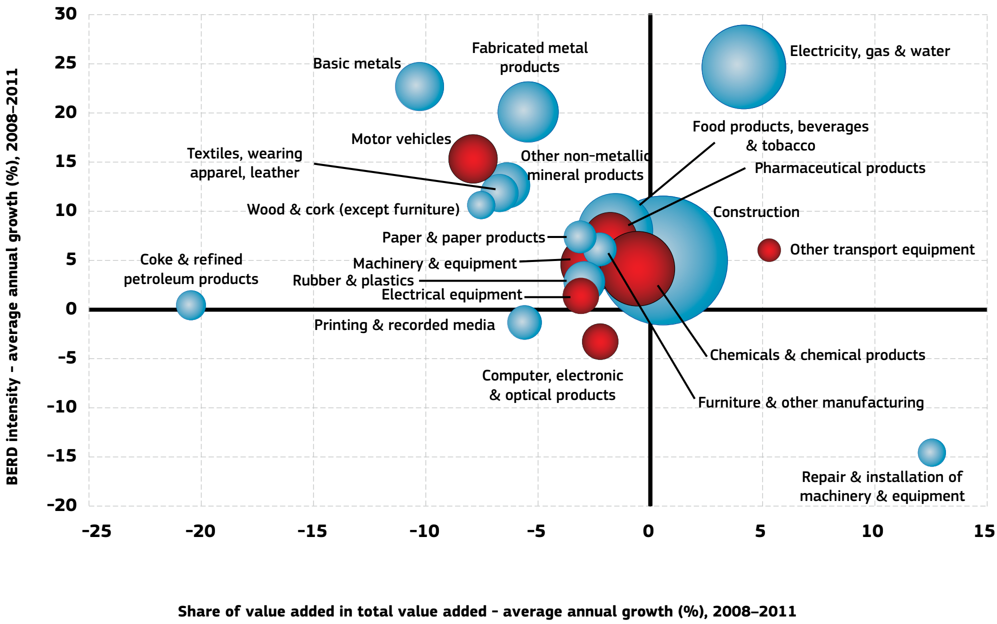
Its composite score is dragged down by its share of MHT exports and the share of knowledge-intensive services in services exports, which are both below the EU average. The latter is explained in particular by the high volume of exports in some logistics-, transport- and trade-related services, which are linked to its geographical intermediation role and which are classified as non-knowledge intensive. As the country's low scores for this indicator reflect some specificities of its economic structure which are unrelated to any underperformance, Belgium's situation in terms of innovation output is more positive than the impression given by the indicator.

Belgium also scores relatively poorly on the DYN component (fast-growing innovative enterprises), since a comparatively high share of its fast-growing companies is in sectors with low innovativeness scores, such as construction and transport. The country needs more fast-growing firms in innovative sectors to accelerate the renewal of its economic fabric and to speed up the transition towards a more knowledge-intensive and innovation-driven economy.

Upgrading the manufacturing sector through research and technologies

The graph below illustrates the upgrading of knowledge in different manufacturing industries for the period 2008-2011. The position on the horizontal axis illustrates the changing weight of each industry sector in value added over the period. 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 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.

Belgium – Share of value added versus BERD intensity: average annual growth, 2008–2011



Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: Eurostat
Note: ([1]) High-tech and medium-high-tech sectors (NACE Rev. 2 – two-digit level) are shown in red.

The graph shows that, throughout the crisis, the de-industrialisation trend continued in Belgium with the shares in total value added in nearly all manufacturing sectors decreasing between 2008 and 2011: this evolution is similar to that observed at the EU level as a whole. One striking exception, however, is the 'Other transport equipment' sector showing very good strong growth dynamics in value added coupled with even stronger growth in R&D expenditure (concentrated in aeronautics). The graph also shows that the high-tech and medium-high-tech sectors (in red) have remained more resilient in Belgium throughout these crisis years than the other manufacturing sectors. The 'Motor vehicles' sector appears to be an exception, being the only 'red' sector with an annual decrease in value added of more than 5 %.

The very rapid increase of R&D intensities shown on the graph in several sectors should be interpreted with caution as they concern sectors where the absolute levels of R&D expenditure are actually quite low[9]. Nevertheless, the graph does show that R&D intensities have grown in most sectors: beyond the key role of the pharmaceutical sector indicated on page 2 above, a fairly generalised knowledge intensification of the economy and, to some extent, a broadening of the innovation base seem to have developed in recent years in Belgium, although this remains too limited. In 2011, 43 % of the BERD was still concentrated in large firms (of more than 1000 employees) as against 46 % in 2002. Reducing administrative barriers and overall complexity of incentive schemes need to be part of the policy efforts to broaden the innovation base towards SMEs.

[11] This is also the case for the 'Motor vehicles' sector where the level of R&D expenditure in Belgium is very low, far off the level in the countries of origin of the car-manufacturing companies.

Key indicators for Belgium

BELGIUM	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	0.79	1.16	1.25	1.25	1.37	1.38	1.53	1.52	1.65	5.6	*1.81*	15
Performance in mathematics of 15-year-old students: mean score (PISA study)	:	:	520	:	:	515	:	:	515	-0.2 (3)	495 (4)	5 (4)
Business enterprise expenditure on R&D (BERD) as % of GDP	1.42	1.24	1.29	1.32	1.34	1.34	1.41	1.52	*1.52*	*2.9*	1.31	7
Public expenditure on R&D (GOVERD + HERD) as % of GDP	0.52	0.56	0.55	0.55	0.61	0.66	0.67	0.67	*0.70*	*4.8*	*0.74*	10
Venture capital as % of GDP	0.22	0.06	0.29	0.31	0.18	0.29	0.13	0.16	0.14	-15.2	0.29 (5)	13 (5)
S&T excellence and cooperation												
Composite indicator on research excellence	:	:	:	52.3	:	:	:	:	61.1	3.2	47.8	6
Scientific publications within the 10% most cited scientific publications worldwide as % of total scientific publications of the country	:	12.8	13.0	13.3	13.5	13.4	:	:	:	0.2	11.0	3
International scientific co-publications per million population	:	887	914	1004	1079	1146	1208	1299	1313	5.5	343	6
Public–private scientific co-publications per million population	:	:	:	81	85	88	90	97	:	4.7	53	5
FIRM ACTIVITIES AND IMPACT Innovation contributing to international competitiveness												
PCT patent applications per billion GDP in current PPS (EUR)	3.3	3.6	3.7	3.8	3.5	3.8	3.9	:	:	1.4	3.9	8
License and patent revenues from abroad as % of GDP	:	0.36	0.39	0.36	0.30	0.53	0.53	0.50	0.55	8.6	0.59	8
Community trademark (CTM) applications per million population	77	95	105	124	128	161	170	164	156	4.7	152	14
Community design (CD) applications per million population	:	28	27	31	28	31	33	33	30	-0.3	29	9
Sales of new-to-market and new-to-firm innovations as % of turnover	:	:	13.6	:	9.5	:	12.4	:	:	14.1	14.4	14
Knowledge-intensive services exports as % total service exports	:	41.9	42.7	37.6	40.1	41.7	41.9	42.3	:	3.0	45.3	9
Contribution of high-tech and medium-tech products to the trade balance as % of total exports plus imports of products	0.80	1.06	1.81	1.61	1.69	1.17	1.46	2.37	2.27	-	4.23 (6)	13
Growth of total factor productivity (total economy): 2007 = 100	96	98	99	100	99	96	97	98	97	-3 (7)	97	13
Factors for structural change and addressing societal challenges												
Composite indicator on structural change	:	:	:	58.6	:	:	:	:	60.8	0.7	51.2	5
Employment in knowledge-intensive activities (manufacturing and business services) as % of total employment aged 15–64	:	:	:	:	14.9	14.4	14.6	14.9	15.2	0.6	13.9	11
SMEs introducing product or process innovations as % of SMEs	:	:	45.4	:	44.0	:	47.8	:	:	4.3	33.8	2
Environment-related technologies: patent applications to the EPO per billion GDP in current PPS (EUR)	0.28	0.23	0.24	0.29	0.33	0.32	:	:	:	5.4	0.44	8
Health-related technologies: patent applications to the EPO per billion GDP in current PPS (EUR)	0.76	0.88	0.69	0.59	0.51	0.61	:	:	:	1.8	0.53	8
EUROPE 2020 OBJECTIVES FOR GROWTH, JOBS AND SOCIETAL CHALLENGES												
Employment rate of the population aged 20–64 (%)	65.8	66.5	66.5	67.7	68.0	67.1	67.6	67.3	67.2	-0.1	68.4	16
R&D intensity (GERD as % of GDP)	1.97	1.83	1.86	1.89	1.97	2.03	2.10	2.21	*2.24*	*3.4*	*2.07*	8
Greenhouse gas emissions: 1990 = 100	103	100	97	94	96	88	93	85	:	-9 (8)	83	12 (9)
Share of renewable energy in gross final energy consumption (%)	:	*2.3*	*2.6*	*2.9*	*3.2*	*4.4*	*4.9*	*4.1*	:	*9.0*	13.0	25
Share of population aged 30–34 who have successfully completed tertiary education (%)	35.2	39.1	41.4	41.5	42.9	42.0	44.4	42.6	43.9	1.1	35.7	8
Share of population aged 18–24 with at most lower secondary education and not in further education or training (%)	13.8	12.9	12.6	12.1	12.0	11.1	11.9	12.3	12.0	-0.2	12.7	21 (9)
Share of population at risk of poverty or social exclusion (%)	:	22.6	21.5	21.6	20.8	20.2	20.8	21.0	*21.6*	*0.0*	24.8	12 (9)

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) The value is the difference between 2011 and 2007. A negative value means lower emissions.
(9) The values for this indicator were ranked from lowest to highest.
(10) Values in italics are estimated or provisional.

2014 Country-specific recommendation on R&I adopted by the Council in July 2014

"Restore competitiveness [...] by promoting innovation through streamlined incentive schemes and reduced administrative barriers."

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