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## RIO COUNTRY REPORT 2015: Belgium

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**Abstract**

The 2015 series of RIO Country Reports analyse and assess the policy and the national research and innovation system developments in relation to national policy priorities and the EU policy agenda with special focus on ERA and Innovation Union. The executive summaries of these reports put forward the main challenges of the research and innovation systems.

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## **Foreword**

The report offers an analysis of the R&I system in Belgium for 2015, including relevant policies and funding, with particular focus on topics critical for EU policies. The report identifies the main challenges of the Belgium research and innovation system and assesses the policy response. It was prepared according to a set of guidelines for collecting and analysing a range of materials, including policy documents, statistics, evaluation reports, websites etc. The quantitative data is, whenever possible, comparable across all EU Member State reports. Unless specifically referenced all data used in this report are based on Eurostat statistics available in February 2016.

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## Executive summary

### **Context**

Belgium is a small densely populated federal State (11.2m inhabitants in 2013, about 2.21% of the EU28 population). Total gross domestic product (GDP) was €400.6b (at market prices) in 2014 (2.9% of EU28). Per capita GDP in 2014 was €36,000. This is 31.9%% above the EU28 average (i.e. €27,300). There are significant regional differences in the GDP per capita: Wallonia lies just below the EU28 average (98.3% in 2010), Flanders lies well above (132.7%) and Brussels-Capital lies extremely high above (250.2%). The dispersion of regional GDP per inhabitant was 26.8 in 2010, which puts Belgium amongst the highest countries in Western-Europe.

The main responsibility for research and innovation policy and funding in Belgium lies with the three regions (Brussels-capital, Wallonia and Flanders) and the three communities (Flemish, French and German-speaking, with the latter not deploying R&I policy due to its small size and lack of related institutes - but being included in the Walloon Region). The regions are the main source of innovation and business R&D support, while the communities are the main sources of scientific research support. The federal level does not function as an umbrella body above regional and community levels, but is a complementary layer alongside the regions and communities. Jointly, there are thus five active levels of public governance for R&I policy (the Flemish government responsible for both Community and Regional policy). It is important to point out that R&D tax credits, a major R&D instrument in Belgium, is a competence of the federal state and is not devolved to the regions or communities. Belgium's R&D intensity has been increasing over the past years from 1.97% in 2009 to 2.42% in 2013 and 2.46% in 2014, which is above the EU28 average of 2.01% (2013).

Key developments in the R&I system in 2015 included:

(1) At inter-regional level:

- A joint call targeting collaborative projects with SMEs was launched in early 2015 by the three regions. The main objective of the BEL-SME program is to strengthen the competitive capacity of SMEs by: (i) increasing collaboration between SMEs from different regions, (ii) increasing the cooperative and competitive capability of SMEs to work in interregional R&D networks, (iii) helping them to develop new products, processes or technical services that exceed the existing state of the art and have good market opportunities by lowering the economic risks.

(2) For Wallonia:

- Marshall Plan 4.0: In May 2015, the Walloon Government approved the Marshall Plan 4.0 (2015-2019), as the successor of the earlier Marshall Plan 2.Green (Plan Marshall 2.Vert, €1.6b over five years (2010-2014)) and Marshall Plan 2022 of the previous legislatures. The label "4.0" reflects the Government's intention of embracing the digital revolution. The new plan aims to strengthen the collaboration with the Wallonia-Brussels Federation (the French Community<sup>1</sup>) and is centered on 5 axes: education and training, economic and industrial policy, Optimization of the infrastructure and accessibility of locations of economic activity, Conversion to a circular economy, and transition to digital economy.

- The Smart Specialization (S3) strategy of Wallonia, titled "Towards a regional policy for sustainable industrial innovation", was adopted in September 2015. This strategy constitutes the common basis of industrial policies, regional research and innovation, and in particular the actions developed in axis 2 of the Marshall Plan 4.0 and the axis "Innovation 2020" of the Operational ERDF Programme 2014-2020.

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<sup>1</sup> This remains the denomination i.e. in the official journal. In the remainder of the report, we use both denominations.

- The Agence de l'Entreprise et de l'Innovation (AEI), which is the new single point of contact for companies, has been operational since January 2015.
- A Digital Plan (Plan du Numérique) was proposed in September 2015. The goal is to develop the digital economy and its dissemination throughout all sectors, particularly in the areas of health, smart cities and mobility.
- The Walloon Small Business Act 2015-2019, which, as part of its 1<sup>st</sup> objective (entrepreneurship) aims for early detection of SMEs with high growth potential to offer them customized guidance. The tax shift of October 2015 (see previous point) foresees that SMEs with 6 or fewer employees will be exempt from paying social security contributions for the 1<sup>st</sup> employee.

### (3) For Flanders

- Flanders: Vision 2050. This strategy adopted in September 2015 substitutes the previous long term vision of the Flemish Government, the Flanders in Action initiative (VIA). Vision 2050 formulates long-term objectives for society – most of which have direct implications for R&I - addressing not only current strengths but also challenges in realizing them.
- In 2015, preparations started for the announced organisational reform of the EWI policy domain. The Research Foundation Flanders (FWO) as of 2016 will include the programmes of the Hercules Foundation for research infrastructure and computing (which is being liquidated) as well as 3 support programmes of the innovation agency, IWT: TBM (applied biomedical research), SBO (strategic basic research), and the SB-fellowships (strategic research fellowships). As of 2016, FWO is the single contact point for researchers active in the Flemish Community. Also, the new Flanders Innovation and Entrepreneurship (AIO, Agentschap Innoveren en Ondernemen), as of 2016 is the one-stop shop for all business support. AIO is the result of the merger of Enterprise Flanders (AO) with the business-related support programmes of the IWT (agency for Innovation by Science and Technology), which is suspended.

### (4) For Brussels-capital

- Strategy 2025: This new multi-annual strategy for Brussels adopted in June 2015 lists the rationalisation of the institutional landscape for business support as one of its 18 objectives. This exercise will be informed by the new Regional Innovation Plan (2015-2020, to be completed), which will target the domains of smart specialization for the Brussels economy (Strategy 2025, p20).

### (5) At Federal level

At the federal level, as of 1 July 2013 the fiscal support for the partial wage withholding tax exemption for researchers is increased to 80%. The total foregone fiscal revenues for R&D (including patents) amount to 1.25 billion. The space activities at the federal level are further strengthened and will be integrated in an "independent" space department as of 2016. The scientific public service and the research role of the Federal Scientific Institutions will be maintained, but independent from the Belgian Science Policy Office. The Belgian Science Policy Office is expected to be integrated as a directorate within another Public Service.

Belgium generally proves to have a high quality research system that is considered to be inadequately translated into economic performance (EC, 2015). Thus, public-private collaboration on innovation is described as one of the major concerns at all government levels. In the last few years, a substantial number of policy measures have been adopted to improve this aspect.

The identified challenges for Belgium's R&I system are:

- Improve public-private collaboration on innovation
- Address the expected shortage of human resources for R&I



## **R&I Challenges**

### **Challenge 1: Improve public-private collaboration on innovation**

#### Description

Belgium shows a relatively solid performance regarding private R&D expenditure (8<sup>th</sup> position, Innovation Union Scoreboard), but scores only average for other input indicators such as R&D expenditure in the public sector (14<sup>th</sup> position). Performance indicators for innovation output also depict a mixed picture, with below EU average scores for community trademarks (19<sup>th</sup> position), export of medium and high-technology products (17<sup>th</sup> position), sales of innovations (15<sup>th</sup> position) and SMEs introducing marketing or organisational innovations (17<sup>th</sup> position). This contrasts with the good results regarding research outputs as illustrated by the share of public-private co-publications (3.3%, compared to 1.8% for the EU28) over the period 2011-2013. Therefore, the high quality of the research system is considered to be inadequately translated into economic performance (EC, 2015) and public-private collaboration on innovation is described as one of the major concerns at all government levels (OECD, 2014). Several measures are in place in each region aimed at economic exploitation of research, but research outputs are so far not aligned with the absorptive capacity of SMEs (RIO country report, Belgium, 2014). In this context, one of the main challenges of the Belgian R&I system is to link accumulated research capacities and results to the economic eco-system.

#### Policy response

In the last few years, Belgium has implemented a substantial number of measures to become a more knowledge-intensive economy.

In Wallonia and the federation Wallonia-Brussels, the Research Strategy 2011-2015 "Towards an integrated research policy" developed a specific action plan to support young innovative companies and public-private research collaboration. Encouraging growth of companies through R&I policy is an integral part of the Marshall Plan 4.0, adopted in May 2015. A cornerstone of that strategy is the further development of the competitiveness clusters, based on the rationale of smart specialization.

The Flemish government also develops a pro-active policy and spent €2.20b in science and innovation policy in 2014, of which €1.40b was for R&D (Speurgids, 2015). In July 2015, the Flemish Government approved a concept note on a new cluster policy and started the elaboration of this process with a call end 2015 for Innovative Business Networks (IBN). In another initiative to strengthen the transfer of scientific knowledge to the business sector, the 2014-2019 Policy Note for Work, Economy, Science and Innovation emphasizes the transition of doctoral graduates to the labour market as one of its main priorities (NRP, 2015).

The Brussels Capital Region's main instrument for spanning the boundary between public and private entities is the Bridge programme, which was launched for the first time in 2010. Bridge projects are academic research projects for which economic enhancement in the Brussels-Capital Region may be envisaged in the short or medium term. Further initiatives have been announced in Brussels' Strategy 2025, most notably the objective to transition Brussels to a "Smart City", whereby the precise agenda will be determined jointly with the smart specialisation strategy that will be updated in the future Regional Innovation Plan 2015-2020.

#### Assessment

The wave of recent reforms undertaken at all regional levels shows that Belgium has put knowledge transfer and innovation at the very top of its agenda. This effort needs to be sustained. Public innovation support can still be simplified and more targeted to increase Belgium's performance in maximising the commercial benefits of R&D (Council, 2015).

In addition, the competitiveness clusters and the research and technology centers created over the last decade need further sustained funding, regular evaluation and expert management in order to contribute effectively to the economy (RIO Country Report Belgium, 2014). A clear opportunity to capitalize further on Belgium's excellent science base is to make universities and public research organizations more entrepreneurial (EC, 2014). While some universities already display quite strong performance in this respect, entrepreneurial universities and PROs could take up an even stronger role as catalysts of Triple Helix interactions.

## **Challenge 2: Addressing the expected shortage of human resources for R&I**

### Description

While the labour force in Belgium is generally well-qualified, the share of science, technology, engineering and mathematics (STEM) graduates is low at 15.74% (EU28: 25.44%) and declining, while demand exceeds the number of graduates (EC, 2005; OECD, 2014). Shortages in these fields are considered as a potential major barrier for future innovation and are already emerging for certain functions, such as ICT experts. In the Flemish Community, the number of STEM graduates has started to rise again in recent years. In 2014, 37.7% of enterprises with job vacancies requiring specialised ICT skills reported problems in filling these positions. For the ICT workforce alone, the shortfall is expected to rise from about 8,000 in 2012 to 30,000 in 2020 (EC, 2015).

More generally, a skill mismatch is observable - particularly acute in the Brussels-Capital region - and is mainly related to an undersupply of highly-skilled job-seekers and to an over-representation of low-skilled job seekers (EC, 2015; OECD, 2014).

### Policy response

At all levels, different measures have been taken to tackle the issue of human resources for innovation. Belgium developed a Youth Guarantee Implementation Plan, updated in 2014, which constitutes an early intervention strategy to ensure young people are maximally integrated into the economy through job and traineeship offers. (EC, 2015). In 2012, Flanders launched the STEM Action Plan in combination with a science communication plan to increase the number of secondary and higher education students in STEM (OECD, 2014). This initiative will be extended: the Policy Note Work, Economy, Science & Innovation 2014-2019 has announced the development of a new strategy, jointly with the Minister for Education, in order to increase the inflow of students into STEM curricula and to increase the share of students with a first work experience. In order to lower the threshold for Flemish students to become entrepreneurs, from 2016 they will be able to obtain - whilst studying at a university or college - a 'certificate of management knowledge', which is a formal requirement to start a business for people who do not (yet) have a Bachelor degree. Wallonia's *Beware Fellowships* support researcher mobility and promote awareness of S&T among youth (OECD, 2014).

The Marshall Plan 4.0 (see in particular its Axis 1) aims to better align the supply of graduates in Wallonia to business needs, amongst others through the set-up of an inventory of 'professions of the future'.

Complementarily, all regions have developed action plans against early school leaving in the last years to reduce the mismatch between low-skilled workers and high-skilled occupations. Policy attention has also increasingly turned towards attracting foreign researchers or researchers from the own Community that are active abroad, in Flanders (Odysseus, [PEGASUS]<sup>2</sup>), the French Community (Ulysse) and the Brussels Capital Region (Attract). Another noteworthy initiative in this regard is the plan of several universities to increase the number of Master programs offered entirely in English.

At federal level, the government increased the wage withholding tax deduction for the employment of researchers to 75% in 2009, and 80% as from 1 July 2013 (OECD, 2014). This tax incentive amounted to €761 million in 2014, compared to €696 million in 2013.<sup>2</sup>

### Assessment

Some progress is being observed towards addressing skill mismatches and early school leaving (EC, 2015). The number of measures that have been taken in the last year denote an awareness and concern at all government levels regarding the human resource problem and its implications for innovation. Since the successful translation of science and technology into products and services – see the 2<sup>nd</sup> challenge - is strongly related to the availability of a pool of aptly skilled workers (EC, 2015), these efforts should be sustained, and if possible increased. Particularly commendable are the efforts to increase inward mobility of human capital, and the introduction of more flexible higher education trajectories to mitigate the strict separation of education and work.

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<sup>2</sup> See [http://finance.belgium.be/sites/default/files/downloads/TABLEAU\\_INVENTAIRE\\_2014\\_FINAL.xlsx](http://finance.belgium.be/sites/default/files/downloads/TABLEAU_INVENTAIRE_2014_FINAL.xlsx) (last consulted 04/2016).

# 1. Overview of the R&I system

## 1.1 Introduction

**Table 1:** Main R&I indicators 2012-2014

Indicator	2012	2013	2014	EU average
GDP per capita	35,100	35,600	36,000	26,767
GDP growth rate	0.1%	0.3%	1.1%	0.3%
Budget deficit as % of GDP	-4.1%	-2.9%	-3.2%	-3.4%
Government debt as % of GDP	103.8%	104.4%	106.5%	85.3%
Unemployment rate as percentage of the labour force	7.6%	8.4%	8.5%	10.5%
GERD in €m	9,153	9,545	9,874	9,663 (EU-28, 2013-2013)
GERD as % of the GDP	2.36%	2.42%	2.46%	2.01%
GERD (EUR per capita)	825	855.2	881.3	
Employment in high- and medium-high-technology manufacturing sectors as share of total employment	5.0%	4.7%	4.8%	5.6% (EU-28, 2012-2013)
Employment in knowledge-intensive service sectors as share of total employment	47.6%	46.7%	n.a.	39.2% (EU-28, 2012-2013)
Turnover from innovation as % of total turnover	11.2%	n.a.	n.a.	11.9% (EU-28, 2012)
Value added of manufacturing as share of total value added	24.9%	25.7%	n.a.	n.a.
Value added of high tech manufacturing as share of total value added	3.2%	4.0%	n.a.	n.a.

Source: Eurostat

The Belgian research system is highly “devolved” due to the federalisation process of the last 25 years that has gradually split competencies and transferred them from the federal level to the regions and communities. The main responsibility for research policy and funding lies with the three regions and the three communities. It is however important to point out that R&D tax credits, a major R&D instrument in Belgium, is a competence of the federal state and is not devolved to the regions or communities. Belgian R&D intensity has been increasing over the past years from 1.97% in 2009 to 2.24% in 2012 and 2.28% in 2013, which is above the EU-28 average of 2.01% (2013). This demonstrates, given the modest but positive GDP growth in real terms in 2009-2012, a strong commitment to R&D support and investment in the country. All Belgian authorities are committed to the 3% target, both at the federal level and the regional or community levels. Equally agreed upon is the target to finance 1% of this R&D from public sources; i.e. government and higher education. These objectives have been repeated in the July 2014 Regional and Community Government Agreements and in the October 2014 Federal Government Agreement. Total turnover from innovation (as % of total turnover) amounted to 11.2% in 2012, which is slightly lower than the EU-28 average of 11.9% in 2012 (Eurostat, Feb 2015).

The budget deficit amounted to 4.1% of GDP in 2012 but was reduced in the following years: 2.9% in 2013 and 3.1% in 2014, comparable to the EU-28 average of 3.0% (Eurostat, 2014). Government debt arose to 106.7% of GDP in 2014 (compared to 86.8% for the EU-28), up from 104.1% in 2012 and 105.1% in 2013. The total unemployment rate has consistently been below the EU average in recent years, with 7.6% of the labor force in 2012, 8.4% in 2012 and 8.5% in 2013 (versus 10.2% for the EU-28 in 2014). In terms of the economic structure, the share of industry in value added has steadily declined, from 19.9% in 2003 to 15.6% in 2013. Agriculture is a very small sector in Belgium, accounting for only 0.8% of value added in 2013.<sup>3</sup> In terms of employment, the services sector is the most important, with 77.4% of total employment in 2014 (versus 70.7% employed in services for the EU-28). Conversely, 12.8% of the labor force in 2014 was active in the manufacturing sector compared to 15.4% for EU-28. High-tech and low-tech manufacturing accounted for respectively 1.1% and 4.7% of employment in 2014 (Eurostat, 2014).<sup>4</sup>

## **1.2 Structure of the national research and innovation system and its governance**

### **1.2.1 Main features of the R&I system**

The various Belgian authorities are functioning fully autonomously. Constitutionally there are seven Belgian authorities carrying out their own policy in the wider field of science, research, technology and innovation. In practice, there are only five active entities, since the region of Flanders and the Flemish community’s governments have merged since their establishment in 1980 and, due to its small size and absence of research-performing higher education institutes, the German-speaking community does not carry out any R&I policy.<sup>5</sup>

Belgium is different from most EU Member States since most of the R&I competences (instruments and budgets) have been devolved towards the 2 community and 3 regional governments, each enjoying complete autonomy of decision-making power in these matters.

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<sup>3</sup> See [http://ec.europa.eu/eurostat/statistics-explained/index.php/National\\_accounts\\_and\\_GDP](http://ec.europa.eu/eurostat/statistics-explained/index.php/National_accounts_and_GDP) (last consulted 01/2016).

<sup>4</sup> See <https://rio.jrc.ec.europa.eu/en/stats/data-catalogue/1372> (last consulted 01/2016).

<sup>5</sup> These are the Belgian Federal government and 4 regional/community governments: the Flemish Government, the Government of the Walloon-Brussels Federation (=the French Community), the Walloon Government, and the Government of the Brussels Capital Region.

The federal State retains some competences as an exception to this rule. More specifically, the regions have authority on research policy for economic development purposes, thus encompassing technological development and applied research, including strategic research centers and other knowledge centers. The communities (French Community, Flemish Community and German-speaking Community) are responsible for education and fundamental research at universities and higher education establishments, including the Community scientific institutes. The Federal Government is in charge of the federal scientific institutes, intellectual property (IP) law, standardisation, fundamental metrology, nuclear research, corporate taxation, employment legislation and social security. The R&D tax credit, a major policy instrument in Belgium, is therefore a competence of the federal state. It also retains the responsibility for research that is part of international agreements, such as space research. See Figure 1 for an overview of the STI governance system.<sup>6</sup>

This institutional context has a profound influence on the governance of research policy. It has created a complex system and means, for example, that HEI policy for universities and university colleges in the Brussels Capital Region (with no Community competences) is governed by both the Flemish Community and the Wallonia-Brussels Federation, each for their own institutes. Nevertheless, the Brussels Institute for Research and Innovation (Innoviris) also provides several programmes targeted to universities, such as Attract, Anticipate, Doctiris or Bridge<sup>7</sup>. The logic behind the division of competences is however quite strict and does not lead to disputes over competences very often. The federal level does not function as an umbrella body above regional and community levels, but is an additional and complementary layer alongside the regions and communities (ERAC, 2011).

Policy making is driven by the normal election cycles for all authorities - elections at federal level coincided with regional elections in 2014 - as well as by the annual budget cycles.

All authorities commit to the target of 3% of GDP to be invested in R&D (2% financed from the private sector and 1% from the public sector). This ambition is reflected in the policy documents relevant for R&D policy of all entities. These include the Brussels Regional Innovation Plan 2006-2013 and its actualisation in November 2012 and the 2014-2019 Government Declaration of the Brussels Government (July 2014), the Marshall Plan 2.Green 2010-2014 in Wallonia, succeeded in spring 2015 by the Marshall Plan 4.0, the Government declaration 2014-2019 of the Federation Wallonia-Brussels / French Community (July 2014), Declarations of regional and community policies in Wallonia and in the French Community (2014), the 2014-2019 Government Declaration of the Flemish Government (July 2014), the Flemish policy note 2014-2019 on Work, Economy, Science and Innovation (October 2014).<sup>8</sup> The new Federal Government of October 2014 aims at reinforcing policy coordination with all other federated entities of the country.<sup>9</sup> In this regard, it announced the establishment of a repository of all federal measures (grants, fiscal measures) of relevance for all governance levels.

Private funding is dominating total funding of the Belgian R&I system, with about 57% of domestic expenditures on R&D in 2013 financed by the business sector (Belspo, 2013).<sup>10</sup> For business expenditures in R&D (BERD), the share of privately financed R&D amounted to 76% in 2013. Universities and the higher education sector at large (e.g. also including university colleges) play an important role in the R&I system: total HERD in 2013 amounted to €1.99 billion, which is 20% of all domestic R&D expenditures.

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<sup>6</sup> See Ziarko et al. (2012) and BELSPO (2013) for a more detailed description of the R&I system.

<sup>7</sup> See <http://www.innoviris.be/en/financial-aid-for-research-organisms/brussels-aid> (last consulted 10/2015).

<sup>8</sup> These policy documents are referenced and discussed in more detail in section 2.2.

<sup>9</sup> See [http://www.premier.be/sites/default/files/articles/accord\\_de\\_gouvernement\\_-\\_Regeerakkoord.pdf](http://www.premier.be/sites/default/files/articles/accord_de_gouvernement_-_Regeerakkoord.pdf) (p103, last consulted 10/2015).

<sup>10</sup> See <http://www.stis.belspo.be/en/statisticsRD.asp>, R&D statistics for all sectors, table CE1 (last consulted 01/2016).

In comparison, 8% of total R&D expenses in 2013 were done in the government sector (PROs). Within BERD, 34% of R&D expenditures were made by companies with fewer than 250 employees, while companies with more than 1,000 employees account for 45% of all business R&D (Belspo, 2013).<sup>11</sup>

### 1.2.2 Governance

Reflecting the highly decentralised nature of the Belgian R&I system, this section presents separately the R&I structures at federal level, for Flanders and for Wallonia.

At federal level, the Federal Science Policy Office (BELSPO, i.e. the Programmatory Public Service for Science Policy) is responsible for

- monitoring science policy at federal level, the design and implementation of research programmes and networks.
- managing Belgium's participation in European and international organisations and the supervision of ten federal scientific establishments. BELSPO offers the government reliable, validated data, allowing it to take evidence-based decisions in areas such as sustainable development, the fight against climate change, biodiversity, energy, health, mobility and the information society.
- managing the Belgian contribution to the European Space Agency and coordinating with BELNET, the Belgian national research network, which provides high-speed internet access to Belgian universities, colleges, research centers and public services.
- introducing Belgian researchers into international research networks.

It is important to point out that the latest Federal Government Agreement of 1 October 2014 announces the suppression of BELSPO as distinctive Federal Science Policy Office (Federal Government Agreement 2014, p. 105)<sup>12</sup>, in the context of the rationalisation of Federal Public Services. BELSPO is expected to be integrated as directorate within another Public Service (probably Public Service for Economic Policy), but the implementation of this integration is still ongoing. Meanwhile it has been decided to integrate the space department of Belspo into a separate space agency (planned for 2016).

In the Brussels-Capital Region, The Brussels Institute for Research and Innovation (INNOVIRIS) manages the implementation of research and innovation funding. Innoviris funds scientific research and technological innovation. Businesses, research organisations and non-profit sector in the Brussels-Capital Region can apply for financial support for research with and without an economic purpose.

Innoviris provides a number of services:

- Grants and subsidies for industrial research and precompetitive development at SMEs and large businesses;
- Supporting the diffusion of the results of academic research to the Brussels economy;
- Providing assistance to spin-offs from scientific research (e.g. the "Launch" programme<sup>13</sup>);
- Providing research organizations and the non-profit sector with tools aimed at facilitating development of projects (e.g. the "Co-create" program, which targets applied research and innovation projects with the aim to establish "Living Labs" involving the end users as partners.<sup>14</sup>);

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<sup>11</sup> See <http://www.stis.belspo.be/en/statisticsRD.asp>, R&D statistics for all sectors, table CE12 (last consulted 01/2016).

<sup>12</sup> See [http://www.premier.be/sites/default/files/articles/accord\\_de\\_gouvernement\\_-\\_regeerakkoord.pdf](http://www.premier.be/sites/default/files/articles/accord_de_gouvernement_-_regeerakkoord.pdf) (last consulted 01/2016).

<sup>13</sup> See <http://www.innoviris.be/en/financial-aid-for-research-organisms/brussels-aid/launch-brussels-spin-off> (last consulted 10/2015).

<sup>14</sup> See <http://www.innoviris.be/en/financial-aid-for-research-organisms/brussels-aid/co-create-living-labs> (last consulted 10/2015).

- Providing research organizations with grants and subsidies for research, e.g. the "Attract", "Anticipate" or "Bridge" programmes<sup>15</sup>, as well as studies on specific themes. This support includes European programs and networks in which Innoviris participates, e.g. EUREKA.<sup>16</sup>

Innoviris promotes financing tools applicable to scientific research on various relevant forums. It represents the Brussels-Capital Region at various scientific research coordination bodies and maintains international relations in this field. Innoviris also generates the economic indicators needed to develop effective research policy and has launched an own regional Scoreboard on Research and Innovation in the Brussels-Capital Region since 2012. This scoreboard was published for the first time in November 2012; it includes key regional effort and performance indicators related to innovation.<sup>17</sup> Innoviris also runs the secretariat of the scientific policy council (Conseil de la politique scientifique) of the Brussels-Capital Region. In the 2012 update of the Regional Innovation Plan for the Brussels Capital Region, one of the 5 objectives relates to strengthening the governance of innovation. The operational initiatives linked to this objective are the strategic monitoring of regional RDI policy and strengthening the scientific policy board (CPS).<sup>18</sup> In terms of monitoring and evaluation of RDI policy, there is no resource specifically allocated to strategic intelligence for the development of innovation. The Region does however have key players such as IBSA (Brussels Institute for Statistics and Analysis)<sup>19</sup> to which it can turn to develop such knowledge.

The new multi-annual strategy for Brussels adopted in June 2015, Strategy 2025, lists the rationalisation of the institutional landscape for business support as one of its 18 objectives. This exercise will be informed by the new Regional Innovation Plan (2015-2020, to be completed), which will target the domains of smart specialization for the Brussels economy (Strategy 2025, p20).

Flanders has various initiatives, support programs and institutes in the field of science, research and innovation (Geerts *et al.*, 2014):

- Direct support for R&D and innovation in a broad sense
  - Research grants for PhD fellowships and other financial support channels for basic and applied research that is conducted by researchers at universities and institutes in cooperation with companies, networks of knowledge and businesses.
  - All business R&D&I support, e.g. technology transfer, technology advice, technology scans, networking, dissemination of innovation, knowledge and technology, valorisation or research results, feasibility studies, knowledge vouchers, etc.
  - Various forms of collective research: joint industry-science research, innovative networks, clustering
  - The promotion and popularisation of STI (in education, society, business, science centers), mobility of researchers, etc.
- All research related to the community (= person-related) and the regional (= territory-related) competencies
  - Broad innovation policy
  - Scientific research policy (fundamental, applied and strategic basic research), including
    - (research at) higher education institutes (university colleges, universities)
    - (research at) public research organisations (PROs)
    - (research at) scientific institutes of the Flemish Community
    - (research at) various institutes that generate knowledge or scientific output

<sup>15</sup> See <http://www.innoviris.be/en/financial-aid-for-research-organisms/brussels-aid> (last consulted 10/2015).

<sup>16</sup> See <http://www.innoviris.be/en/financial-aid-for-research-organisms/european-aid> (last consulted 10/2015).

<sup>17</sup> <http://www.innovativebrussels.irisnet.be/en/documents/mise-a-jour-du-pri-en> (p24, last consulted 10/2015).

<sup>18</sup> See <http://www.innoviris.be/en/rdi-policy/regional-innovation-plan> (p23-26, last consulted 10/2015).

<sup>19</sup> See <http://www.statistics.irisnet.be/> (last consulted 10/2015).



- Infrastructure in the field of research and innovation (small, medium-scale and large-scale research infrastructure)
  - Science parks, technology parks, incubator sites, etc.
  - Policy research for the Flemish responsibilities (competencies): economic support, industrial policy, entrepreneurship, social economy, public works, employment, environment, nature conservation, forestry, agriculture, energy (except for nuclear energy), heritage, (primary, secondary and higher) education, water management, transport, vocational training, health, culture, tourism, care, health and well-being, data transmission, sports, media, youth, etc.
- Access to finance
    - Support (financial instruments) for start-ups, spin-offs, participations, seed capital, risk capital, guarantees, fast-growing or technology-oriented businesses, business angels, loans, etc.

At the public governance level, fundamental research (= community competence), as well as of innovation and applied research (= regional competencies) are being dealt with in one specific commission of the Flemish Parliament and by a single minister in the government (Geerts *et al.*, 2014). From August 2014, Minister Muyters holds the portfolio for Science and Innovation, which he combines with Work, Economy and Sports. Furthermore, there is a single administration (the EWI department) responsible for preparing and monitoring RDI policy. The new Flemish government decided to restructure the advisory landscape in Flanders. Currently (2015), there are three advisory councils active in the EWI policy area: the socio-economic council Flanders (SERV) for the economic issues, the Flemish Council for Science and Innovation (VRWI) for the science and innovation domain, and The Industry Council, which was established by the previous government to give advice on a new industrial policy for Flanders, but which has no legal basis. The VRWI and the Industry Council will be replaced in the course of 2016<sup>20</sup> by a new advisory council on innovation and entrepreneurship (VARIO, Vlaamse Adviesraad voor Innoveren en Ondernemen). An International Advisory Board of innovation experts evaluated the system<sup>21</sup> and concluded that the VRWI (with members nominated by universities, employers' organisations and unions, strategic research centers, etc.) mirrored incumbent vested interests, that often have a strong stake in the status quo, at the expense of pursuing the long-term public interest. The advisory board recommended the Flemish Government to evolve from a representative council to an independent board, where members are appointed according to meritocratic principles, based on expertise and experience, and who can speak in a personal capacity – and not as representatives of an interest group. Such an independent council has the ability to competently oversee the STI domain and shake up the system where needed.

The new board will focus on proactive strategic advice on its own initiative while reactive advice will be handled by the SERV (Socio-economic Council of Flanders). At the implementation level, the Agency for Innovation by Science and Technology (IWT) is responsible for innovation, which is a regional competence. In the course of 2016, the IWT innovation agency will be merged with Enterprise Flanders (AO) to create the Flanders Innovation and Entrepreneurship (AIO, Agentschap Innoveren en Ondernemen). Not all the tasks of the IWT will be transferred to this new agency; some of them will be integrated into the Research Foundation Flanders (FWO). The AIO will act as a one-stop-shop for all business-oriented topics.

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<sup>20</sup> See <https://www.vlaamsparlament.be/parlementaire-documenten/parlementaire-initiatieven/982734> (last consulted 10/2015).

<sup>21</sup> See <http://www.vrwi.be/publicaties/eerste-iab-rapport-walk-talk> and <http://notabene.vrwi.be/artikel/time-to-walk-the-talk/> (last consulted 04/2016).

For the community competencies, specific funding agencies (notably, the Research Foundation Flanders, FWO), the Hercules Foundation (for research infrastructure)<sup>22</sup> and initiatives such as the Special Research Fund (BOF) all support universities, university colleges, scientific institutes, research centers and companies of the Flemish Community that are located in both the Flemish Region and the bilingual Brussels Capital Region. In the Government Declaration for the period 2014-2019, it has been decided that the Hercules Foundation will be merged with the FWO (Research Foundation Flanders) and that the long-term strategic oriented IWT programs will be transferred to FWO. The establishment of both the new AIO and the reformed FWO/Hercules is operational since the beginning of 2016.<sup>23</sup> Finally, the Flanders Holding Company (PMV)<sup>24</sup>, supports (innovative) companies<sup>25</sup> with guarantees, loans, risk capital, participations in the capital, etc.

As regards Wallonia and the French Community, since September 2014, the two governments are chaired by two distinct Minister-presidents. However, regarding R&I policy, the current allocation of ministerial portfolios might imply a stronger coherence in policy implementation than before, since a single Minister (Mr Marcourt) holds the portfolios related to R&I:

- Economy, Industry, Innovation and Digital at the regional level
- Higher education, research and media at the community level

The avowed aim is to enhance the level of coherence of government action between education, research and economic policies. Other individual ministers, from either government are autonomously responsible for funding research in their specific fields of competence (agriculture, environment, energy, health). Furthermore, the government has decided, in the broader context of rationalisation, simplification and alignment of support programmes, to merge the agencies AST (Agency for Technological Support), ASE (Agency for Economic Support) into one single agency called Agency for Enterprise and Innovation (AEI).<sup>26</sup> The merger is operational as from 2015.

The Ministerial cabinets, more or less in consultation with the administrations, are responsible for policy development. Science policy councils at Federal level (FRWB-CFPS: Federal Science Policy Council) and in the three regions (the Science Policy Council of the Brussels-Capital Region (RWB/CPS), Flemish Council for Science and Innovation (VRWI, for Community and Region), Walloon Science Policy Council (CWPS) advise their respective governments on science policy strategies and on funding mechanisms (design and evaluation).

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<sup>22</sup> In the Government Declaration for the period 2014-2019, it has been decided that the Hercules Foundation will be merged with the FWO.

<sup>23</sup> <https://www.bestuurszaken.be/stand-van-zaken-fusies> (last consulted 04/2016).

<sup>24</sup> The Flemish Energy Company (VEB) will be integrated into the PMV. These reorganizations reduce the number of agencies in the area of economics, science and innovation to three (FWO, AIO, PMV).

<sup>25</sup> See <http://www.pmv.eu/nl/ondernemers> (last consulted 10/2015).

<sup>26</sup> See <http://www.aei.be/>. The agency was created by the Decree of 28 November 2013, <https://wallex.wallonie.be/index.php?doc=27057&rev=30953-19025> (last consulted 10/2015).

Cooperation between the various governments takes place primarily in the Inter-Ministerial Conference for Science Policy (IMCWB/CIMPS) that meets occasionally, and its two permanent sub-committees CIS (International Co-operation) and CFS (Federal co-operation) that meet on a regular basis. As regards the CFS, coordination tends to focus on practical issues such as carrying out harmonised statistical surveys (R&D, Community Innovation Survey (CIS), etc.) and submission to the European Commission, Eurostat, OECD, etc. of statistics or policy surveys. The CFS has several subcommittees by theme, for example the CFS-STAT (statistics), CFS-INFRA (on research infrastructure), and CIS-CFS (which prepares Belgian positions for the ERAC, such as a joint Belgian document on the ERA Roadmap).<sup>27</sup> A result of the CIS-CFS coordination activities is the joint BEL-SME call<sup>28</sup>, organised by the Flemish former IWT (now AIO), Brussels Capital Innoviris and Walloon DG06. Another initiative of intra-Belgian cooperation (outside the CFS-CIS) is a joint action plan on research that was agreed in March 2011 between the Brussels-Capital Region, the Walloon Region and the Wallonia-Brussels Federation. This has led to joint tendering and an improvement in coherence between similar regional programmes through, for example, closer cooperation between administrations and the coordination of criteria and timetables. This joint action plan was evaluated for the first time in May 2012 and was on that occasion enriched by complementary actions. Proposals for similar cooperation have been made between the Brussels Capital Region and Flanders, and will be implemented. In connection with the federal relaunch Plan of July 2012, a federal entities work group – specifically dedicated to “research, development and innovation” aspects – was set up.<sup>29</sup>

In terms of R&I policy evaluation, the 5 authorities responsible for R&I (see section 1.2.1) follow a multipronged approach. First, funding agencies carry out evaluation and impact studies on a regular basis. E.g. the main funding agency for R&D in the business sector, the IWT (to be replaced by the AIO, see section 2.3), conducts regular studies on the effectiveness of its support programs (e.g. additionality effects), typically in collaboration with external consultants or academics.<sup>30</sup> Second, at a higher level of aggregation, governments have ordered independent audits of the R&I system as a whole. A well-known example are the “Soete-reports” of 2007<sup>31</sup> and 2012<sup>32</sup>, in which prof. Soete of the University of Maastricht chaired a committee of experts to review and give expert recommendations on the Flemish R&I system. In the EWI department, there exist a separate evaluation unit. Comparable examples in Wallonia are the OECD review of its regional innovation system (OECD, 2012)<sup>33</sup>, the initiative of DG06 (the operational Directorate of Economy, Employment and Research in Wallonia) to organize a peer review of the Walloon smart specialization strategy<sup>34</sup> and the evaluation by the IWEP (the Walloon Institute of Evaluation, Foresight and Statistics) of the Competitiveness Poles (see section 2.2) in the Marshall 2.Vert strategy.<sup>35</sup> Another comprehensive evaluation effort was the evaluation of the science policy in 2012-2013 by the Walloon Science Policy Council (CPS).<sup>36</sup> Finally, regional and federal authorities participate in the collection of R&D and innovation statistics, which are reported and made available to stakeholders.

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<sup>27</sup> For a list of the various subcommittees, see [https://www.belspo.be/belspo/coordination/scienPol\\_FCC\\_nl.stm](https://www.belspo.be/belspo/coordination/scienPol_FCC_nl.stm) (last consulted 04/2016).

<sup>28</sup> See <http://www.iwt.be/subsidies/extrasteun/belsme> (last consulted 04/2016).

<sup>29</sup> See <http://www.innoviris.be/en/rdi-policy/regional-innovation-plan> (p28-29, last consulted 10/2015).

<sup>30</sup> See <http://www.iwt.be/english/iwt-content/IWT-study> (last consulted 01/2016).

<sup>31</sup> See [http://www.iwt.be/sites/default/files/eindrap\\_doorlichting\\_innovatie\\_instrumentarium.pdf](http://www.iwt.be/sites/default/files/eindrap_doorlichting_innovatie_instrumentarium.pdf) (last consulted 01/2016).

<sup>32</sup> See <http://www.ewi-vlaanderen.be/nieuws/tweede-rapport-soete-over-innovatie-vlaanderen-17-aanbevelingen> (last consulted 01/2016).

<sup>33</sup> See <http://www.oecd.org/belgium/regionalinnovationwallonia2012.htm> (last consulted 01/2016).

<sup>34</sup> See <http://s3platform.jrc.ec.europa.eu/regions/be3/tags/be3> (last consulted 12/2015).

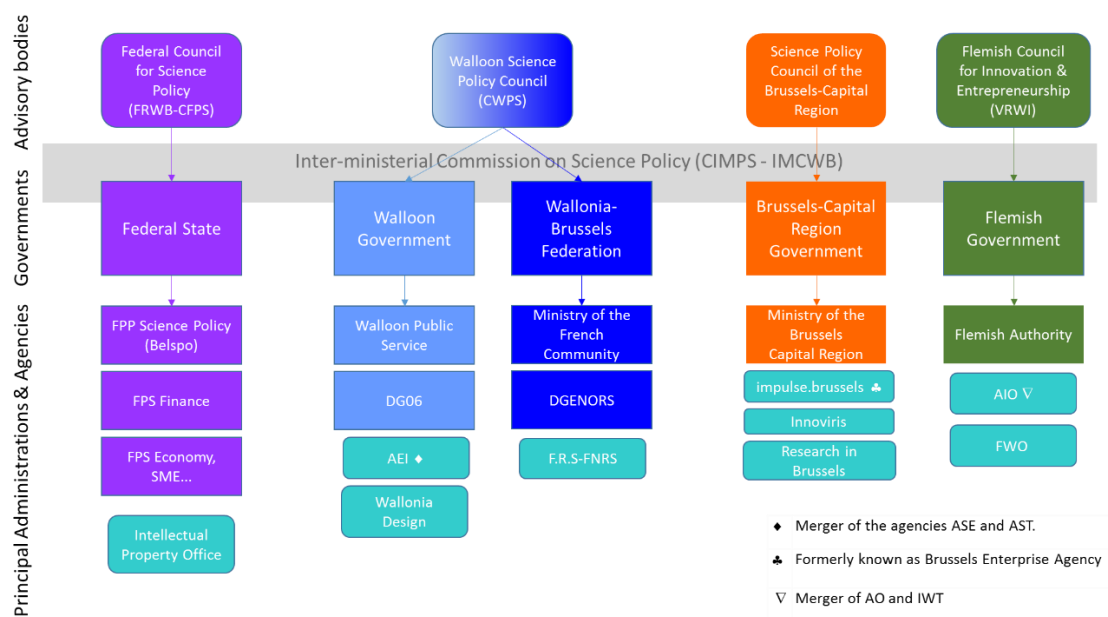
<sup>35</sup> See [http://www.iweps.be/sites/default/files/evaluation\\_thematique\\_poles.pdf](http://www.iweps.be/sites/default/files/evaluation_thematique_poles.pdf) (last consulted 01/2016).

<sup>36</sup> See [http://economie.wallonie.be/sites/default/files/CPS\\_Rapportevaluation2012\\_2013\\_def.pdf](http://economie.wallonie.be/sites/default/files/CPS_Rapportevaluation2012_2013_def.pdf) (last consulted 01/2016).

For example, in Flanders, the Expertise Center for R&D Monitoring (ECOOM)<sup>37</sup> and the Department of Economy, Science & Innovation of the Flemish Government (EWI)<sup>38</sup> and the Research Center of the Flemish Government (a part of the new Department for Public Governance and the Chancellery as of 2016) publish a wide range of R&D and innovation indicators, which are consulted by various stakeholders such as the Flemish Council for Science & Innovation Policy (VRWI) as the basis for policy advice.<sup>39</sup>

Figure 1 contains an overview of the different R&I governance levels in Belgium and the key advisory bodies, administrations and agencies.<sup>40</sup>

**Figure 1:** R&I governance in Belgium



### 1.2.3 Research performers

Belgium has seventeen federal scientific institutes<sup>41</sup>, which are of diverse types and cover a wide variety of research activities and collections. These include museums, libraries, weather and space observatories, as well as research institutes dealing with crime, African culture, geology and public health. At the administrative level, they are managed by various policy fields and under the overall responsibility of the federal Minister for Science, as part of the Programmatic Public Service (PPS) for Science Policy, Belspo.

These scientific establishments have a two-fold mission: a scientific public service mission (the development, maintenance and dissemination of scientific, technical and cultural information and documentation, collection conservation, etc.) and a research mission (through research often conducted in partnership with the universities of the Flemish and/or French Community). The federal scientific institutes in the field of nature and space are (excluding the domains of arts and documentation): the Belgian Institute for Space Aeronomy, the Royal Belgian Institute of Natural Sciences, the Royal Meteorological Institute, the Royal Museum for Central Africa, and the Royal Observatory of Belgium (including the Planetarium).

<sup>37</sup> See <https://www.ecoom.be/en/indicatorenboek> (last consulted 01/2016).

<sup>38</sup> See <http://www.speurgids.be/> (last consulted 01/2016).

<sup>39</sup> See <http://vrwi.be/publicaties> (last consulted 01/2016).

<sup>40</sup> Note that in terms of funding agencies, only the main entities are included in the diagram. Additional players in the ecosystem include public venture capital and regional investment organizations like PMV and GIMV (Flanders), Investis and SOWALFIN (Wallonia), SRIB/GIMB/Brustart (Brussels). These entities are discussed in section 5.4.

<sup>41</sup> 10 of them report to BELSPO.

In addition to these institutes, there are also a number of federal partner institutions and other organizations subsidized by the PPS (for example, the University Foundation), whilst some of the federal scientific institutes report to other federal public services (in the field of public health, for example, there is the Scientific Institute of Public Health and the Veterinary and Agrochemical Research Center).

The Federal Government also has responsibility for two other research organizations: the National Institute for Radio-elements, and the renowned Nuclear Energy Center (SCK or CEN). The latter is located in Mol, alongside the Flemish VITO, which is responsible for the non-nuclear aspects of energy research, materials, remote sensing, and environment. The new federal government (2014) has decided to alter the governance structure for the federal scientific institutions, which will both be granted more autonomy but will also face greater accountability requirements and will be encouraged to realize scale economies among each other.<sup>42</sup> As part of this operation, the State Secretary for Science Policy (Mrs Sleurs) has allocated €11.3m for additional investments in 2015, based on priorities that the federal scientific institutions themselves had put forward. Further, as mentioned in section 1.2.2, the Federal Government will reorganize the science policy field at the federal level, as a result of which the Programmatic Public Service (PPS) for Science Policy will be merged into another administrative unit (as a federal public service). As far as universities are concerned, the Federal Government does not have any direct authority, as higher education is a competence of the (regional) Communities.

In Flanders, the universities represent the first pillar of the higher education system and represent the major part of the scientific output in the Flemish R&D ecosystem: the universities generate almost 90% of all non-private scientific output in Flanders (Geerts *et al.*, 2014).<sup>43</sup> The five universities of the Flemish Community are: the Katholieke Universiteit Leuven (KU Leuven), Universiteit Gent (UGent), Universiteit Antwerpen (UA), Vrije Universiteit Brussel (VUB), and Universiteit Hasselt (UHasselt). Public funding for the universities can be categorised into three budgetary flows: a basic allowance ('sokkels'), performance-based institutional funding and a variety of project funding sources. The other pillar of the Flemish higher education system is the "hogescholen" or university colleges. These colleges provide higher education and advanced vocational training, and their mission includes research and the provision of other services to society. Since the academic year 2013-2014, the academic (i.e. non-vocational) education of the university colleges has been integrated in the university system. This took place within the Flanders' framework of the so-called "associations": cooperation agreements between one university and one or more university colleges. These associations were set up at the introduction of the Bachelor-Master structure in 2004 and are the result of the Bologna process. The bachelor qualification is the highest obtainable at the university colleges; master diplomas (and higher) remain the preserve of the universities. Several university colleges are currently merging with each other, affiliated to one of the five associations: KU Leuven, Ghent, Antwerp, Brussels and Limburg. Only statutorily registered universities and university colleges can take part in this system and receive government funding to support their educational and research activities. Apart from universities and university colleges, a limited number of other officially registered institutions, such as the Vlerick Leuven-Ghent Management School, the Institute of Tropical Medicine (Antwerp) and the Antwerp Management School, are also allowed to participate. Also in the Wallonia-Brussels Federation, universities play a key role as research performers.

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<sup>42</sup> See [http://www.premier.be/sites/default/files/articles/Accord\\_de\\_Gouvernement\\_-\\_Regeerakkoord.pdf](http://www.premier.be/sites/default/files/articles/Accord_de_Gouvernement_-_Regeerakkoord.pdf) (p104, last consulted 10/2015).

<sup>43</sup> All information relating to on-going research conducted at the Flemish universities can be consulted via [www.researchportal.be](http://www.researchportal.be) (last consulted 01/2016).



The 6 universities are: the Catholic University of Louvain (UCL), Saint-Louis University, Brussels (USL-B), the University of Namur (UNamur), the Free University of Brussels (ULB), the University of Mons (UMons) and the University of Liège (ULg).

Apart from the universities, the leading Flemish research and innovation actors are the five strategic research centers or SOCs ("Strategische Onderzoekscentra") or PROs (public research organizations). Each of the centers is active in a specific research area and they have co-founded several start-up companies, often based on breakthrough research. The SOCs/PROs are: IMEC (nano-electronics and nano-technology), VIB (bio-molecular research in diverse fields of the life sciences), VITO (multidisciplinary research center for energy, materials, environmental and terrestrial observation), iMinds (ICT research, in particular the development of broadband applications), Flanders Make<sup>44</sup> (production technology and know-how in the field of smart assembly). Within the Flemish Community, there are five scientific institutes, each managed by a department of the Flemish Government. These perform scientific research in a specific policy field, and are: the Institute for Agricultural and Fisheries Research (ILVO), the Research Institute for Nature and Forest (Institut voor Natuur- en Bosonderzoek (INBO), Royal Museum of Fine Arts Antwerp (KMSKA), Agency for Archaeological Heritage (AOE), and the Botanic Garden Meise (since 2014 a Flemish Agency). Wallonia has also taken initiatives that aim at excellent science and technology development in a limited number of 6 thematic areas, but follows a slightly different approach. The Competitiveness Poles group research centers, large companies and high-tech SMEs in domains such as mobility & transport (e.g. SkyWin), environment and sustainable development (GreenWin) and food health (BioWin).<sup>45</sup>

The companies are of great importance within the STI system. About 57% of domestic expenditures on R&D in Belgium in 2013 was financed by the business sector (section 1.2.1), amounting to 70% in Flanders (Geerts *et al.*, 2014). However, there is a lot of heterogeneity among companies. Most large companies are clearly innovation-active, with some of them having significant research budgets. Given the industrial texture in Flanders, most of these large enterprises belong to multinational groups, so that their research policy is not exclusively determined in Flanders. The main sectors that conduct research are life sciences and chemistry, ICT and communications, and the electrical machinery and apparatus industry. Alongside the large, innovation-intensive companies, a group of high-technology SMEs has arisen in recent years and continues to grow steadily, notwithstanding the setbacks (and the failures) that have been caused as a result of the difficult economic climate. Moreover, even though the large majority of SMEs do not conduct research directly, many of them outsource research to some extent, so that they can also be regarded as innovation-oriented. According to the Community Innovation Survey (CIS) carried out in 2013, 56% of all companies (2012) in Flanders can be called innovative, defined as having introduced new or renewed product or process innovations, or organizational or marketing innovations. Nevertheless, innovation continues to be largely concentrated in industry and large companies. In 2012, the R&D intensity in the business sector was 1.62%. Flanders therefore ranks higher than the EU-28 average and the Netherlands, but distinctly lower than the Scandinavian countries, Germany, the USA and Japan. Also in the Walloon Region, companies are key R&D performers. Noteworthy is the particularly strong concentration of R&D: about 60% of business R&D is conducted in high-tech sectors (most notably pharmaceuticals, accounting for 49% of business R&D) and mainly in large enterprises (57.4% in 2011).<sup>46</sup>

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<sup>44</sup> In 2013, the Flemish Government decided to establish a new SOC under the name "Slimme Maakindustrie" (Strategic Research Centre for Smart Manufacturing). It will be known in English as Flanders Make and was officially launched October 2014.

<sup>45</sup> See <http://clusters.wallonie.be/federateur-fr/les-poles-de-competitivite-wallons.html?IDC=341> (last consulted 01/2016).

<sup>46</sup> See [http://economie.wallonie.be/sites/default/files/CPS\\_Rapportevaluation2012\\_2013\\_def.pdf](http://economie.wallonie.be/sites/default/files/CPS_Rapportevaluation2012_2013_def.pdf) (last consulted 01/2016).

Innovation increasingly happens in collaboration between different entities, as evidenced by the emergence of distinct collaborative structures which are now an inherent part of the landscape of research performers. A number of these innovative networks, involving various knowledge actors and industries - typically companies belonging to a specific sector - are being supported by the Government of Flanders, often in cooperation with that specific sector. The main policy instrument for this support is the "VIS trajectories" scheme, whereby innovative solutions are offered for a specific problem or a demand driven opportunity relating to a collective of companies, resulting in a clear (economic) added value for a broad target group. Since 2000, the Flemish Government also has supported a number of "Competentiepolen" (excellence centers). These organizations are primarily oriented towards the proper structuring of and proper cooperation between the actors of a specific industrial sector, by providing relevant research and innovation potential at the Flemish level. Within the excellence centers, industrial partners cooperate with the PROs, universities, professional organizations, etc. The main activities are knowledge creation and knowledge diffusion. Since 2012, these centers were supported under the mechanism for "Lichte Structuren" (the "Innovation Platforms") scheme. Examples of the 11 innovation platforms were: Flanders' DRIVE (automotive industry, now a division of Flanders' Make, center for smart manufacturing), VIL (logistics), MIX (innovative media), SIM (materials), Flanders' Food (innovative food industry), etc.

Another type of player in the R&I performers landscape are the collective centers. Their main activities are collective research, various services of a scientific or technical nature (provided individually to their members), dissemination of technical information and training. The collective centers were founded by the Belgian business federations, usually by way of an association, and are mainly active in the field of applied research relevant to the companies in their sector. In addition, they often participate in European, federal and Flemish research programmes and carry out self-generated research in order to maintain their overall levels of knowledge and expertise. Examples of collective centers are the Collective Center for the Belgian Technology Industry (SIRRIS), the Belgian Welding Institute (BWI), the Scientific and Technical Service Center for the Belgian Textile Industry (Centexbel), etc. Also Wallonia brings together research performers in clusters, in which the collective research centers, such as the aforementioned SIRRIS and Centexbel, are a key element in the network.<sup>47</sup>

Apart from the aforementioned organizations, there also exist a variety of other institutions and organizations in the public domain with activities that primarily focus on (scientific) data collection, research and/or knowledge generation. Some of these bodies play a prominent worldwide role in their field of activity. They include:

- The Institute for Tropical Medicine, ITM (Instituut voor Tropische Geneeskunde, ITG): one of the world's leading institutes for training, research and support in the field of tropical medicine and health care in developing countries, providing (reference) clinical services for the management of tropical diseases.
- Neuro-electronics Research Flanders, NERF: this basic research initiative is a collaborative venture between Imec, VIB and KULeuven.
- Energyville vzw: is a collaboration between research actors who aim to excel in the field of innovative European energy research and who wish to drive the transition towards a sustainable energy infrastructure for large urban areas.
- The Center for Research and Conservation (CRC), the research institute of the Royal Zoological Society of Antwerp (RZSA) conducts applied and fundamental hypothesis-driven conservation research in various zoological disciplines.
- Etc.

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<sup>47</sup> See <http://recherche-technologie.wallonie.be/fr/menu/ressources/competences-s-t/les-centers-collectifs-de-recherche-agrees/index.html> (last consulted 01/2016).

Other recent initiatives include the so-called “Living Laboratories”, or test beds, which have been set up in a number of fields in Flanders. These are structured test environments in which organizations can test innovative technologies, products, services and concepts, using a representative sample of individuals, who are used as testers in their normal living and working environments. Living Labs were set up in the field of electric vehicles (the project has now been terminated) and house renovation/building, Social Innovation and Care Innovation.

Apart from institutes related to or managed by the federal or regional governments, there are also a number of other EU or international institutions that collect scientific data or conduct research, and are located in Flanders. Some of these receive regional funding or support. Examples include:

the Von Karman Institute for fluid dynamics.

the EU’s joint research center (JRC) known as the Institute for Reference Materials and Measurements (IRMM).

the Project Office of the Intergovernmental Oceanographic Commission (IOC) of UNESCO for the International Oceanographic Data and Information Exchange (IODE) programme and the European Marine Observation and Data Network (EMODnet).

Other examples of international research-related establishments are the executive offices of the EU’s joint initiatives for Innovative Medicines (IMI), Clean Sky, ECSEL (previously ENIAC, nanoelectronics and ARTEMIS, embedded systems), Fuel Cells and Hydrogen (FCH), Shift2Rail, but also the secretariat of COST and of EUREKA, the pan European intergovernmental network gathering 41 countries for collaboration in research and innovation, all of which are located in Brussels.



## **2. Recent Developments in Research and Innovation Policy and systems**

### **2.1 National R&I strategy**

#### **Political context**

On the 25th of May 2014, Belgium had elections for all of its governance levels (except the local and province levels), i.e. for the federal, regional, community and European parliaments. The previous Federal government had been formed after the longest political crisis in Belgium's history (541 days of negotiations after the elections of June 2010 before the creation of a Federal government in December 2011) and after it reached a political agreement on the 6th State Reform of the country. Between December 2011 and October 2014, the Federal Government ('Di Rupo I') subsequently organised and prepared the actual implementation of the 6<sup>th</sup> State Reform, which involves a substantial transfer of competences from the Federal State to the Regions and Communities. From 2014 onwards, this transfer of competences has been implemented by organizing the actual take-over by Regions and Communities. This reform is an important extension of the regional and community competences. A whole range of responsibilities is transferred, some of them completely (e.g. policy relating to unemployment, care for the elderly, etc.), others partly (e.g. fiscal authority). In the field of Research and Innovation policies, most competences had already been transferred after 1988 and in the course of the 1990s, so the impact of the 6<sup>th</sup> State Reform is rather limited. In the field of R&I, the national botanic garden since 2014 has been transferred to the Flemish authority. Another issue is the transfer of the inter-university attraction poles (IUAP) to the Communities.

The previous Federal Government was constituted by three political parties from each language community (Christian-Democrats, Socialists, Liberals). The new Federal Government put in place in October 2014 now consists of the French speaking Liberals (MR), and the Flemish Christian Democrats (CD&V), Flemish Liberals (Open VLD) and Flemish Nationalists (NV-A). The federal government Agreement of 1 October 2014 sets out a range of measures to tackle the financial crisis and contains a number of austerity measures. Some substantial savings are expected to occur by limiting the public administrations' expenses (at Federal level but also in the Regions and Communities) and by e.g. postponing the automatic wage indexation by one year. On the other hand, the planned savings are aimed to generate some room to reduce labor costs for companies, which are considered to be relatively high in Belgium and therefore hampering the competitive position of domestic companies. Some of these new policy initiatives at the federal level may impact R&I, as discussed in more detail in section 2.2.

#### **R&I Strategies**

Given that the main responsibility for R&I is allocated to the three regions and the three communities, there is no unified national strategy. Instead, each region/community has its own multi-annual plan that covers research and innovation, either as a sub-element of an overall plan or as a specific strategy. More specifically, the different Government agreements of July (Communities, Regions) and October 2014 (federal authority) present broad political orientations - some of them regarding R&I policies - and the translation into detailed or operational propositions took place thereafter. These policy notes or 'policy action plans' were submitted by the new governments to their respective parliaments for discussion, amendments and approval after the summer of 2014.

The main multi-annual plans running in 2015 are:

- Flanders: Vision 2050, which replaces the previous long-term vision of the Flemish Government, the Flanders in Action initiative (ViA).<sup>48</sup> The preceding ViA strategy was based on an agreement between the social partners, stakeholders and the government and it was aimed at making Flanders one of the top five EU regions by 2020 in terms of economic performance. Like ViA, Vision 2050 formulates long-term objectives for society – most of which have direct implications for R&I - addressing not only current strengths but also challenges in realizing them. It defines 7 “transition priorities” that aim at strategic, structural changes such as the transition to a circular economy, a society characterized by life long learning, etc. In terms of governance, each transition priority will be allocated to a responsible Minister of the Government and will be managed using a separate budget.
- Brussels: Strategy 2025, adopted in June 2015, in which the Brussels Regional Government defines 18 objectives in the domains of economy, education, science, etc.<sup>49</sup> This plan encompasses putting in place a new Regional Innovation Plan for Brussels (based on the RIP of 2006 that was updated in 2012<sup>50</sup>).
- Wallonia: the Walloon Marshall Plan 4.0<sup>51</sup>, which replaces the “Marshall Plan 2.Green”.<sup>52</sup> In addition, a new research & innovation strategy 2015-2019 is in preparation<sup>53</sup>, following up on the Stratégie Recherche 2011-2015.

In order to ensure coordination, the 2011 Federal Government Agreement foresaw the drafting of an overarching inter-regional STI-strategy in order to reach the 3% GERD/GDP target and meet the goals of the National Reform Plan and the EU 2020 Strategy. The inter-regional/community plan would aim to improve the coordination and efficiency of STI policy. The new Federal Government of October 2014 reconfirms this ambition and aims at reinforcing policy coordination with all other federated entities of the country. In this regard, it announces the establishment of a repository of all federal measures (grants, subsidies, fiscal measures) of relevance for all governance levels.<sup>54</sup>

## 2.2 R&I policy initiatives

### R&I policy features across government levels

Given the problematic financial situation and the political will to arrive at a balanced budget in 2015 or 2016, several austerity measures were taken. However, in the field of R&D, major cutbacks are not planned except when considering the Belgian Science Policy Office and the Federal Scientific Institutions, which will most probably be granted a lower budget for the period 2014-2019. The Federal Government’s Coalition agreement points to a need for more coordination between the communities, the regions and the Federal Government in order to achieve the 3% target. At the same time, decisions have been made to delegate certain matters to the regional level. A noteworthy example is the transfer in 2017 from the Federal to the Community level of the so-called ‘inter-university attraction poles’ (IUAP), which are scientific networks of excellence grouping the best teams from multiple Belgian universities across the linguistic Communities.

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<sup>48</sup> <http://www.vlaanderen.be/nl/vlaamse-regering/visie-2050-een-langetermijnstrategie-voor-vlaanderen> (last consulted 10/2015).

<sup>49</sup> <http://www.ces.irisnet.be/publications/autres-publications-1/autres-publications-du-conseil/16-juin-2015-1> (last consulted 12/2015).

<sup>50</sup> <http://www.innovativebrussels.irisnet.be/en/documents/mise-a-jour-du-pri-en> (last consulted 10/2015).

<sup>51</sup> See <http://www.wallonie.be/fr/plan-marshall> (last consulted 10/2015).

<sup>52</sup> See [http://www.investinwallonia.be/wp-content/uploads/2012/03/PM2vert\\_EN\\_9dec2010.ppt](http://www.investinwallonia.be/wp-content/uploads/2012/03/PM2vert_EN_9dec2010.ppt) (last consulted 10/2015).

<sup>53</sup> Déclaration de Politique Communautaire 2014-2019, p36. See <http://gouvernement.cfwb.be/d-claration-de-politique-communautaire-2014-2019-f-d-rer-pour-r-ussir> (last consulted 10/2015).

<sup>54</sup> See <http://www.premier.be/fr/accord-de-gouvernement>, p103 (last consulted 10/2015).

These poles were one of the very few remaining initiatives that by design fostered collaboration in basic research between the institutions of the Flemish and the French Communities (i.e. the universities).

Further, also as part of the reshuffling of responsibilities between government levels, the management of the botanic garden of Meise was transferred from the federal to the regional level, following an agreement on the 5<sup>th</sup> State Reform in 2001, converting it from a Federal Scientific Institution to a Flemish Agency.

Besides responsibilities shifting between government levels, the priorities in the policy mix of the three Belgian regions show distinctive features, reflecting their specific institutional and economic environments. At the same time, a number of measures are similar in their objectives yet differ in implementation. A noteworthy common feature of both the Flemish and Walloon systems is the emphasis on measures aimed at encouraging increased co-operation between the research base and enterprises. While in the 1990s research policies got more and more integrated with innovation policy and entrepreneurship, since a couple of years there is a trend towards more integration of the 'research and innovation fabric' into industrial policy. This is demonstrated by the shift towards more close-to-market policies and public intervention and more attention for demand-side policies, focusing on technology deployment, living labs, pilot plants, lead user platforms, etc. In Flanders, for instance, research and innovation is increasingly seen as a key ingredient of the "New Industrial Policy" (after the 2014 elections: new industrial entrepreneurship). In Wallonia, all competences regarding higher education, scientific research, industrial research, innovation, entrepreneurship, economy and trade have been regrouped within one single minister portfolio (Minister Marcourt), which is another indication of the need and wish to further integrate the whole innovation trajectory within industrial and economic policy. Nevertheless, there are differences in implementation between the regions. For example, in Wallonia, there is a strong focus on schemes aimed at encouraging knowledge diffusion through the exchange or temporary assignment of skilled researchers or innovation specialists from universities and research centers to enterprises (and vice versa), as demonstrated by the FIRST55 family of measures. In Flanders, this type of action is subsumed mostly within the IWT schemes of the Innovation Mandates<sup>56</sup> and the Baekeland mandates<sup>57</sup>.

Another key similarity is that the regions and communities have all made commitments to invest more in R&D with a clear thematic or sectorial component. Broad societal needs and challenges have come to the fore of policy making in Flanders<sup>58</sup>, while environmental and health concerns are prominent in all regions c.q. communities. Again, the way that such common policy objectives are operationalized differs between regions. For example, in Wallonia, priority themes are aligned with the priorities of Competitiveness Poles<sup>59</sup>. In Flanders, the strategic research centers (IMEC, VIB, etc.)<sup>60</sup> address the grand challenges, as do several tailored initiatives, e.g. innovation in health (CMI<sup>61</sup>, Flanders' Care<sup>62</sup>), energy (Energyville<sup>63</sup>), social innovation (social innovation factory<sup>64</sup>), etc.

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<sup>55</sup> See <http://recherche-technologie.wallonie.be/fr/menu/acteurs-institutionnels/service-public-de-wallonie-services-en-charge-de-la-recherche-et-des-technologies/departement-des-programmes-de-recherche/direction-des-programmes-regionaux/les-programmes-first/index.html> (last consulted 01/2016).

<sup>56</sup> See <http://www.iwt.be/subsidies/innovatiemandaten> (last consulted 10/2015).

<sup>57</sup> See <http://www.iwt.be/subsidies/baekeland-mandaten> (last consulted 10/2015).

<sup>58</sup> Identified in the aforementioned ViA ("Vlaanderen in Actie") process.

<sup>59</sup> See <http://clusters.wallonie.be/federateur-fr/les-poles-de-competitivite-wallons.html?IDC=341> (last consulted in 12/2015).

<sup>60</sup> See <http://www.investinlanders.be/en/flavor/Why-Flanders/page/State-of-the-art-research-centers-> (last consulted 12/2015).

<sup>61</sup> See <http://www.cmi-vzw.be/> (last consulted 10/2015).

<sup>62</sup> See <http://www.flanderscare.be/> (last consulted 10/2015).

<sup>63</sup> See <http://www.energyville.be/> (last consulted 10/2015).

<sup>64</sup> See <http://www.socialeinnovatiefabriek.be/> (last consulted 10/2015).

Finally, while a further integration of all stages of the innovation cycle in the policy mix is a common trend in all regions, the weak coordination of policies between regions and communities, and across governance levels, remains a point of attention in Belgium. That said, and as mentioned in section 1.2.1, the new Federal Government aims at reinforcing policy coordination with all other federated entities of the country, and initiatives have been taken in this respect, such as a common repository of innovation data and joint project calls for SMEs (see section 2.3).<sup>65</sup> An interesting evolution with respect to policy coordination across entities is the collaboration between the Walloon and the Brussels-Capital Region (e.g. the Competitiveness Poles), accelerated since 2011. Another example is the joint decision of the Walloon Government and the French Community to annually allocate €11m Euro to support strategic fundamental research.<sup>66</sup>

### *Federal Government*

Since the early nineties, the center of gravity of scientific and innovation policy has been transferred in Belgium from the federal to the regional and community levels. Direct support to innovation by enterprises or universities is now in the hands of regions and communities. However, the federal government remains the main actor in terms of fiscal incentives for R&D and has introduced several of these incentives over the past years. Key initiatives include the partial exemption of the wage withholding tax for researchers and a tax deduction for patent incomes. The federal government Agreement of 1 October 2014 has announced the intention to continue the policy of a reduced wage withholding tax for researchers, and to study the desirability of further strengthening its fiscal policy to promote R&D activities, such as an expansion of the tax deduction for patent income to revenues from software licenses.<sup>67</sup> Over the last years, there has been a move to improve and optimise the fiscal incentives allocated to both scientific and industrial research. This effort has made some in-roads into reducing the competitiveness gap for undertaking research in Belgium due to high wages and social security charges. Also, there were efforts to better align and integrate the federal fiscal instruments with the direct support offered by e.g. the regions (e.g. 'MIDAS' database developed by Wallonia integrating all measures regardless of governance level<sup>68</sup>). An important operational consequence of the Federal Government Agreement of October 2014 is that the federal services for science policy (Belgian Science Policy Office – Belspo) will be integrated in another federal administration (probably the Federal Public Service for economy, sme, self-employed and energy)<sup>69</sup>.

### *Wallonia and Wallonia Brussels Federation*

In May 2015, the Walloon Government approved the €2.9b (2015-2019)<sup>70</sup> Marshall Plan 4.0, as the successor of the earlier Marshall Plan 2.Green<sup>71</sup> (Plan Marshall 2.Vert, €1.6b over five years (2010-14)) and Marshall Plan 2022<sup>72</sup> of the previous legislatures. The label "4.0" reflects the Government's intention of embracing the digital revolution.

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<sup>65</sup> See [http://www.premier.be/sites/default/files/articles/Accord\\_de\\_Gouvernement\\_-\\_Regeerakkoord.pdf](http://www.premier.be/sites/default/files/articles/Accord_de_Gouvernement_-_Regeerakkoord.pdf) (p103, last consulted 10/2015).

<sup>66</sup> See <https://wallex.wallonie.be/index.php?doc=27693&rev=29070-19549> (Decree of 20/2/2014, last consulted 12/2015).

<sup>67</sup> See <http://www.premier.be/fr/accord-de-gouvernement>, p6 & p103 (last consulted 10/2015).

<sup>68</sup> See <http://www.aides-entreprises.be/WD200AWP/WD200Awp.exe/CONNECT/Midas> (last consulted 10/2015).

<sup>69</sup> See <http://www.premier.be/fr/accord-de-gouvernement>, p105 (last consulted 10/2015).

<sup>70</sup> Of this amount, €468m will be sourced from alternative financing to support investment projects. Note that projects defined as part of the 'Marshall Plan 2.Green', amounting to €841m using alternative financing, will be realized in the 2015-2019 period. See <http://www.wallonie.be/fr/plan-marshall> (last consulted 04/2016).

<sup>71</sup> See <http://www.investinwallonia.be/why-wallonia/economie-et-plan-marshall/?lang=en> (last consulted 01/2016).

<sup>72</sup> See <http://www.investinwallonia.be/2013/09/launch-of-the-marshall-plan-2022-priority-for-education/?lang=en> (last consulted 01/2016).

The new plan aims to strengthen the collaboration with the Wallonia-Brussels Federation (the French Community) and is centered on 5 axes:

1. Education & training, with particular attention to strengthen apprenticeships, knowledge of foreign languages and renewed infrastructure of training centers;
2. Economic and industrial policy, which will continue the past strategy of Competitiveness Poles (pôles de compétitivité) that will be the key mechanism to implement the "smart specialization" strategy (see below);
3. Optimization of the infrastructure and accessibility of locations of economic activity, including hospitals;
4. Conversion to a circular economy, including the development of renewable energy initiatives, support for companies to control energy costs and building renovation;
5. Transition to a digital economy, with a focus on public services ("administration 4.0") and smart cities.

As a key legislative initiative, the research decree was modified in May 2015, with a view to simplify the types of calls, foster excellence in scientific research and make Wallonia's participation in the European Research Area more robust.<sup>73</sup> In terms of spanning the boundary between science and innovation, the government aims at the wide dissemination of research and innovation results within the economic fabric, as well as an improved functioning of the constituent elements of the regional innovation system.<sup>74</sup> In this perspective, the implementation of the 2011-2015 Integrated Research Strategy<sup>75</sup> and the "Creative Wallonia" Plan has been continued<sup>76</sup>. Further, and in accordance with European guidelines, a revised strategy for the period 2015-2019 entitled "towards a regional policy of sustainable industrial innovation" (embodying the region's smart specialisation strategy) was adopted by the Walloon Government in September 2015.<sup>77</sup> It constitutes the common strategic base of regional research and innovation policies, in particular the actions developed in axis 2 of the Marshall Plan 4.0 (mentioned above) and the axis "Innovation 2020" of the Operational ERDF Programme 2014-2020.<sup>78</sup> At the core of the S3 strategy are the Competitiveness Poles, defined as a partnership between companies, research centers and training/education organizations that jointly constitute a critical mass at the regional level.<sup>79</sup> The Poles are determined through a combination of a top-down (identification of priority domains) and bottom-up (by a call for proposals) process, after which they were analyzed by a jury and formally recognized by the government. Among the 6 identified Competitiveness Poles are GREENWIN (chemistry, environmental technology), SKYWIN (materials) and BIOWIN (biomarkers, innovative therapies).

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<sup>73</sup> See <https://wallex.wallonie.be/index.php?doc=29418> (last consulted 01/2016).

<sup>74</sup> "Innovation" is one of the three main pillars (besides "simplification" and "to assemble") of the Walloon 2014-2019 Government Declaration. Efforts towards more innovation will be built up around the continuation of the Marshall Plan (Marshall Plan 2022, now superseded by the Marshall Plan 4.0) (see <http://gouvernement.wallonie.be/d-claration-de-politique-r-gionale-2014-2019-oser-innover-rassembler>, p5, last consulted 10/2015).

<sup>75</sup> « Stratégie Recherche 2011-2015. Vers une politique intégrée de la Recherche », Cabinet of Minister Nollet, December 2011 (see <http://nollet.wallonie.be/strategie-recherche-2011-2015-vers-une-politique-integree-de-la-recherche>, last consulted in 02/2015)

<sup>76</sup> Ibidem, p23 (integration and perpetuation of the Creative Wallonia Programme within the new 'Agency for Enterprise and Innovation'); Ibidem, p32 (announcement of the evaluation leading to the revision of the 'integrated research strategy').

<sup>77</sup> <http://economie.wallonie.be/content/la-strat%C3%A9gie-de-sp%C3%A9cialisation-intelligente-de-la-wallonie-%C3%A9t%C3%A9-adopt%C3%A9e-par-le-gouvernement> (last consulted 01/2016).

<sup>78</sup> The plan is also known as "Wallonie-2020.eu".

See [http://europe.wallonie.be/sites/default/files/PO\\_annexe\\_SFC.pdf](http://europe.wallonie.be/sites/default/files/PO_annexe_SFC.pdf) (p70, last consulted 10/2015).

<sup>79</sup> See <http://economie.wallonie.be/sites/default/files/Pr%C3%A9sentation%20S3%20Wallonie%20-%20juillet%202015.pdf> (last consulted 10/2015).



In addition, the Wallonia-Brussels Partnership for Researchers was adopted in 2011. It is the contribution of the Wallonia-Brussels Federation to the implementation of the European Charter for Researchers, the European Code of Conduct, the European Commission Partnership for Researchers, the recommendations of the Helsinki Group on Women and Science and the human resources strategy of the "Innovation Union" of the European Union.

### *Brussels Capital Region*

The Regional Innovation Plan of the Brussels Capital Region (2006) covering the period 2007-2013 focused on regional R&D strategic platforms, clusters and plans to increase regional R&D capacities up to the 3% target. In 2012, the plan was updated in line with the EU 2020 strategy and the regional policy orientations<sup>80</sup>. One of the objectives is to elaborate a "smart specialisation strategy" for the region by identifying the sectors in which the region will invest, in order to reshape and adapt the financial measures and instruments, rethink a governance model and align the priorities with future EU funding (ERDF, HORIZON 2020). More specifically, the main objectives of the updated Regional Innovation Plan of the Brussels Capital Region (November 2012) are the following:

- Use Smart Specialisation to drive the economy and employment;
- Create a favorable environment for innovative companies;
- Increase the attractiveness of Brussels as a European hub of knowledge;
- Increase Brussels' participation in European projects;
- Strengthen the governance of innovation.

The government Agreement of October 2014 confirmed the commitment to the 3% objective and emphasized smart specialization as the guiding principle for its RDI strategy, in line with the Regional Innovation Plan, and relies on the existing Competitiveness Poles and clusters as the vehicles to implement this strategy. Testimony of that approach is the objective to convert Brussels into a "Smart City" through the creation of a new big data platform that is linked to the "Infopole ICT cluster", in order to develop technological and training partnerships between educational, public and private actors<sup>81</sup>. The Region intends to rely much more on the European Regional Development Fund 2014-2020 to develop innovation. As indicated in the official summary of the 2014-2020 OP of the Brussels Capital Region, 19% of the overall budget is allocated to research and innovation<sup>82</sup>. Finally, in June 2015 the Brussels Capital Region presented its new development plan, Strategy 2025. This plan is broad in scope, addressing 18 objectives that range from education to local commerce. One of the objectives is the support of research and innovation, which announces the development of a new Regional Innovation Plan 2015-2020 and echoes RDI-related aspects of the government declaration, such as smart specialization and the transition towards a Smart City.<sup>83</sup>

### *Flanders*

For the current governing period, the main policy plans are the Government Declaration of the Flemish Government (July 2014), the Policy Note 2014-2019 on Work, Economy, Science and Innovation (October 2014), the Flemish Reform Programme for the Europe 2020 strategy, and Vision 2050 (September 2015), and the annual policy notes (the first of the period covers 2015-2016).

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<sup>80</sup> See <http://www.innovativebrussels.irisnet.be/fr/accueil/plan-regional/mise-a-jour-du-plan-regional-pour-l-innovation> (last consulted 10/2015).

<sup>81</sup> <http://www.parlbruparl.irisnet.be/2014/07/declaration-de-politique-generale-du-gouvernement/>, p25-26 (last consulted 12/2015).

<sup>82</sup> See [http://ec.europa.eu/regional\\_policy/index.cfm/EN/atlas/programmes/2014-2020/belgium/2014be16rfop001](http://ec.europa.eu/regional_policy/index.cfm/EN/atlas/programmes/2014-2020/belgium/2014be16rfop001) (last consulted 12/2015).

<sup>83</sup> See <http://rudivervoort.be/MP/wp-content/uploads/2015/08/Strategie-2025-Pijler-1-Laatste-versie-11062015.pdf> (last consulted 10/2015).

The Government Declaration for 2014-2019 lists three focal points of policy<sup>84</sup>:

1. A demand-driven and market-oriented public policy in the field of economy and innovation, with increased attention for 'downstream' instruments like pilot projects, living labs, proofs-of-concept;
2. A simplification and rationalization of structures and instruments with faster and easier procedures, more transparency, better client-friendliness and a clear one-stop-shop function;
3. A higher focus on business-oriented innovation and valorisation, strong knowledge organizations with excellent research and a growth path for the 3% target for R&D, whereby public outlays strive towards 1% by 2020.<sup>85</sup>

After the elections of May 2014, the EWI-domain has become the responsibility of a single minister again, similar to the situation in 2006-2009.<sup>86</sup> Hence, there now is a single policy note on Work, Economy, Science and Innovation for 2014-2019, which falls under the responsibility of the Flemish minister for Work, Economy, Innovation and Sports (Mr Muyters). The strategic and operational objectives related to STI are commented upon in more detail in section 2.3 (subsection *Flanders*), and can be summarized<sup>87</sup> as follows:

- Invest in agile employees and companies, which includes attention for framework conditions for innovation-driven entrepreneurship;
- Invest in an excellent knowledge base, which includes a qualitative elaboration of the 3% target, investments in state-of-the-art research infrastructure, open data and open access policies;
- Invest in a simplified and tailored delivery of services, which includes providing a single contact point for the entrepreneur;
- Protect the competitiveness of companies;
- Invest in European, international and interregional networks;
- Activate the innovation potential in SMEs and in large companies;
- Innovative procurement at government level;
- Mining of foreign employment potential.

In 2015, the new Flemish Government released Vision 2050, its long-term strategy for Flanders, as the successor of the Flanders in Action plan (ViA, "Vlaanderen in Actie"). Vision 2050 includes a number of goals related to research and innovation policies, as discussed in section 2.1.

In recent years, the Flemish government has further elaborated and shifted its STI strategy in various ways, namely through various measures to widen the support to the innovation trajectory, to stimulate diffusion of innovation especially towards SMEs and to better facilitate the access to finance. Attention for 'demand pull' in policy has generally increased, by stimulating demand-driven initiatives as well as initiatives in the field of grand challenges. Examples of these measures include:

- the SOFI and SOFI2<sup>88</sup> fund for spin-off companies based on research results at universities and PROs;
- SPRINT-projects for innovation projects in large companies that have a low R&D intensity<sup>89</sup> (see also description in section 2.3);

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<sup>84</sup> <https://www.vlaanderen.be/nl/publicaties/detail/het-regeerakkoord-van-de-vlaamse-regering-2014-2019> (last consulted 10/2015).

<sup>85</sup> See <http://www.vlaanderen.be/nl/publicaties/detail/het-regeerakkoord-van-de-vlaamse-regering-2014-2019>, p21 (last consulted in 01/2016).

<sup>86</sup> See <http://www.vlaanderen.be/nl/publicaties/detail/het-regeerakkoord-van-de-vlaamse-regering-2014-2019> (last consulted 10/2015).

<sup>87</sup> See <http://www.vlaanderen.be/nl/publicaties/detail/beleidsnota-2014-2019-werk-economie-wetenschap-en-innovatie> (last consulted 10/2015).

<sup>88</sup> See <http://www.pmv.eu/nl/diensten/sofi> (last consulted 12/2015).

- the establishment of a new strategic research center on smart manufacturing ("Flanders Make")<sup>90</sup>;
- a new programme on transformative medical research (TGO)<sup>91</sup>;
- the re-orientation of the excellence centers into innovation platforms (previously "Lichte Structuren")<sup>92</sup>, e.g. the new initiative on innovative sustainable chemistry (FISCH)<sup>93</sup>.

Modifications to the Flemish Parliament Act on Science and Innovation (Wetenschaps- & Innovatiedecreet, 25/4/2014)<sup>94</sup> strengthened and consolidated into a single Framework Act the legal and budgetary basis for all R&D&I actors (IWT, FWO, Hercules Foundation, policy on Science communication, the 5 provincial innovation centers,...). Also, the regulation on the Industrial Research Fund (Besluit Industrieel Onderzoeksfonds, 11/09/2014) was altered<sup>95</sup> with clarifications in the definition of valorisation-oriented parameters (spin-off companies). Related to the reduction in the working budgets of Flemish universities, the regulation of the Special Research Fund (Besluit Bijzonder Onderzoeksfonds, 3/4/2015) was changed<sup>96</sup> to give them more autonomy on how to deal with budget deficits by reducing the compulsory BOF contribution.

The new minister for Work, Economy and Innovation puts a strong emphasis on strengthening cooperation among companies. Cluster policy will essentially be centered on two types of clusters: spearhead clusters and innovative enterprise networks. The former have the potential to create large effects on employment and added value, and will receive long-term support (10 years). The (smaller) innovative enterprise networks have essentially the same set-up, except that they focus on future potential and/or emerging markets. These networks can request 50% co-funding from the government for a maximum of 3 years. Selection of spearheads will be strict and based on exercises like the one by the Flemish Council for Science and Innovation (VRWI), mentioned in section 2.2.1.

Specifically for projects from large companies and other R&D-knowledge intensive businesses it is assumed that cooperation with other companies – and especially SME's – and knowledge institutes in a Flemish or an international context is common practice rather than an exception.

### **Evaluations, consultations, foresight exercises**

Conté et al (2009) reported that almost all EU member states indicated that they had some evaluation schemes in place to assess their public R&I support. Belgium is no exception: while evaluation of research and innovation policy is not an entirely systematic practice, all the authorities seek to evaluate specific measures or initiatives or organisations on a periodic basis. For example, in 2011, according to its management contract, the Walloon Technology Promotion Agency (AST) was evaluated and Wallonia invited the OECD in 2012 to review its regional innovation system. In the ERAC, a peer review was conducted on Belgium in 2010 and previously in 2005.

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<sup>89</sup> See <http://www.vlaanderen.be/nl/ondernemen/groeien-en-investeren/subsidie-voor-een-sprint-project> (last consulted 10/2015).

<sup>90</sup> See <http://www.flandersmake.be/> (last consulted 10/2015).

<sup>91</sup> See <http://www.iwt.be/subsidies/tgo> (last consulted 10/2015).

<sup>92</sup> See <http://www.iwt.be/subsidies/innovatieplatformen> (last consulted in 12/2015).

<sup>93</sup> See <http://www.fi-sch.be/en/> (last consulted 10/2015).

<sup>94</sup> See <http://data-onderwijs.vlaanderen.be/edulex/document.aspx?docid=14104>

<sup>95</sup> <http://data-onderwijs.vlaanderen.be/edulex/document.aspx?docid=14113>

<sup>96</sup> <http://data-onderwijs.vlaanderen.be/edulex/document.aspx?docid=14492>



### *At the Federal level*

At the Federal level, several studies have been undertaken to evaluate (whether or not in relation to R&D subsidies) the partial wage withholding tax exemption for highly qualified R&D personnel (Federal Planning Bureau and Belspo).<sup>97</sup> A pilot project is launched together with ESA (January 2015 – December 2016) for putting in place an evidence base for evaluating the socio-economic impact of public funding for space activities. Also an evaluation is planned for the ten Federal Scientific Institutions linked to the Belgian Science Policy Office.

### *In Wallonia*

Regarding the Walloon “Marshall Plan 2.Green”, all measures implemented are subject to monitoring by a unit especially set up for this purpose within the General Secretariat of the Public Service of Wallonia (IWEPS) and a program of thematic assessments was developed by the Walloon government. The same applies to the programs co-financed by Structural Funds. A thematic evaluation of actions for development and exploitation of innovation potential in Wallonia was carried out in 2012.

The implementation of a strategic approach for the management of programs to support RDI in the Walloon region was introduced in the legal texts in 2008 (Decree of 3 July 2008 to support Research, Development and Innovation). This initiative has become concrete with the adoption of the strategy for an integrated research 2011-2015. This Decree provides for an external evaluation of the implementation of this strategy at the end of its five year implementation period. It also stipulates the systematic collection of data on the outcomes and impacts of all projects financed under the Decree.

The aforementioned peer assessment of the Walloon regional innovation system, produced by the OECD, was finalised in 2012 and publicly presented at the start of 2013. This analysis has already guided the Government in several areas of reform, in particular with regard to the re-organisation of the innovation landscape in Wallonia, i.e. the creation of WALTECH and creation of the Enterprise and Innovation Agency. Following the regional elections of 2014, the regional government Agreement confirmed the creation of the Enterprise and Innovation Agency (AEI, see also section 1.2.2). Regarding WALTECH, no further information appeared. The peer assessment furthermore backed up the Government intentions on the consolidation of different policies, in particular the competitiveness poles, the integrated Research Strategy and the Creative Wallonia Plan. In the government Agreement of 2014, these policies are still at the core of the general orientations and should therefore gain in importance in the legislation 2015-2019. The Government Agreement foresees a whole series of evaluations in the coming legislative period.<sup>98</sup>

### *In Flanders*

In Flanders, a strong evaluation culture has emerged in the last decade. For example, all Strategic Research Centers have been evaluated in the last five years (IMEC, VIB and iMinds in 2011 and 2013, VITO in 2012). Furthermore, the EWI department set up a dedicated unit for policy monitoring and evaluation in 2009. The influential 2007 Soete review recommended simplification and a more “customer friendly set of instruments in Flanders”. The Flemish research and innovation system has been reviewed for the second time by Luc Soete (UNU-Merit, The Netherlands) in 2012 and the “Soete 2”-report was finalised in 2013.

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<sup>97</sup> <http://www.plan.be/publications/publication-1398-en-public+support+for+rd+and+the+educational+mix+of+rd+employees>; <http://www.plan.be/press/communique-503-fr-incitants+fiscaux+pour+la+recherche+et+le+developpement+en+belgique+analyse+du+bureau+federal+du+plan>

<sup>98</sup> See the Government Declaration [http://www.wallonie.be/sites/wallonie/files/publications/dpr\\_2014-2019.pdf](http://www.wallonie.be/sites/wallonie/files/publications/dpr_2014-2019.pdf) (p32, last consulted 12/2015).

Evaluation needs are defined in the programming documents of specific measures and performance indicators are set out in the management agreement for implementing organisations with the Government, which enables a clear and transparent evaluation process. Evaluations at programme level are often assigned to external experts. These are usually published in a complete or summarised version or are available on demand. Examples of such evaluations commissioned by the Agency for Science and Innovation (IWT) in Flanders are<sup>99</sup>:

- Effects of collaboration in IWT-funded industrial R&D projects (study nr 78)
- New microeconomic evidence on public R&D grants in Flanders (study nr 75)
- Monitoring and evaluation of the competence research centers (study nr 69)
- Analysis of R&D subsidy applicants and beneficiaries (study nr 64)
- Behavioural additionality of IWT R&D grants (study nr 56)

#### *In Brussels-capital*

In the Brussels Capital Region, even if evaluation practices have been up to very recently very limited, during the preparation of the updated R&D strategy in 2011, the regional R&D system has been assessed with respect to financing, governance, and the policy mix. At the same time, the region has elaborated a "R&D scoreboard", a tool which should allow monitoring the regional R&D policy at programme and projects level. The R&D scoreboard has been implemented in 2012. Furthermore, Innoviris has set up a specific unit dedicated to the task of monitoring R&D evolution in the region and ensuring a "strategic R&D intelligence". For the new multi-annual Strategy 2025, the public regional service of Brussels (SPRB) will follow up on progress.

Belgium has quite a number of Public-Private partnerships, notably the excellence centers in Flanders, the competitiveness poles in Wallonia, and the strategic platforms in the Brussels Capital Region. In Wallonia, the competitiveness poles have been assessed by IWEPS in 2014.<sup>100</sup> The evaluation results have been taken into account for defining new priorities and policy orientations. In Flanders, the instrument has been subject to change: the excellence centers were re-oriented as of 2012 into "innovation platforms" (whereby an evaluation took place for most of these) with little overhead and no more direct research funding, which should enhance synergies between public and private partners and enable more transparent governance. In this light, the performance of the new innovation platform is measured via Key Performance Indicators (KPIs) and funding depends on these KPIs. A final remaining challenge may be the integration and search for synergies at Belgian level, as innovation platforms in Flanders and competence poles in Wallonia have a relatively high regional character.

### **2.3 European Semester 2014 and 2015**

The main issues and recommendations put forward in the 2015 European Semester Country Report for Belgium are the following:

- Access to public support is considered complex and time-consuming, and the available support is fragmented. Also in the CSR of July 2014, the Council of the European Union reckoned that innovation support was considered "*well developed and covers the full innovation cycle but has become complex and is fragmented*". It recommended Belgium to "*(...) restore competitiveness by (...) promoting innovation through streamlined incentive schemes and reduced administrative barriers (...)*". (Recommendations of the Council to Belgium, 8 July 2014, Official Journal of the European Union C247/4-5). The simplification of the institutional landscape and improved coherence and efficiency of public actions are a major objective of the Belgian authorities.

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<sup>99</sup> See <http://www.iwt.be/english/iwt-content/IWT-study> (last consulted 12/2015).

<sup>100</sup> See <http://www.iweps.be/evaluation-du-plan-marshall-2vert> (last consulted 12/2015).

In Wallonia, for instance, the decree on setting up an agency for entrepreneurship and innovation was adopted at the beginning of 2014 and an optimisation process for R&D support management is in progress, and the simplification and rationalization of the instruments' portfolio is a key pillar of the new 2014 Governmental Agreement.<sup>101</sup> The landscape of support to R&D will also be deeply simplified, notably by reducing the variety of calls (see new research and innovation decree and R&I strategy). As mentioned in section 1.2.2, the Government declaration 2014-2019 of the Flemish Government states that innovation agency IWT will be merged with Enterprise Flanders agency into an Agentschap voor Innoveren en Ondernemen (AIO) (Agency for Innovation and Entrepreneurship) that will act as a one-stop-shop for all business support measures. The Hercules Foundation will be merged with the Research Foundation Flanders, FWO, and it will be considered which programmes from IWT can better be integrated into the FWO.

For the implementation of its Regional Plan for Innovation, the Brussels-Capital Region has increased its support to RDI regional players wishing to take part in European programmes and partnerships.<sup>102</sup>

All regions and the Federal Government also foresee the extension of programmes dealing with administrative simplification, often (but not exclusively) in the context of the further implementation of the SBA. For example, in June 2015 the Walloon Government approved the Walloon Small Business Act 2015-2019, which explicitly acknowledges administrative simplification through its inclusion as a transversal objective.<sup>103</sup>

- Although the funding of business R&D is split between the federal government and the regions (which are the main actors), there is no organised coordination to ensure that support is optimally balanced between the different instruments and that trans-regional synergies are fully exploited. In this regard, the federal Government Agreement of 1 December 2011 had already suggested an "inter-federal plan for research and innovation" to coordinate efforts of all entities towards this objective. The new Federal Government of October 2014 aims at reinforcing policy coordination with all other federated entities of the country. In this regard, it announced the establishment of a repertory of all federal measures (grants, subsidies, fiscal measures) of relevance for all governance levels.
- Bottlenecks on taxation and labor market performance contribute to the overall innovation challenge. In October 2015, the Federal Government announced an agreement on a major tax reform.<sup>104</sup> A key element in the agreement is the reduction of social security contributions of for-profit companies, which stipulates that by 2018 the maximum contribution is capped at 25%. For salaries that were already below this rate, the charge will be reduced by 4 to 5%. Further, for the non-profit sector there will a reduction of contributions of €144.3 million in 2016, €239.4 million in 2018 and €364.5 million in 2020.
- The strengths of the research and innovation system are inadequately translated into economic performance, with Belgium generally lacking fast-growing firms in innovative sectors. This target group has received explicit attention in recent policy making, in particular in the Walloon Small Business Act 2015-2019, which, as part of its 1<sup>st</sup> objective (entrepreneurship) aims for early detection of SMEs with high growth potential to offer them customized guidance.

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<sup>101</sup> [http://www.wallonie.be/sites/wallonie/files/publications/dpr\\_2014-2019.pdf](http://www.wallonie.be/sites/wallonie/files/publications/dpr_2014-2019.pdf), (last consulted 10/2015).

<sup>102</sup> <http://www.innovativebrussels.irisnet.be/fr/accueil/plan-regional/mise-a-jour-du-plan-regional-pour-l-innovation-1>, p. 23-24 (last consulted in 02/2015).

<sup>103</sup> See <http://economie.wallonie.be/content/small-business-act-wallon-2015-2019-le-nouveau-plan-d%E2%80%99action-pme-pour-la-wallonie> (last consulted 10/2015).

<sup>104</sup> See <http://www.bloomberg.com/news/articles/2015-10-10/belgian-govt-reaches-accord-on-2016-budget-tax-shift-belga> (last consulted 10/2015).

The tax shift of October 2015 (see previous point) foresees that SMEs with 6 or fewer employees will be exempt from paying social security contributions for the 1<sup>st</sup> employee.

- While Belgium has a generally well-qualified workforce with a high participation rate in tertiary education, the share of science and engineering graduates remains low, with the shortage of qualified ICT experts particularly pronounced. Belgian companies also perform rather poorly on participation in lifelong learning. For promoting STEM education, a new strategy has been developed in Flanders in 2014-2019 (see section 5.3).

The key R&I-relevant aspects of Belgium's NRP for 2014 and 2015 can be summarized as follows:

#### *Collaboration between federal entities and internationally*

- In the context of the Federal Government economic stimulus plan, it was decided to create a transversal technology intelligence platform - available as an online database since January 2015 - in order to pool information on innovation. It was developed by the Federal Planning Bureau at the request of the Scientific and Technical Information Service (Belspo) and provides an assessment of the performance of the Belgian regions in science, technology and innovation.<sup>105</sup>
- In terms of support measures, a joint call targeting collaborative projects with SMEs was launched in early 2015 by the three regions.<sup>106</sup>
- Other recent examples of cross-regional cooperation include the joint call of the Brussels-Capital Region and the Flemish Region of the programme "ZorginnovatieRuimte Vlaanderen" (Care Innovation Space Flanders, targeting healthcare for elderly people)<sup>107</sup>, the ICON programme<sup>108</sup> of iMinds (Flanders), which has been opened for companies located in the Brussels Capital Region, the WB Move programme<sup>109</sup> (Wallonia), which has been opened for Brussels-based research organizations.

#### *Federal government*

- The fiscal support policy for R&D was intensified in 2013, particularly with regard to the partial wage withholding tax exemption for researchers, namely an increase from 75% to 80% as from 1 July 2013. The reductions in the pay-roll tax for R&D personnel reached €0.7 billion (2013) and the tax credits for investments in research and development reached €0.35 billion (2012). Fiscal deduction for income from patents amounted to €193 million (2012).
- The European Agreement of 19 February 2013 on the Unified Patent Court (UPC) was ratified by the Federal Parliament. The UPC Agreement constitutes a crucial step in the development of the European patent with unitary effect, as intended in regulation 1257/2012 of 7 December 2012 implementing enhanced cooperation in the area of the creation of unitary patent protection.

#### *Flemish government*

- Flanders made clear efforts for R&D&I in 2015 by allocating additional funds, such as an extra €20 million following the agreement on the competitiveness pact in December 2013.

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<sup>105</sup> See <http://www.innovationdata.be> (last consulted 12/2015).

<sup>106</sup> See <http://www.iwt.be/subsidies/extrasteun/belsme> (last consulted 12/2015).

<sup>107</sup> See <http://www.iwt.be/subsidies/proeftuinzorg> (last consulted 12/2015).

<sup>108</sup> <http://www.iminds.be/en/succeed-with-digital-research/co-operative-research/icon-research-program> (last consulted 12/2015).

<sup>109</sup> See <https://recherche-technologie.wallonie.be/fr/menu/acteurs-institutionnels/service-public-de-wallonie-services-en-charge-de-la-recherche-et-des-technologies/departement-des-programmes-de-recherche/direction-des-programmes-regionaux/les-programmes-mobilisateurs/le-programme-wb-move/index.html> (last consulted 12/2015).

Moreover, €16.8 million was allocated to the integration of higher education within the Flemish Community.<sup>110</sup> The total budget for R&D&I in 2015 remains stable in comparison to 2014 (2014: €2.205 billion; 2015: €2.183 billion).

- During the summer of 2013, the Flemish Government decided to set up a strategic research center (SOC) for the manufacturing sector within which companies, research centers and universities cooperate to do high-level research for the manufacturing industry.
- The objective of Flanders Make is to steer technological research and innovation in mechatronics, product development and production technologies to the industry needs to reach higher added value for a competitive international manufacturing industry in Flanders. The new Flanders Make center was officially opened in October 2014 and has been active since 2015.
- Besides the establishment of Flanders Make, the province of Limburg – which was strongly affected by the closure of the local Ford plant – other research initiatives were taken in this location. For instance, a research group of VIB (biotechnology) on immune diseases, a Careville Limburg lab dedicated to innovations in healthcare for elderly people, the Digital Health Innovation (DHI) expertise center and an incubator (iMinds) on ICT and digital media for technological enterprises.
- The new Flemish government, installed in 2014, continues to focus on an ambitious strategy for R&D and innovation, and is striving to achieve the 3%-objective, of which 1/3 through public funding. In 2014, the Flemish government invested €2.18 billion in science and innovation policy, of which €1.35 billion was for R&D. A growth path for science and innovation investments has been planned for the period 2014-2019.
- In the beginning of 2014, an additional €10 million was allocated to the spin-off funding instrument fund (SOFI) of the Flanders Holding Company (PMV) to support innovative spin-offs.
- In the EU-regional policy for the programming period 2014-2020, the budget to which the Flemish Region is entitled will decline. However, given the importance of the transition to a knowledge economy, a higher amount – both in relative and in absolute terms – has been foreseen for R&D&I in the ERDF Operational Programme submitted by the Flemish Region, namely €138 million in 2014-2020 (40% of the total).<sup>111</sup>
- Besides these initiatives, the new Policy Note for Work, Economy, Science and Innovation for the period 2014-2019 contains the following priorities for R&D&I:
- Versatile employees and companies, amongst others via the STEM-action plan 2012-2020 and the SOFI-fund for research-based spin-offs.
- An excellent knowledge base with a strategy for researchers and other knowledge workers addressing career aspects, international talent, mobility from and to industry, etc.
- Increased customer friendliness and accessibility of support instruments for R&I actors through the establishment of a new Agency for Innovation and Enterprise (Agentschap voor Innovatie en Ondernemen, AIO), integrating Enterprise Flanders (AO) and the business oriented services of IWT (agency for Innovation by Science and Technology).
- Investing in European, international and interregional networks, such as the Vanguard Initiative<sup>112</sup>, the EU Horizon 2020 programme, bilateral collaborations, and participation in EU Joint Programming, Joint Technology-initiatives, ESFRI (research infrastructure), KETs (key enabling technologies), and EIT-KICs.

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<sup>110</sup> In 2013-2014, the further integration of the higher education sector into bigger 'university associations' has been continued. This rationalization process has led to scale effects and substantial savings (through sharing of services for instance).

<sup>111</sup> This amount is based on the assumption that R&D&I represents 40% of the total ERDF resources for "investment in growth and jobs" (Objective 2) and Interreg (Objective 3)

<sup>112</sup> See <http://www.s3vanguardinitiative.eu/> (last consulted 10/2015).



- Activation of the innovation potential of SMEs and large businesses through focused instruments for innovative starters, innovative companies and innovation followers through for example the VIS-IV-trajectories for "innovation-followers" and the SPRINT-projects for large companies with a small or no research department.
- Supporting innovation through public procurement, with a focus on opportunities for SMEs.

#### *Walloon government*

- In December 2014, the Walloon government sketched the initial outlines for the reform of its research and innovation policy. As mentioned in section 2.2, this has led to a new multi-year strategy for research and innovation- the Marshall Plan 4.0, approved in May 2015 - which accounts for nearly €2.9 billion in the 2014-2019 legislature.
- The decree governing support for research was revised in 2015 in order to reduce the number of calls for submissions and to encourage collaboration and the emergence of structural actions.<sup>113</sup> Special attention will be paid to supporting platforms for innovation technologies and for the industrial application of research. In addition to alignment with the European framework on support for RDI, the revision of the 2008 decree will allow the introduction of measures for financing infrastructure associated with research projects and the grouping of research centers on a voluntary basis.
- The financing of the fund for strategic fundamental research is sustained with respect to its two strategic pillars: research on sustainable development (€5 million per year) and life sciences (€6 million per year).<sup>114</sup>
- Public outlays for R&D will continue to rise, and will be supplemented, starting from 2015, by resources derived from structural funds (€440 million for the period 2014-2020 have been earmarked for the Innovation axis of the ERDF programme, and nearly €2 million are allocated for the ESF).
- In the context of the Competitiveness Poles policy, €41 million will be budgeted in the framework of the Marshall Plan 4.0 on an annual basis to support the research projects of the Poles, increased by €15 million in 2017 and 2018. Furthermore, significant budgets were earmarked in the spring of 2014 for the support of 2 innovation platforms which stem from the Poles (Proton therapy, €47 million; Reverse metallurgy, €41.5 million).
- Various projects were launched for interregional or international cooperation with regard to R&D&I (ERA-Nets, KIC raw materials). A dialogue was initiated with the actors concerned, particularly the Competitiveness Poles, in order to reinforce the participation in European programmes (Horizon 2020), in accordance with the Region's strategy for smart specialisation. Its involvement in the "Vanguard Initiative" also forms part of this.
- Within the framework of the Marshall Plan 4.0, the Walloon Government also plans to emphasize the creation and development of innovative companies. Key initiatives are discussed below.
- In the context of the Plan Creative Wallonia, a pilot project for creativity cheques was launched, 2 living labs were opened ("e-health" and "smart gastronomy"), and 7 creative hubs designed to spread creative economy practices within the territory were initiated and will be made permanent with the support of the ERDF.
- The Agence de l'Entreprise et de l'Innovation (AEI), which - as mentioned above - is the new single point of contact for companies, has been operational since January 2015.

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<sup>113</sup> See <https://wallex.wallonie.be/index.php?doc=29418> (last consulted 01/2016).

<sup>114</sup> See <https://wallex.wallonie.be/index.php?doc=27693&rev=29070-19549> (last consulted 10/2015).

- A Digital Plan (Plan du Numérique), which has been given a budget of about €200 million, was proposed in September 2015.<sup>115</sup> The goal is to develop the digital economy and its dissemination throughout all sectors, particularly in the areas of health, smart cities and mobility.
- A big data platform linked to several competitiveness clusters (Infopole, Twist, Photonique) will be set up in 2015<sup>116</sup> and the start-up accelerator Nest'Up<sup>117</sup> - with the application period in September-October 2015 - will be developed with hosting, finance and guidance services.

### *Brussels Capital Region*

- In 2014, the Brussels Capital Region provided €32.1 million in support to R&D projects. In addition, 20% of the ERDF resources for the period 2014-2020 (€95 million in total) in the Brussels Capital Region are reserved for reinforcing research, promoting innovation and encouraging knowledge transfer. For 2015, the Region has planned an R&D budget of €39.7 million.
- In 2014, in the form of the Co-create programme, the Brussels Capital Region launched a new R&D instrument designed to bring Brussels residents, the research and innovation sector and the business world closer together through living labs.<sup>118</sup>
- In line with the implementation of the Regional Innovation Plan, the Brussels Capital Region reinforced the support to regional R&D actors in 2014 to enable them to participate in European R&D programmes and partnerships. In particular, the Region joined the ERA-net Smart Cities and Communities, the article 187 Joint Technology Initiative ECSEL, and the article 185 Joint Programme Ambient Assisted Living II (AAL II) and renewed its support to the Eurostars (R&D for SMEs) programme and the EUREKA initiatives.
- In June 2015 the government of the Brussels Capital Region has launched the Strategy 2025, which aims to revitalise the Brussels economy with a 10-year vision for the combined implementation of policies for employment, economy, research, training and education. As mentioned in section 2.2, this will include the development of a new Regional Innovation Plan 2015-2020, which will ensure the gradual increase in the credit made available to Innoviris, the regional Institute for research and innovation.
- In 2015, the region has also been working on a new legal framework for its Research and Innovation funding agency (INNOVIRIS) which will allow it to adapt to the new state aid rules regulation, implement the new Regional Innovation Plan 2015-2020 and the regional Smart Specialisation Strategy but also to integrate a series of new actions and instruments with the idea to integrate a higher Open Innovation dimension in the regional strategy.

## **2.4 National and Regional R&I Strategies on Smart Specialisation**

Many of the regional aspects are covered in other sections, due to the specificities of the Belgian research and innovation system. There are explicit regional smart specialisation strategies, as described in section 2.2, even if they are not labelled explicitly that way.

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<sup>115</sup> <https://www.digitalwallonia.be/plandunumerique/> (last consulted 10/2015).

<sup>116</sup> See <http://economie.wallonie.be/sites/default/files/Strategie%20de%20sp%C3%A9cialisation%20intelligente%20de%20la%20Wallonie%20septembre%202015.pdf> (last consulted 10/2015).

<sup>117</sup> See <http://www.creativewallonia.be/projets/creative-business/nest-up.htm?lng=fr> (last consulted in 02/2015).

<sup>118</sup> See <http://www.innoviris.be/en/financial-aid-for-research-organisms/brussels-aid/co-create-living-labs/co-create-living-labs> (last consulted in 01/2016).

## In Flanders

In 2010-2012, the Economics, Science & Innovation department (EWI) participated in the OECD project "Smart specialisation for innovation growth". As a part of this, a comparative study of sectorial strengths in science, technology and economy, the so-called "specialisation profiles", was performed.

This study analysed the relative performance of Belgium, focusing on scientific development (based on the analysis of publications<sup>119</sup>), technology development (based on patent analysis) and economic development (based on labor market data). The analysis highlighted a mismatch between knowledge production and the technological and economic fabric of the country and more particularly in the Southern part of the country, as the strengths in science do not correspond with the technological and economical strengths.<sup>120</sup>

Another initiative to obtain evidence-based identification of regional strengths was the foresight study of the Flemish Council for Science and Innovation (VRWI), which was updated in 2013-14 during a foresight 2025 exercise.<sup>121</sup> The results were used as input to develop the concept note 'A smart specialisation strategy for a targeted cluster policy' (approved by the Flemish Government on March 8, 2013).<sup>122</sup> The note outlined an approach centered on 6 innovation nodes, thematic areas where knowledge and innovation competences are bundled to address societal challenges (examples are 'eco-innovation', 'sustainable mobility'...). The phased plan of the concept note included a pre-roadmap for a policy of advanced clusters during the legislative period 2014-2019. Since November 2013, pilot trajectories have been started in the fields of sustainable chemistry, additive manufacturing and materials to develop a partnership to design a roadmap for clusters. These pilots for developing new cluster policies explored the conditions for strategic cooperation between government services and cluster organisations on the wide range of policies (innovation, training, trade, regulation) that are needed to accomplish the transformation objectives with roadmaps for concrete cases. As a result, the pre-conditions for such strategic cooperation on the side of cluster management and government are better understood (the need for specific competences and planning priorities). In this context and on the occasion of a European high level conference on smart specialisation in November 2013, Flanders initiated the Vanguard Initiative. This is a platform of European regions who want to be at the forefront in the application of smart specialization and re-industrialisation (by innovation). A pilot project was set up, focusing on advanced manufacturing, in which regional strengths in this area were mapped and linked, with the ultimate objective to reach co-investments by actors in the involved industrial regions.

The new Flemish Government fully endorses the logic of smart specialization but also intends to rationalize earlier initiatives, as indicated in a concept note of Minister Muylers in July 2015. As mentioned in section 2.2, cluster policy will be simplified and will revolve around two types of clusters: spearhead clusters and innovative company networks. The former have the potential to create large effects on employment and added value, and will receive long-term support (10 years). The (smaller) innovative enterprise networks have essentially the same set-up, except that they focus on future potential and/or emerging markets. These networks can request 50% co-funding from the government for a maximum of 3 years. Selection of spearheads will be strict. The concept note will be elaborated starting end 2015 and implemented during 2016, with the goal of operationalizing the policy by the end of 2016 or beginning 2017.<sup>123</sup>

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<sup>119</sup> Analysis of the so-called Activity Index.

<sup>120</sup> This mismatch has already been identified in Capron and Cincera (2002).

<sup>121</sup> See <http://www.vrwi.be/en/publications/study-26-vrwi-foresight-study-2025> (last consulted 10/2015).

<sup>122</sup> See <http://www.ewi-vlaanderen.be/nieuws/conceptnota-slimme-specialisatiestrategie-voor-gericht-clusterbeleid> (last consulted 10/2015).

<sup>123</sup> See <http://www.philippemuylers.be/nieuws/meer-impact-met-nieuw-innovatiebeleid> (last consulted 10/2015).



A strong incentive for these regional efforts comes from EU Regional Policy (the structural funds), since, for the period 2014-2020, the regions have to document their smart specialisation strategy in an (ex ante) Regional Innovation Strategy before they can receive EU financial support through the Structural Funds.

In response, the Flanders' ERDF Operational Programme 2014-2020 listed 8 priority domains in the framework of a smart specialisation strategy and was approved by the EC in December 2014.<sup>124</sup> In relation to this, and in order to support the Flemish global approach for the six key technologies (KET), a call for roadmaps was issued in 2013.<sup>125</sup> The KET roadmaps were completed in 2014 and presented for conclusions in April 2015.<sup>126</sup>

### *In Wallonia*

Wallonia's cluster policy, centered on the "competitiveness poles" has been pursued and intensified over the past years with an increased focus on 'integrated innovation'.<sup>127</sup> Wallonia's 'smart specialisation strategy' is rooted in its cluster policy designed to stimulate the development of business niches in regional areas of specialization based on the dynamics of collaboration and innovation. This cluster policy is supplemented by more horizontal approaches to stimulate research and innovation, creativity and entrepreneurship in the Walloon economy. In Wallonia, the smart specialisation process follows a consistent approach since 2009. In 2013 – 2014, the revised innovation strategy 'Marshall Plan 2022' confirmed that the cluster policy and the competitiveness poles remain at the core of the regional R&I and industrial policy. The latest extension of the multi-year strategy, the Marshall Plan 4.0 (2014-2019), announced the intention to renew the strategy of the competitiveness poles and to recast the R&D&I Decree to buttress the smart specialization strategy. With respect to the latter, the Walloon Parliament has adopted a new R&D&I Decree in May 2015, revising the previous law of 2008.<sup>128</sup> A first key principle behind the reform is to apply the excellence criterion used for deciding on support to the competitiveness poles also more manifestly to research projects. The goal is to install a consistent approach towards both economic and research actors. Second, the decree foresees in administrative simplification by reducing the types of projects from 10 to 3. Finally, closer alignment of priority research domains with the 6 competitiveness poles is expected to strengthen industry-science links. Up to now, 6 competitiveness poles have been created in the areas of logistics, aerospace, health, agro-food, mechatronics and green technologies. For their specific support, the Government has developed a policy mix for investment (typically co-financing), R&I, exportation and FDI, training and networking. The competitiveness poles are complemented by 7 clusters of firms (mostly SMEs) that were defined in a bottom-up fashion.

Policy is geared towards further leveraging the competitiveness poles, in particular by regional and international collaboration. Recent experiences in the projects 'Protontherapy' and 'Reverse Metallurgy' will be used as the stepping stone. For example, for the latter project - which is centered on the Mécatech pole and which involved the University of Liege as an academic partner - collaboration with universities and research centers in other regions will be sought (e.g. IMEC and VITO in Flanders) within the context of calls for Horizon 2020 and the EIT Raw Materials.

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<sup>124</sup> See <http://s3platform.jrc.ec.europa.eu/regions/be2/tags/be2> (last consulted 10/2015).

<sup>125</sup> See <http://www.iwt.be/subsidies/extrasteun/KET> (last consulted 10/2015).

<sup>126</sup> See <http://www.ewi-vlaanderen.be/evenementen/ewi-focus-19-key-enabling-technologies-roadmaps-waar-staan-we-en-waar-gaan-we-naartoe> (last consulted 10/2015).

<sup>127</sup> Cfr. new R&I strategy for 2015-2019, which completes the S3 synthesis document submitted to the Commission, as part of the ERDF.

<http://economie.wallonie.be/sites/default/files/Strategie%20de%20sp%C3%A9cialisation%20intelligente%20de%20la%20Wallonie%20septembre%202015.pdf>

<sup>128</sup> See <https://wallex.wallonie.be/index.php?doc=29418> (last consulted 12/2015).

Like Flanders, Wallonia is a partner in the aforementioned Vanguard Initiative of European regions that aim to use smart specialisation strategy for realizing growth.

#### *In Brussels-Capital*

The Brussels Capital Region identified its priorities to be in the domains of ICT, life sciences, and environment. The Bridge programme, formerly known under the name 'strategic platforms' was launched for the first time in 2010. It was inspired by the Regional Plan for Innovation (PRI) and aims to reinforce measures taken since 2006 in the frame of so-called "impulse" programmes. More specifically, Bridge projects (3 years, once renewable, financed at a rate of 100%) are academic research projects for which economic enhancement in the Brussels-Capital Region may be envisaged in the short or medium term. For this reason, collaboration with partners in industry is requested. For its 5<sup>th</sup> edition that started in 2014, the theme of the Bridge programme was information security. In 2015, the launched call focused on energy harvesting, storage and management, and projects will be selected in 2016.

Moreover, in compliance with the ESIF regulations, several large thematic projects were selected to be funded with ERDF funds in the domain of IT empowerment (research, technology transfer, education and training, spin-off creation etc.), health (cancer research) and energy. Impulse (the Brussels enterprise agency) also animates regional clusters gathered around the priority themes. In addition, Strategy 2025 (approved in June 2015) puts forward support for research and innovation as one of its 18 objectives. One of the operational targets within this objective is to make the transition to a "Smart City", whereby the precise needs will be determined in conjunction with the smart specialisation strategy that will be detailed in the new Regional Innovation Plan (2015-2020, under construction), as mentioned in section 1.2.2. Preparatory actions and concertations with other regional stakeholders (transport, IT infrastructure, etc.) are being organised in 2015.

Overall, the RIS<sup>3</sup> process has been an intensive and difficult process for many European regions. On the one hand, the EC has probably over-estimated the capacity (and capability in terms of budget, competencies,...) of a region and its administration to position itself 'smartly' against other regions and to identify relative strengths (and weaknesses) as well as specific specialisation niches that make the difference for a region in an international context. Many activities were launched (especially by JRC-IPTS) to support intelligent benchmarking and positioning, through e.g. peer reviews. For Wallonia, such a peer review was carried out in 2012 (see section 2.2.1).<sup>129</sup> On the other hand, in many regions different administrations and cabinets were responsible for the regional innovation strategy (RIS<sup>3</sup>) and the regional development strategy (Structural Funds), which has largely contributed to 'disconnect' the elaborated RIS<sup>3</sup> from its effective, operational implementation through the Operational Programmes. This was partly true in Belgium too (particularly in Brussels). In Wallonia and in Flanders, shared initiatives were taken within the administrations (via joint task forces) to avoid this 'pillarisation' as much as possible. In Wallonia, the RIS<sup>3</sup> built exclusively on the competitiveness poles policy which is Wallonia's main instrument for innovation and industrial policy. The new R&I policy that emerged from that exercise is now the common framework for both regional policies and structural funds.

Finally, most RIS<sup>3</sup> foresee monitoring and evaluation mechanisms, but to different degrees. In Flanders and Wallonia, evaluation practices are quite well-established (see section 1.2.2 for a discussion on R&I policy governance) In the Brussels Capital Region, evaluation and monitoring practices (specifically for innovation) are a very recent phenomenon and remain less well developed.

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<sup>129</sup> See <http://s3platform.jrc.ec.europa.eu/regions/be3/tags/be3> (last consulted 10/2015).

## 2.5 Main policy changes in the last five years

The table summarizes pivotal events in R&I policy in the past 5 years. It does not aim to be exhaustive, but highlights key legislative changes and strategic reorientations.

**Table 2:** Main policy changes in the last five years

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### Main Changes in 2011

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Flanders: decision of the Flemish Government to define 13 transition areas within the Flanders in Action program to address societal challenges<sup>130</sup>.

Wallonia: Research strategy 2011-2015<sup>131</sup>

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### Main changes in 2012

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Brussels: update of the Regional Innovation Plan<sup>132</sup>

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### Main changes in 2013

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Flanders: Codex Higher Education<sup>133</sup>

Wallonia: adoption of the Marshall Plan 2022<sup>134</sup>; Decree on the merger of the agencies AST and ASE into the AEI<sup>135</sup>

Federal: Increase of the partial wage withholding tax exemption for researchers to 80% as from 1 July 2013

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### Main Changes in 2014

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Flanders: Governing Agreement decision to merge the agencies IWT and AO into the AIO; reorganization of the FWO (incl. integration of research infrastructure fund Hercules); Decision of the Government on the Industrial Research Fund and interface activities of the associations in the Flemish Community<sup>136</sup>

Wallonia: Decree on the financing of university research<sup>137</sup>; Decree on support for strategic fundamental research<sup>138</sup>

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### Main Changes in 2015

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Flanders: adoption of the new multiyear strategy Vision 2050<sup>139</sup>; revision of the Flemish Parliament Act on the organisation and financing of the R&I policy<sup>140</sup>; Decision of the Government on the Special Research Fund (BOF)<sup>141</sup>

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<sup>130</sup> See <http://www.vlaandereninactie.be/over/transities> (last consulted 01/2016).

<sup>131</sup> See <http://recherche-technologie.wallonie.be/fr/particulier/menu/sciences-et-techniques/strategie-recherche-2011-2015/colloque-politique-scientifique-17-01-2012.html?TEXT=strat%C3%A9gie+pluriannuelle> (last consulted 01/2016).

<sup>132</sup> See <http://www.innovativebrussels.irisnet.be/en/documents/mise-a-jour-du-pri-en> (last consulted 01/2016).

<sup>133</sup> See <http://data-onderwijs.vlaanderen.be/edulex/document.aspx?docid=14650> (last consulted 01/2016).

<sup>134</sup> See <http://www.investinwallonia.be/2013/09/launch-of-the-marshall-plan-2022-priority-for-education/?lang=en> (last consulted 01/2016).

<sup>135</sup> See <https://wallex.wallonie.be/index.php?mod=voirdoc&script=wallex2&PAGEDYN=indexBelgiqueLex.html&MBID=2013207327> (last consulted 01/2016).

<sup>136</sup> See <http://data-onderwijs.vlaanderen.be/edulex/document.aspx?docid=14113> (last consulted 01/2016).

<sup>137</sup> See [http://www.gallilex.cfwb.be/document/pdf/40180\\_000.pdf](http://www.gallilex.cfwb.be/document/pdf/40180_000.pdf) (last consulted 01/2016).

<sup>138</sup> See <https://wallex.wallonie.be/index.php?doc=27693&rev=29070-19549> (last consulted 01/2016).

<sup>139</sup> See <https://www.vlaanderen.be/nl/publicaties/detail/vision-2050-flemish-sustainable-development-strategy-2010-2014> (last consulted 01/2016).

<sup>140</sup> See <http://data-onderwijs.vlaanderen.be/edulex/document.aspx?docid=14104> (last consulted 01/2016).

<sup>141</sup> See <http://data-onderwijs.vlaanderen.be/edulex/document.aspx?docid=14492> (last consulted 01/2016).

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Brussels: adoption of the new multiyear Strategy 2025<sup>142</sup>

Federal level: decision to create an independent Space agency

Wallonia: adoption of the new multiyear strategy Marshall Plan 4.0<sup>143</sup>; Small Business Act 2015-2019<sup>144</sup>; Digital Plan<sup>145</sup>; Smart Specialization Strategy<sup>146</sup>; revision of the Decree on the support for R&D and innovation<sup>147</sup>

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<sup>142</sup> See <http://www.ces.irisnet.be/publications/autres-publications-1/autres-publications-du-conseil/16-juin-2015-1> (last consulted 01/2016).

<sup>143</sup> See <http://www.wallonie.be/fr/plan-marshall> (last consulted 01/2016).

<sup>144</sup> See <http://www.wallonie.be/fr/actualites/small-business-act-wallon-2015-2019-le-plan-daction-pme> (last consulted 01/2016).

<sup>145</sup> See <https://www.digitalwallonia.be/plandunumerique/> (last consulted 01/2016).

<sup>146</sup> See <http://economie.wallonie.be/content/la-strat%3%A9gie-de-sp%3%A9cialisation-intelligente-de-la-wallonie-%3%A9t%3%A9-adopt%3%A9-par-le-gouvernement> (last consulted 01/2016).

<sup>147</sup> See <https://wallex.wallonie.be/index.php?doc=29418> (last consulted 01/2016).

### 3. Public and private funding of R&I and expenditure

#### 3.1 Introduction

**Table 3:** Basic indicators for R&D investments

Indicator	2011	2012	2013	2014	2015	EU average
GERD (as % of GDP)	2.15%	2.36%	2.42%	2.46%	n.a.	2.03% (EU-28, 2014)
GERD (Euro per capita)	742.8	825	855.2	881.3	n.a.	558.4 (EU-28, 2014)
GBAORD (€m)	2395.6	2489.6	2522.6	2727.0	2569.9 <sup>148</sup>	3315.3 (EU-28, 2014)
R&D funded by BES (% of GDP)	1.29%	1.35%	1.38%	n.a.	n.a.	1.12% (EU-28, 2013)
R&D funded by PNP (% of GDP)	0.01%	0.01%	0.01%	n.a.	n.a.	0.03% (EU-28, 2013)
R&D funded by GOV (% of GDP)	0.50%	0.67%	0.69%	n.a.	n.a.	0.66% (EU-28, 2013)
R&D funded by HES (% of GDP)	0.06%	0.02%	0.02%	n.a.	n.a.	0.02% (EU-28, 2013)
R&D funded from abroad (% of GDP)	0.28%	0.31%	0.32%	n.a.	n.a.	0.20% (EU-28, 2013)
R&D performed by HEIs (% of GERD)	22.3%	20.3%	20.7%	20.3	n.a.	23.2% (EU-28, 2014)
R&D performed by government sector (% of GERD)	7.9%	8.1%	8.3%	8.1%	n.a.	12.3% (EU-28, 2014)
R&D performed by business sector (% of GERD)	68.8%	70.8%	70.7%	71.1%	n.a.	64.0% (EU-28, 2014)

All Belgian authorities are committed to the 3% target, both at the federal level and the regional or community levels. Equally agreed upon is the target to finance 1% of this R&D from public sources; i.e. government and higher education. These objectives have been repeated in the July 2014 Regional/Community Government Agreements and in the October 2014 Federal Government Agreement. In 2014, Belgium invested 2.46% of its GDP in R&D (see Table 3), or €9.9 billion. This is a historical record for the country and the monotonic increase since 2011 is in line with the EU target of 3% for 2020.

<sup>148</sup> Based on preliminary data, see Belspo web site <http://www.stis.belspo.be/nl/statisticsCredits.asp> (last consulted 04/2016).

As part of its science policy, the federal government financially supports the Belgian actors involved in the innovation effort of the country to enable Belgium to be an economy increasingly oriented towards knowledge. Besides fiscal incentives (discussed further in section 3.2), the Federal level still plays an important role in funding and coordinating international cooperation agreements at national level (e.g. coordinating participation in ESA programmes, CERN research effort, etc). This policy is part of the EU 2020 Strategy to promote smart, sustainable and inclusive growth in member countries to establish conditions conducive to competitiveness and higher employment rates.

In comparison with its European neighbours (using 2014 data), Belgium is behind Germany (2.84%), but ahead of France (2.26%), the Netherlands (1.97%) and the United Kingdom (1.72%).

The upward trend in the Belgian R&D intensity illustrates the serious involvement of Belgium in innovation and in research as the country manages to maintain the growth of its R&D efforts over GDP growth.

This trend of R&D in Belgium for the period 2011-2014 is largely explained by the R&D performed by firms, which accounts for 69% of spending in Belgium (2013). The privately funded component of R&D, strongly linked to the economic situation, saw its growth stagnate at 1.16% of GDP in 2009, but recovered in subsequent years, and reached 1.38% in 2013. This recovery is supported by some of the major private players in the Belgian technological landscape, but the trend is also positive for the rest of the companies.

Total public funding of R&D in Belgium in 2013 amounted to €3.5 billion. Government budgetary appropriations for R&D (GBAORD) in Belgium were €2.5b in 2013, a 5% increase compared to 2011. They further increased to €2.7b in 2014, but preliminary figures for 2015 show a decrease (for the Flemish and Walloon Region) to just above the 2013 level.<sup>149</sup> The GBAORD has evolved in line with the GDP, so public R&D intensity remains stable at around 0.7% of GDP.

Furthermore, forgone revenues, due to the various fiscal measures to stimulate R&D activities (e.g. see the tax exemptions for researchers' wages and patent income, discussed in section 2.2), steadily increased to reach almost one third of total public support (€1.1 billion) in 2010 (Belspo, 2013). The latest available data regarding RDI tax incentives show a substantial increase of foregone revenues for the federal treasury. Wage withholding tax exemptions increased from €651m in 2012 up to €696m in 2013 and €761m in 2014 (an increase of 14%).<sup>150</sup> Between 2011 and 2012 (latest figures available) the patent income deductions increased from € 114m to € 193m. The investment tax deductions related to R&D increased just slightly, from €346m up to €352 million.

In 2014, 71.1% of intramural R&D expenditure was performed in the business sector (EU28: 64.0%), 20.3% in the higher education sector (EU28: 23.2%), and 8.1% in the government sector (EU28: 12.3%).

Belgium has been quite successful in terms of accessing European funds for R&I. For the 6<sup>th</sup> framework programme, Belgium acquired 4.6% of all funding (close to €700m in 1,983 projects involving 3,126 participants, which is in line with Belgium's share of GDP. Belgium's share increased to 4.8% (3,931 projects, 5,931 participants) in FP7 and 5.9% in H2020, with the latter percentage based on funding allocated so far (i.e. 649 projects with 1,003 participants).

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<sup>149</sup> See <http://www.stis.belspo.be/nl/statisticsRD.asp> (last consulted 04/2016).

<sup>150</sup> See [http://finance.belgium.be/sites/default/files/inventory\\_federal\\_tax\\_expenditures\\_2015.pdf](http://finance.belgium.be/sites/default/files/inventory_federal_tax_expenditures_2015.pdf) (last consulted 04/2016).

As reported in the 2013 Belgian annual report on STI indicators (BELSPO), the most popular FP7 thematic areas were "Information and Communication Technologies" and "People", followed by "Transport (including Aeronautics)", "Health" and "Research for the Benefit of the SMEs". This is also reflected by a high percentage (>12.5%) of Belgian project partners with a role as coordinator for the thematic areas "Information and Communication Technologies" and "Health", which is less the case for "Transport (including Aeronautics)" and "Research for the Benefit of the SMEs". Another feature is the high percentage (almost 15%) of Belgian project coordinators in the thematic area "Space". This means that Belgium has a significant amount of very good and experienced researchers in this domain, a statement that is supported by one of the highest success ratios. In contrast, the thematic area "Nanosciences, Nanotechnologies, Materials and new Production Technologies" has also a very high percentage of Belgian project partners with a role as coordinator, but the success ratio of this group is much lower than that of the thematic area in general (19.2% vs. 34.7%). This suggests that Belgian project coordinators would benefit from some support. The same conclusion can be drawn for the thematic area "Research Infrastructures", with a significant difference between the rates of success of projects with at least one Belgian partner involved (39%) and the ones led by a Belgian partner (15.79%). On the other hand, the success rate for a project increases considerably when the Belgian project partner is taking the lead of a project in the thematic area "Security" (23.2% vs. 36.8%).

In the European context, Belgium's performance is above average (BELSPO, 2013). In terms of total number of applicants, Belgium is positioned at an eighth place when comparing EU-27. This is slightly better as one would expect based on the number of inhabitants (tenth place). The financial allocations of regional policy (ERDF) for Belgium over the new period 2014-2020 amount to €2.28b. Almost half of this budget (€1.04b) concerns transition regions, all based in Wallonia.

## **3.2 Smart fiscal consolidation**

### **3.2.1 Economic growth, fiscal context and public R&D**

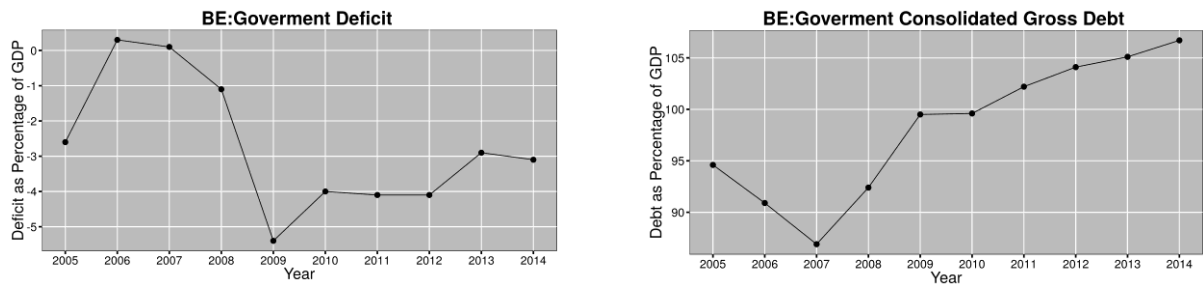
The Belgian economy has been moderately hit by the crisis, suffering a one-off decrease of the real GDP of 2.3% in 2009. However, a period of subdued growth began after 2010 with growth rates still close to zero in 2012-13 and only 1.3% in 2014 and 2015. Some acceleration of growth to 1.3-1.7% is expected during 2016-17 thanks to competitiveness gains and employment growth.

The high public debt has been a constant feature of the last decades of Belgium's public finances. The effort to reduce debt stopped during the crisis (Figure 2) due to bank bailouts. The deficit peaked at 5.4% of GDP in 2009. Thanks to the austerity measures of the subsequent 3-4 years it has gradually decreased to 2.9-3.1% by 2013-14 and it is set to further narrow slowly from 2.9% in 2015 to 2.4% in 2017 as a result of consolidation measures taken recently at all levels of government. The level of public debt rose from 87% of GDP in 2007 to 106% in 2015. It is projected (EC) to decrease marginally to 106.5% by the end of 2017 due to weak nominal economic growth that may not be enough to "absorb" the subsequent budget deficits. Further, there is an important volume of contingent liabilities related to guarantees to the financial sector.<sup>151</sup>

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<sup>151</sup> Although decreasing steadily, risks are concentrated on one single entity accounting for 9.4% of GDP in 2014.





**Figure 2:** Government deficit and public debt

Data source: Eurostat

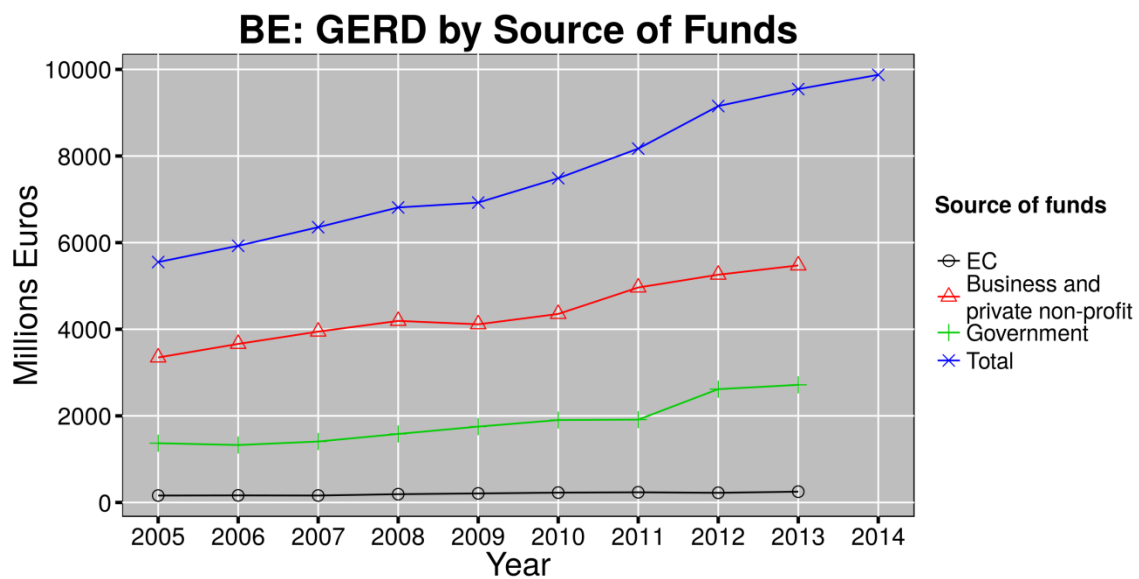
Total GERD in Belgium was €9,546 million in 2013. There are three main sources of R&D funding: the business sector (€5,435m), the government (€2,717m), and foreign funding (€1,257m). Direct funding from the government goes to business enterprises (€827m), the government (€431m) and the higher education sector (€1,448m).

**Table 4:** Key Belgian Public R&D Indicators.

	2007	2009	2013
GBAORD, % of gov. exp.	1.22	1.23	1.17
GERD, % of GDP	1.84	1.98	2.42
out of which GERD to public, % of GDP	0.54	0.65	0.70
Funding from GOV to, % of GDP			
Business	0.07	0.09	0.21
Public (GOV+HES)	0.34	0.41	0.48
Total	0.41	0.50	0.69
EU funding, % of GDP	0.05	0.06	0.06

Source: Eurostat

Table 4 shows the historical evolution of GERD financing in current prices in Belgium.



**Figure 3:** Funding of GERD

Data source: Eurostat

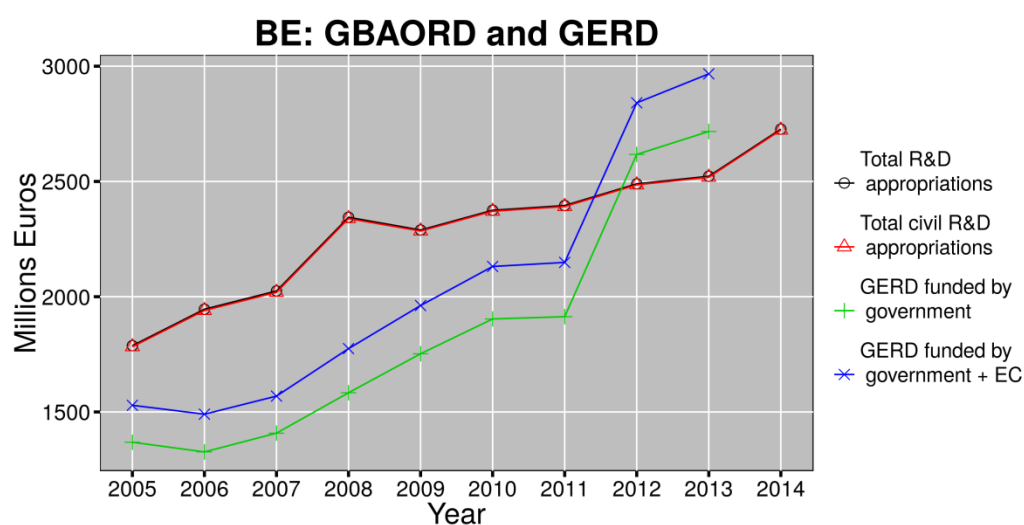
The total GERD increased almost linearly in the period 2005-2013, with a flattening in 2009 as a consequence of the decrease in funding from the private sector that year.

The private sector is the main funder of the Belgian GERD. The gap with the contribution from the government appears to be growing after 2009, due to the faster growth of the R&D funding from the private sector. The funding from the European Commission remains roughly constant in the period under scrutiny, amounting to roughly 12% of the GERD funded by the government (see Figure 3).

### 3.2.2 Direct funding of R&D activities<sup>152</sup>

#### 3.2.2.1 Direct public funding from the government

Direct public funding is usually the main source of the total governmental support to R&D. Figure 4 shows the time evolution of the total R&D appropriations (GBAORD) and the GERD directly funded by the government.



**Figure 4:** R&D appropriations and government funded GERD in millions of national currency  
Data source: Eurostat

The total (civil) appropriations grow almost linearly in the period 2009-2014, after a dip in 2009.<sup>153</sup> Note that the appropriations for military R&D are almost non-existent in Belgium.

The government-funded GERD stagnates in 2011, but the lack of further data does not allow one to determine whether this trend carries on in the following years.

It is worth mentioning that when the GBAORD and the government GERD are measured as percentage of GDP, then a quite different picture emerges. For the GBAORD, the levels in 2014 are very similar to those in 2009, whereas 2011 represents a dip for the GERD funded by the government.

<sup>152</sup> The sources of R&D funding according to the Frascati manual are: Government sector (GOV), Higher education sector (HES), Private non-profit sector (PNP) and Abroad (including EC). In this analysis the public sector as source of funds is given by the GOV part of the total intramural R&D expenditure (GERD), whereas the public sector as a sector of performance is the aggregation of GOV and HES.

<sup>153</sup> As noted in section 3.1, preliminary numbers indicate a decrease in GBAORD in 2015. See <http://www.stis.belspo.be/en/statisticsCredits.asp> (last consulted 04/2016).

### 3.2.2.2 Direct public funding from abroad

The data about the foreign public sources of R&D funding for Belgium is shown (in millions of euros) in Table 5.

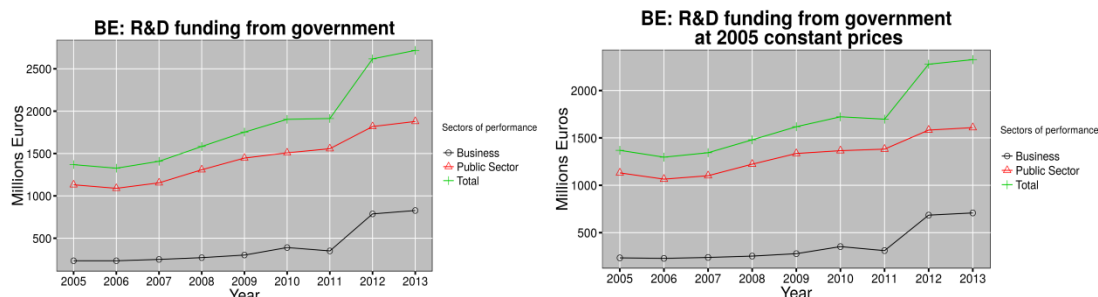
**Table 5:** Foreign public sources used for financing total Belgium R&D (millions of Euros)

Source from abroad	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total	688.64	789.35	826.67	837.23	836.15	997.22	1059.06	1187.68	1256.88
BES	481.52	552.36	589.12	574.19	544.19	724.69	775.20	882.73	910.20
EC	160.31	163.65	160.73	191.47	209.10	227.69	235.36	223.77	249.83
GOV	1.95	4.01	3.88	1.86	2.16	4.71	2.04	2.25	2.42
HES	0.00	0.00	0.00	0.00	0.00	0.35	0.46	3.85	10.69
International Organizations	31.63	43.42	43.77	40.77	50.30	24.27	26.54	68.90	77.03
Total as % GERD	12.40	13.32	13.00	12.29	12.08	13.32	12.96	12.98	13.17
EC as % GOVERD	11.71	12.34	11.41	12.09	11.93	11.96	12.30	8.55	9.20

Note that the business sector, while per definition not a source of public funding and therefore not the main focus of this section, is the main source of funding from abroad. The contribution from the European Commission increased in nominal values, but its share of the GERD funded by the government remains almost constant around 12%. Overall, the funding from abroad is significant as it amounts to more than 12-13% of the Belgian GERD. The contributions from international organizations are negligible. Unfortunately, the data about the direct funding from abroad is far from recent since no information is available for Belgium after 2011.

### Distribution of public funding

Figure 5 shows how the distribution of public funding to sectors of performance evolves over time.



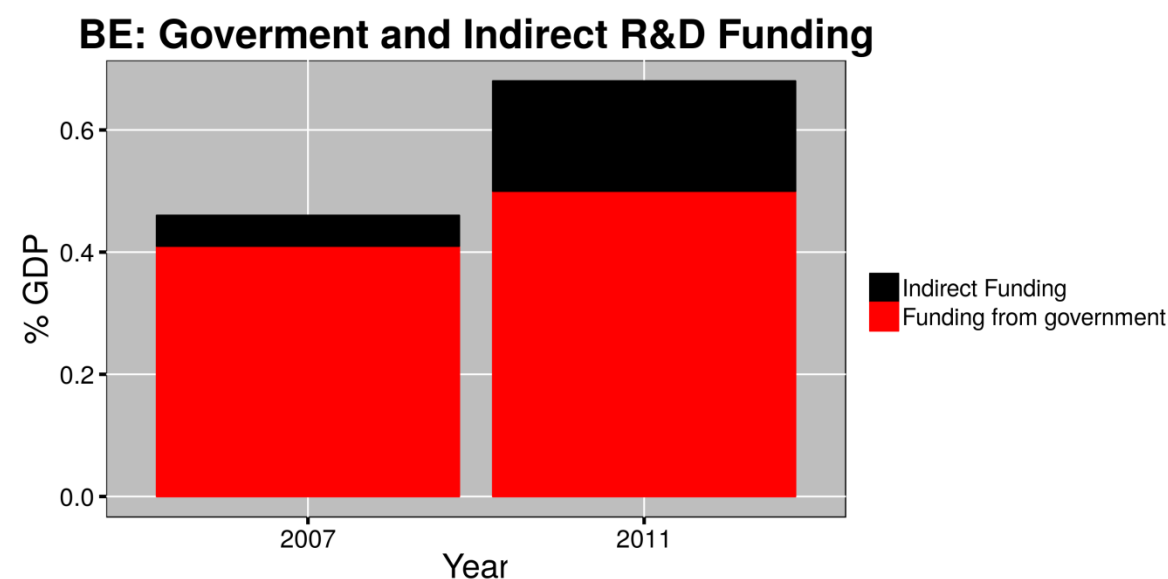
**Figure 5:** Government intramural expenditure by sectors of performance  
Data source: Eurostat

Unsurprisingly, the public sector is the main recipient of the government funding. The gap between the total funding from the government and the government funding devoted to the public tends to widen after 2008, most likely due to the growth of the government funding to the business sector. Similar conclusions are reached also when expressing the levels of funding at 2005 constant prices (Figure 5, right panel).

### 3.2.3 Indirect funding – tax incentives and foregone tax revenues

The Federal Authority reported €1.1 billion of foregone fiscal revenues in the field of R&D in 2010 (Federale Overheidsdienst Financien, 2012)<sup>154</sup>, which is about one third of total public involvement. Three major measures account for the bulk of these forgone revenues. The most important measure stems from the partial exemption from advance payment on the wages of R&D personnel or R&D knowledge workers and accounted for €528.6 million in 2010. The second most popular measure is the tax credit for R&D having an environmental character, amounting to €308.6 million in 2010. As a third measure, the deductions on revenue from patents amount to €219.5 million in 2010. The remaining €21 million are devoted to other measures such as innovation premiums, deductions for risk capital, fiscal treatment of foreign researchers, deductions for R&D investments covering intangible assets, and tax relief for regional subsidies (BELSPO, 2013).<sup>155</sup>

A more recent source provides additional information on two of the most important measures. In seven years' time, the foregone tax revenues due to the tax incentives on the wages of R&D personnel have increased 8-fold from €66.95 million in 2005 to €528.62 million in 2010 and €560.19 million in 2011 (Rekenhof, 2013).<sup>156</sup> The same report indicates that the deductions for patent income amounted to €29.9 million in 2008 (when the measure was introduced) to €603.42 million in 2010 and €772.32 million in 2011.



**Figure 6:** Government and indirect funding to R&D. Data sources: OECD.

<sup>154</sup> Given the lack of harmonisation in tax regimes in the EU, data come directly from national sources, using domestic definitions. Due care should therefore be taken when comparing data from different sources.

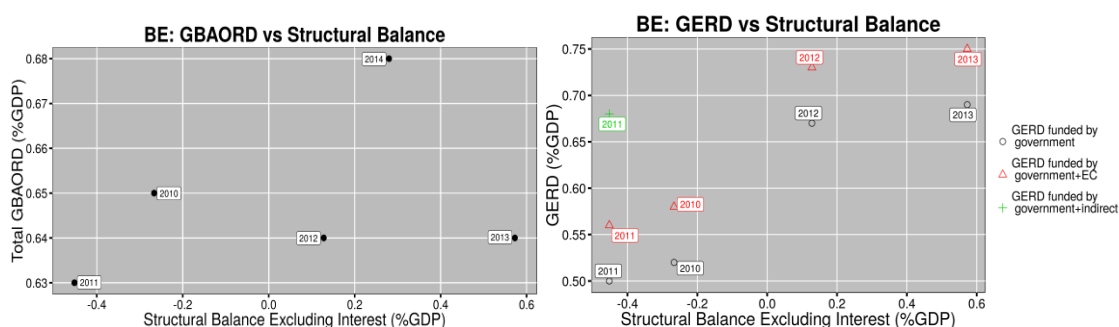
<sup>155</sup> See [http://www.belspo.be/belspo/organisation/Publ/pub\\_ostc/BRIST/BRIST\\_Indic\\_2013\\_en.pdf](http://www.belspo.be/belspo/organisation/Publ/pub_ostc/BRIST/BRIST_Indic_2013_en.pdf) (last consulted 04/2016).

<sup>156</sup> Rekenhof, 2013, Onrechtstreekse federale steunmaatregelen voor onderzoek en technologische ontwikkeling (O&O). See <https://www.ccrek.be/NL/Publicaties/Fiche.html?id=280c517f-b033-47be-baae-9ed6a3ffe752> (last consulted 04/2016).

Figure 6, based on OECD data, is in qualitative agreement with the considerations expressed above in this section. In particular, note the growth of the indirect funding both as percentage of GDP and as a share of the funding from the government.

### 3.2.4 Fiscal consolidation and R&D

Figure 7 shows the scatterplot of the structural balance versus the GBAORD as % GDP (left panel) and versus GERD as % GDP (right panel).<sup>157,158</sup>



**Figure 7:** Fiscal consolidation and R&D  
Data source: AMECO, Eurostat, OECD

One observes that post-crisis fiscal adjustment had a negligible overall impact. In the period 2010-2014 the GBAORD fluctuated between 0.63% and 0.68% of the GDP without any apparent correlation with the structural balance. The minor structural budget deficit (0.4% of GDP) in 2011 turned into a minor surplus (0.2-0.5% of GDP) in the following years. Fiscal consolidation steps also appear uncorrelated to the GERD. In 2010 and 2011, when the structural balance was negative, the GERD funded by the government accounted for about 0.5% of GDP and the following years when the structural balance became positive the direct public R&D expenditure increased by 0.15% of GDP.

Belgium increased both in nominal and relative terms its public support to R&D after the crisis, mainly after 2011. The minor fiscal consolidation of 2010-2014 was not correlated to the R&D public funding and therefore, it did not compress the fraction of GDP devoted to the public funding of R&D.

## 3.3 Funding flows

### 3.3.1 Research funders

Figure 1 in section 1.2.2 provided an overview of the R&I governance landscape in Belgium. The key science funding agencies (in the Communities) are the FWO (Flanders) and F.R.S-FNRS (French Community). Note that funding for basic and fundamental research is managed separately from the funding streams for applied research, innovation & technology, which are a regional competence and are managed mainly by the IWT (Flanders, as of 2016: the AIO), AEI (Wallonia) and Innoviris (Brussels Capital Region). The Federal Science Policy Office (Belspo) manages scientific projects at the federal level, as explained in section 1.2.2.

### 3.3.2 Funding sources and funding flows

The shares of public R&D provided by the different political authorities reflect their relative (economic) size but also regional differences in R&D strategy.

<sup>157</sup> Structural balance data comes from the AMECO database the other indicators were taken from Eurostat and OECD.

<sup>158</sup> Data concerning indirect financing through R&D tax incentives are not of sufficient quality in order to take them into account in this analysis.

The Flemish Government and, to a far lesser extent the Brussels-Capital Region, constantly increase their government R&D budget. The French Community stagnated at the beginning of the 21st century, but the R&D budgets have been growing ever since. The R&D budget of the Federal Authority fluctuates in nominal terms during the period under consideration due to the contributions made to the space programme (Belspo, 2013). The shares of the respective governments in the GBAORD in 2014 were 22% (Federal), 51% (Flanders), 26% (Walloon Region & French Community) and 1% (Brussels Capital Region).<sup>159</sup>

The major sources of EU R&I funding are the Structural Funds and the Framework Programme research funding – the Seventh Framework Programme for Research and Development (FP7) from 2007-13, and Horizon 2020 from 2014-20. This funding complements member states' own public investment in R&I. From 2007-2013, of the €347 billion Structural Funds budget, about €86 billion, or a quarter, went to R&I. Veugelers (2014) reports that in some countries, Structural Funds for research and innovation are of the same magnitude as national R&I budgets, meaning that Structural Funds (almost) double the volume of government R&I funding included in GBAORD data for the country. However, for Belgium, this is not the case as R&I funding from structural funds - based on 2007-2013 data and expressed as a percentage of GBAORD - amounts to only 2%. That being said, there are regional differences, with Wallonia receiving significantly more funding from structural funds than Flanders. FP7 funds (using 2008-2012 data) amount to roughly 13% of Belgium's GBAORD.

For the period 2014-2020, the European Structural and Investments budget for Belgium amounts to €2.7 billion, with the ESF accounting for the largest share (38%), followed by the ERDF (35%), the EAFRD (23.9%), the YEI (1.6%) and the EMFF (1.5%).<sup>160</sup> As shown in Table 6, the share of ESIF explicitly allocated to R&I is €278 million (10.3% of ESIF), primarily from the ERDF (€263.5m) and the rest coming from the EAFRD (€14m). The funds earmarked for R&I are primarily targeted at public R&I infrastructure (20.5%), technology transfer and university-enterprise cooperation benefiting SMEs (15.2%) and R&I processes in SMEs such as voucher schemes (13.7%). As pointed out by the European Commission<sup>161</sup>, the country-specific challenges related to ESIF for Belgium include fiscal sustainability (given its high, though stabilized, public debt), labor market reforms and competitiveness of firms. Also energy efficiency and greenhouse gas emissions are important issues, for which the resolution will not only have a positive environmental impact but also increased economic efficiency through, for example, reduced import dependency. In terms of the absorption of the funds, Belgium is among the leading member states as measured by the aggregate rates of project selection (above 80%, compared to the EU28 average of 70%).<sup>162</sup>

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<sup>159</sup> See <http://www.stis.belspo.be/en/statisticsCredits.asp> (last consulted 04/2016). Preliminary figures for 2015 confirm this distribution.

<sup>160</sup> See <https://cohesiondata.ec.europa.eu/countries/BE> (last consulted 01/2016).

<sup>161</sup> See [http://ec.europa.eu/contracts\\_grants/pdf/esif/invest-progr-details-each-ms\\_en.pdf](http://ec.europa.eu/contracts_grants/pdf/esif/invest-progr-details-each-ms_en.pdf) (last consulted 01/2016).

<sup>162</sup> See [http://ec.europa.eu/regional\\_policy/how/policy/doc/strategic\\_report/2013/strat\\_report\\_2013\\_en.pdf](http://ec.europa.eu/regional_policy/how/policy/doc/strategic_report/2013/strat_report_2013_en.pdf) (last consulted 01/2016).

**Table 6:** ESIF funds for 2014-2020 by fund and theme

Theme	ESF	ERDF	EAFRD	YEI	EMFF	Total	Share
Competitiveness of SMEs	-	243	238	-	13	494	18.2%
Sustainable & Quality Employment	365	-	9	42	0	416	15.4%
Social Inclusion	340	19	50	-	-	409	15.1%
Educational & Vocational Training	287	28	18	-	-	333	12.3%
Environment Protection & Resource Efficiency	-	169	106	-	26	302	11.1%
Low-Carbon Economy	-	197	97	-	1	294	10.9%
Research & Innovation	-	264	14	-	-	278	10.3%
Climate Change Adaptation & Risk Prevention	-	6	106	-	-	111	4.1%
Technical Assistance	37	24	10	-	1	72	2.7%
Total	1,029	950	648	42	42	2,710	100%
Share	38.0%	35.0%	23.9%	1.6%	1.5%	100%	

Abbreviations: European Regional Development Fund (ERDF), European Social Fund (ESF), Cohesion Fund (CF), European Agricultural Fund for Rural Development (EAFRD), European Maritime and Fisheries Fund (EMFF).

### 3.4 Public funding for public R&I

#### 3.4.1 Project vs. institutional allocation of public funding

The discussion in this section relies on the following definitions, following Steen (2012). *Institutional funding* is defined as the total of national budgets in a given country, attributed to an institution, with no direct selection of R&D project or programmes and for which money the organisation has more or less freedom to define the research activities to be performed. Institutional funding can be in the form of non-competitively allocated block funding. Institutional funding may also be allocated in a competitive manner tied to institutional assessments (performance-based funding). *Project funding* is defined as the total of national budgets in a given country, attributed to a group or an individual to perform an R&D activity limited in scope, budget and time, normally on the basis of the submission of a project proposal describing the research activities to be done.



As discussed in sections 1.2.2 and 3.3.2, the main public bodies responsible for allocating research and innovation funds are, given the strongly autonomous character of the government actors in the Belgian research and innovation system, different between the federal level, the regions and the communities.

#### *In Flanders*

The Flemish Parliament Act on financing the universities and HEIs in Flanders of 2009 and replaced by the Codex Higher Education in October 2013, describes the mechanism for the allocation of institutional funding in Flanders.<sup>163</sup> The financing mechanism is a combination of block funding and a variable part, which the latter depending on education and research (output) parameters. The Flemish Parliament Act on the organisation and budgeting of Science and Innovation policy of 2009<sup>164</sup> (adapted afterwards and for the last time in September 2015) sets the framework for the organisation and the budgeting of Flemish RTD policy and FWO (fundamental and strategic research), IWT (industrial and strategic research) and Hercules Foundation (research infrastructure), and a number of institutes that receive funding.<sup>165</sup> In Flanders, the Flemish Government defines policy orientations and provides institutional funding to HEIs. Its main funding instrument for research is the Special Research Fund (BOF), which allocates funds to universities using criteria known as the 'BOF-key', explained in more detail in section 3.4.2. Basic research at universities is mainly financed through FWO (€175.3 million allocated for 2015) and BOF (€182.2 million allocated for 2015), which complement universities' working budgets. While FWO allocates its budgets on the basis of scientific interuniversity competition, universities redistribute their BOF allocations on the basis of a further intra-university competition.

#### *In Wallonia*

The Decree covering research, development and innovation activities in Wallonia of 2008 provides the legal basis for the regional measures covering research and innovation.<sup>166</sup> As mentioned in section 2.4, a revised R&D&I Decree was adopted in May 2015.<sup>167</sup> The Decree explicitly mentions the implementation of a funding allocation process based on "an objective and rational analysis of the strengths and weaknesses of projects". It stipulates that this evaluation may involve external experts, but this is not compulsory.

#### *In Brussels-capital*

The Brussels-Capital 2009 Ordinance aiming at promoting research, development and innovation<sup>168</sup> provides the legal basis for the regional measures covering research and innovation. A next Ordinance is under preparation and shall enter into force at the end of 2016 or January 1<sup>st</sup> 2017.

In the French Community, the National Scientific Research Fund (F.R.S-FNRS) aims at stimulating new scientific knowledge in all scientific areas. It supports projects following a bottom-up approach. Its experts assess projects proposed by individual researchers and research teams i.e. using a system of competitive project funding.

The decentralized (autonomous by authority) nature of the R&D&I governance system makes it complex, if not impossible, to make an overarching statements regarding the shares of project versus institutional funding in Belgium, since there may be differences between levels of governance and regions/communities in the way funding is attributed.

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<sup>163</sup> See <http://data-onderwijs.vlaanderen.be/edulex/document.aspx?docid=14650#1275> (last consulted 12/2015).

<sup>164</sup> See <http://www.ond.vlaanderen.be/edulex/database/document/document.asp?docid=14104> (last consulted 01/2016).

<sup>165</sup> As discussed in section 1.2.2, it has been decided that IWT will be merged in the course of 2015 partly with FWO and partly with the Enterprise Agency (Agentschap Ondernemen).

<sup>166</sup> See <http://wallex.wallonie.be/index.php?doc=11217> (last consulted 10/2015).

<sup>167</sup> See <https://wallex.wallonie.be/index.php?doc=29418> (last consulted 10/2015).

<sup>168</sup> [http://www.innoviris.be/nl/ontdek-innoviris/wettelijke-informatie/nouvelle\\_ordonnance.pdf](http://www.innoviris.be/nl/ontdek-innoviris/wettelijke-informatie/nouvelle_ordonnance.pdf) (last consulted 10/2015).

Moreover, in Belgium (as in many other countries) universities benefit from a large autonomy to allocate funds as they wish i.e. either top-down according to predefined research agendas and strategies or fully bottom-up and competitively (in some cases, mixed systems co-exist as well). Therefore, there are no precise statistics on the share of institutional versus project funding. The only aggregate data available are the ones provided by BELSPO (Belgian Science Policy Office) that regroup all Government budget appropriations or outlays for R&D (GBAORD) at all levels (federal, regions, communities) according to their purpose (i.e. 'institutional' or 'functional').<sup>169</sup> GBAORD statistics are deduced from the ex-ante data based on the budgets of the competent authorities. These statistics give an overview of the estimation of R&D expenditure by the public authorities and are consequently less precise. However, they have the advantage of being available quite rapidly. Here, appropriations are classified according to their purpose, whatever the budget (such as the federal, regional and community authorities) from which these appropriations arise. For this purpose, the "Belgian nomenclature for the analysis and comparison of estimations for the R&D budget appropriations or outlays of the Belgian authorities", also called CFS/STAT nomenclature, has been used. It presents broad categories and statistical series that take into account the means attributed to every function. Hence, the classification used is aimed at systematically presenting the intentions of the authorities rather than the detailed contents of the R&D activities financed. As mentioned, the data distinguishes between two purposes, namely Institutional (higher education; scientific institutions; etc.) and Functional (R&D action programmes; funds for university - (like FWO and F.R.S.-FNRS), basic -, industrial - or applied research, etc.). This classification between 'institutional' and 'functional' does not perfectly map to the abovementioned distinction proposed by the OECD between institutional block funding, competitively allocated institutional funding and competitively allocated project-funding. In particular, while "functional funding" corresponds largely to (competitive) project funding, "institutional funding" encompasses both competitive and block funding.

Based on 2014 data, the institutional funding amounts to 41% of public funding for R&I, but this share drops to 34% if one omits the Special Research Funds for universities (budget line 130)<sup>170</sup>, which are instances of (mostly) competitive institutional funding. Also, as mentioned above, the working expenses in Flemish universities are partly variable and allocated using education- and research-based parameters, so the sensu stricto institutional funding may be considered even lower. The relative shares of functional and institutional funding have remained quite stable over the past decade, although competitive institutional funding (the 'special research funds', budget line 130) have gained in importance, from about 2% of total spending to 8% in 2013.

These figures, however, should be interpreted and used with the greatest caution, for at least two reasons. Firstly, a non-negligible part of the 'institutional funding' is used by universities following their own priorities to fund research within their walls. The way of allocating these funds can vary among the universities, with some budgets being allocating in full, open competition ('project-funding') while other parts of the budget being allocated following the shares of PhD students or numbers of publications per faculty for instance ('competitive institutional funding'). Secondly, even the most competitive, project-based programmes for R&D, such as the inter-university attraction poles (funded at federal level through BELSPO), funding for research infrastructures (through the Hercules Foundation for the Flemish Community), research grants for fundamental research at universities or funds for industrial research may in reality not be fully competitive, e.g. due to heterogeneous consortia.

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<sup>169</sup> See tables and statistics under "GBARD: overview 1989-2014 per institutional or functional purpose" at <http://www.stis.belspo.be/en/statisticsCredits.asp> (last consulted 10/2015).

<sup>170</sup> See <http://www.stis.belspo.be/docs/bokoo/Tableau2.1.xls> (last consulted 10/2015).

### 3.4.2 Institutional funding

Given the complex R&I landscape in Belgium (see the overview in section 1), funding practices are not discussed exhaustively, but illustrated by focusing on a few examples that highlight the main approaches. For institutional funding, it is common practice in Belgium to use so-called 'ex-ante allocation keys' to distribute research funding between universities, after which the funds are further allocated inside the university at its own discretion (but typically using competitive project funding). This mechanism can be illustrated by the practice in Flanders, where three main distribution keys for institutional funding are used that all incorporate a competitive logic:

The 'BOF-key': BOF (Bijzonder Onderzoeksfonds – Special Research Fund) is next to the funds from the Research Foundation – Flanders (FWO), Flanders' main competitive funding scheme for fundamental research;

The 'IOF-key': IOF (Industrieel Onderzoeksfonds – Industrial Research Fund) is Flanders' main competitive funding for industrial research;

The 'Hercules-key': Hercules Foundation is Flanders's agency for funding research infrastructures at universities and Strategic Research Centers. As mentioned in section 1.2, Hercules will be merged with the FWO from January 2016.

The 'Special Research Fund' (BOF) provides funding for fundamental research at universities allowing them to define their own research policy, and hence using these funds to fund research within the university; it is a secondary funding flow from the regional government to universities. The funding a university receives, is competitive but allocated depending on the so-called 'BOF-key'. Since 2012 (Decision Flemish Government of 21.12.2012, last revision 17.08.2015)<sup>171</sup>, the BOF allocation formula takes into account five key indicators:

- Master degrees;
- Doctorate degrees;
- Diversity (in particular, shares of female researchers at various seniority levels);
- Publications;
- Citations.

Once the initial allocation using the BOF key has been done, the universities are responsible for further allocating the funding within the university. The system was put in place to allow universities allocating longer term funding to their best researchers, in order for them to reinforce excellence policy.

The 'Industrial Research Fund' (IOF) is one of the two main programmes in Flanders for the support of strategic basic research. Whereas the 'Strategic Basic Research Fund' (SBO) is aiming at cooperative research between universities and research institutes and the subsidy is awarded by a specific government agency (IWT)<sup>172</sup> after an open competition (with external expert judgment), the IOF is divided over the Flemish universities every year, based on an allocation key using several criteria. As in the BOF system, every university then has an intra-university competition to award the IOF-funding to projects. Since 2009 (Decision Flemish Government of 29.05.2009, last revision 11.09.2014)<sup>173</sup>, it is based on 6 parameters:

- Number of PhD degrees;
- Number of publications and citations;
- Revenues from industrial research contracts;
- Revenues from participation into the EU Framework programmes;
- Number of patents;
- Number of spin-off companies.

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<sup>171</sup> See <http://data-onderwijs.vlaanderen.be/edulex/document.aspx?docid=14492> (last consulted 10/2015).

<sup>172</sup> Note that, as of 2016, the SBO is being transferred to the renewed FWO.

<sup>173</sup> See <http://data-onderwijs.vlaanderen.be/edulex/document.aspx?docid=14113> (last consulted 10/2015).

For the allocation of subsidies for medium-scale research infrastructure projects, the Hercules Foundation (as of 2016, FWO) uses an average of both allocation keys, weighted according to the level of the respective budgets. Since BOF represents a much larger budget than IOF (i.e. ca. 90% of the joint BOF-IOF budget), the weighted average is consequently substantially skewed towards BOF. All three allocation keys are updated each year and published in the Belgian State's official legislative documents (Moniteur Belge – Belgisch Staatsblad).

In Wallonia and Wallonia-Brussels Federation, the two main sources of university funding are the Special Research Fund (Fonds Spécial pour la Recherche, FSR) and the Concerted Research Actions (Actions de Recherche Concertées, ARC). Also here, allocation keys are used, but they are generally less tied to competitive output parameters (Decree 30.01.2014).<sup>174</sup> For the FSR, the funds are distributed based on the number of awarded degrees i.e. not a research parameter. For the ARCs, 80% is allocated based on awarded degrees while the remaining 20% is allocated based on the university share in terms of the following (equally-weighted) criteria:

- European FP funding;
- Post-doctoral researchers;
- Academic staff who obtained their PhD from another university;
- Publications;
- Citations.

In sum, while there are regional differences in the ways competitive institutional funding is implemented, overall there has been an increasing adoption of such funding practices relative to block funding. This evolution has been recognized in the 2014 ERA Progress Report, which identified measures to support the allocation of institutional funding based on institutional performance in 17 Member States, among which Belgium. These forms of institutional funding typically protect the smallest institutions by guaranteeing a minimum share in budget and (as opposed to project funding) give universities a relatively stable financial framework. This long-term predictability of funding is generally acknowledged to be a strong asset of the Belgian research systems, especially in periods of economic downturn. The joint share of competitively allocated institutional funding and project-funding (discussed further in the next section) has most likely increased significantly over the past 10-20 years in Belgium as compared to 'block funding'. However, this shift occurred mainly towards competitively allocated institutional funding, and less towards project-funding. The rationale behind this shift was the wish to increase competition in the Belgian research fabric while guaranteeing minimum budgets for small institutions and predictable budgets for everyone.

### 3.4.3 Project funding

Figure 1 in section 1.2.2 contains the principal funding instruments, with indications of the ones that allocate funding on a project basis. The basis for the priorities in project funding is provided by the government agreements, policy notes, and multi-annual strategic plans as discussed in section 2.

The allocation of competitive project-funding (e.g. FWO, FNRS, IWT, Hercules Foundation – large infrastructure, etc.) follows strict peer-review evaluation procedures, according to international and European standards and submitted to regular evaluations. In general terms, the procedure is as follows<sup>175</sup>:

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<sup>174</sup> See [http://www.galilex.cfwb.be/document/pdf/40180\\_000.pdf](http://www.galilex.cfwb.be/document/pdf/40180_000.pdf) (last consulted 10/2015).

<sup>175</sup> IDEA Consult (2012), "Assessment revised structure and operations of FWO evaluation panels", (Confidential Briefing Note), Feb 2012; IDEA Consult (2013), "Onderzoekersbevraging FWO dienstverlening" [Researchers' Survey on FWO activities], (Confidential Briefing Note), Feb 2013.

- Publication of the call for proposals.
- Remote evaluation by external, foreign peer-reviewers (applicants are usually given the opportunity to propose and refuse some peer-reviewers).<sup>176</sup>
- Central evaluation by thematic panels: 2 or 3 experts per proposal, starting from input by external referees (which are not allowed to be part of the panel, which consists of scientists affiliated to Belgian universities<sup>177</sup>), present their assessment to the panel. The panel collectively decides on the score of the proposal. Experts are then responsible for the 'feedback letter', which is written and sent to all applicants.
- Ranking and selection, based on available budget.

The composition and structure of panels has been revised regularly (e.g. for FWO in 2010) to better match with, for example, the ERC's list of expert panels. In line with these efforts, the 2014 ERA Progress Report acknowledged the (assumed) use of the principles of peer review in all project calls in 21 member states, including Belgium. Belgium had its R&D&I peer review in 2010-2011 initiated within the ERAC.

More aggregate evaluations of the entire R&I system have been undertaken in the recent past. As mentioned in section 2.2.1, the Walloon research and innovation system has been reviewed by the OECD (OECD, 2012), while the Flemish landscape was reviewed by Luc Soete, rector of Maastricht University (Expertengroep Soete, 2012).

The 2014 OECD STI Outlook identified a number of initiatives in Belgian policy that address global and societal challenges, for example environmental challenges. In 2014, the Brussels Capital Region decided to develop Smart City Mobility (also see section 2.2) in conjunction with innovative public procurement for transport. The Walloon Marshall Plan 2 Green emphasized environmental issues and industrial ecology, a focus that will continue in the new Marshall Plan 4.0 in axis IV (support of energy transition and circular economy). Already in 2011, Wallonia launched a competitiveness cluster for green technologies (GREENWIN), which supports several energy research programmes. It also launched the Employment-Environment Alliance to promote sustainable construction, which in the new Marshall Plan 4.0 will be refocused to renovation of existing buildings. Two major initiatives in Flanders are the Flemish Climate Policy Plan 2013-20 and the Flemish Second Energy Efficiency Action Plan (2011-2016), which has adopted new energy standards, especially in construction and housing, aimed at energy-neutral buildings by 2021. As discussed in sections 1.2.3 and 2.2, several other initiatives exist that respond to the aims of the grand challenges including energy and environment (e.g. Energyville) but also others (e.g. innovation in health, such as CMI). The federal level has focused on societal challenges by launching BRAIN-be (Belgian Research Action through Interdisciplinary Networks, 1<sup>st</sup> phase in 2012-2017, total budget is around €117m). This framework programme targets the needs for scientific knowledge of the federal departments and aims to support the scientific potential of the Federal Scientific Institutions, but is open to the whole Belgian scientific community (universities, public scientific institutions and non-profit research centers).

#### **3.4.4 Other allocation mechanisms**

Besides the main project and institutional funding, there are a few other initiatives which cannot directly be classified under these headings. One example are the schemes for science communication, e.g. to promote the inflow of students into STEM studies.

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<sup>176</sup>At F.R.S.-FNRS, applicants are not involved in the identification and selection of remote evaluators; however, they have the opportunity to give in the application file up to 3 names of scientists they would not accept for peer review, even if they do not know if those scientists are in the F.R.S.-FNRS experts database.

<sup>177</sup>Note that for F.R.S.-FNRS, each Scientific Panel is made up of 9 members chosen from outside the French-speaking Community of Belgium (CfB), including the President and 6 members chosen among the members of the academic institutions of the French-speaking Community of Belgium or among Research Associates, Senior Research Associates, and Research Directors of the F.R.S.-FNRS.



However, these cases are few and represent only a marginal share of the public R&I budget. Most public funding can be categorized as either project or institutional funding, as discussed in the previous two sections.

### **3.5 Public funding for private R&I**

#### **3.5.1 Direct funding for private R&I**

Government funding of R&I in the business sector runs through two distinct channels: indirect and direct funding. Measures such as subsidies, grants, loans and contracts and availability of infrastructure are direct measures that apply to cover costs incurred in specific R&D projects. Indirect measures for R&D have a looser relation to R&D activities, in the sense that the amount of the fiscal exemption can typically be freely spent by the firm i.e. also on non-R&D related activities.

Two thirds of public aid (€2.4b) is funded through R&D budgets covering all forms of subsidies, be it through competitive funding or through institutional block funding.

Based on an opinion poll that looks into the mix between the use of direct and indirect measures by firms, the Federal Office for Science Policy (BELSPO, 2013) reports that about one third (32%) of firms exclusively relies on direct fiscal measures; whereas a minority of 3% only uses subsidies. Two thirds of the firms (65%) use a mix of both fiscal measure and subsidies.

Looking at the latest policy developments and long-term trends, policy tools and funding instruments for innovation tend to cover a larger part of the innovation trajectory in Belgium, with an increasing focus over the past 5 years on the downstream part of the cycle, closer-to-market. Since 2010, various new instruments have been put in place (first in Flanders, then in Wallonia, more recently in the Brussels Capital Region) such as demonstrators, living labs, lead users platforms and pilot plants, which all tend to focus on the so-called 'Technology Readiness Levels 5-8', i.e. beyond prototyping and demonstration activities.<sup>178</sup> Technology parks and incubator sites have existed for many years already. In Flanders, the new SOFI-funds also add to foster the creation of companies based on R&D results. The idea is to go beyond prototyping and to support the further nurturing and upscaling of new technologies or applications. The rationale for public intervention here is that, even though the activities are closer to the market, there remains a market failure. The distance-to-market is smaller, but in most cases, investment size is much bigger. Therefore, there is a need for public support to leverage additional, private investment. In this context, regional authorities, mainly in Flanders, are relying increasingly on financing solutions such as Public-Private-Partnerships. Elsewhere in Belgium, direct funding targeted at intermediaries but spilling over to firms (e.g. through the funding of cluster associations, TTOs or other intermediaries) was also increasingly used. Finally, a number of newly introduced measures address the SME 'growth gap'. For example, Flanders Enterprise (merged with IWT in 2016, see section 2), offers the 'Gazelle Jump' program to fast-growing and/or ambitious SMEs. The program does not (merely) provide funding, but offers support under the form of (amongst others) coaching and subsidies for hiring a manager responsible for growth and export.<sup>179</sup> The Walloon Government dedicates special attention to SMEs with high growth potential in its Small Business Act 2015-2019, through customized coaching and financial support.

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<sup>178</sup> See [http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014\\_2015/annexes/h2020-wp1415-annex-g-trl\\_en.pdf](http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-g-trl_en.pdf) (last consulted 12/2015).

<sup>179</sup> See <http://www.agentschapondernemen.be/themas/snelle-groei-gazellen> (last consulted 10/2015).

However, despite this trend, there is still a lack of 'funding coverage' in these segments of the innovation trajectory beyond TRL 5. The reason is two-fold. First, the EU State Aid Framework, even though conditions have been eased in 2014, allowing for more funding support for closer-to-market activities in the R&I field, remains restrictive compared to legal frameworks outside the EU and in some other policy fields such as education, culture, media, environment, etc. This, however, is not specific to Belgium but is a restriction for the whole EU. Second, and specific for Belgium, the country and its regions lack critical mass and market size to develop large activities for technological market uptake. Some joint efforts between regions (such as the creation of the joint Pôle de Compétitivité on Agro-technologies between Champagne and Ardennes in France) may be a solution to overcome this, as well as the participation to some Horizon2020 programmes such as the INNOSUP-programme.<sup>180</sup>

### 3.5.2 Public procurement of innovative solutions

The total market of public procurement in Belgium is equal to 7% of GDP (approximately €26 billion).<sup>181</sup>

#### Legal public procurement framework

An analysis of the Belgian state in relation to public procurement of innovation is complicated due to the fact that most policies and expenditures related to public procurement of innovation are made at the regional level (Flanders, Wallonia, Brussels) as many relevant competencies, e.g. for innovation policy, have been devolved to this level of government. At the federal level, directives 2004/17/EG and 2004/18/EG have been implemented into federal law in 2006.<sup>182</sup> A new version integrating the two laws was made in 2011 and in June 2013 new governmental regulations for public procurement came into effect.<sup>183</sup> The latter is not directly or solely concerned with public procurement of innovation (PPI) but provides part of the legal framework. The new European procurement directive, which needs to be implemented in national law by April 2016 includes several provisions which should facilitate the procurement of innovation as pre-commercial procurement (Rekenhof, 2015).<sup>184</sup>

#### **PCP/PPI landscape**

Although the Belgian authorities (collectively) have sought to use investment in space research (through the European Space Agency) as a form of pre-commercial public procurement, the use of public procurement to stimulate research and innovation is not yet widespread. The 2012 update of the Regional Plan for Innovation of the Brussels-Capital Region put forward the objective ("axis 7") to stimulate demand for innovative goods and services through innovative public procurement.<sup>185</sup> Innovation-driven public procurement initiatives in Belgium have been mostly implemented in Flanders and managed by the Agency for Innovation by Science and Technology (IWT). After the launch of their action plan on innovative procurement, 12 Innovation Procurement Platforms have since 2009 been launched in 10 different domains.<sup>186</sup>

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<sup>180</sup> See <http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-innosup-2014-2015.html> (last consulted 10/2015).

<sup>181</sup> <http://marchespublics.cfwb.be/fr/informations-generales/pratiques-de-marche/achats-publics-durables/index.html>

<sup>182</sup> [http://www.ejustice.just.fgov.be/cgi\\_loi/change\\_lg.pl?language=nl&la=N&cn=2006061557&table\\_name=wet](http://www.ejustice.just.fgov.be/cgi_loi/change_lg.pl?language=nl&la=N&cn=2006061557&table_name=wet)

<sup>183</sup> <http://www.bestuurszaken.be/Belgische-regelgeving>

<http://www.publictendering.com/pdf/legislation/handleidingnieuwewet.pdf>

<sup>184</sup> [https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0ahUKEwi6xLyEw8TKAhUHORoKHS2QCmcQFgghMAE&url=https%3A%2F%2Fwww.ccrek.be%2FDocs%2F2015\\_45\\_InnovatiefAanbesteden.pdf&usg=AFQjCNFkfudHF6OusX9Unf\\_cFXZJdhdmJA&bvm=bv.112454388,d.d24&cad=rja](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0ahUKEwi6xLyEw8TKAhUHORoKHS2QCmcQFgghMAE&url=https%3A%2F%2Fwww.ccrek.be%2FDocs%2F2015_45_InnovatiefAanbesteden.pdf&usg=AFQjCNFkfudHF6OusX9Unf_cFXZJdhdmJA&bvm=bv.112454388,d.d24&cad=rja)

<sup>185</sup> <http://www.innoviris.be/fr/politique-rdi/plan-regional-dinnovation/mise-a-jour-du-plan-regional-pour-linnovation>

<sup>186</sup> Culture, Sustainable building, Public Works, Agriculture, Environment, Social Innovation, Education, Geographical Services, Healthcare, and Economy). RIO Country Report 2015, Belgium.



The IWT (as of 2016: AIO) developed a methodology which made a distinction between the procurement of existing innovations which were new to the procuring government service and purchases of solutions which required further research and development work. In the first case, the procurement can follow a classical procurement procedure. In the second case, the IWT proposed the procedure of pre-commercial procurement. This procedure falls outside the government's procurement regulations and aims for the development of a prototype by several service providers in a phased process. Only after this prototype has been developed a potential commercial procurement procedure is started. Each policy domain was asked to indicate a contact point to detect innovation needs within their services. This identification of needs was to lead to a master plan. For projects with sufficient perspectives for innovation a market exploration could start, normally in the form of an innovation platform. These platforms should bring together actors from the supply and demand side resulting in a report with a decision on the procedure to be followed (classical or pre-commercial) (Rekenhof, 2015)<sup>187</sup>.

In early 2013, the €10 million budget that was reserved for 2008-2012 had not yet been fully used. The Flemish government decided that the program could be extended to the end of 2013. Another part of the policy that was extended to the end of 2013 was that each Flemish minister was requested to set aside up to €1 million to co-finance innovation procurement opportunities, in agreement with the Flemish minister responsible for technological innovation policy and to the extent credit is available.

The IWT took the lead in developing an adequate methodology to procure innovations; because the programme and the methodology were new, both the IWT and the other policy making bodies went through a learning process. The sixteen projects resulted seven years after the start of the programme in four cases in a procurement, three times with a classical procurement and once with a pre-commercial procurement. Nine projects were ended after the market exploration, three of those were continued in a more limited scale outside the innovative procurement programme. For three other projects, two pre-commercial procurement procedures are ongoing, while one has been terminated due to a lack of applications (Rekenhof, 2015).<sup>188</sup> According to the Rekenhof (Court of Auditors) which carried out an evaluation of the programme published in December 2015, these results are insufficient. The Rekenhof (2015) indicated that the horizontal approach, implementing procurement of innovation across all policy domains had led to a "too strong" spread of available resources and had not taken into account that 1) the needs for innovation in different policy domains differed, and that 2) the costs involved to come to an innovative solution in different policy domains differed as well.<sup>189</sup> As a consequence, it considered that the programme often did not select the most appropriate projects with the greatest need for innovation fitting within the overarching innovation policy. Due to the lack of prioritisation and the absence of links to existing innovation-oriented organisations, it assessed that little progress was being made on the way to an improvement in innovation policy or a more future oriented procurement policy in the different policy domains. In addition, there were several other developments which limited the impact of the policy, including the suspension of the programme in 2013. The latter resulted in the suspension of three ongoing projects, leaving the concerned actors in doubt about their exact status.

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<sup>187</sup> [https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0ahUKewi6xLyEw8TKAhUHORoKHS2QCmcQFgghMAE&url=https%3A%2F%2Fwww.ccrek.be%2FDocs%2F2015\\_45\\_InnovatiefAanbesteden.pdf&usg=AFQjCNFkfudHF6OusX9Unf\\_cFXZJdhdmJA&bvm=bv.112454388,d.d24&cad=rja](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0ahUKewi6xLyEw8TKAhUHORoKHS2QCmcQFgghMAE&url=https%3A%2F%2Fwww.ccrek.be%2FDocs%2F2015_45_InnovatiefAanbesteden.pdf&usg=AFQjCNFkfudHF6OusX9Unf_cFXZJdhdmJA&bvm=bv.112454388,d.d24&cad=rja)

<sup>188</sup> [https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0ahUKewi6xLyEw8TKAhUHORoKHS2QCmcQFgghMAE&url=https%3A%2F%2Fwww.ccrek.be%2FDocs%2F2015\\_45\\_InnovatiefAanbesteden.pdf&usg=AFQjCNFkfudHF6OusX9Unf\\_cFXZJdhdmJA&bvm=bv.112454388,d.d24&cad=rja](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0ahUKewi6xLyEw8TKAhUHORoKHS2QCmcQFgghMAE&url=https%3A%2F%2Fwww.ccrek.be%2FDocs%2F2015_45_InnovatiefAanbesteden.pdf&usg=AFQjCNFkfudHF6OusX9Unf_cFXZJdhdmJA&bvm=bv.112454388,d.d24&cad=rja)

<sup>189</sup> [https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0ahUKewi6xLyEw8TKAhUHORoKHS2QCmcQFgghMAE&url=https%3A%2F%2Fwww.ccrek.be%2FDocs%2F2015\\_45\\_InnovatiefAanbesteden.pdf&usg=AFQjCNFkfudHF6OusX9Unf\\_cFXZJdhdmJA&bvm=bv.112454388,d.d24&cad=rja](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0ahUKewi6xLyEw8TKAhUHORoKHS2QCmcQFgghMAE&url=https%3A%2F%2Fwww.ccrek.be%2FDocs%2F2015_45_InnovatiefAanbesteden.pdf&usg=AFQjCNFkfudHF6OusX9Unf_cFXZJdhdmJA&bvm=bv.112454388,d.d24&cad=rja)

In his response in October 2015, the Flemish minister did not dispute the findings from the evaluation from the Court of Auditors. It provided further clarifications on several initiatives foreseen in the light of the new Flemish Government Agreement 2014-2019. This agreement flagged innovative procurement as a priority and aims to set up a more encompassing framework, possibly including quotas for the innovative procurement channel. A concrete commitment is the target to deploy a minimum of 3% of public procurement budgets for the procurement of innovation.<sup>190</sup>

### PPI/PCP initiatives

**Table 7:** Overview Flemish PCP/PPI projects

number	Realised	Market exploration	Precommercial procurement	Classical procurement (PPI)
1 Eye Screener	Yes	Yes	No	Yes
2 Sustainable construction	Yes	Yes	No	Yes
3 E-book platform	Yes	Yes	Yes	Yes
4 monitoring construction sites	Partially	Yes	No	Yes
5 personal development plan	Partially	Yes	No	No
6 complementary coin system	Partially	Yes	No	Yes
7 Schools of the future	No (no offers)	Yes	Yes	NA
8 Visual Flanders	No	Yes	No	Yes
9 Energy neutral construction without additional costs	No (suspended)	Yes	No	No
10 innovative systems, materials and techniques for repairing facades	No (suspended)	Yes	No	No
11 hydrographic sounding	No (suspended)	Yes	No	No
12 Catalytical eco-platform	No	Yes	No	NA
13 infrastructure and culture information system	No	Yes	No	no
14 E bike	No	Yes	No	no
15 Greenhouse horticulture	Ongoing	Yes	Yes	NA
16 speech and language technology subtitling in Dutch	Ongoing	Yes	Yes	Not yet known

<sup>190</sup> <http://www.ewi-vlaanderen.be/en/node/4229>

### 3.5.3 Indirect financial support for private R&I

There has been an increased and continued use of fiscal incentives in Belgium over the past 10 years. The larger recourse to fiscal incentives, however, has not occurred at the expense of direct or indirect funding support for R&D and innovation, on the contrary. The trend in these various categories of funding instruments shows a net reinforcement of the policy mix, overall. The fragmented governance of these instruments (indirect support is a federal authority, direct support is handled by the regions) calls for an increased coordination of funding instruments, to the extent possible.

As mentioned in section 3.1, foregone revenues due to the various fiscal measures to stimulate R&D activities, steadily increased to reach €1.25 billion in 2013.<sup>191</sup> The latest available data regarding RDI tax incentives show a substantial increase of foregone revenues for the treasury between 2010 and 2013, related to the partial wage withholding tax exemptions, patent income deductions and tax deductions for R&D investments. As mentioned in section 3.1, RDI tax incentives imply substantial foregone revenues for the federal treasury. Wage withholding tax exemptions increased from € 651m in 2012 up to €696m in 2013 and €761m in 2014.<sup>192</sup> Between 2011 and 2012 (latest figures available) the patent income deductions increased from €114m to €193m. The investment tax deductions related to R&D increased just slightly, from €346m up to €352 million.

## 3.6 Business R&D

### 3.6.1 The development of business R&D intensity

The Belgian R&D intensity (GERD as % of GDP) was 2.46% in 2014 (provisional Eurostat data). BERD constituted the largest share of this at 1.75% of GDP. Belgium therefore ranks higher than the EU-28 average and for example the Netherlands, the UK and France but lower than the Scandinavian countries, Germany, the USA and Japan.

The Belgian federal government provides a broad range of substantial R&D tax incentives.<sup>193</sup> Foregone tax revenues as a result of these incentives have grown considerably over the past (see §3.5.2). Also direct government support for business R&D doubled between 2011 and 2012 to 0.2 % of GDP. While Figure 9 shows that business funds 71 % of BERD and government 12%, the relative contribution of government support would be higher if foregone tax revenues due to R&D tax incentives were taken into account.

The Belgian business enterprise sector is very heterogeneous in terms of R&D and innovation. Most large companies are clearly innovation-active.<sup>194</sup> Some of them have significant research budgets. Most of these large enterprises belong to multinational groups, so that their research and innovation policy is not exclusively determined in Belgium. Alongside the large, innovation-intensive companies, a group of high-technology SMEs has arisen in recent years and continues to grow steadily, notwithstanding the setbacks (and the failures) that have been caused as a result of the difficult economic climate after 2008. In 2012, there were 511,726 SMEs (99.8% of all firms) and 840 large enterprises (0.2%), totaling 68.9% and 31.1% of total employment.

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<sup>191</sup> See [http://finance.belgium.be/sites/default/files/downloads/TABLEAU\\_INVENTAIRE\\_2014\\_FINAL.xlsx](http://finance.belgium.be/sites/default/files/downloads/TABLEAU_INVENTAIRE_2014_FINAL.xlsx) (last consulted 04/2016).

<sup>192</sup> See [http://finance.belgium.be/sites/default/files/Inventory\\_federal\\_tax\\_expenditures\\_2015.pdf](http://finance.belgium.be/sites/default/files/Inventory_federal_tax_expenditures_2015.pdf) (last consulted 04/2016).

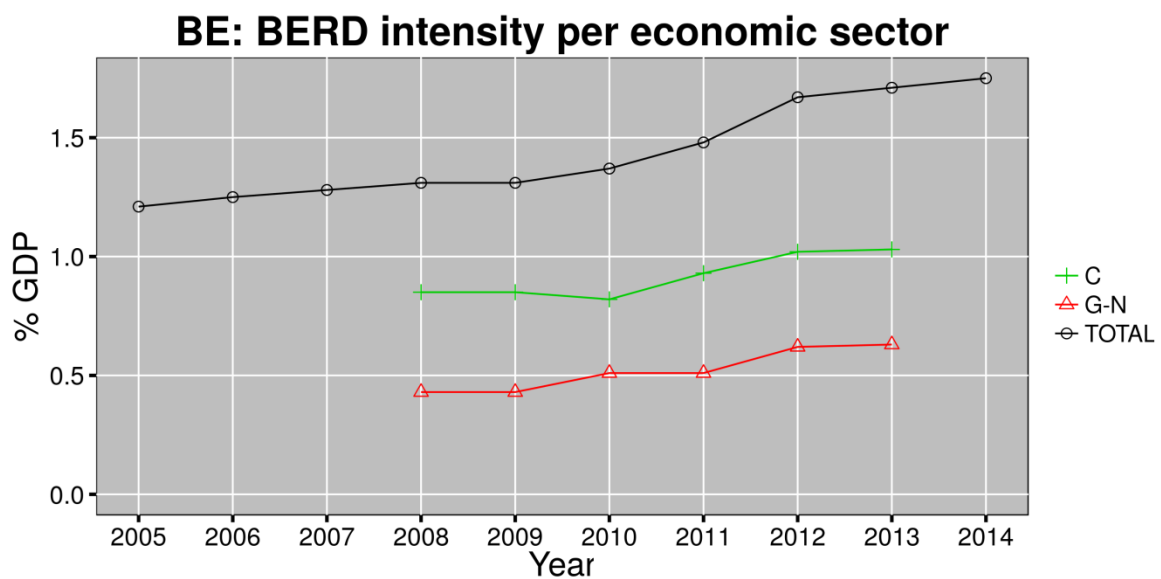
<sup>193</sup> The primary measures include the partial exemptions on the wage withholding tax for researchers and the revenues from patents, and the tax deductions for R&D investments.

<http://financien.belgium.be/sites/default/files/downloads/Fiscale%20incentives%20voor%20R%20D%20-%202015.pdf>

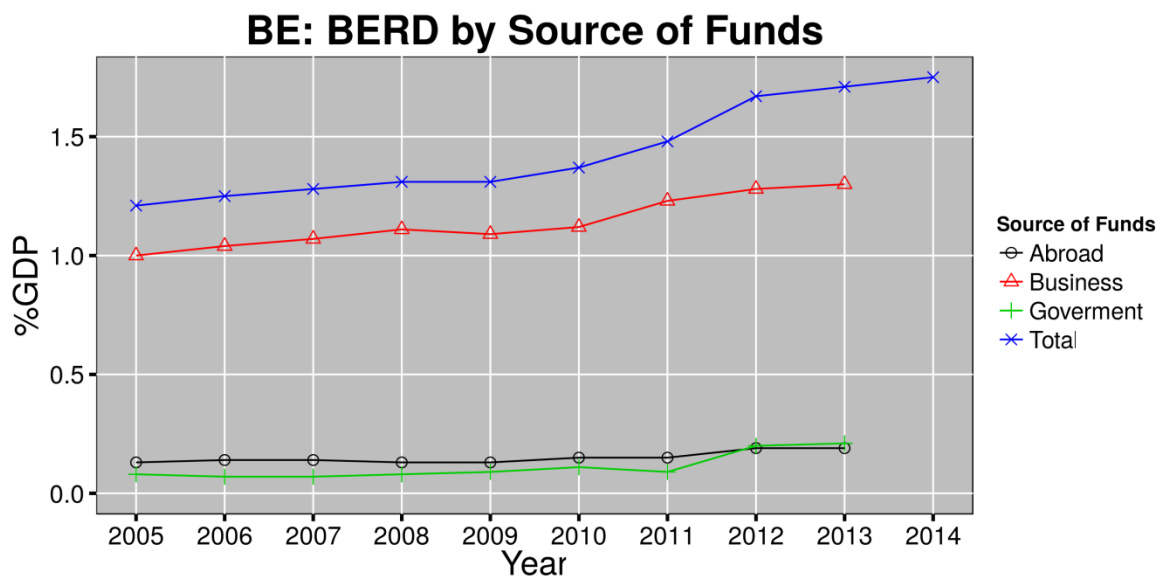
<sup>194</sup> In Flanders (but also Belgium as a whole), 56% of companies - taking into account all firm sizes - introduced a product -, process -, marketing - or organizational innovation, which is better than the EU-28 average at slightly below 50% (CIS2013, reported in the indicatorenboek 2015, Figure 4.22).

According to the SBA Factsheet Belgium (2013), Belgium's SMEs have weathered the crisis much better than those of most other Member States.<sup>195</sup> Employment in Belgian SMEs increased by 4% between 2008 and 2012, while in many other Member States this period was associated with considerable job losses in SMEs. Moreover, even though the large majority of SMEs do not conduct research directly, many of them outsource research to some extent, buy innovation elsewhere or are active in networks, so that they can also be regarded as innovation-oriented. The CIS survey results for Belgium confirm the high proportion of innovative companies overall. Nevertheless, innovation continues to be largely concentrated in industry and large companies.

BERD increased in both the manufacturing and service sectors between 2008 and 2013, though the share of manufacturing decreased from around 65 to 60% of total BERD while the share of the service sectors became more important.



**Figure 8:** BERD intensity broken down by most important macro sectors (C= manufacture, G\_N=services).



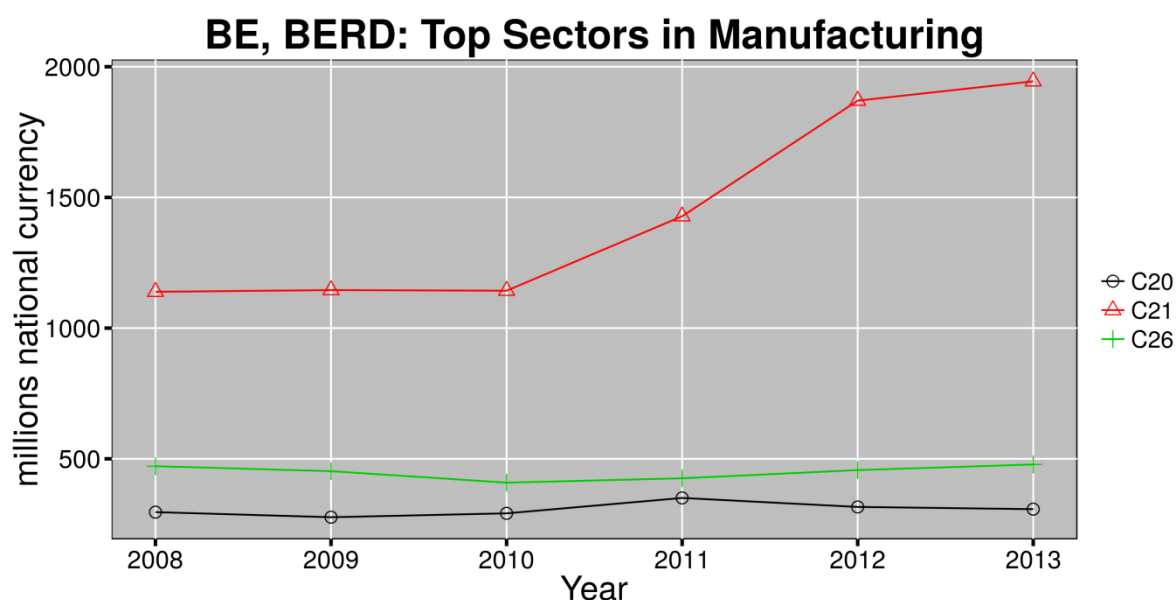
**Figure 9:** BERD by source of funds

<sup>195</sup> See also <http://www.ewi-vlaanderen.be/sites/default/files/documents/indicatorenboek2013.pdf>

### 3.6.2 The development of business R&D intensity by sector

The economic sector that was mainly responsible for the increase in BERD is pharmaceuticals (NACE C21). There is a number of medium to large pharmaceutical companies with substantial R&D activities in Belgium. The largest Belgian based R&D performer is UCB, spending over 786 million euro in R&D in 2014 and ranking 50<sup>th</sup> on the 2015 Industrial R&D scoreboard of top R&D spenders in the EU.<sup>196</sup> In 2012 it received a €200+ million loan from the EIB for investing in the development of new drugs. Other pharmaceutical firms with R&D activities include the former Solvay Pharmaceuticals (now Abbott) and R&D labs of other large pharmaceutical companies such as Janssen (part of Johnson and Johnson). In addition, there is a number of smaller pharmaceutical biotech firms active in Belgium, including Thrombogenics (707<sup>th</sup> in the 2015 scoreboard) and Ablynx (989<sup>th</sup>). The biopharmaceutical research industry in Belgium is R&D intensive and invests a comparatively large share of its turnover in R&D in Belgium.

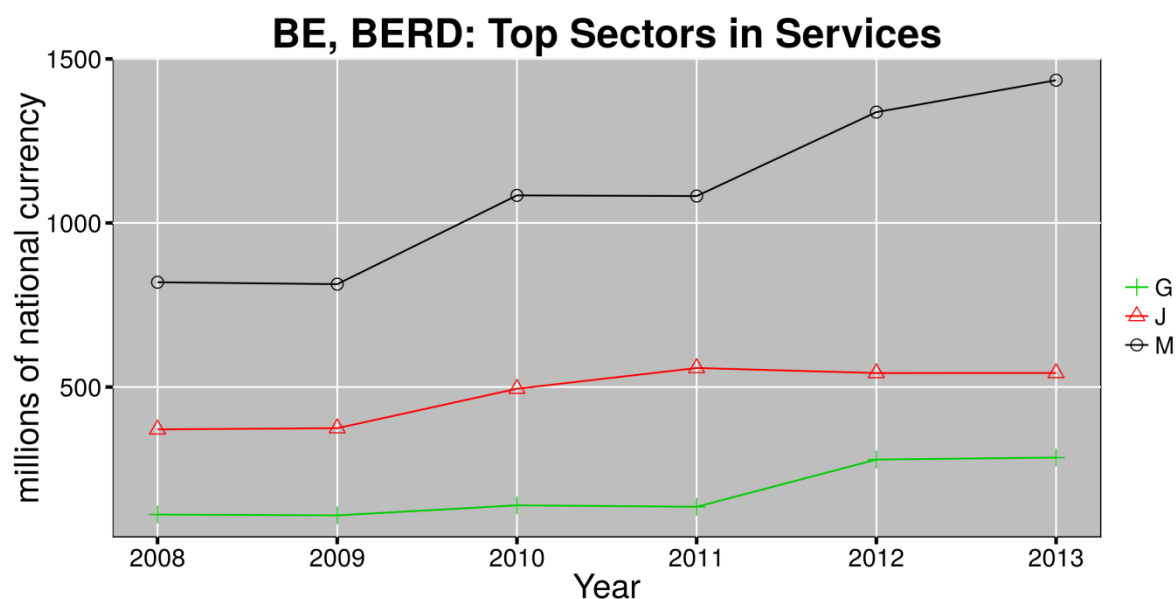
BERD in the Manufacture of computer, electronic and optical products (NACE C26) in 2010 and 2011 was lower than the 2008 values, but regained its 2008 levels in 2013. There is a decrease in R&D expenditure by Agfa-Gevaert (171<sup>th</sup> in the 2015 ranking) in 2012 and 2013, but this doesn't fully explain the drop in C26 BERD.<sup>197</sup> The chemical sector (NACE C20), with one of Belgium's leading Scoreboard companies Solvay (95<sup>th</sup>) declines after a peak in 2011, but remains also in 2013 above 2008 levels of BERD.



**Figure 10:** Top sectors in manufacturing (C20=Manufacture of chemicals and chemical products, C21=Manufacture of basic pharmaceutical products and pharmaceutical preparations, C26=Manufacture of computer, electronic and optical products).

<sup>196</sup> <http://iri.jrc.ec.europa.eu/documents/10180/649011/SB2015%20EU%201000>

<sup>197</sup> <http://iri.jrc.ec.europa.eu/scoreboard.html>



**Figure 11:** Top service sectors (J=information and communication, G=wholesale and retail trade; repair of motor vehicles and motorcycles, M=professional, scientific and technical activities).

The most important contribution to the BERD increase comes from the combined services sectors, especially professional, scientific and technical activities (NACE M) and Information and Communication (NACE J). In the former (M), which is the service sector with the highest levels of BERD, BERD increased by over 50% between 2009 and 2013. While part of this increase may be due to the outsourcing of R&D activities by Belgian SMEs, internal R&D expenditures also show an increasing trend.<sup>198</sup> The increase in R&D tax incentives may have contributed to this development as well. The information and communication sector also experienced a growth in BERD between 2009 and 2011 after which it flattened out. Wholesale and retail trade witnessed a considerable BERD increase between 2011 and 2012. While BERD remained stable in 2008-2009, all the service sectors studied increased in the post-crisis period. The share of the sectors G-N in total BERD increased from 33 to 37 % between 2008 and 2013.

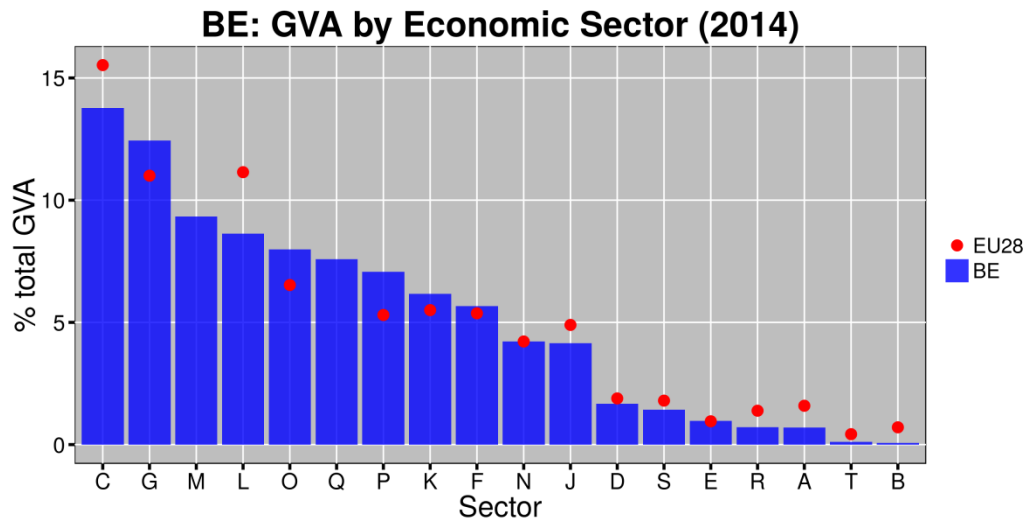
### 3.6.3 The development of business R&D intensity and value added

The manufacturing sector accounts for a low share of Belgian GVA at 12.8%, in comparison to the EU28 average of 15.2%. By contrast, professional scientific and technological activities (sector M), takes a higher share of Belgian GVA than the EU28 average. Value added has been growing considerably over the last decade with only a reduction in the growth rate in 2008 – 2010. The effect of the crisis on this sector appears therefore to have been relatively modest.

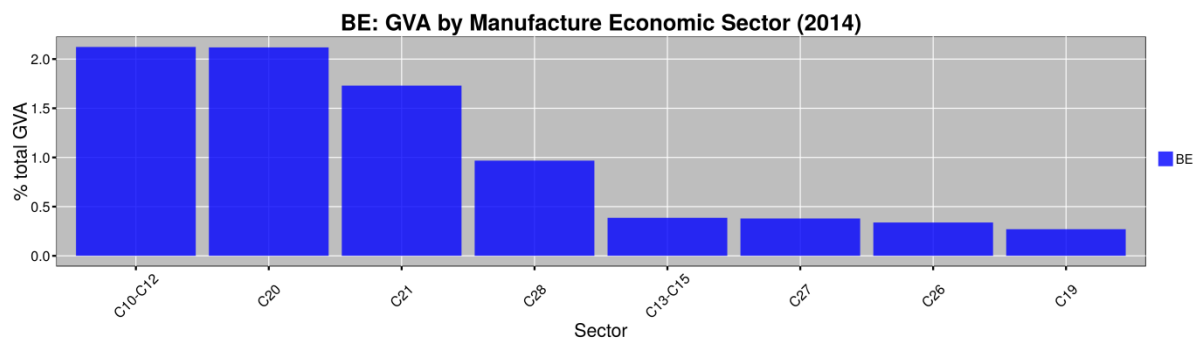
The total wholesale and retail trade saw its value added in millions increase considerably over the last decade. This sector did experience a decrease in the wake of the crisis, but rebounded quickly and resumed its growth. The Information and Communication sector on the other hand represents a smaller share of total GVA. Value added in this sector has been growing, though at a slower pace than in the M and G sectors. There appears not to have been a strong effect of the crisis. On the other hand, BERD increased rapidly between 2009 and 2011 and remained stable ever since, indicating that this sector has become more BERD intensive. Both value added and BERD increased considerably for the M sector of professional scientific and technological activities. The BERD intensity has also increased in this sector.

<sup>198</sup> Data for companies in Flanders: Indicatorenboek 2015 (p15-19, Figure 2.12). <https://www.ecoom.be/en/Indicatorenboek2015>

Important manufacturing sectors in Belgium include the food, beverages and tobacco sectors, with leading companies like AB InBev. The share of GVA of this sector is similar as the share in the EU28. The Chemical sector, with leading companies like Solvay, has a considerably larger share of GVA than the EU average. The Chemical sector, a cyclical industry and one of the leading sectors in terms of BERD intensity, experienced only a small dip in value added following the crisis and quickly rebounded. The pharmaceutical sector continued to grow in value added until 2011 after which it started to decline somewhat. In comparison to 2008, the BERD intensity in this sector has increased considerably. The manufacture of machinery and equipment and the manufacture of computer, electronic and optical products sectors comprise a relatively low share of Belgian value added relative to the EU28 average.

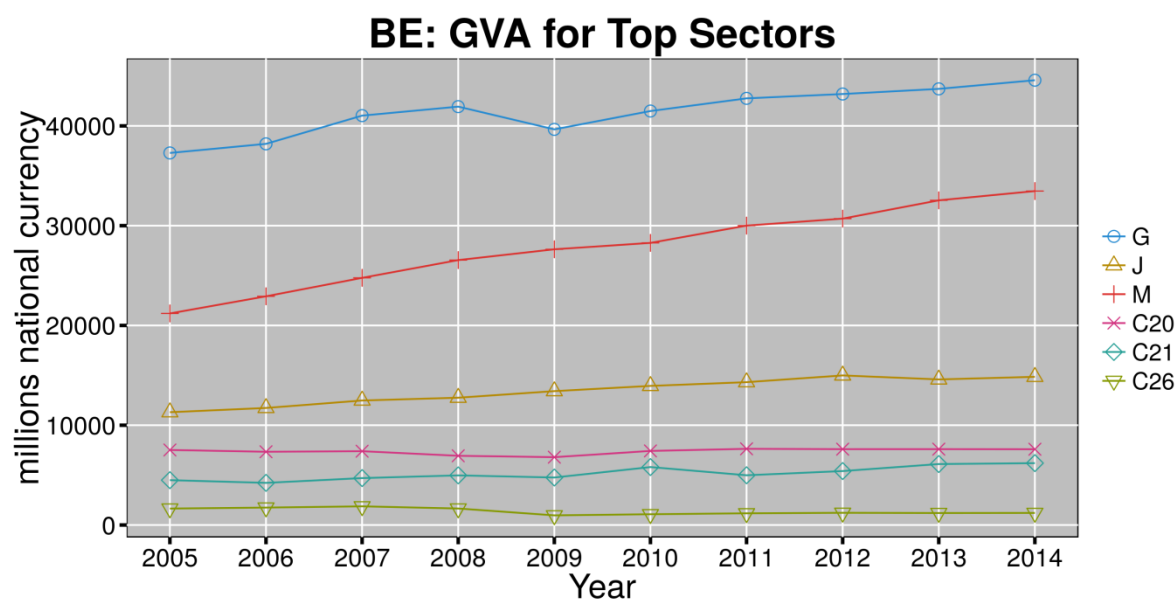


**Figure 12:** Economic sectors as percentage of the total GVA. Top 6 sectors in decreasing order: 1) Manufacture (C); 2) Wholesale and retail trade, repair of motor vehicles and motorcycles (G); 3) Real estate activities (L); 4) Professional, scientific and technical



**Figure 13:** GVA in manufacturing. Top 6 manufacturing sectors: 1) Manufacture of food products; beverages and tobacco products (C10-C12); 2) Manufacture of chemicals and chemical products (C20); 3) Manufacture of machinery and equipment n.e.c. (C28); 4) Manufacture





**Figure 14:** Value added at factor cost for the leading manufacture and service sectors shown in Figure 10 and Figure 11.

While general employment in most of the main sectors studied has been stable or increased, employment in the electronics, computer and optical sector as well as the information and communication sector has decreased substantially. At least for the information and communication sector this did not have a negative impact on the number of scientists and engineers employed in 2013.

High growth enterprises can mainly be found in the service sectors, however their relative shares among the total active firms in a sector are higher in the manufacturing fields studied.

In the broad service and manufacturing sectors studied, the employment of scientists and engineers increased across the board, albeit with some heterogeneity (sectors C and G lost employment, J and M gained). The highest growth in absolute and relative terms was found in the M sector of professional, scientific and technological services.

### 3.7 Assessment

It is tenuous to draw general conclusions on “the” R&D&I funding system for a country like Belgium as it effectively harbours multiple systems. Nevertheless, some overall observations can be made. First, while regional differences exist, there has been a shift towards competitively allocated institutional funding and away from block funding. The rationale behind this shift was to increase competition in the Belgian research fabric by incorporating performance-based criteria in funding mechanisms. While establishing a causal link between the reform of science funding and the effects on scientific output is difficult, descriptive statistics show favourable evolutions. For example, the relative citation rate for Flemish research in life sciences, natural sciences and engineering, which was already above the world standard in 2002-2006, further improved in 2008-2012.<sup>199</sup> For the same disciplines, Belgium’s publication share in global scientific output in 2008-2013 is higher than the one of countries like Denmark and Finland, and the number of publications per 10,000 inhabitants rose to 17.4 in 2013, ahead of Germany (12.1), but lagging behind, for example, the UK (15.4).<sup>200</sup>

<sup>199</sup> See <https://www.ecoom.be/indicatorenboek2015> (p44, last consulted, 01/2016).

<sup>200</sup> See <https://www.ecoom.be/indicatorenboek2015> (p43, last consulted, 01/2016).

While these numbers suggest that the funding system is geared to excellence, any system based on explicit incentives runs the risk of skewing behaviour to the measured parameters (e.g. volume of publications) while neglecting other aspects (e.g. quality of research, job satisfaction of researchers, societal involvement). In particular, the debate on publication pressure has intensified in recent years and has received explicit attention from funding agencies.<sup>201</sup>

With regards to the combination of direct and indirect support measures in a “policy mix”, there is as of yet insufficient evidence to shape policy. While the financial impact of the fiscal measures is substantial, current knowledge on which instrument – or what combination – is most conducive to increase private R&I or long-term growth is limited. The advice that more coordination is needed between the ingredients of the policy mix is therefore valid but does not offer clear-cut policy prescriptions.

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<sup>201</sup> See for example <http://www.fwo.be/media/268601/Annual-part-1.pdf> (last consulted 10/2015).

## 4. Quality of science base and priorities of the European Research Area

### 4.1 Quality of the science base

**Table 8:** Bibliometric indicators, measuring the quality of the science base

Indicator	Year	EU average
Number of publications per thousand of population	2.42 (2013)	1.43 (2013)
Share of international co-publications	59.6% (2013)	36.4% (2013)
Number of international publications per thousand of population	1.44 (2013)	0.52 (2013)
Percentage of publications in the top 10% most cited publications	15.07% (2000-2013, full integer counting)	11.29% (2000-2013, full integer counting)
Share of public-private co-publications	3.3% (2011-2013)	1.8% (2011-2013)

Source: JRC IPTS RIO elaboration on Scopus data collected by Sciencematrix in a study for the European Commission DG RTD (Campbell, 2013). The share of public-private co-publications is derived from the Scival platform and is also based on Scopus data<sup>202</sup>. The data on public-private co-publications is not fully compatible with the data included in the IUS, due to differences in the methodology and the publication database adopted.

On average in 2013, Belgium produced 24.2 publications per 10,000 inhabitants, well above the EU-28 average (14.3). There is also a high propensity to collaborate across borders with 59.6% of publications co-published with co-authors from outside the country. In 2013, Belgium had about 1,440 international scientific co-publications per million population, which is above all the EU member states except Denmark, Finland, Luxembourg, the Netherlands, Sweden, Switzerland and Iceland.

In the period 2002-2013, 15% of the Belgian scientific publications were in the top 10% most cited publications worldwide, compared to an average of 11.3% for the EU28 (Science Metrix, 2014).<sup>203</sup> The share of public-private co-publications in Belgium is 3.3% in the period 2011-2013 against 1.8% for the EU28.<sup>204</sup>

Belgium is ranked seventh in the EU28 by the 2014 Innovation Union Scoreboard and is amongst the group of "innovation followers" (third after Luxembourg and the Netherlands). With regard to the 'enablers' of innovation, Belgium scores well in terms of tertiary educated population and in terms of quality and openness of the scientific output. Conversely, Belgium has relatively low numbers of new doctorate graduates (although increasing, see section 4.4.1 and a low intensity of public R&D expenditure.

<sup>202</sup> Scival © 2016 Elsevier B.V. All rights reserved. SciVal® is a registered trademark of Reed Elsevier Properties S.A., used under license.

<sup>203</sup> These publication data are based on Elsevier's Scopus database. ScienceMetrix, Analysis and Regular Update of Bibliometric Indicators, study conducted for DG RTD. See also [http://ec.europa.eu/research/innovation-union/index\\_en.cfm?pg=other-studies](http://ec.europa.eu/research/innovation-union/index_en.cfm?pg=other-studies).

<sup>204</sup> Scopus based publication indicators derived from Elsevier's SciVal platform, www.scival.com.

With respect to firms' activities, Belgium scores well in terms of business R&D (intensity) and venture capital (intensity) as well as in terms of public-private co-publications (proxy for industry-academia collaborative linkages). Conversely, Belgium's performance in patenting is relatively low, compared to the EU average.

Similarly, Belgium's innovation output record shows a mixed picture. While the country demonstrates above-average performance in terms of the medium-tech and high-tech content of its product exports, it scores slightly below EU average in terms of knowledge-intensive service exports and in licence and patent revenues from abroad.

Recent measures to improve the governance of the science systems in Belgium were discussed in earlier sections, for example the decision of the Federal Government to grant more autonomy to the federal scientific institutions (section 1.2.3), or the new R&D&I decree in Wallonia that foresees an administrative simplification by reducing the types of projects from 10 to 3 (section 2.4).

## **4.2 Optimal transnational co-operation and competition**

### **4.2.1 Joint programming, research agendas and calls**

Efforts taken to implement joint research agendas addressing grand societal challenges

Belgium is very active in joint research agenda initiatives at EU level. Belgium is involved in 4 article 169/185 initiatives (Ambient Assisted Living, European and Developing Countries Clinical Trials Partnership, EMRP and Eurostars), in 8 of the 10 joint programming initiatives and in dozens of ERAnet (Flanders: 50, Wallonia: 8, Brussels: 2) and ERAnet+ and ERA-net co-funds covering a diversity of societal challenges. The IWT (Flanders) and Innoviris (Brussels) also participated in the article 187 (JTI) initiatives ARTEMIS and ENIAC, which in the H2020 program will be superseded by the ECSEL Joint Undertaking. In 2014, Flanders supported 10 EUREKA projects in 3 clusters (ITEA2, CATRENE, CELTIC+) and Brussels 4 projects in two clusters (ITEA2 and CATRENE). At the Federal level, the sizeable participation in ESA is noteworthy (see section 2.3).

Several bilateral agreements further reinforce cooperation. These agreements are signed at Federal level or Community level. At the Federal level, agreements exist with Bulgaria, China, Poland, Russia, Vietnam. The Wallonia-Brussels Federation (French Community) signed agreements with Argentina. International collaboration in the Flemish Community is set up through the FWO (Research Foundation Flanders), via the following channels: a) exchange agreements for individual researchers; b) scientific cooperation with other countries (e.g. Japan, China, Bulgaria, Brazil...); c) bilateral research cooperation with other agencies (e.g. Brazil, China, Ecuador, Vietnam...). The FWO also collaborates with its European and international sister organizations in various networks and with other European research organizations or similar institutions. This includes the European Science Foundation (ESF), Science Europe, CECAM and the ECT.

In addition, the FWO supports access to the research facilities of important international or multilateral initiatives, such as the EMBO (Heidelberg) or the ESO (Munich, Santiago). This applies equally to the so-called "Big Science" projects: CERN-CMS and CERN-ISOLDE (Genève); ESRF-DUBBLE (Grenoble); the Mercator telescope (La Palma, Spain), Spiral2 (Caen), and Ice Cube (the Arctic area). The strategic research centers (IMEC, VITO, etc.) or other knowledge centers including the universities also cooperate with counterparts abroad through networks, establishments, treaties, etc., often in domains that are related to the grand challenges. In August 2013, Belgium was involved in 125 joint calls related to EU joint research agendas. Moreover, bilateral agreements are also implemented by yearly joint calls.

The 2014 ERA Progress Report acknowledged the willingness to foster transnational cooperation in national R&I strategies in more than half of the Member States, among which – as the above discussion demonstrates – Belgium. Cross-border initiatives such as the Top Technology Region/Eindhoven-Leuven-Aachen Triangle (TTR-ELAT) (the Netherlands, Belgium and Germany) are a nice example of this.

Mutual recognition of evaluations that conform to international peer review standards

The main mutual recognition mechanism in Belgium is implemented at Community level through the Lead Agency Procedure<sup>205</sup>, which implies that a proposal is evaluated by the Lead Agency only, according to national rules. The partner funding organisation accepts the evaluation results as a basis for its decision process. The objective of Lead Agency agreements is to enhance the cooperation between the scientists of signatory countries. The FWO (Flanders) has Lead Agency agreements with Luxembourg, Austria, the Netherlands and Slovenia. In 2015, the F.R.S.-FNRS (French Community) signed a Lead Agency collaboration agreement with the National Research Fund of Luxembourg (FNR).<sup>206</sup>

Overall, an important constraint for Belgium is the absence of comprehensive national policies or mechanisms for domestic co-ordination of cross-border governance arrangements (OECD 2014 STI Outlook).

#### **4.2.2 RI roadmaps and ESFRI**

The European ESFRI Roadmap 2016 update process was launched in September 2014. In the framework of this update, ESFRI is expecting proposals for new (or major upgrades of) research infrastructures of pan-European interest corresponding to the long term needs of the European research communities, covering all scientific areas. The Belgian authorities are committed to, and participate in, the ESFRI programme on research infrastructure. The 2014 ERA Progress Report acknowledged that the regions have roadmaps for the development of regional innovation, and that there is the intention to contribute to the development of ESFRI in a national roadmap. Such a roadmap at the Belgian level, ensuring a clear division of responsibilities and guiding rules between Federal authorities and Communities, is still under construction.<sup>207</sup> In 2015, Flanders (EWI department) has started the drafting of an own Flemish ERA roadmap, involving the stakeholders from knowledge actors. In the inventory of research infrastructures of European relevance (MERIL)<sup>208</sup>, Belgium lists 14 RIs (with 562 European RIs registered in the system), making them visible for foreign researchers.

There are 24 research infrastructures in Belgium funded by the European Commission<sup>209</sup> and for which measures are taken to provide competitive and open transnational access (ERA progress report, 2014).<sup>210</sup>

#### **4.3 International cooperation with third countries**

Collaboration with countries outside the EU is mainly handled through bilateral agreements at the federal and Community level, both in Flanders and the Wallonia-Brussels Federation, as discussed in section 4.2.1. According to the ERA Survey 2014<sup>211</sup>, Belgium allocates about 0.2% of its public budget to collaboration with 3<sup>rd</sup> countries, compared to an average of 0.7% for the EU28, with Germany as an outlier (4.3%). Research performers in 24 Member States generally report very low shares of funding received from third countries, including Belgium where the share of research funding coming from third countries is virtually zero. Nevertheless, some Belgian R&I performers are closely linked to actors in 3<sup>rd</sup> countries, e.g. the US or Japan. As a comparison, Hungary scores exceptionally high, reporting almost 9%. While the degree of funding

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<sup>205</sup> See <http://www.fwo.be/en/fellowships-funding/international-collaboration/lead-agency-procedures/cooperation-with-arrrs/> (last consulted 12/2015).

<sup>206</sup> See <http://www.fnrs.be/index.php/news-international/420-appel-pdr> (last consulted 01/2016).

<sup>207</sup> See [http://ec.europa.eu/research/infrastructures/index\\_en.cfm?pg=esfri-other-roadmaps](http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=esfri-other-roadmaps) (last consulted 10/2015).

<sup>208</sup> See <http://portal.meril.eu/> (last consulted 01/2016).

<sup>209</sup> See [http://ec.europa.eu/research/infrastructures/index\\_en.cfm?pg=mapri](http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=mapri) (last consulted 01/2016).

<sup>210</sup> See [http://ec.europa.eu/research/era/pdf/era\\_progress\\_report2014/era\\_progress-report\\_150521.pdf](http://ec.europa.eu/research/era/pdf/era_progress_report2014/era_progress-report_150521.pdf) (last consulted 01/2016).

<sup>211</sup> See [http://ec.europa.eu/research/era/pdf/era\\_progress\\_report2014/era\\_progress-report\\_150521.pdf](http://ec.europa.eu/research/era/pdf/era_progress_report2014/era_progress-report_150521.pdf) and [http://ec.europa.eu/research/era/eraprogress\\_en.htm](http://ec.europa.eu/research/era/eraprogress_en.htm) (last consulted 01/2016).

received may reflect the attractiveness of the research performing organisations in the country, the existence of bilateral agreements (see section 4.2.1 on transnational cooperation), but also the intense researcher exchange in universities and strategic research centers like IMEC<sup>212</sup>) suggest that the Belgian R&I system is quite open. This is confirmed by the high level of co-publications with foreign partners (see section 4.1). The openness of the R&I system is fostered by support programmes that stimulate the international mobility of researchers, such as [PEGASUS]<sup>2</sup> (see section 4.4.3 on accessibility of grants), the "Séjour scientifique" or the Odysseus programme (see section 5.3 on STEM policy).

## **4.4 An open labour market for researchers**

### **4.4.1 Introduction**

The Belgian market(s) for researchers and scientifically educated people is characterised by a strong autonomy of the universities. At the same time, the increased efforts and investment in research and innovation (as % of GDP) over recent years went together with stronger policy attention for human resources in all regions and communities. Consequently, each year the number of doctoral degrees awarded in Belgium has increased. This phenomenon applies to all scientific disciplines and it is not matched with a rising number of vacant academic positions. Therefore, the extra investments in doctoral education were intended as a deliberate attempt to revitalise the economy with more highly-educated staff, innovation-ready and equipped with wide-ranging knowledge. Analysing recent figures and evidence, one can conclude that the envisioned spill-over effects did in fact take place. A majority of doctorate holders make a successful transition from an academic environment to a diversity of employment sectors in all types of professions: approximately 30% of graduates still works at the university 10 years after graduation (BELSPO 2013, based on the 2010 Career of Doctorate Holders (CDH) survey).

Compared to the rest of the EU, Belgium has a higher-than-average level of people employed in an S&T sector (HRST): 33.2% of the active population versus 30.2% for the EU-28, based on 2013 data (Eurostat). A more narrow definition considers whether people actually work as scientists or engineers. Also here, Belgium performs above the EU-28 average (7.7% of the active population versus 6.4%, based on 2013 data). In 2013, Belgium employed 66,407 R&D personnel (FTE, Eurostat), of which 44,650 researchers. The number of researchers has grown substantially in recent years (+21.4% in FTE, 2008-2013, Eurostat). Regional data for Flanders (Indicatorenboek 2015) shows that in 2008-2013, the FTEs in R&D have grown by 14.5%. This increase was split over sectors as follows: +10.1% in companies, +29.4% in public research centers, +19.4% in higher education, -13.8% in public and private non-profit.

According to the latest CDH survey (2010), 68.6% of the 4,445 respondents have been employed at least once in another sector outside the university since the time of their graduation, while 31.4% reported they were still employed at the university. Industry, especially, succeeds in attracting a large pole of the outflow of doctorate holders from the university, and this group has been continuously increasing over recent years: in a period of ten years 6% more doctorate holders have made a career turn from academics to industry. The third most important employer of doctorate graduates is government. Government employs on average 10% of all doctorate holders and this percentage does fluctuate much. Other employment sectors, such as hospitals, institutes of higher education outside the university and the private non-profit sector provide fewer career opportunities for professionals with a doctoral degree (van Rossem and Derycke, 2013).

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<sup>212</sup> IMEC had 73 nationalities among its 2,209 staff in 2014 and was awarded the HR Excellence in Research label by the European Commission. See the IMEC annual report 2014, <http://www2.imec.be/content/user/File/2014.pdf> (last consulted 01/2016).



#### 4.4.2 Open, transparent and merit-based recruitment of researchers

In Belgium, Higher Education Institutions and Public Research Organizations enjoy a large degree of autonomy in terms of hiring decisions. However, the Federal level encourages open recruitment (e.g. the 'Charter & Code' has been endorsed by BELSPO) and certain rules for public service jobs at the federal level have to be followed, while also specific rules at the level of the Communities apply.

The designation of a panel for the recruitment of permanent positions is an obligation for all HEIs and PROs, following public service rules at federal level and FWO at a Flemish Community level (e.g. for "Aspirant Mandaat") and F.R.S.-FNRS at the level of the French Community. On other aspects, different requirements exist between the Federal level and each Community. For example, rules on the rights to receive feedback provided to applicants and to appeal the hiring committee's decision exist at Federal level and for the Flemish Community, but only about feedback for the French Community. Language barriers, in particular at the Dutch speaking universities, e.g. the fact that professors should be able to teach courses or take examinations in Dutch, constitute a limitation for international hires. Nevertheless, in practice, the international orientation of many study programmes allows accommodating international researchers rather easily.

Belgian institutions in general apply open and transparent recruitment processes, e.g. by publishing job vacancies including selection criteria, but the information is often difficult to find for an external user. The reason is that vacancies for researchers or open academic positions are published by the universities themselves, so there is a variety of publication channels and methods. No central repository of vacancies per Community / Region has been set up, which is explained by the existence of other channels. These include the Euraxess portal, where (in 2013) the number of researchers posts advertised per thousand researchers in the public sector was 44.1 in Belgium compared with 72.3 among the Innovation Union reference group (and an EU average of 43.7). This relatively low score may be explained by the use of other international job listings (for non-faculty positions) that are well known within disciplines (e.g. Economic Research Network, Akadeus...). Also, it should be noted that given the increased focus on scientific performance, it is in the institutions' own interest to ensure a wide diffusion of vacancies in order to attract the best possible candidates.

The Belgian Euraxess portal consists of three portals distinguishing between the Federal level and both Communities. Each one provides clear information on job opportunities, social security, pension contributions, accommodation and administrative assistance. There are 11 Belgian EURAXESS Services Centers and 6 Belgian EURAXESS Local Information Points.

The Belgian country profile of the Researchers' Report 2014 indicates that Belgian institutions apply most principles of an open and merit-based recruitment system. The only exception is that the burden of proof that the recruitment procedure was open and transparent is not placed on the employer. However, this judgment is widely based on the practices of Belgian institutions, as mandatory rules are limited to the points mentioned above.

At Federal level, the BELSPO endorsed the 'Charter & Code' in 2011. All strategic research centers and universities in Flanders have acknowledged and implemented the 'Charter & Code' principles.<sup>213</sup> Most are actively implementing the principles while FWO, IWT, all universities and the life sciences research institute in Flanders (VIB) and IMEC and iMinds have either received the HR Excellence logo (which demonstrates their commitment to implement the 'Charter & Code' principles in their HR strategies) or are working towards it.

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<sup>213</sup> See <http://www.fwo.be/en/the-fwo/organisation/hr-strategy/> (last consulted 12/2015).



In the Wallonia-Brussels Federation, the EURAXESS Rights Group<sup>214</sup> (made up of university representatives), the Fund for Scientific Research (FRS-FNRS) and the Walloon administration have agreed on a communication plan for the implementation of the 'Charter & Code'. Five universities of the Wallonia-Brussels Federation (UCL (Louvain), ULB (Université Libre de Bruxelles), ULG (Liège), UMONS (Mons), Unamur (Namur) have already obtained the HR Excellence in Research logo. It also implies their full commitment to develop a more transparent system with regard to the research job opportunities and the recruitment selection process. The procedure is under way for F.R.S.-FNRS, and FUSL Facultés universitaires Saint-Louis. Among others, the FUNDP ("Facultés Universitaires Notre-Dame de la Paix", now "UNamur") initiated in 2013 new measures relating to open recruitment, such as better selection and recruitment procedures, non-discriminatory gender policies, transparent research job offers, work-life balance, equal access to salaries and fostering job stability.

Between 1990 and 2009 the annual number of doctorate degrees awarded at Belgian universities has more than doubled. While the natural sciences continue to dominate the total doctoral production during the entire period, sharper increases in the awards of doctorate degrees are identified in the fields of medical and health sciences – with nearly as many doctorate degrees awarded in 2008-2009 as in natural sciences. Engineering and technology and the social sciences also demonstrate a sharp increase in doctorate production over the entire period (Boosten & Vandeveld, 2010).<sup>215</sup> Based on the 2010 CDH survey (Belspo) on the careers of Belgian<sup>216</sup> doctorate holders, shows that academia remains the largest sector of employment for doctorate holders in all disciplines, except for those in engineering and technology, who are more likely to be employed in industry (37.6%). The share of PhD holders working at university decreases when considering older cohorts: one year after graduation, 39.6% is employed at university, while five and ten years after graduation, respectively 33.0% and 31.0% of the doctorate holders are still working at a university (Boosten & Vandeveld, 2010).

A recent study on survival in the academic labor market (Pellens & Balsmeier, 2014), based on the same data, shows that important drivers for leaving academe include scientific productivity (negative effect on leaving), patenting (positive effect on leaving) and individual preferences for doing business (positive effect).<sup>217</sup> A recent study indicates that about 1 in 5 Ph.D. graduates at a Flemish university obtain an academic post as professor at a Flemish university.

The increasing number of Ph.D. graduates suggests that these chances are decreasing slightly for the current generation if the total number of professorships is to remain the same (ECOOM UGent, 2015).

Although women are no longer underrepresented among higher education students (ECOOM, 2014)<sup>218</sup>, they remain underrepresented among higher education professionals. While the number of male and female students starting a PhD was roughly balanced in the academic year 2010-2011 with 50.7% men and 49.3% women (ECOOM, 2013)<sup>219</sup>, the proportion of women still decreases rapidly when moving up the academic hierarchy.

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<sup>214</sup> See [http://www.euraxess-cfwb.be/doc/SPW\\_DG06\\_Parteneriat\\_FWB\\_UK\\_BD.pdf](http://www.euraxess-cfwb.be/doc/SPW_DG06_Parteneriat_FWB_UK_BD.pdf) (last consulted 12/2015).

<sup>215</sup> <https://www.belspo.be/belspo/ScienceConnection/012/CareersDoctorateHolders.pdf> (last consulted 01/2016).

<sup>216</sup> An important methodological limitation of the survey relates to the fact that it was administered to PhD holders who could be traced via the National Register of Belgian citizens. As a result, while international researchers receiving their doctorate from a Belgian university take up 27.9% of the total doctorate holders population, their representation in the CDH survey data is only 4.2%.

<sup>217</sup> <http://www.sciencedirect.com/science/article/pii/S0165176513005272%20%E2%80%A6> (last consulted 01/2016).

<sup>218</sup> Eurostat (2013). Share of women among tertiary students.

<http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tps00063&plugin=1> (last consulted 01/2016).

<sup>219</sup> ECOOM (2013). Databank HRRF-3 (1990-2011).

[https://www.ecoom.be/sites/ecoom.be/files/downloads/20140204%20Ecoom%20brief\\_EAK%20finaal%20Engels.pdf](https://www.ecoom.be/sites/ecoom.be/files/downloads/20140204%20Ecoom%20brief_EAK%20finaal%20Engels.pdf) (last consulted 01/2016).

At Flemish universities, in 2011, men accounted for 60.9% of the post-doc positions (in FTE) and 77.7% of the appointed faculty positions (in FTE) (VLIR, 2012)<sup>220</sup>.

Precise statistics about the mobility of researchers are not available since existing data sources (e.g. the data collected by ECOOM for Flanders, or the MORE2 study at European level<sup>221</sup>) offer only a partial coverage, in particular with respect to outgoing mobility and at non-university research centers (SVR, 2014)<sup>222</sup>. Statistics for Flemish universities indicate that for junior researchers at universities working on a PhD, the share of foreigners increased from 5.3% (1990-1991) to 29.7% (2010-2011)<sup>223</sup>. In the same period, the share of foreign senior academic staff at Flemish universities, i.e. professors, increased from 5% to 9%. Hence, the more senior academic corps employed on permanent contracts is much less international than the group of younger researchers on temporary contracts.

#### 4.4.3 Access to and portability of grants

Policies related to cross-border and portability of grants is the competence of the Communities. The Flemish Community and the Wallonia-Brussels Federation (previously the French Community) allow the cross-border grants for foreigners, residents and non-residents, with requirements that differ depending on the Community, but which don't constitute major obstacles.<sup>224</sup> One recent example is the new mobility programme launched by the FWO (Flanders) in 2015, entitled [PEGASUS]<sup>2</sup>, with co-financing of the COFUND work programme within the Marie Skłodowska-Curie Actions of Horizon 2020.<sup>225</sup> This programme aims to stimulate the international mobility of researchers by attracting excellent postdoctoral researchers to the Flemish Community via incoming fellowships on the one hand, as well as by offering postdoctoral researchers in the Flemish Community the opportunity to carry out part of their research abroad on the other hand.

The Flemish Community allows the portability of grants for short to medium-long stays in other countries during the mandate. The grants cannot be completely transferred abroad. The grant and fellowship beneficiary should be linked to a Flemish university, most often through their supervisor. The Wallonia-Brussels Federation does not permit portability of grants to other EU countries. Portability is also allowed for the Federal "Back to Belgium"-grants (Belspo)<sup>226</sup>, for a limited period of three months.

#### 4.4.4 Doctoral training

Doctoral training is a competence of the Communities (Flemish Community and Brussels-Wallonia Federation). However, at Federal level, Centers of Excellence called Federal Scientific Institutes have been established in partnerships with Belgian universities to enhance the training of human resources, in particular within Doctoral Schools.

The French Community created doctoral schools in 2004. The Flemish Community launched in 2011 the Support Programme for Young Researchers with a budget of 4 million euros per year to provide to PhD students and young researchers training (doctoral schools), career development incentives, support attendance in international events and job fairs. It covers several items of the innovative doctoral training

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<sup>220</sup> VLIR. (2012). Statistische gegevens betreffende het personeel aan de Vlaamse universiteiten. Telling 1 februari 2012. <http://www.vlir.be/content1.aspx?url=personeelsstatistieken> (last consulted 01/2016).

<sup>221</sup> MORE2 (2013). Support for continued data collection and analysis concerning mobility patterns and career paths of researchers. Final report for the European Commission. [http://ec.europa.eu/euraxess/pdf/research\\_policies/more2/Final%20report.pdf](http://ec.europa.eu/euraxess/pdf/research_policies/more2/Final%20report.pdf) (last consulted 01/2016).

<sup>222</sup> SVR (2014). <http://www4dar.vlaanderen.be/sites/svr/publicaties/Publicaties/svr-studies/2014-09-25-svrstudie2014-1-migraties.pdf> (last consulted 01/2016).

<sup>223</sup> ECOOM HRRF (2013). <https://www.ecoom.be/en/doctoralcareers> (last consulted 01/2016).

<sup>224</sup> <http://www.fwo.be/>; <http://www.fnrs.be/>

<sup>225</sup> See <http://www.fwo.be/en/fellowships-funding/postdoctoral-fellowships/pegasus%20marie-sk%C5%82odowska-curie-fellowships/> (last consulted in 12/2015).

<sup>226</sup> See [https://www.belspo.be/belspo/organisation/call\\_grants\\_retour\\_en.stm](https://www.belspo.be/belspo/organisation/call_grants_retour_en.stm) (last consulted in 12/2015).

principles. In 2013, a first evaluation carried out by the Expertise Center on R&D monitoring showed that the budget had been used by the universities to reinforce their HR policy for young researchers and provide more opportunities for training and career development outside of academia, consistent with the increase in doctoral degrees (see section 4.4.1). In 2013, this programme became a permanent funding programme for the universities of the Flemish Community. In the current support program, the universities pay increased attention to intersectoral mobility and gender issue awareness. In the Wallonia-Brussels Federation, several of the initiatives in the Wallonia-Brussels Partnership for Researchers (adopted by the Governments of the Wallonia-Brussels Federation and Wallonia in 2011) encourage training (e.g. action 12: evaluate good practices for doctoral training) and access to jobs (e.g. action 21: partnership with companies to supply the Euraxess job site with vacancies for researchers).

#### **4.4.5 Gender equality and gender mainstreaming in research**

Based on 2011 data (Eurostat), in the business sector about 28% of researchers is female while female researchers represent 51% of the researchers in the government sector and up to 75% in higher education. However, the representation of female researchers in the higher education sector *in higher ranks* remains low: in 2013, 15.6% of researchers in grade A was female, a slight improvement compared to 12.9% in 2010 (She Figures 2015). Belgium is also among the countries where the share of institutions headed by a woman is (just) below the EU average, but the Commission acknowledged initiatives for the access of female researchers to senior positions (ERA Progress Report 2014).

At Federal level, the Ministry for the Interior and Equal Opportunities together with the Center for Equal Opportunities and Opposition to Racism, and the Federal Public Service for Diversity and Equal Opportunities promote equal opportunities. All Flemish universities have action plans on gender equality in the research profession. These were drawn up in collaboration with the Flemish Interuniversity Council (VLIR) and started implementation in 2014.

In early 2014, the Wallonia-Brussels Federation allocated a €150,000 budget to finance a "Gender contact person" ("Personnes Contact Genre") in each university of the Wallonia-Brussels Federation,<sup>227</sup> in charge of gender matters within their university. Their first mission will be to write an annual report on gender balance.

New legislation on research funding through the special research funds (valid from 1 January 2013) puts emphasis on gender balance at universities. It fosters equality in the make-up as between women and men for post-doctoral and permanent faculty positions, and encourages gender balance in administrative boards, research councils and selection juries. Moreover, the gender dimension has also been incorporated in funding mechanisms: as mentioned in section 3.4, the Special Research Fund in Flanders uses the share of female researchers at various seniority levels in the university as a funding allocation criterion. To ensure that gender policy at universities is developed bottom-up, the Flemish Interuniversity Council (Vlaamse Interuniversitaire Raad/VLIR) set up the High-Level Task Force Gender<sup>228</sup> (Researchers' Report, 2014). The group aimed to improve the gender balance among professors, researchers and students by means of university-based gender action plans. As of January 2014, all Flemish universities had published their gender action plan. The Wallonia-Brussels Partnership for Researchers (adopted by the Governments of the Wallonia-Brussels Federation and of Wallonia in May 2011), follows the recommendations of the Helsinki Group on Women and Science.

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<sup>227</sup> See <http://marcourt.wallonie.be/actualites/~la-federation-wallonie-bruxelles-dope-l-egalite-femmes-hommes-dans-les-carrieres-scientifiques.htm?lng=fr> (last consulted 12/2015).

<sup>228</sup> See [http://www.vlir.be/media/docs/Gelijkekansen/GenderActieplan-Executive\\_Summary.pdf](http://www.vlir.be/media/docs/Gelijkekansen/GenderActieplan-Executive_Summary.pdf) (last consulted 12/2015).

In addition, the Wallonia-Brussels Federation has established a 'Women and Science' standing working group<sup>229</sup> aimed at enforcing equality between men and women.

The group will implement the Wallonia-Brussels Partnership's actions on gender equality as well as the Walloon Government's Roadmap on equal opportunities.

The Flemish Community and the Federal authorities grant the same rights (including maternity leave) to researchers under employment contracts as all employees. For those receiving a fellowship, benefits vary depending on the institution's policy. In addition to social security provisions (including maternity leave provisions), the Walloon Government ensures that all researchers enjoy the same rights to grant extension and alternative incomes during maternity leave. The provisions are applicable to researchers with fixed-term contracts as well as grant beneficiaries. The Wallonia-Brussels Fund for Scientific Research (FRS-FNRS) allows for an extension of a mandate or a grant for a period equal to that of the suspension when a fixed-term mandate or a grant is suspended due to maternity, paternal or adoption leave. A replacement income is then provided by the health care mutual (as is also the case for open-ended mandates) and a complement is provided by the FRS-FNRS to compensate for the loss of income. For mobility schemes and research programmes funded by BELSPO, maternity leaves and number of children can be invoked to prolong contracts or be mentioned in the application form as extra information for the jury.

Most of the above measures and strategies to improve gender balance have been explicitly acknowledged in the ERA Progress Report 2014 (§3.4).

## **4.5 Optimal circulation and Open Access to scientific knowledge**

### **4.5.1 e-Infrastructures and researchers electronic identity**

The main initiatives are situated at the Federal level. BELSPO has established an operational unit named BELNET<sup>230</sup> responsible for the Belnet network (the research network for Belgian universities, schools of higher education, research centers and government service), the BNIX platform (the Belgian internet exchange that makes possible high-speed data exchange), and CERT.be (the federal cyber emergency team for Belgium). Nearly 200 institutions representing more than 650,000 users are connected to BELNET. It provides on request services such as a platform for e-collaboration or video conferencing. At Community level, Flanders developed virtual labs in the areas of medicine and new materials. In the context of BELNET, measures have been taken (at national level) to address issues such as personal data security, identity validation and tracking. BELNET is also a partner in the GEANT project for high-speed network infrastructure.<sup>231</sup>

In terms of federated electronic identities, one of the main systems is eduroam, an international roaming service for users in research, higher education and further education and whose development is supported by the aforementioned European GÉANT project. It provides researchers, teachers and students easy and secure network access when visiting an institution other than their own. In Belgium, all universities and university colleges, as well as some federal scientific institutions participate in eduroam.<sup>232</sup> Eduroam technology is widely deployed in all European Member States and Associated Countries, with an estimated 200,000 wifi base stations equipped and 21 million accesses per week (100 % growth year/year) including 12 % across border access (as of April 2014).

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<sup>229</sup> See <http://www.recherchescientifique.be/index.php?id=620> (last consulted 12/2015).

<sup>230</sup> See <http://www.belnet.be/nl> (last consulted 12/2015).

<sup>231</sup> See [http://www.geant.org/Projects/GEANT\\_Project\\_GN4-1/Pages/Home.aspx](http://www.geant.org/Projects/GEANT_Project_GN4-1/Pages/Home.aspx) (last consulted 12/2015).

<sup>232</sup> See <http://www.eduroam.be/node/3> (last consulted 12/2015).

Another federated identity solution used by several universities (e.g. KU Leuven) is Shibboleth, an open source solution connecting users to applications both within and between organizations. The system – also managed by Belnet - offers universities the possibility to make license agreements with publishers for particular research groups, rather than opting for expensive university-wide licenses.

#### 4.5.2 Open Access to publications and data

The start of Open Access in Belgium was the signing of the Berlin Declaration on Open Access<sup>233</sup> in 2007 by Belgian public funding organisations and research institutions, signalling their commitment to the dissemination of publicly funded scientific research through Open Access. Open Access to scientific research offers stakeholders an alternative for traditional ways of disseminating scientific research results, which do not always meet their demands. Free, online access is the most effective way to ensure widespread and democratic consultation and usage of publicly funded research results. During the last years, research results available in Open Access gained considerable visibility internationally, which proves beneficial to individual authors, institutions and funders. In October 2012, the ministers of Science and Research at federal level and from each Community signed a Declaration on Open Access in Brussels in which they agreed to make Open Access the default for all Belgian research output. The main funding agencies (FWO and F.R.S.-FNRS) oblige to self-archive all articles coming from research funded by them. The DRIVER project led by Ghent University (UGent)<sup>234</sup> played an important role to promote Open Access awareness in the scientific community and among repository managers. It was followed by other initiatives, in particular from the University of Liege.

Many universities and research institutions in Belgium run an institutional or subject-based repository. At present almost all universities and major university colleges have Open Access repositories: 23 Belgian repositories are listed on OpenDOAR.<sup>235</sup> Available full-text contents include doctoral and licentiate theses, journal articles, conference papers, reports, books and book chapters. In the World ranking of Repositories the Belgian repositories are doing well, with 3 repositories listed in the top 100 of repositories worldwide, namely those of the Catholic university of Leuven, The university of Liege and Ghent University. According to Archambault et al. (2014), Belgium was between 2008 and 2013 ranked in the top-7 of the EU-28 in terms of share of Open Access Papers (as % of total scientific production).<sup>236</sup>

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<sup>233</sup> See <http://openaccess.mpg.de/Berlin-Declaration> (last consulted 12/2015).

<sup>234</sup> See <https://biblio.ugent.be/project/41L08907> (last consulted 12/2015).

<sup>235</sup> See <http://openaccess.be/open-access-in-belgium/open-access-repositories/> (last consulted 12/2015).

<sup>236</sup> Archambault, E., Amyot, D., Deschamps, Ph., Nicol, A., Provencher, Fr., Rebut, L. and Roberge, G. (2014), "Proportion of Open Access Papers Published in Peer-Reviewed Journals at the European and World Levels—1996–2013, Science Metrix, (RTD-BG-PP-2011-2: Study to develop a set of indicators to measure open access), Brussels, available at [http://science-metrix.com/files/science-metrix/publications/d\\_1.8\\_sm\\_ec\\_dq-rtd\\_proportion\\_oa\\_1996-2013\\_v11p.pdf](http://science-metrix.com/files/science-metrix/publications/d_1.8_sm_ec_dq-rtd_proportion_oa_1996-2013_v11p.pdf) (last consulted 10/2015).

While there are many Open Access initiatives at disaggregate level, there is currently no connection between open science and national policy agendas. Joint consultation on open access and open data among the different actors has however been initiated. The International Co-operation Commission and Federal Co-operation Commission (CIS-CFS) Open Access Consultation Group<sup>237</sup> was created on 28 October 2013; its mission states that Belgian institutions agree to pursue conformity with and interoperability of implemented systems. The Open Access Consultation Group's members share knowledge and best practices, inform other parties, stimulate initiatives, co-ordinate international reporting and events to raise public awareness, and explore related fields. This is a bottom-up initiative with no link to formal national strategic objectives. More top-down, the Belgian Federal Science Policy Office's STIS (Scientific and Technical Information Service) is consulting all federal departments that finance research in order to draft best practice for a federal open access policy. An OA working group tackles different policy aspects one by one (business plan, authors' rights, licences, mandates, awareness, use of international standards, etc.).

On 28 February 2014, the Flemish Authority held a special hearing on the development of Flemish open access policy. Research Foundation Flanders (FWO), as mentioned above, already has OA regulations.<sup>238</sup> Flanders Research Information Space (FRIS) is the Flemish research portal that provides information on Flemish researchers, organisations and projects. FRIS' goal is to eventually harvest the publications produced by these projects. Both the Flemish and the federal governments have initiated talks on providing access to government data, an issue related to open data as it is an effort to support published scientific research results (cfr the Flemish Action Plan Open Data).<sup>239</sup>

An initiative that has gained international exposure was set up by Liège University, who adopted its open access mandate as early as May 2007. Researchers have to archive their outputs themselves, following the principle of Immediate-Deposit & Optional-Access (IDOA). Assessment of research performance and the evaluation of researchers within this university are exclusively based on the outputs that are deposited in the Open Repository and Bibliography (ORBi). This model is often referred to internationally as the "Liège Model".

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<sup>237</sup> See [www.belspo.be/belspo/coordination/scienPol\\_FCC\\_en.stm](http://www.belspo.be/belspo/coordination/scienPol_FCC_en.stm) (last consulted 10/2015).

<sup>238</sup> See <http://www.fwo.be/en/general-regulations/> (last consulted 12/2015).

<sup>239</sup> See <https://www.bestuurszaken.be/opendata> (last consulted 10/2015).



## 5. Framework conditions for R&I and Science-Business cooperation

### 5.1 General policy environment for business

While it offers a stable business environment, Belgium has never been among the top countries in terms of its regulatory environment and how conducive it is to start or run a business. In the World Bank's "Doing Business" index, Belgium is positioned 42<sup>nd</sup> in 2014. Another key indicator of the dynamism of an economy, the total entrepreneurial activity (TEA), is particularly low for Belgium (5.4% in 2014) compared to other innovation followers, such as the Netherlands (9.3%) or the UK (8.6%). While having a strong science system, the diffusion power of the Belgian innovation system is considered to be (too) low, not able to generate sufficient new economic activity or upgrade the existing products and services with more innovation. Even if manufacturing industries and services with high technological content, such as pharmaceuticals or ICT activities, have a strong importance in Belgium, the added value is indeed rather low. Gross value-added of industry in 2010 was 12.8% (see also section 3.6.3).<sup>240</sup> Furthermore, R&D and innovation efforts do not seem to lead to significant economic outputs. An example is the lower level of community trademarks and designs in Belgium, with a score of 89 and 91 respectively, compared to the EU28 (=100) (IUS, 2015).

As a response, the various Belgian authorities have sought to develop (or reinforce) most of the framework conditions conducive to business R&D and innovation. At the supply side, indirect support for R&D&I has been supplemented by the increasing use of tax incentives which allowed reducing the labour cost of researchers and established a tax reduction for income from patents (see sections 3.1 and 3.5.2). The Federal Government Declaration of October 2014 consolidated the federal portfolio of tax incentives and even foresees to expand it to incomes from software licences.<sup>241</sup> While in the late nineties, there was a gradual shift towards more tax incentives, since 2004 the increasing recourse to fiscal incentives represents a net reinforcement of the portfolio since public direct funding has been maintained or even increased as well. Besides, efforts have been made to expand the venture capital market as a supplementary source of finance (see section 5.4 below). Based on the IUS 2015, Belgium has one of the highest venture capital intensities in the EU.<sup>242</sup> Belgium, and in particular its communities, have also increased efforts in terms of improving the supply and career prospects of highly skilled human resources (see section 4.4). Finally, during the Belgian EU Presidency in the second half of 2010, Belgium was the leading actor for the launch of the Community Patent. Its implementation is currently leading to an important harmonisation at EU level with lower patenting costs as the expected result.

The various Belgian authorities have also gradually reinforced or expanded demand side policies and policy tools. While public procurement is not yet widespread and used to foster innovation, some important new initiatives were recently taken in this regard (see section 3.5.1). Especially the regions, responsible for industrial research and innovation, have gradually developed new demand-driven tools such as lead-user platforms, living labs or innovation platforms (see sections 2.2 and 5.7). However, the size of the local market and the high relative dependence on foreign FDI and MNEs remains a challenge for the country to reap the benefits of demand-pull innovation.

Belgium, and in particular its regions have finally intensified their efforts to simplify and improve the regulatory environment conducive to more entrepreneurship and business innovation (see sections 1.2.2 and 2.2). Wallonia, Flanders and the Brussels Capital Region as well, have implemented large parts of the Small Business Act since late 2008.

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<sup>240</sup> Own calculations based on <http://www.nbb.be/belgostat/>

<sup>241</sup> <http://www.premier.be/fr/accord-de-gouvernement>, p103 (last consulted 10/2015).

<sup>242</sup> Belgium ranks 4<sup>th</sup> behind Luxemburg, the UK and Denmark.



An important challenge for Belgium remains the rationalization of the broad and highly diverse portfolios of measures. This governance complexity and lack of coordination has been recognized many times and is one of the main concerns of the recent, October 2014 Federal Government Declaration.<sup>243</sup> In particular, there is a need to better exploit synergies and complementarities between the regions, e.g. between Brussels (strong academic eco-system, highly concentrated demand and tertiary activities, weak industrial base but rich entrepreneurial fabric characterised by non-manufacturing branches because of its urban particularities and a very small territory compared with the 2 other regions) and Flanders/Wallonia (strong eco-system of industrial actors and technology suppliers). A stronger coordination between these regions should be sought and reinforced. Recent initiatives such as the e-health platform between Brussels and Flanders (Brussels e-Health and Flanders' Care) demonstrate the strong benefits of such a coordination. While Brussels concentrates university hospitals and elderly population, Flanders supplies technological solutions and prototypes, so that they jointly constitute a lead users platforms for testing e-monitoring applications, electronic patients' registry, etc.

Belgium has gradually developed its portfolio of instruments, adding demand-side policies to supply-side direct and indirect support. The whole portfolio is impressive but in a next stage the various governance levels should evolve together towards further cooperation, which remains a structural challenge for the Belgian R&D&I system (see section 6). This should happen in the context of the current rationalisation process announced in almost every region.

## **5.2 Young innovative companies and start-ups**

The relative performance of Belgium to the EU28 in terms of SMEs with product and/or process innovations is 138 (with EU28=100, IUS 2015). For SMEs with marketing and/or organizational innovation, Belgium scores 101, but is clearly below the EU average for the share of fast growing firms in the economy (score of 87). The structure of Belgium's SME sector is very similar to that of the EU28. This is reflected in, for example, the similar distribution of SMEs and large companies in the business economy. In 2012, there were 511,726 SMEs (99.8%) and 840 large enterprises (0.2%) totalling 68.9% and 31.1% of total employment. According to the SBA Factsheet Belgium (2013), Belgian SMEs have weathered the crisis much better than those of most other Member States. Employment in Belgian SMEs increased by 4% between 2008 and 2012, while in many other Member States this period was associated with considerable job losses in SMEs. Since Belgium is a federal state, the regional administrations of the Brussels Capital Region, Flanders and Wallonia are responsible for most of the competences involved. The three administrative bodies actively promote SME-friendly policies at all levels. In particular, Federal and regional SME envoys help implement the SBA.

Flanders and Wallonia have put regional entrepreneurship and SME strategies in place, implemented in collaboration with local stakeholders. The European Commission has recognised the Walloon SBA strategy as an example of good practice for its unique regional design. The Flanders Region has been awarded the European Entrepreneurial Region Award by the Committee of the Regions in 2014 for its innovative actions in the field of promoting entrepreneurship.<sup>244</sup>

The improvement of the innovation framework for SMEs is strongly related to the progress in implementing the Small Business Act (SBA). Overall, the Belgian SBA profile presents a quite positive picture. Assessing the progress per governance level reveals differences in priority choices. The Federal government focused mainly on three priorities of the SBA: stimulation of entrepreneurship, access to finance and administrative simplification.

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<sup>243</sup> <http://www.premier.be/fr/accord-de-gouvernement>, p103 (last consulted in 02/2015).

<sup>244</sup> See the SBA fact sheet of 2014 [http://ec.europa.eu/growth/smes/business-friendly-environment/performance-review/files/countries-sheets/2014/belgium\\_en.pdf](http://ec.europa.eu/growth/smes/business-friendly-environment/performance-review/files/countries-sheets/2014/belgium_en.pdf) (last consulted 10/2015).

Furthermore, as an outcome of the 6<sup>th</sup> State Reform, more competencies are being regionalized like for instance the financing instruments of the federal participation fund. Policy making in the Brussels Capital region also focused on the SBA principles, but considering its small size and its urban particularities, the measures were/are strongly articulated around a triangle of intervention fields: coaching, training and financing. The Brussels Capital is now working on a Brussels SBA which will take in account all the regional aspects of the European SBA. The Walloon government has been particularly active in the entrepreneurship field, with a specific focus on the stimulation and training/education of entrepreneurship and female entrepreneurship in particular, but also the categories "skills and innovation" (e.g. subsidies for consultancy and creative industries) and "internationalization". Also at the Flemish level, the government and the public administration have been quite active as well over recent years.

An important federal measure targeted at Young Innovative Companies, is the partial wage withholding tax for researchers.<sup>245</sup> While the rate of the tax exemption initially amounted to 25% in 2006 (and was gradually increased to 80% from July 2013 onwards), YICs have benefited of a 50% rate since 2006.

### 5.3 Entrepreneurship skills and STEM policy

In international perspective, Belgium has strengths in terms of openness and international exchange (mobility) of human resources, and a well educated population (see earlier statistics in section 4.4.1). However, Belgium still needs to strengthen its human resource base in science and technology as well as its policies to improve the working conditions for researchers (salary, career prospects, financing for projects), although recent years have shown quite some progress in this area (see section 4.4). Nevertheless, it remains a challenge to increase the inflow of people choosing a career in research, to improve the number of graduates in the S&T domains and to create easier access to the labour market for an increased number of foreign graduates (see also section 4.4.1). National bodies do not monitor inward and outward flows of researchers in Belgium, so no reliable data are available on transnational mobility. However, in 2009, 9% of the HRST was non-national. A recent survey of junior researchers (doctorates) in Flanders showed that 16.8% of the researchers are foreigners; half of which comes from an EU country. The personnel records of the Flemish universities and research institutes give a similar picture (17%). The share of foreign researchers declines with seniority: only 5% of the professors is foreign, against about 30% of the postdocs.

In this regard, a number of programmes have been recently setup in the communities and the regions, such as the Wallonia-Brussels Partnership for Researchers, which was set up in 2011 (see also section 4.4.4). It outlined 25 actions, such as open recruitment and portability of subsidies, training of researchers, and PhD holders' access to the job market.

Particular attention in STEM policy has gone to measures to (re-)attract Belgian researchers who settled abroad: return mandates from the federal level, scientific impulse mandates such as ULYSSE<sup>246</sup> from the French Community (F.R.S-FNRS) as well as the ATTRACT program in the Brussels-Capital Region. Flanders (Flemish Community) offers brain gain programmes (Odysseus<sup>247</sup> and visiting postdoctoral fellowship grants) as well as brain drain prevention (Methusalem<sup>248</sup>). The FWO's Odysseus programme offers both high potentials and senior PI's the necessary means to start a new research group at a Flemish university. These can either be foreign researchers or Belgian researchers that have worked abroad for the last couple of years.

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<sup>245</sup> The Federal Science Policy Office specified the criteria for a YIC: [http://www.belspo.be/belspo/fisc/profit\\_YIC\\_nl.stm](http://www.belspo.be/belspo/fisc/profit_YIC_nl.stm)

<sup>246</sup> See <http://www.fnrs.be/index.php/financements/mandats> (last consulted 10/2015).

<sup>247</sup> See <http://www.fwo.be/nl/actueel/oproepen/odysseusprogramma/> (last consulted 10/2015).

<sup>248</sup> See <http://www.ewi-vlaanderen.be/ewi/wat-doen-we/programmas-subsidies/financiering-van-onderzoek/methusalemprogramma> (last consulted 10/2015).

The commitment is double: the university ensures a fixed appointment with a competitive salary, while the FWO provides the researcher with substantial start-up funding (up to €150,000 per year for senior researchers and up to €200,000 per year for high potentials). Until recently, instruments aimed at boosting researcher mobility in Flanders were primarily aimed at funding the research as such. From 2011 onwards, Flanders is also investing substantially in setting up tenure tracks (€3.5m) and graduate schools (€4m). The [PEGASUS]<sup>2</sup> program (mentioned in section 4.4.3), co-funded by the EU's Marie Curie Fund, offers the possibility to foreign postdoctoral researchers who want to stay either one or three years at a university. The high number of applications demonstrates the external visibility of these measures.

The F.R.S-FNRS also proposes short-term (3 years) positions and grants to non-national PhD holders coming to a university lab within the French Community, e.g. the "Séjour scientifique".<sup>249</sup> Another way of attracting researchers is setting up top class research infrastructures; especially the Strategic Research Centers (IMEC, VIB, VITO, iMinds, since 2014 also Flanders Make) in Flanders are internationally renowned. In this light, Wallonia-Brussels International (WBI) allowed the competitiveness clusters designated by the Marshall plan to allow universities to host students from institutions of excellence abroad. An identical programme exists for graduates from Wallonia and the French Community institutes in Brussels who wish to study in a university of excellence abroad. In Wallonia, the scheme FIRST International allows Walloon companies and research centers to collaborate with foreign research organisations, which host a researcher for a minimum of six months. Nonetheless, most of the Walloon programmes remain open to Walloon stakeholders only. Only recently, some programmes were opened to partners of other Belgian regions, most notably the competitiveness poles.

In Flanders, the FWO has underwritten the Science Europe roadmap, which is the result of an update of the former EUROHORCS roadmap. As a consequence, FWO fellowships are open to all nationalities. For the pre-doctoral grants a Master's degree from a university of a European member state is required. Moreover, FWO fellows are free to perform parts of their research abroad while maintaining both their salary and bench fee (see also the discussion in section 4.4.3 on the portability of grants). In Wallonia, only companies with an establishment in Wallonia are eligible to regional grants whereas all French-speaking universities can apply.

With respect to more practical and administrative mobility issues, a guide for mobile researchers coming to Belgium has been published on the Belgian EURAXESS portal. It contains information to mobile researchers on visa and residence permit, social security, taxes and bringing along family members. Furthermore, inward mobility is being promoted at federal level by the scientific visa since 2007, which is implemented by law and which improves framework conditions for foreign researchers. The procedure to obtain a visa and a residence permit for any researcher from a third country hosted by a chartered organisation in Belgium is simplified.

A number of challenges in attracting research talent remain. First, the remuneration of researchers is relatively low compared to the private sector (even though Belgian researchers are relatively well-paid compared to their counterparts in other countries) as well as a low participation of women in research (for the latter, see the discussion in section 4.4.5). The level of salaries of academic staff in research organisations is established by law for the federal scientific institutes (FPS Justice, 1998), for the F.R.S-FNRS and for the Flemish research institutions. According to the Researchers' report 2013 (Deloitte, 2013), Belgium is amongst the best paying countries for first stage researchers (i.e. researchers up to the point of PhD) According to the same source, PhD stipends (in PPPs) were about double as the EU28 average.

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<sup>249</sup> See <http://www.fnrs.be/index.php/mobilite-internationale> (last consulted 10/2015).

Second, a mismatch exists in the supply and demand for high-skilled researchers and engineers, with a shortage of highly skilled engineers and scientists in the fields of physics, chemistry and IT. Finally, in an EU perspective, community regulations prescribe the use of the official language at HEIs, which can be a barrier to foreign researchers.

With respect to STEM education, the current Flemish Government announced the plan to develop a new STEM strategy, jointly with the Minister for Education (Policy Note Work, Economy, Science & Innovation 2014-2019) in order to increase the inflow of students into STEM curricula.

Entrepreneurship education in higher education has received more attention in recent years, amongst others thanks to the attention for entrepreneurship by organizations as Flanders DC and Creative Wallonia. Linked to this is the growth in accelerators, which offer start-ups customized coaching in the early stages of their life cycle. A known initiative is Nest'Up in Wallonia (under the auspices of Creative Wallonia, now part of the new Marshall Plan 4.0). Also in Flanders, several accelerators are active (e.g. Idealabs) while also corporate accelerators like the one of Microsoft are active in the three regions. An indirect effect of the increased attention for entrepreneurship has been the increased offering of specialized Entrepreneurship majors in university curricula. However, the content of study programmes falls within the responsibility of individual universities and university colleges and is not steered by inter-institutional or inter-Community coordination.

#### **5.4 Access to finance**

Several agencies have implemented measures to support the financing of innovation (venture capital, guarantees, loans) and to shape demand for innovative products and services.

For instance, the Flanders Holding Company, PMV (ParticipatieMaatschappij Vlaanderen), provides financial leverage to projects, acting as an 'entrepreneur' and as a facilitator that creates, structures and manages co-operation with private partners. Its goals are to support innovative starters, facilitate growth of Flemish companies, stimulate 'spearhead' sectors, support specific sectors and solve temporary liquidity problems of creditworthy companies. The PMV financial instruments invest in companies, projects and sustainable development. PMV's activities mainly consist of three pillars: risk capital (e.g. TINA fund), loans, guarantees and investments in funds (ARKimedes). It has developed a wide range of instruments aimed at different purposes, at various target groups, and ranging from the pre-start phase to the international growth phase. Innovative companies are eligible for support through these instruments, while complementary incubation support is managed through IWT. The total value of the amounts managed in the different PMV instruments exceeds €1b.

Among its instruments, several have an explicit innovation dimension. The Flemish Innovation Fund (Vlaams Innovatiefonds, Vinnof) is specifically aimed at innovative start-up companies. It provides risk capital for the early stage of a company, with the expectation that entrepreneurs will find it easier to call upon private investors in later phases. Vinnof invests seed capital during three stages: pre-start, start and initial growth. PMV also manages the TINA-fund, a €200m fund aimed at supporting innovative projects. The SOFI-fund has been established to support spin-off companies based on research results in one of the Flemish PROs (IMEC, VIB, VITO, iMinds, Flanders Make) or the universities (SOFI2-fund). Another example is Flanders' Care Invest, designed to invest in innovative companies in the care sector. Finally, the "Innovatiemezzanine"-scheme is a subordinate loan for starting companies that have already received a grant from the IWT.

BAN Vlaanderen, the business angels network in Flanders, is a platform in which starting or growing entrepreneurs seeking risk capital are matched with informal private investors, so-called 'Business Angels'. The latter offer not only money but also their proper know-how, experience and contacts. BAN Vlaanderen is a market place where demand and supply meet, rather than an investment fund.

GIMV (Flanders Investment Company) is Belgium's most important private equity and venture capital provider and a major European and international market player. It makes venture capital investments in promising high-tech companies and also focuses on buyouts and growth financing, to support companies' development and growth. Initially it was set up by the Flemish Government that still holds a minority stake in the company. GIMV manages for example the Biotech Fonds Vlaanderen that was set up in 1994 to provide venture capital to existing and starting medium and large sized companies in the Flemish biotechnology sector (Geerts *et al.*, 2014).

In Wallonia, three instruments were set up in order to provide risk capital for innovative companies: the seed funds "Invests" and Novallia (a subsidiary of SOWALFIN), which are dedicated to supporting innovative projects, and SOFIPOLE, which was created by the Marshall Plan to support projects of the clusters.

Since 2003, the "Invests" supply seed funds to support the launch of spin offs. The aim was to have a more proactive investment policy against spin offs and to lay the foundation for ongoing collaboration with universities. It was decided subsequently to develop this policy as part of the Marshall Plan 2006-2009 and to adapt the criteria and modalities. Thus the measure has been extended to start-ups whose main business is to develop, implement, exploit or market a product, service or innovative process. The Marshall Plan 2.Vert extended this action from 2014 onwards to - amongst other things - finance also spin offs in the field of environmental technologies, and to increase the age limit of spin offs funded from 5 to 8 years (CWPS, 2014). There are currently 9 Invests and 14 subsidiaries that cover Wallonia as a whole.<sup>250</sup>

In 2009, the Government entrusted SOWALFIN with an additional mission to promote (the funding of) innovative projects in SMEs. A new subsidiary, Novallia, was created for this purpose. An initial allocation of €46m was made available by the regional government, complemented by funding from the European Regional Development Fund (€12.5m under 'Regional Competitiveness and Employment' and €33.5m under 'Convergence'). In late 2013, an additional allocation of €4m was decided by the Walloon Government. Novallia takes the form of subordinated fixed-rate loans with a duration of up to 10 years. The maximum amount of aid per project is €500,000 and the loan covers up to 40% of the expenses generated by the project. When combined with other public financing tools such as the Invests, the SRIW, the Participation Fund or another aid from the Walloon Region, a minimum of 25% private contribution is required. A preferential rate is granted to SMEs that meet the criteria of "Young Innovative Company" as defined by the decree of July 3, 2008. The assessment made by ADE<sup>251</sup> points out that Novallia has a real success because of its good match to the needs of SMEs and the modalities of its implementation, such as its 'revolving' character, meaning that it can be maintained beyond the program period. This has had an important impact on creating or improving products and, to a lesser extent on creating and improving services. The funding granted impacted positively the development and sustainability of the job creation in the beneficiary companies. The impact on the overall regional SME population remained limited however, given the limited number of companies affected.

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<sup>250</sup> See <http://www.investinwallonia.be/why-wallonia/financial-aid/the-invests/?lang=en> (last consulted 10/2015).

<sup>251</sup> ADE, « Evaluation des actions en matière de développement et d'exploitation du potentiel d'innovation en Wallonie, cofinancées dans le cadre des PO FEDER 2007-2013 Convergence et Compétitivité régionale et Emploi », Décembre 2012, p. 112.



SOFIPOLE is a subsidiary of the Société régionale d'Investissement de Wallonie (SRIW) created as part of the Marshall Plan. It mainly finances investment in infrastructure and equipment for projects of competitiveness clusters. It is also responsible for the regional participation in incubators, investment funds and other companies aiming at the development of new technologies.

In the Brussels Capital Region, Innoviris offers a number of early-stage financing support options, such as *Rise* (aimed at financing innovative start-ups) and *Launch* (aimed at spin-offs based on scientific research). Brustart, a subsidiary of the Regional Brussels Investment Company (GIMB) offers financing of maximum €250,000 to local companies of maximum 5 years old. In its new multi-annual investment plan, Strategy 2025, the Brussels Capital Region announced the set-up of a pre-seed funding instrument jointly with the Regional Brussels Investment Company (finance.brussels, ex-SRIB). That agency also manages a dedicated fund for start-ups and therefore provides funding through equity participation in these innovative enterprises.

Besides financing, the Regions offer more hands-on support. For example, the Brussels Capital Region agency IMPULSE provides support to young innovative companies for business planning, technical-economic monitoring, legal and financial matters, and search for partners. In Flanders, Flanders Enterprise and the sub-regional (provincial) Innovation Centers offer similar support. The new Marshall Plan 4.0 for Wallonia contains new initiatives, such as a 'flash diagnostic', offering SMEs an overview of their opportunities for digitization.

## 5.5 R&D related FDI

A major R&D funding flow is due to R&D internationalisation, which is highly relevant for a small open economy like Belgium where 66% of business R&D is carried out by foreign-controlled affiliates (CFS/STAT, 2013). The share of foreign capital investments in R&D activities in Belgium during the period 1991-2002 has risen sharply, from approximately 1% to 15%. After having reached a peak in 2002, figures started to dwindle until they stabilised around the level of 10%. This pattern has been attributed to the strategic reorientation of a limited number of firms in the pharmaceutical industry (Belspo, 2013). When considering the location of the decision center of the company, i.e. foreign-controlled R&D in Belgium, there has been an upward trend from 2003 to 2011. After having reached a relative maximum in the period 2007-2009, foreign-controlled R&D figures started to increase again in 2011. Over time, foreign-controlled BERD has always been proportionally more important in comparison with resident-controlled BERD. In total, the business sector covers 69% of GERD (2011).

Policy for attracting R&D related FDI can be categorized along two dimensions. First, there are measures aimed at improving general framework conditions for R&D intensive companies. Measures such as the R&D tax incentives, discussed in section 3.5.2, fall in this category. Also the tax shift of October 2015 (see section 2.3) further lowers the cost of labor. The second strand of policy that ties into the objective of attracting R&D related FDI, are the various forms of public-private partnerships (the innovation platforms in Flanders, the competitiveness poles in Wallonia, the strategic platforms in Brussels, see among others section 2.2.1). These structures provide connection points for foreign companies to tap into the strong science and research base in Belgium to strengthen their innovation activities.<sup>252</sup>

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<sup>252</sup> See for example the ongoing projects of the FISCH, the competence pool for sustainable chemistry: <http://www.fisch.be/en/overview-projects/> (last consulted 10/2015).

## 5.6 Knowledge markets

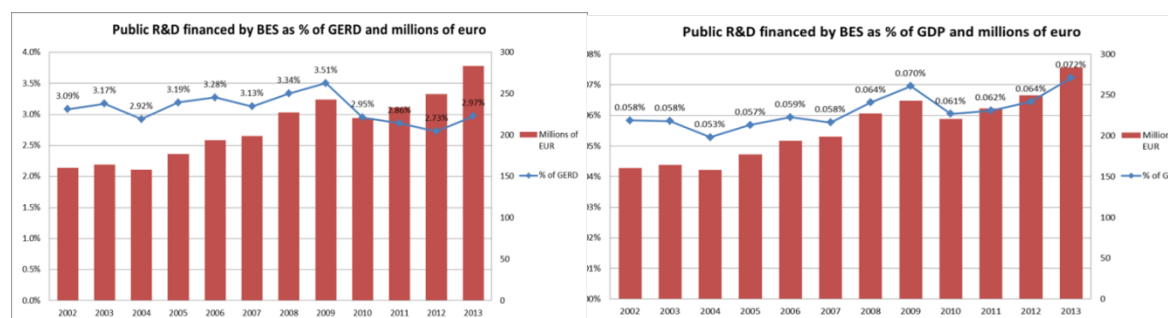
According to international standards IPR protection in Belgium corresponds to the highest quality standards possible, thanks to both the institutional set up (national patent office) and the presence of specialized companies for IPR support. The limited size of the Belgian market, however, implies that large companies will primarily seek for a protection either in a bigger market (such as France or Germany) or through the EPO in Munich. Over the past years the Regions and the Communities have developed a whole set of initiatives to expand (subsidized) IPR support to small and micro companies, either within existing structures (such as within TTOs located on university campuses) or as new initiatives (such as the non-profit organisation PICARRE launched in 2012 in Wallonia)<sup>253</sup>.

The Flemish and French Communities fund knowledge transfer offices (the so-called interface structures) at their respective universities and other HEIs under their competencies, the so-called TTO's. Interface structures have the mission of stimulating external contacts at the universities and have thus received gradually additional competencies with regard to IPR support. Another example is the Industrial Research Fund (IOF) of the Flemish Community.

Besides direct support for IPR protection (targeted advice, raising awareness, training, patent searches and pre-filing, other initiatives aiming at triggering IPR-'markets' such as trading platforms matching IP supply and demand are not yet in place.

## 5.7 Public-private cooperation and knowledge transfer

### 5.7.1 Indicators



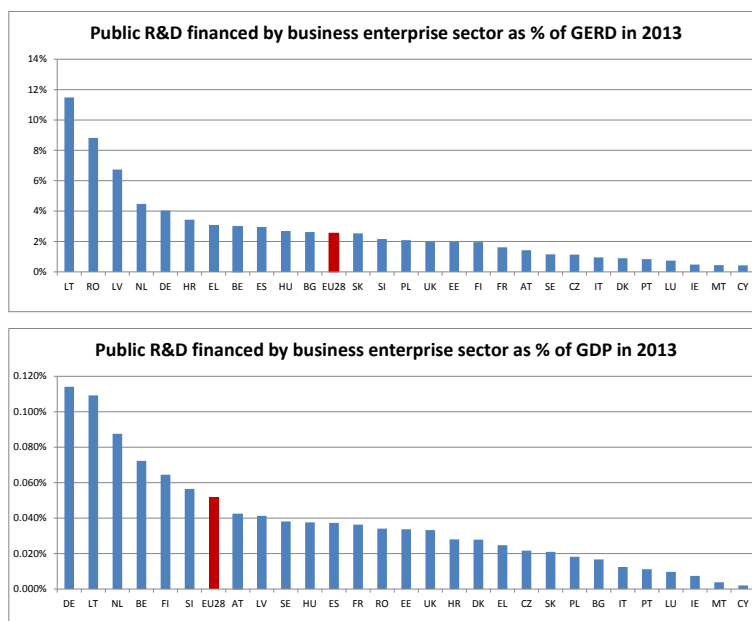
**Figure 15:** BES-funded public R&D in Belgium as % of GERD (in €MLN) and % of GDP

The level of the Belgian business enterprise sector (BES)-funded public R&D expenditure as a percentage of GERD increased between 2004 and 2009, save a small dip in 2007 (left panel of Figure 15). From 2010 to 2012, it dropped to below-2004 levels, to recover somewhat in 2013. In absolute terms, funding levels remained around €220-230m between 2008 and 2012 and surpassed €250m in 2013.

The indicator expressed as a percentage of GDP shows a very similar trends until 2010 (right panel of Figure 15). From 2011 onwards, the indicator increased to above 2009 levels. The differences between these trends are due to the Belgian GERD growing more rapidly than GDP.

<sup>253</sup> <http://www.picarre.be/> (last consulted in 12/2015).





**Figure 16:** BES-funded public R&D as % of GERD and as % of GDP in 2013 in Member States<sup>254</sup>

The two charts in Figure 16 show the values of BES-funded public R&D in the EU28 as percentages of GERD and GDP respectively. On both indicators Belgium is among the top 5 member states. The relatively high share of public R&D which is funded by the business enterprise sector (around 10% in 2013 has shown a noticeable stability over the past fifteen years. Compared to the EU average (7.8%)<sup>255</sup> this suggests a relatively strong collaboration pattern between academic research and industry.

Considering that R&D funding in Belgium is mainly a regional competence, it is relevant to explore the differences between Flanders and Wallonia. If the Eurostat approach of taking only domestic (but not foreign) sources into account is used<sup>256</sup>, then the private support for Public and Private research institutes is 6.6% in Flanders, comparable to the 5.4% in Belgium as a whole. In case both foreign and domestic sources are taken into account, the Flemish figure rises to 41% and the figure for the whole of Belgium to 35%.

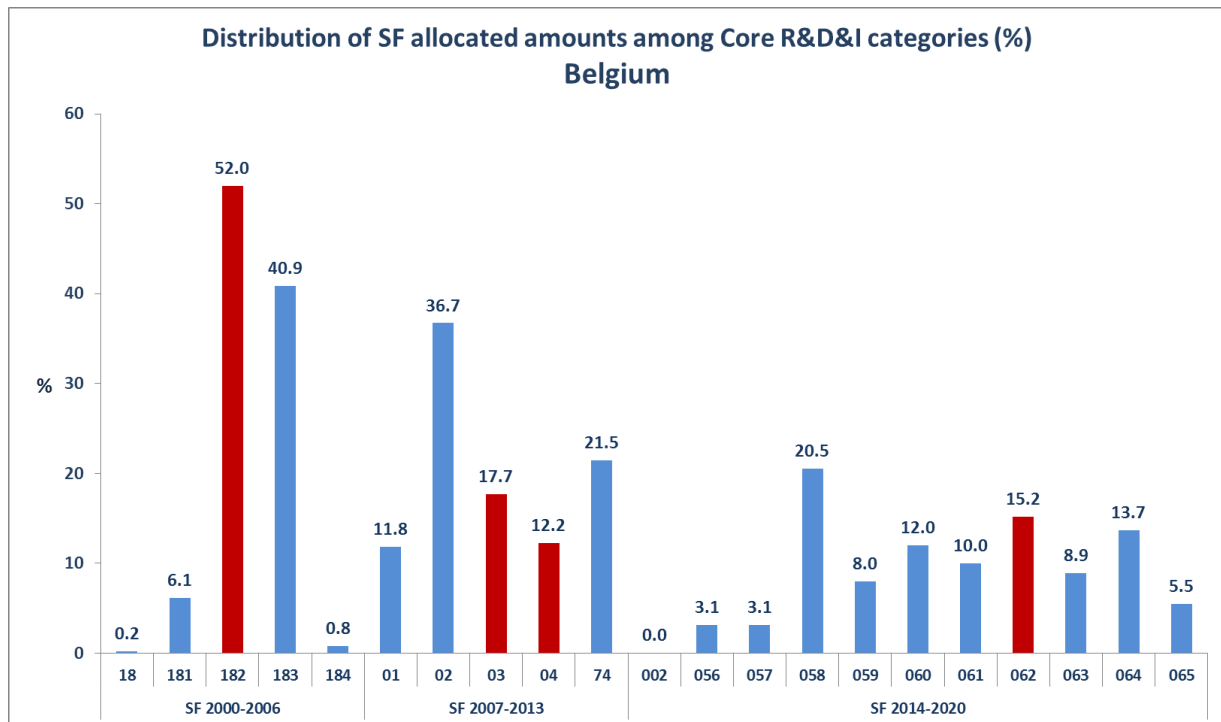
### Structural funds devoted to knowledge transfer

In 2000-2006 52% of the structural funds was focused on knowledge transfer (KT) related activities (see Figure 17). The KT share was lower in the period 2007-2013 with around 30% and lower still in 2014-2020 with 15.2 %. Note that this drop in relative shares does not necessarily imply a drop in the absolute amount of funding going to KT related activities under the Structural funds.

<sup>254</sup> 2013 was chosen as the latest data series providing a full comparison within EU-28.

<sup>255</sup> OECD STI outlook 2013

<sup>256</sup> From commonly reported numbers (e.g. in the indicatorenboek), business funding of HERD in Flanders seems well above national figures. However, this is partially due to a difference in accounting (personal communication with the Federal Science Policy Office, 2015). In this report, we follow the Eurostat conventions.



**Figure 17:** Structural Funds for core R&D activities 2000-2006, 2007-2013 and 2014-2020<sup>257</sup>. We use the categories: 182 (2000-2006), 03 and 04 (2007-2013) and 062 (2014-2020) as proxies for KT activities.

<sup>257</sup> Figure 17 provides the Structural Funds allocated to Belgium for each of the above R&D categories. The red bars show the categories used as proxies for KT. Please note that the figures refer to EU funds and they do not include the part co-funded by the Member State. The categories for 2000-2006 include: 18. Research, technological development and innovation (RTDI); 181. Research projects based in universities and research institutes; 182. Innovation and technology transfers, establishment of networks and partnerships between business and/or research institutes; 183. RTDI infrastructures; 184. Training for researchers.

The categories for 2007-2013 include: 01. R&TD activities in research centres; 02. R&TD infrastructure and centres of competence in specific technology; 03. Technology transfer and improvement of cooperation networks; 04. Assistance to R&TD particular in SMEs; 74. Developing human potential in the field of research and innovation.

The categories for 2014-2020 include: 002. Research and Innovation processes in large enterprises; 056. Investment in infrastructure, capacities and equipment in SMEs directly linked to Research and Innovation activities; 057. Investment in infrastructure, capacities and equipment in large companies directly linked to Research and Innovation activities; 058. Research and Innovation infrastructure (public); 059. Research and Innovation infrastructure (private, including science parks); 060. Research and Innovation activities in public research centres and centres of competence including networking; 061. Research and Innovation activities in private research centres including networking; 062. Technology transfer and university-enterprise cooperation primarily benefiting SMEs; 063. Cluster support and business networks primarily benefiting SMEs; 064. Research and Innovation processes in SMEs (including voucher schemes, process, design, service and social innovation); 065. Research and Innovation infrastructure, processes, technology transfer and cooperation of enterprises focusing on the low carbon economy and on resilience to climate change.

## Cooperation: Share of innovative companies cooperating with academia

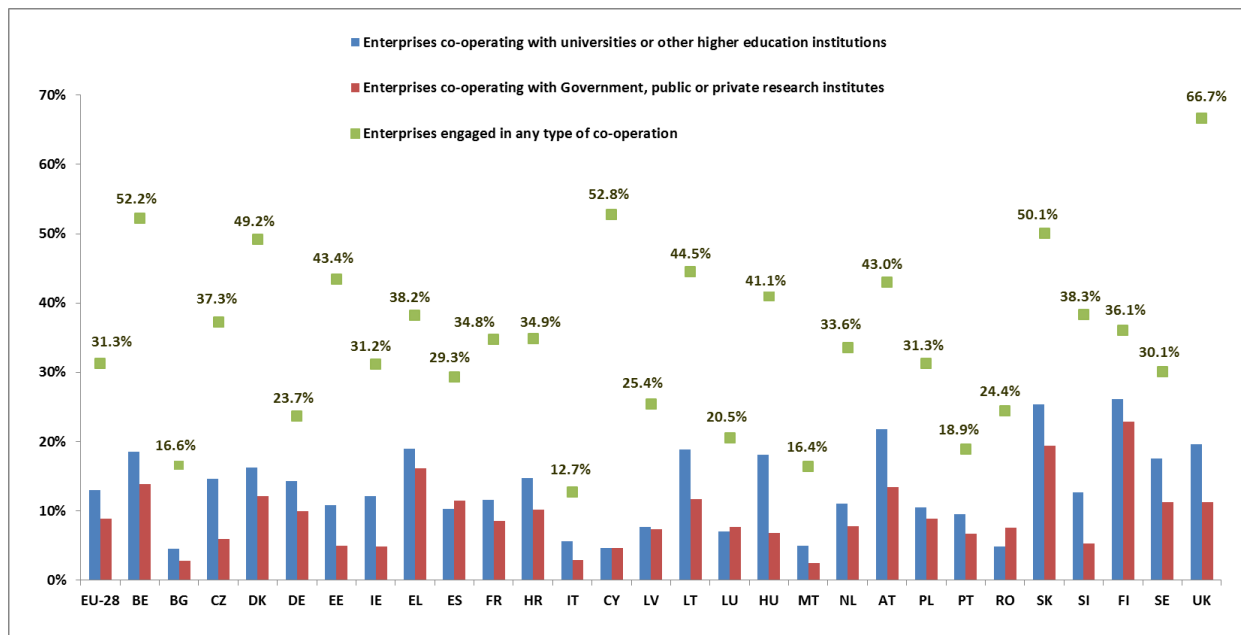


Figure 18: CIS survey 2012 – share of enterprises cooperating with academia

Figure 18 depicts the level of cooperation activities of innovative companies in the EU28, according to the CIS 2012. The percentage of "enterprises engaged in any type of co-operation" (green dot) is in Belgium among the highest in the EU and at 52.2% well above the EU28 average of 31.3%. The percentage of enterprises involved in cooperation with universities or other HEIs (blue bar) is 18.3%, whereas government, public or private research institutes (red bar) is 13.9%. Both indicators are also well above the values of the EU28 average, which are 13.0% and 8.9%, respectively.

Belgium has a relatively high share of PhD holders working in the business sector (33.4%, CDH 2010). Data from the CDH survey are not available for the EU average, but for this indicator Belgium is ranked within the top-3 of the countries surveyed (after Denmark and the Netherlands, but before the USA). Belgium ranks also among the top of OECD countries with regard to the share of innovative large companies collaborating on innovation with higher education institutes and public research centers (44%, OECD 2013). In this context, universities appear to be the second most important innovation partner for innovating companies in Belgium. The strong position of Belgium, however, slightly deteriorates when one considers SMEs only, instead of all companies or only the large companies.<sup>258</sup>

### Cooperation: Technology Transfer Offices (TTOs), incubators and technological parks

Throughout Belgium, university interfaces (or TTOs) have been set up. This process already started before the 1990s. Key priorities include the facilitation of the acquisition and transfer of knowledge and technologies from universities to enterprises – including support in IPR, licensing, the setting up of spin offs, etc. The Flemish and the French Communities each have a system of support for TTO's that are active at their respective universities. More generally, 90% of RPOs have a TTO (ERA Progress Report, 2014).

<sup>258</sup> OECD (2013), Science, Technology and Industry Scoreboard 2013, p. 125-129; ECOOM (2013), 'Vlaams Indicatorenboek 2013, p152-153.

The regions (dealing with applied R&D) and the communities (dealing with fundamental and basic research) have all made commitments to invest more in R&D and there is concerted effort to focus this funding on either thematic or sectoral approaches such as the Flemish strategic research centers (IMEC, VIB, etc.) and innovation platforms, or the Walloon competitiveness poles and the Brussels' clusters and strategic platforms. An interesting recent evolution is the strong focus on the coordination/opening of programmes (cf. competitiveness poles, S&T awareness raising campaigns) between the Walloon and the Brussels-Capital regions, accelerated since 2011 and the strong coordination of policies between Wallonia and the Wallonia-Brussels Federation (previously French Community). This resulted, for instance, in the inter-regional agreement between Wallonia and Brussels to allow Brussels companies access to programmes and projects launched and funded by the Walloon competitiveness poles.

There are considerable differences in the size and research performance of Belgian universities. In the same vein, there are considerable differences in the means, mandate and activities of their respective TTOs.

Around the major Flemish universities, science parks have been established which often include incubators. These science parks include (in brackets the university with which they are most closely associated): Arenberg Research Park (KU Leuven); Haasrode Research Park (KU Leuven); Greenbridge science park (Ghent University); Zwijnaarde science park (Ghent University); Innotek; Waterfront Researchpark (University of Antwerp); Limburg Science Park (Hasselt University), Science Parks Zellik and Mercator (VUB). Similarly, science parks and incubators have been formed around the major Walloon Universities: Louvain-la-Neuve Science Park; Liège Science Park; Crealys Science Park (Namur); Aéroport Science Park (Charleroi – ULB); Initialis Science Park (Mons); Qualitis Science Park; Novalis Science Park. The latter two science parks have, since recently, also a university tie with Louvain-la-Neuve and Liege, respectively.

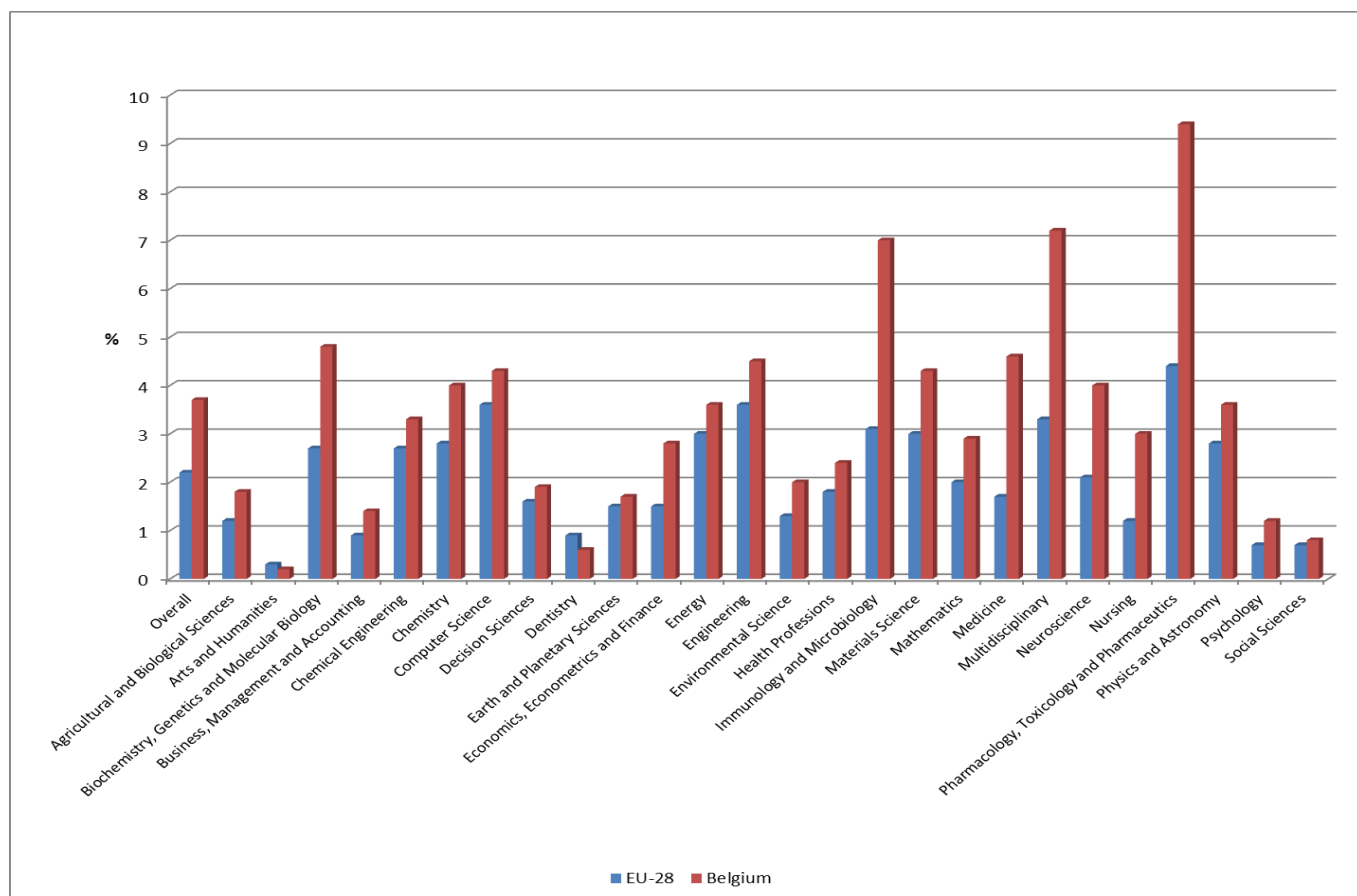
The Walloon government has stimulated the formation of clusters (since 2001) and competence pools (since 2005)<sup>259</sup> in logistics and transport, environment and sustainability, health and nutrition and transversal technologies. The Flemish government also established several excellence centers<sup>260</sup> - after 2012 reshaped through the "Lichte Structuren" support scheme (= innovation platforms), and now integrated into the new cluster policy (end 2015 –beginning 2016) by the new Flemish government - in mobility and transport, the chemical industry, industrial design, mechatronics, labour organisation and social innovation. The Flemish and Walloon cluster policies feed into their respective smart specialisation strategies.

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<sup>259</sup> See <http://clusters.wallonie.be/federateur-fr/les-poles-de-competitivite-wallons.html?IDC=341> (last consulted 04/2016).

<sup>260</sup> See <http://www.iwt.be/subsidies/innovatieplatformen> (last consulted 04/2016).

## Cooperation: Share of public-private co-publications



**Figure 19:** Co-publications by field 2003-2013 in Belgium. Scopus database

Figure 19 shows the 2003-2013 average percentage of academia-industry co-publications (relative to all publications by field in Belgium) compared to the European average. Scopus data also indicate that the percentage of co-publications has decreased slightly in the last ten years, with 3.4% of public-private co-publications in 2013 compared to an average of 3.7% over the whole 10 year period. This is well above the EU-average of 2.2%.<sup>261</sup> The domains with highest percentage of co-publications (excluding the multi-disciplinary category) are Pharmacology and Pharmaceutics, Immunology & Microbiology, and Biochemistry, Genetics and Molecular Biology. All fields are to some extent related to biotech, a high tech field in which Belgium has a relatively strong Revealed Technological Advantage (technological specialisation based on an analysis of its patent portfolio). The chemical and pharmaceuticals industry in Flanders alone represents 34% of total private R&D expenditures in Belgium (2011).<sup>262</sup>

<sup>261</sup> RIO elaboration based on Scopus data.

<sup>262</sup> See <http://ec.europa.eu/enterprise/policies/innovation/policy/regional-innovation/monitor/base-profile/flanders> (last consulted 04/2016).

## **Cooperation: Patenting activity of public research organisations and universities together with licensing income**

The share of university patents in the total Belgium patent output (EPO) increased from 6.6% to 12.5% in 2011.<sup>263</sup> Within Europe, Belgium has one of the highest percentages of university patents. If one excludes the patents with a foreign applicant, this share increases to 15% for Belgium and to 20% for Flanders.

This increasing share is growing with time and started in 1996. This is the period after the introduction of Flemish Parliament Acts concerning the service-providing mission of universities, including the parliament act on the ownership of inventions.<sup>264</sup> Overall, the strong patenting activity of Belgian universities is an indication of their ambition to engage in the valorisation of the knowledge they produce and can be a prelude to Knowledge Transfer.

Another proxy for knowledge transfer is the extent at which patented inventions (EPO patents) cite non-patent literature<sup>265</sup>, or, in other words, the extent at which inventions are science-based. In this regard, Belgium has a clear above-average performance when it comes to the share of EPO patents in the country citing non-patent literature (35% versus 25% for the EU28, OECD 2013).

The share of cross-sector (business, academia, etc.) co-applications in the total patent portfolio was around 13.5% in the period 2002-2011. Over time this share has increased, amounting to 14.6% in 2010. The number of cross-sector co-inventions was 72.6% in the period 2002-2011. Over time this share has decreased somewhat, attaining 68.5% in 2010.<sup>266</sup>

The EKTIS study<sup>267</sup> indicates that in Belgium there are:

- About 3.4 patents granted per 1000 researchers. This is well below the EU average of 4.5.
- There are 4.7 license agreements per 1000 researchers, somewhat below the EU average of 6.5.
- These patents, however, generate over €2 million in license income per 1000 staff. With the latter figure Belgium is among the leading countries in the EU28 and scores well above the EU average of €399,000.
- The number of research agreements per 1000 research staff is at 94.6 close to the EU average of 82.8.

## **Cooperation: Companies**

Whereas some universities, most notably KU Leuven, Ghent University and Liege University hold large patent portfolios and boast a large number of spin-off firms (more than 100 for the KU Leuven), the number of spin-offs from other universities is considerably smaller and the size and degree of activity of their TTOs is expected to be smaller as well. A quick analysis of the websites of TTO offices of Flemish and Walloon universities revealed that around 200 and 165 spin off companies are associated with these universities respectively. Some of these companies have been acquired since their establishment by other firms and some may no longer exist.<sup>268</sup>

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<sup>263</sup> The university patent application indicator underestimates the role of universities in patenting. The share would be higher if one would take into account all patents with an *inventor* based at a university, which some researchers are arguing gives a better insight in the actual role of universities in technology development in an innovation system.

<sup>264</sup> <https://www.ecoom.be/sites/ecoom.be/files/downloads/indicatorenboek2013.pdf>

<sup>265</sup> Non-patent literature refers to backward citations to peer-reviewed scientific papers, conference proceedings, databases (e.g. DNA structures, gene sequences, chemical compounds, etc.) and other relevant literature, with the exception of patent abstracts and commercial patent databases (OECD (2013), p138).

<sup>266</sup> <https://www.ecoom.be/sites/ecoom.be/files/downloads/indicatorenboek2013.pdf>

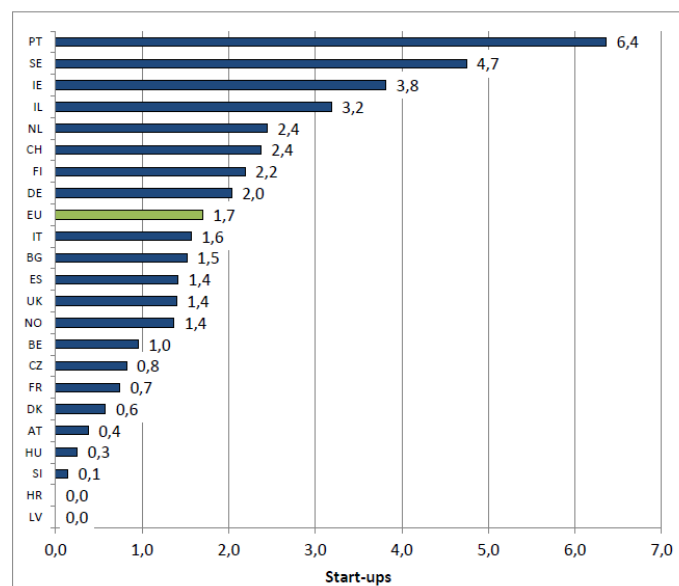
<sup>267</sup> [http://ec.europa.eu/research/innovation-union/pdf/knowledge\\_transfer\\_2010-2012\\_report.pdf](http://ec.europa.eu/research/innovation-union/pdf/knowledge_transfer_2010-2012_report.pdf)

<sup>268</sup> The figure of 365 spin off companies is based on a quick scan of the website of the TTOs of the universities. These may be incomplete or require further cleaning. It is thus an indicative figure and should not be officially published. For

There have been some more detailed studies on Belgian spin off companies, but these studies are no longer very recent and risk being out of date.<sup>269</sup> As will be discussed in the section on financial measures, the SOFI programme aims to offer financial support to the spin offs of the Flemish strategic research centers (SOCs). Since 2012, Flemish universities can also make use of this programme.<sup>270</sup> Wallonia has the "FIRST Spin Off programme" to support university spin offs and the Brussels Capital region has its own programme ("Launch").

According to the EKTIS study<sup>271</sup>, however, the number of academic spin-offs per 1000 research staff in Belgium is relatively low at 1. This is below the EU average of 1.7 and well below countries like the Netherlands and Sweden – though the number is higher than in Denmark.

Exhibit 3-33: Number of start-ups per 1,000 research staff by country, EKTIS 2011 and 2012 results combined



Source: MERIT, European Knowledge Transfer Indicator Survey 2011 and 2012.

## 5.7.2 Policy Measures

In Belgium, R&I policy making is strongly transferred towards the Community/Regional level: relevant policies, laws and financial support programs are developed and implemented at the regional level. There are some exceptions, such as R&D tax incentives, which are implemented at the federal level. Universities are major recipients of R&D tax credits for R&D personnel. They are also beneficiaries from the "patent box".

The regions have all made commitments to invest more in R&D and there is a concerted effort to focus this funding on either thematic or sectorial approaches such as the Flemish strategic research centers (IMEC, VIB, etc.) and excellence centers, or the Walloon competitiveness poles and the Brussels' clusters and strategic platforms.

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example, whereas the TTO site of the university of Liege indicates around 70 spin offs that are not "in liquidation", other sources report that the 100th spin off from this university has recently been established. Presumably, a number of these 100 companies have not survived but it is not possible to assert this with certainty without a more in depth study.

<sup>269</sup> E.g.

<https://www.ecoom.be/sites/ecoom.be/files/downloads/Interim%20rapport%20personeel%20en%20fin%20data%202008.pdf>. Another more recent survey provides little in terms of useful quantitative data but gives some idea of plans for future spin offs by Belgian TTOs:

<http://www.techtransfer.ugent.be/upload/files/NautaDutilh%2520Belgian%2520TTO%2520and%2520Spin%2520off%2520report%25202013.pdf>

<sup>270</sup> <http://www.ewi-vlaanderen.be/ewi/nieuws/sofi-financiert-spin-offs-van-vlaamse-toponderzoekscentra>

<sup>271</sup> [http://ec.europa.eu/research/innovation-union/pdf/knowledge\\_transfer\\_2010-2012\\_report.pdf](http://ec.europa.eu/research/innovation-union/pdf/knowledge_transfer_2010-2012_report.pdf)



An interesting recent evolution is the strong focus on the coordination of programmes (cf. competitiveness poles, S&T awareness raising campaigns) between the Walloon and the Brussels-Capital regions, accelerated since 2011 and the strong coordination of policies between Wallonia and the Wallonia-Brussels Federation. This resulted, for instance, in the inter-regional agreement between Wallonia and Brussels to allow Brussels' companies participating in programmes and projects launched and funded by the Walloon competitiveness poles.

A common feature of both the Flemish and Walloon systems is the emphasis on measures aimed at encouraging increased co-operation between the research base and enterprises. A major difference between the two systems has been the strong focus in Wallonia on schemes aimed at encouraging knowledge diffusion through the exchange or temporary assignment of skilled researchers or innovation specialists from the university/research centers to enterprises (and vice versa), the FIRST family of measures.<sup>272</sup> The FIRST programmes started in 1994 and aim to facilitate the access of enterprises to skilled personnel by intensifying co-operation between public or higher education research organisations and enterprises on R&D activities. It mainly targets universities and universities of applied science. In 2011, the programmes had a budget of €1.5m. The number of applications received annually (10-20/year) and those granted (7-12) is steady, which suggests it matches Higher education institutes needs for support. Since 2006 and the establishment of competitiveness poles in Wallonia, measures stimulating researchers' mobility have been reinforced by research and technology grants stimulating collaborative projects between companies and universities. In Flanders, since the mid-nineties this type of action is subsumed within more general industrial R&D subsidy schemes stimulating industry-academia linkages (see subsidies and grants from IWT (as of 2016: AIO)<sup>273</sup>. Nevertheless, specific support for academia-industry collaboration under the form of people-oriented funding exists. For example, the "Baekeland Fellowships"<sup>274</sup> fund PhD projects at the interface of companies and knowledge institutes and are co-financed by a private company, which contributes to setting the research agenda. In the Brussels Capital Region, the Innoviris agency runs the Doctiris programme to fund PhDs in collaboration with an industrial partner.<sup>275</sup>

All three regions have set up programs to foster the set-up of spin-off companies from universities and public research organisations. Wallonia has the FIRST Spin-Off (FSO) programme (since 1999)<sup>276</sup> which starts with the end of a research project and finishes just after the creation of the spin-off. A key objective of the programme is to encourage university researchers to explore the conditions for industrial and commercial exploitation of the results of their research and if possible to go on to create a company in the Walloon region. Apart from the researcher's salary, the FSO project provides €20,000 to support the functioning of the unit, €5000 for external advice and €2,500 for management and business training. The Brussels-Capital region (Innoviris) runs the Launch spin-off programme, which aims to commercialise the results of scientific research with a view to the creation of new enterprises (spin-offs) in the Brussels-Capital Region. Since its inception in 2006 (then called *Spin-off in Brussels*), the programme has funded 16 spin-offs.

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<sup>272</sup> See <http://recherche-technologie.wallonie.be/fr/menu/acteurs-institutionnels/service-public-de-wallonie-services-en-charge-de-la-recherche-et-des-technologies/departement-des-programmes-de-recherche/direction-des-programmes-regionaux/les-programmes-first/index.html>

<sup>273</sup> See [www.iwt.be](http://www.iwt.be). Note that the IWT will be restructured and renamed to AIO (Agentschap Innovatie en Ondernemen) in 2016.

<sup>274</sup> See <http://www.iwt.be/subsidies/baekeland-mandaten>

<sup>275</sup> Duchene, V., 2015, RIO Country Report 2014

<sup>276</sup> <http://recherche-technologie.wallonie.be/fr/menu/acteurs-institutionnels/service-public-de-wallonie-services-en-charge-de-la-recherche-et-des-technologies/departement-des-programmes-de-recherche/direction-des-programmes-regionaux/les-programmes-first/first-spin-off/index.html>; see also <http://www.sopartec.com/en/breakfast-policies-for-supporting-the-creation-and-development-of-so-in-the-wallonia-region/97/>

The Flemish government launched in 2011 a programme (SOFI) with a budget of €10m to support the formation of spin offs from the Flemish SOC (strategic research centers). Since 2012, Flemish universities can also make use of this programme.<sup>277</sup>

Flanders has other KT-relevant subsidy programmes. For example, TETRA, a programme that aims to transfer applied research by university colleges (and programmes integrated into universities in October 2013, like industrial engineering) to enterprises and social profit organisations.

The added value for the private sector is warranted by the co-financing rate of 7.5% and their active collaboration in the project. The TETRA budget was €10.3m in 2015.<sup>278</sup>

With a view to further stimulate and reinforce research with a potential to valorisation, the Flemish government has established the Industrial Research Fund for universities (IOF). It finances projects which support the knowledge transfer of academic research to private companies. The industrial research fund distributes its research funding to Flemish universities and universities of applied science on the basis of an allocation key which takes into account the valorisation results achieved (based on a) realised income from industrial research, b) income from European collaborative programs, c) size of the patent portfolio as well as d) the number of spin offs).

The Walloon region launched its "mobilisation" programmes in 1994. These programmes aim to increase the expenditure on research and technological innovation in companies and to facilitate the development of collaboration between companies and other actors with the emphasis on knowledge transfer.<sup>279</sup> The Walloon government's program on public-private partnership for breakthrough innovations for R&D aims to match the financial resources of the Walloon Region with those of a company and a research institution in order to achieve technological breakthroughs in a given sector of activity. This scheme had led to the funding of 17 programmes between 2004 and 2010 for a total amount of €35.6 million in public support. It was decided to revise the support modalities as of 2011 in order to reinforce the participation of SMEs. The participation of the Walloon public authorities is limited to €2m per company and per year. In 2012 the budget was 6,000,000.<sup>280</sup>

Several indicators show that Knowledge Transfer (KT) between universities and public research organisations (PROs) and companies functions relatively well in Belgium. These include, among others: 1) the relatively high share of business funding of public sector R&D relative to both GERD and GDP 2) the high share of companies cooperating with universities and public research organisations; 3) the high share of public-private co-publications, 4) the high share of university patents; 5) "several universities showing exemplary performance in spin-off creation (although on average Belgium scores below the EU average)"

Even if Belgium and its regions may not have implemented most of the EC's KT recommendations according to the European Knowledge Transfer Survey (REF), it is clear that the country has a long tradition of policy measures aimed at Knowledge Transfer. It has a dense network of organisations and institutions that facilitate and promote the transfer of knowledge from universities to enterprises – including the setup of spin-off firms in the science parks and incubators which have formed around its regions' universities and research centers. Direct funding of Knowledge Transfer through funding programmes targeted at these activities (or broader innovation support

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<sup>277</sup><http://www.ewi-vlaanderen.be/ewi/nieuws/sofi-financiert-spin-offs-van-vlaamse-toponderzoekscentra> : See also [Vlaams Indicatorenboek 2013](#)

<sup>278</sup> <http://www.ewi-vlaanderen.be/wat-doet-ewi/excellerend-onderzoek/valorisatie-onderzoek/tetra>

<sup>279</sup> <http://recherche-technologie.wallonie.be/fr/menu/ressources/programmes/les-programmes-mobilisateurs.html>

<sup>280</sup> <http://recherche-technologie.wallonie.be/fr/menu/acteurs-institutionnels/service-public-de-wallonie-services-en-charge-de-la-recherche-et-des-technologies/departement-des-programmes-de-recherche/direction-des-programmes-regionaux/les-programmes-partenariat-public-prive/index.html>

programmes with a KT element) are accompanied by indirect support measures, which reduces the costs of R&D&I activities of companies and universities.

## **5.8 Regulation and innovation**

There are few initiatives that have the specific objective of assessing the impact of regulation on innovation. One recent example that could be classified serving this purpose, was the report of the Committee Soete (2012) on the Flemish R&I system, and which was generally quite critical of the complexity of the R&I support landscape.

A concern that has not (yet) received policy attention and to which we return in section 6, is the risk averseness in science funding. The increased focus on 'useful' science that can be translated into economic benefits may lead to an overly conservative approach in funding that does not allocate sufficient means to blue sky research.

## **5.9 Assessment of the framework conditions for business R&I5**

While it is difficult to judge whether Belgium has the necessary framework conditions in place to maximally encourage business investment in innovation (since the counterfactual cannot be observed), a look at overall innovation performance suggests that Belgium's R&I policy is quite effective. It has consistently ranked among the strong innovators (innovation followers) in the Innovation Union Scoreboard, is in 25<sup>th</sup> position<sup>281</sup> worldwide on the Global Innovation Index 2015, etc. In terms of the approach to policy development - and to the extent that one can generalize across 5 different governments - the R&I system that is in place is on track to embrace more demand-side policy initiatives, as discussed in sections 1.2.2, 2.2 and 2.3.

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<sup>281</sup> See <https://www.globalinnovationindex.org/content/page/gii-full-report-2015/> (last consulted 10/2015).

## 6. Conclusions

This chapter provides an assessment of the performance of the national research and innovation system and identifies the main structural challenges faced by the national innovation system. First and foremost, it should be noted that countries with a relatively mature science policy system, like Belgium, typically follow a path of incremental improvement. In recent years, the emphasis has been on consolidating and expanding existing policy initiatives, such as the strategic research centers in Flanders, the policy centered on the Competitiveness Poles in Wallonia, the 'Bridge' Strategic Platforms in the Brussels-Capital Region, etc. That being said, the federal and regional elections of 2014 spawned new government agreements and multi-annual policy development plans, which were discussed in section 2. Several of the policy changes that these plans put forward, aim to address the long-standing structural challenges and some of them have been implemented, or are currently (October 2015) ongoing. The main R&I challenges are summarized in the table below, followed by additional comments and reflections.

Structural challenge	Policy actions addressing the challenge	Assessment in terms of appropriateness, efficiency and effectiveness
(1) Conversion of scientific knowledge into innovation	<p>Adoption of the research strategy 2011-2015 "Towards an integrated research policy" (Federation Wallonia-Brussels)</p> <p>Adoption of the Marshall Plan 4.0, May 2015 (Federation Wallonia-Brussels)</p> <p>2014-2019 Policy Note for Work, Economy, Science and Innovation (Flanders)</p> <p>Bridge projects (Brussels Capital)</p> <p>Brussels' Strategy 2025 (Brussels Capital)</p>	<p>Belgium has put knowledge transfer and innovation at the very top of its agenda.</p> <p>Public innovation support can still be simplified and more targeted to increase Belgium's performance in maximising the commercial benefits of R&amp;D.</p> <p>The competitiveness clusters and the research and technology centers created over the last decade need further sustained funding, regular evaluation and expert management.</p>
(2) Addressing the expected shortage of human resources for R&I	<p>Update of the Youth Guarantee Implementation Plan (2014)</p> <p>Adoption of a STEM action Plan (Flanders, 2014)</p> <p>'Beware' Fellowships (Wallonia)</p> <p>Marshall Plan 4.0, Axis 1 (Wallonia)</p> <p>All regions have adopted action plans against early school leaving</p> <p>Federal R&amp;D wage tax reduction measures</p>	<p>Awareness at all government levels concerning the human resource problem.</p> <p>Progress is being observed regarding skill mismatching and early school leaving.</p> <p>Efforts to increase inward mobility of human capital should be increased</p> <p>The introduction of more flexible higher education trajectories is recommended.</p>

Any assessment of the R&I system in Belgium should take into account that, while Belgian research and innovation performance is not at the top in the EU, the country has managed to consolidate its position of a strong innovator over many years. In line with this observation, and as noted above, the policy mix and focus of policy effort have not changed dramatically over the last five years or even, it could be argued, over a decade.

Considerable policy efforts and corresponding investments have been made for scientific research (via the Federal Government and the Communities) and for enhancing the attractiveness of Belgium as a place to conduct both scientific research (the communities) and science-industry collaboration, including commercialisation (the regions). At the same time, the targeting or strategic orientation of this investment has been subtly changing through a mix of competitive funding programmes and investments into thematically specialised research facilities and centers. The driving forces behind this specialisation are both economic (ensuring that the business sectors are assisted to reconfigure towards new competitive products or that new higher value added sectors emerge) and societal (e.g. dealing with environmental degradation nationally and contributing to tackling climate change globally).

The Belgian policy mix (at all levels) is sophisticated and the various authorities have put in place or further improved a mix of policy advisory and strategic intelligence actions that provide a stronger basis for policy decisions than existed a decade ago. Equally, the evaluation of policy outcomes has become an increasingly applied tool to assist in improving policy effectiveness. A noteworthy component of the efforts to facilitate evaluation of policy, is the increased availability of integrated data sources on R&D&I support. A primary example in this respect is the creation of a database by the Federal Public Service Finance within the context of a working group on the fiscal policy mix in the Central Economic Council (CRB/CCE) that joins various sources of information. More specifically, it combines data from the biannual R&D survey with data on direct R&D support awarded by the regions (Innoviris for the Brussels Capital Region, IWT (as of 2016: AIO) for Flanders and DG06 for Wallonia) and with data on the fiscal support for R&D investments, patent income and researcher wages. This data is available for researchers to conduct analyses on the efficacy of the policy mix (e.g. Dumont, 2012).

This said, the trends in research and innovation performance discussed above, and the evidence from benchmarking exercises such as the IUS, tend to suggest that the rate of improvement both in terms of increasing investment intensity and in terms of innovation performance are insufficient to meet the targets set in policy strategies. We make the following reflections on the multitude of initiatives that have been (or will be) taken.

First, Belgium reaches 2.46% GERD/GDP as of 2014. With sustained efforts in terms of growth of R&D investments, Belgium will arrive close to the 3% GERD/GDP target by 2020. However, sustained efforts not at least in terms of public investment will be necessary.

There is a need to be wary of hasty conclusions that the current policy mix is not working due to the lack of significant progress. Given the economic crisis over the last five years, the Belgian economy and research and innovation system appears to have 'weathered the storm' better than most other neighbouring countries and EU Member States. The introduction and extension of R&D tax reductions on researchers salaries' (in both the higher education and business sectors) may very well have acted as a buffer without which R&D intensity would have declined rather than remaining relatively stable. Similarly, tax incentives for business such as the notional interest<sup>282</sup> measure may have contributed to maintaining the relative attractiveness of Belgium as a place to do research.

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<sup>282</sup> The "notional interest deduction" enables all companies subject to Belgian corporate tax to deduct from their taxable income a fictitious interest calculated on the basis of their shareholder's equity (net assets). The main purpose is to reduce the tax discrimination between debt financing and equity financing. Indeed, in the case of loan capital, the interest paid is deductible from the taxable base, while with equity capital the dividends are taxable. These rules are intended to have the following positive effects: a general reduction of the effective corporate tax rate for all companies, and a higher return after tax on investment and the promotion of capital-intensive investments in Belgium; and an incentive for multinationals to examine the possibility of allocating such activities as intra-group financing, central procurement and factoring to a Belgium-based entity.

Initial results based on the aforementioned integrated database on the policy mix indicate<sup>283</sup> that there are positive additional effects of (for example) the partial exemption of the wage withholding tax for researchers, and that these effects differ for various targets groups. Another exemplary study analyses direct and cross-scheme effects on research versus development intensities in recipient firms (Hottenrot *et al.*, 2014) using data made available by a regional funding agency in Belgium. These studies show that an increased availability of micro data on public support for R&D opens the door to more sophisticated analyses by researchers on policy effectiveness than has so far been possible. This form of 'open data' policy (see also the Star Metrics data mentioned in section 6.1) is therefore a valuable step forward in making cutting-edge impact assessments a component of policy evaluation. Recent initiatives such as the Action Plan Open Data in Flanders confirm authorities' willingness to make progress in this area.

The restructuring of the higher education system (in both Communities) into larger institutions ('associations' or 'academies') has brought together several third level education institutes, mainly the universities and university colleges. This represents a fundamental shift in the higher education and research landscape that allows for a realignment of research potential, such as a greater scope for inter-disciplinary work or merging/pooling research teams across formally autonomous institutes. This is one element that would help to reduce fragmentation of the overall Belgian research system and further improve its performance. In the French Community, the core of the reform consists of the creation of a new single body called ARES (Academy of Research and Higher Education) representing all Higher Education Institutions. This new « umbrella » organisation will allow synergies in the management of the universities, university colleges and miscellaneous higher education institutions. The main aim of the ARES is to facilitate contacts, debates and decision-making in order to create a greater consistency between the institutions and the different types of higher education.

The possibility for the Federal Government to fund nation-wide research programmes has been diminished with the intended transfer of the inter-Community programmes Inter-University Attraction Poles (IUAP) and the Technology Attraction Poles to the Communities and the Regions. Nevertheless, there are clear economies of scope to be reaped by engaging in joint programming, sharing certain research infrastructures or 'pooling' research efforts. The Scottish example of Research Pools may serve as an example for a mechanism to link Flemish, Brussels, Walloon and French Community (Wallonia-Brussels Federation) networks. Such coordination has already proved possible for coordinating Belgium's participation into research infrastructures of the ESFRI roadmap. Other concrete initiatives are the BEL-SME program targeted at collaboration between SMEs from different Belgian regions (see section 2.3).

The efforts to structure and develop major thematically, sector-specific or technology-specific 'clusters' of R&D and innovation through strategic research centers, excellence centers, competitiveness poles, clusters and targeted research programmes have been key components of R&I policy over the last decade(s) and need to be pursued and consolidated further. The evidence from the Flemish strategic research centers (in particular IMEC and VIB) suggests that it may take over a decade before such initiatives achieve critical mass and attain international recognition. Therefore, the Walloon competitiveness clusters and the research and technology centers created over the last decade will need sustained funding, regular evaluation and expert management if they are to begin to contribute effectively to structural adjustment of the economy.

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<sup>283</sup> E.g. Neicu, D., Teirlinck, P., Kelchtermans, S. (2016). Dipping in the policy mix: the behavioral additionality effects for firms supported by both R&D subsidies and tax credits. *Economics of Innovation & New Technology*, 25(3): p218-239.



The realignment of research and innovation policies to contribute to tackling the structural adjustment of the economy or for taking on societal challenges such as the environment and climate change, will require better orientation and focus of the limited amounts of public funding available in the coming years with the need to possibly cut funding from non-priority centers or sectors. This implies the need for a political will to close or merge structures and support measures created over the previous decades. The increased emphasis on smart specialization, also in the new government agreements, will hopefully serve as a guiding principle for making those choices.

Aside from the Federal R&D tax measures, business R&D and innovation is supported via a range of measures managed by the regional authorities. The innovation policy mix has evolved over recent years but an important component remains essentially based on grants (or reimbursable loans) for individual firms to undertake R&D. The IUS data suggests that the intensity of business innovation activity, notably non-technological innovation efforts, is not systematically improving and that the expected impact in terms of boosting turnover from new products remains below expectations. Despite initiatives such as the VIS (Flemish Innovation Co-operation network) programme in Flanders or new coordinating agencies such as the Walloon Technological Stimulation Agency (AST, now merged with AWT and ASE into the 'Agency for Enterprise and Innovation', see section 2.3) aimed at identifying and supporting firms with a potential to innovate more intensively, the situation has not evolved positively. There is a need for a further re-assessment of the effectiveness of the direct support measures and of intermediary support structures that are judged to be over-complex and fragmented, as argued in, for example, the report of the Committee Soete (2012) on the Flemish R&I system. The discussion in section 2.3 demonstrates that governments in various regions do take action to rationalize the R&I governance landscape. Furthermore, authorities signal their awareness of the importance to avoid the (further) proliferation of support measures. For example, the policy note of the new Flemish Government 2014-2019 commits to specifying 'sunset clauses' for new temporary initiatives to avoid the accumulation of clutter in the innovation toolbox, whilst at the same time gather existing initiatives into new schemes as in the new cluster policy that is being elaborated.

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## Abbreviations

AEI	Agency for Enterprise and Innovation (Wallonia)
AIO	Agentschap Innoveren en Ondernemen (Flanders)
ARC	Actions de Recherche Concertées - Concerted Research Actions (Wallonia)
BERD	Business Expenditures for Research and Development
BELSPO	Programmatory Public Service for Science Policy
BOF	Bijzonder Onderzoeksfonds – Special Research Fund (Flanders)
CFS	Federal Co-operation Commission
CIS	International Co-operation Commission
CWPS	Walloon Science Policy Council
EC	European Commission
ECOOM	Expertise Centre for R&D Monitoring (Flanders)
ERA	European Research Area
EPO	European Patent Office
ERA-NET	European Research Area Network
ESA	European Space Agency
ESIF	European Structural and Investment Funds
EU	European Union
EU-28	European Union including 28 Member States
EWI	Department of Economy, Science & Innovation of the Flemish Government
DG06	Operational Directorate of Economy, Employment and Research (Wallonia)
FDI	Foreign Direct Investment
FP7	7th Framework Programme
FPS Finance	Federal Public Service Finance
FRWB-CFPS	Federal Science Policy Council
F.R.S.-FNRS	Fund for Scientific Research (Wallonia-Brussels Federation)
FTE	Full-time equivalent
FWO	Fund for Scientific Research (Flemish Community)
GBAORD	Government Budget Appropriations or Outlays on R&D

GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GIMB/SRIB	Regional Brussels Investment Company
GIMV	Flanders Investment Company
GOVERD	Government Intramural Expenditure on R&D
GVA	Gross Value Added
HEI	Higher Education Institution
HERD	Higher Education Expenditure on R&D
HRST	Human Resources for Science and Technology
H2020	Horizon 2020
ICT	Information & Communication Technologies
IMCWB/CIMPS	Inter-Ministerial Conference for Science Policy
IMEC	Interuniversity Micro Electronics Centre
INNOVIRIS	Brussels Institute for Research and Innovation
IOF	Industrieel Onderzoeksfonds – Industrial Research Fund (Flanders)
IU	Innovation Union
IWT	Agency for Innovation by Science and Technology (Flanders)
IWEPS	Walloon Institute of Evaluation, Foresight and Statistics
PRO	Public Research Organization
R&D	Research and Development
R&D&I	Research, Development and Innovation
RI	Research Infrastructure
R&I	Research and innovation
RIS3	Research and Innovation Strategies on Smart Specialisation
RWB/CPS	Science Policy Council of the Brussels-Capital Region
S3	Smart Specialisation Strategy
S&T	Science and technology
SERV	Socio-Economic Council Flanders
SME	Small and Medium-sized Enterprise

SOC	strategic research centres (Flanders)
SOWALFIN	Société Wallonne de Financement et de Garantie des Petites et Moyennes Entreprises
SRF	Fonds Spécial pour la Recherche - Special Research Fund (Wallonia)
VARIO	Vlaamse Adviesraad voor Innoveren en Ondernemen (Flanders)
VC	Venture Capital
VIB	Flemish Institute for Biotechnology
VITO	Flemish Institute for Technological Research
VRWI	Flemish Council for Science and Innovation



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## Annexe 1 - List of the main R&D performers in the private sector

Company name	Sector	R&D Expenses 2014
UCB	Pharmaceuticals & Biotechnology	€768.0 million
SOLVAY	Chemicals	€285.0 million
ANHEUSER-BUSCH INBEV	Beverages	€178.7 million
UMICORE	Industrial Metals & Mining	€148.0 million
AGFA-GEVAERT	Electronic & Electrical Equipment	€146.0 million
BARCO	Electronic & Electrical Equipment	€90.2 million
PROXIMUS	Fixed Line Telecommunications	€84.0 million
BEKAERT	Industrial Metals & Mining	€59.3 million
KBC	Banking	€56.0 million
XTRION	Technology Hardware & Equipment	€51.8 million

## Annexe 2 - List of the main funding programmes

Name of the funding programme	Timeline	Budget	Target group
<b>Research funding</b>			
Research mandates (FWO, Flanders)	Yearly	€100.1m (2014)	Predocctoral and postdoctoral researchers
Research projects (FWO, Flanders)	Yearly	€113.1m (2014)	Researchers of at least postdoctoral level
Research mandates (F.R.S.-FNRS, French Community)	Yearly	€116.8m (2013)	Predocctoral and postdoctoral researchers
Research projects (F.R.S.-FNRS, French Community)	Yearly	€31.9m (2013)	Predocctoral and postdoctoral researchers
<b>Innovation support</b>			
Company R&D projects, innovation collaborations, innovation mandates (IWT, Flanders; as of 2016: AIO)	Yearly	€175.4m (2015)	Firms, incl. SMEs
Strategic Basic Research (IWT, Flanders; as of 2016, SBO is handled by the FWO)	Yearly	€40.4m (2015)	Research centres, incl. universities
Company R&D projects (Innoviris, Brussels Capital Region)	Yearly	€11.3m (2014)	Firms
R&D in research centres, with economic finality: <i>Bridge, Launch, Doctiris...</i> (Innoviris, Brussels Capital Region)	Yearly	€8.4m (2014)	Research centres
R&D in research centres, with non-economic finality: <i>Anticipate, Attract...</i> (Innoviris, Brussels Capital Region)	Yearly	€7.2m (2014)	Research centres
Competitiveness Poles (DG06, Walloon Region)	Yearly	€66.7m (2014)	Consortia of companies and universities / research centres
Experimental development projects (DG06, Walloon Region)	Yearly	€70.7m (2014)	Firms, incl. SMEs
Industrial research projects (DG06, Walloon Region)	Yearly	€26.6m (2014)	Firms, incl. SMEs
Prototyping projects (DG06, Walloon Region)	Yearly	€24.8m (2014)	Firms, incl. SMEs

### **Annexe 3 - Evaluations, consultations, foresight exercises**

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