Innovation in Belgium:

Results from the European innovation survey CIS2012

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EXECUTIVE SUMMARY

Every two years, under the auspices of Eurostat, a large innovation survey is conducted by national authorities in all EU countries. The latest edition of this survey, called CIS 2012, focuses on innovation activities of commercial firms during the period from 2010 to 2012 (both included). This publication aims at giving an overview of the main results stemming from this survey for Belgium. In short, the main insights are as follows:

1. Firms in Belgium have been a little less innovative over the period 2010-2012 compared to previous periods, and in particular compared to 2008-2010. This is especially true for non-technological innovation (i.e. organizational and marketing innovation). The **innovation rate** (the proportion of innovative firms), however, remains far above the EU average (Belgium has the 6th largest innovation rate in Europe).

2. Innovation is a broad concept and we document the high prevalence of **mixed modes of innovation**: between technological and non-technological innovation, between product and process innovation, and between goods and services innovation. Technological product and process innovation is, however, by far more frequent among innovative firms in Belgium than non-technological innovation.

3. Innovative firms employ a significant larger share of **highly skilled workers** than non-innovative firms.

4. **Technological product or process innovations** are most often developed in-house or in close collaboration with external partners. They are rarely the result of an imitation or pure adoption strategy.

5. The share of turnover due to **radical product innovations** has shrunk over the period 2010-2012. This is somewhat (but not fully) compensated by an increase in the share of turnover of **incremental product innovations.**.

6. There is a drop in the **innovation intensity** (innovation expenditures expressed as a share of turnover). It remains however, slightly, above the EU average.

7. The most important **expenditure items** are the acquisition of machinery, software and equipment (for innovation purposes), intramural R&D, and training expenditures.

8. Firms in Belgium are becoming increasingly more **collaborative** for their innovation activities, and this seems to be a long-term trend, also due to the existence of open innovation. They are, on average, more collaborative than firms in other EU countries. Preferred collaboration partners are to be found in Belgium or in the EU countries. They are most often close business connections: suppliers or clients. Remarkably enough, a substantial share of industrial firms tend to collaborate with universities.

9. To protect innovations, most firms tend to favour informal **protection methods**, such as complexity or lead-time advantage.

10. N**on-technological innovation** has severely dropped over the period 2010-2012.

ANALYSIS OF THE MAIN INDICATORS

0. INTRODUCTION

Every two years, under the auspices of Eurostat, a large innovation survey is conducted by national authorities in all EU countries (and even beyond). This survey, called CIS surveys (for Community Innovation Survey) is conducted in a coordinated and harmonized manner in all participating countries.

The latest survey, called CIS 2012, was conducted between January and October 2012 and focuses on the innovation activities of commercial firms during the period from 2010 to 2012 (both included). The Belgian Science Policy Office was responsible for coordinating the survey for Belgium, in collaboration with its regional partners (EWI for the Flemish Region, DGO6 for the Walloon Region and InnovIRIS for the Brussels Region).

This publication aims at giving an overview of the main results and teachings stemming from this survey for Belgium. Detailed tabulated results can be found on the website of the Belgian Science Policy Office, BELSPO: http://www.stis.belspo.be/en/statisticsCIS.asp

A more precise, technical, description of the CIS survey is provided in Annex 1.

I. MAIN CONCEPTS

According to the Oslo Manual (OECD, 2005), which is the ultimate reference on innovation statistics, an innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method or a new organisational method in business practices, workplace organisation or external relations (§146).

Key for an innovation is that it must be at least new to the firm.

Two main kinds of innovations are to be distinguished: product or process innovations on the one hand, and marketing or organisational innovations on the other hand. The former are called technological product and process innovations (TPP innovations), whereas the latter are termed non-technological innovations.

Innovation in the broad sense of the word refers to both kind of innovations, but in general more attention is devoted to the first kind, i.e. TPP innovations. In this publication, we cover in turn all three aspects: innovation in the broad sense of the term, TPP innovation and non-technological innovation.

Precise definitions of the main terms used in this publication are provided in Annex 2

II. INNOVATION IN THE BROAD SENSE OF THE TERM

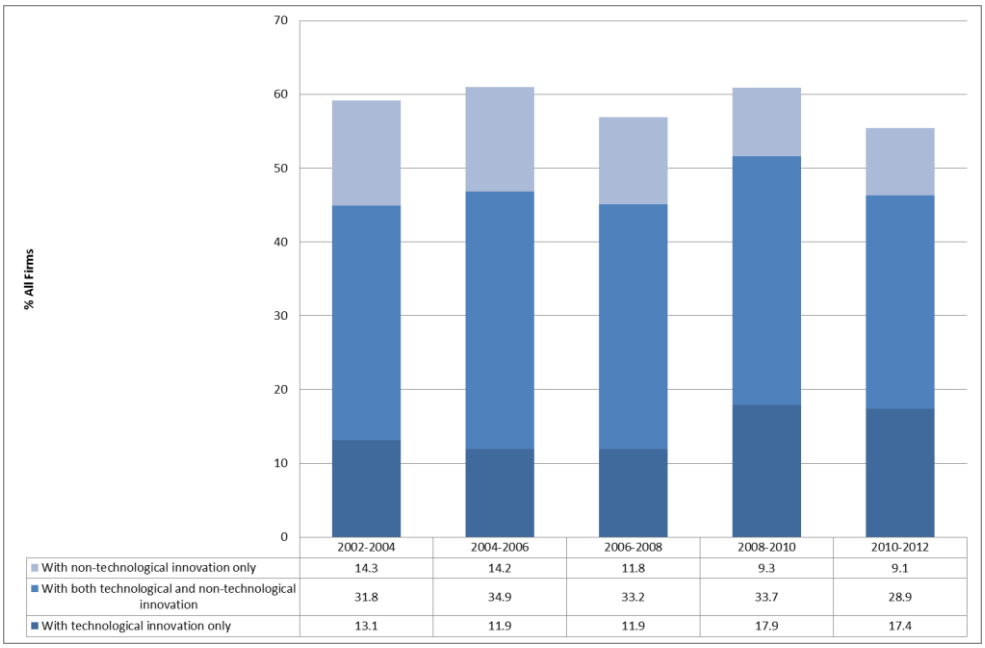
A. How innovative are firms? - The innovation rate

The *innovation rate* measures the proportion of firms that have introduced an innovation over a given period of time. It is often used as a metrics for the "innovativeness" of firms in a country. This indicator can be split along the various types of innovation. We focus here on the two main broad types: technological product or process innovation on the one hand and non-technological (marketing or organisational) innovation on the other hand. To go one step further, we can even discriminate between firms that have introduced only technological innovations, only non-technological innovations, and both forms of innovation.

1. How has innovation evolved across the crisis?

Figure 1 shows the evolution of the various innovation rates. It conveys several messages. First, regarding the effect of the crisis, after a slight drop in 2006-2008, the global innovation rate is again on the rise in 2008-2010. This was mainly due to an increase in the technological innovation rate. However, the global innovation rate decreased over the last period 2010-2012, stepping from 61% down to 55%. It may be the case that, in the aftermath of the crisis and in face of growing uncertainty about the macroeconomic future, firms have mostly engaged in cost-cutting activities. Second, whatever the period under scrutiny, a majority of enterprises is innovative, i.e. most of them introduced at least one form of innovation. Third, technological and non-technological innovations are complementary: a little less than 30% of all the firms have introduced both forms of innovations in 2010-2012. In other words, more than one-half of all innovating enterprises have introduced both forms of innovations[1].

Figure 1: Innovation rates – Evolution (2002-2012)



	2002-2004	2004-2006	2006-2008	2008-2010	2010-2012
With non-technological innovation only	14.3	14.2	11.8	9.3	9.1
With both technological and non-technological innovation	31.8	34.9	33.2	33.7	28.9
With technological innovation only	13.1	11.9	11.9	17.9	17.4

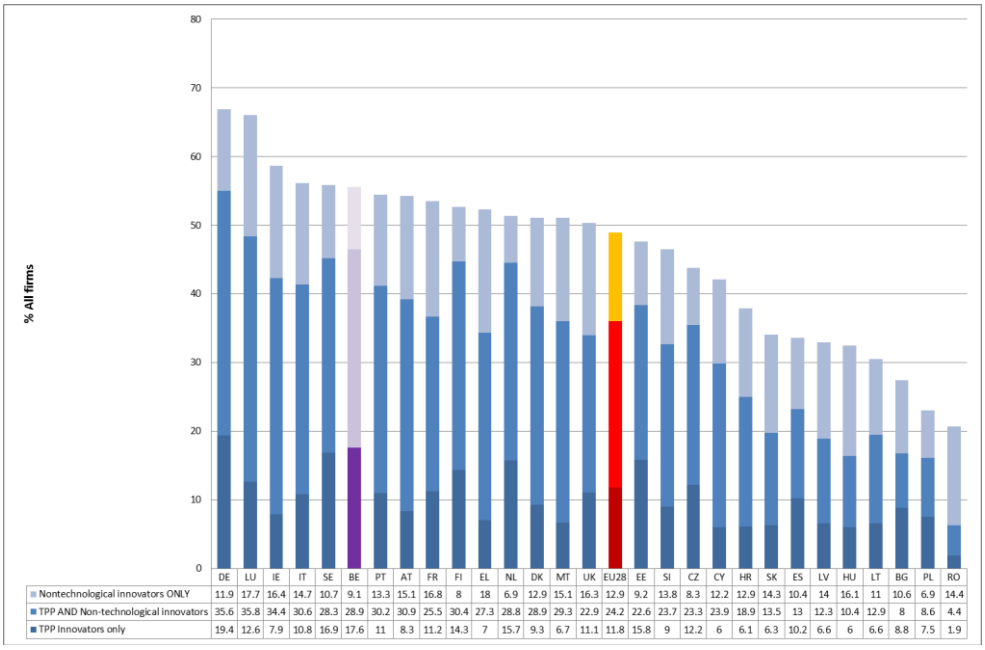
Source: Belspo

[1] It should be noted that these figures are based on a slightly restricted number of sectors, i.e. Core NACE activities according to Com.Reg. 1450/2004, to maintain inter-temporal comparability, see Annex 1 for more details.

2. How does Belgium compare internationally?

Figure 2 provides a comparison with Belgium's European partners. First, it can be seen that our country performs above average (the global innovation rate in Belgium is 55.6% versus 48.9% in the EU-28). Second, in most countries, mixed modes of innovation, i.e. firms introducing both technological and non-technological innovations, dominate the picture. Third, non-technological innovation is on average a little more frequent than technological innovation but these proportions have basically the same order of magnitude (In the EU-28, 36% of the firms have introduced technological innovations and 37.1% have introduced non-technological innovations). This is not the case in Belgium, where technological innovation (46.5%) is clearly more frequent than non-technological innovation (38%). The highest innovation rates are to be found in Germany and in Luxembourg. Belgium is part of a small set of countries lagging just behind these two leaders, together with Ireland, Italy, Sweden, Portugal and Austria. The lowest innovation rates are to be found in Romania and Poland.

Figure 2: Innovation rates – International comparison (2010-2012)



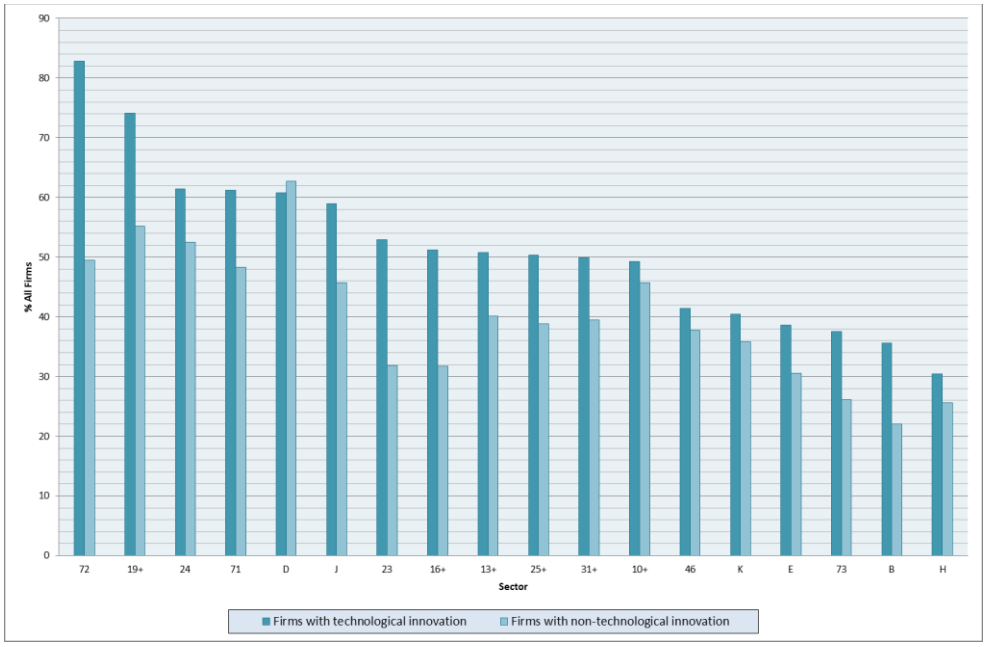
	DE	LU	IE	IT	SE	BE	PT	AT	FR	FI	EL	NL	DK	MT	UK	EU28	EE	SI	CZ	CY	HR	SK	ES	LV	HU	LT	BG	PL	RO
Nontechnological innovators ONLY	11.9	17.7	16.4	14.7	10.7	9.1	13.3	15.1	16.8	8	18	6.9	12.9	15.1	16.3	12.9	9.2	13.8	8.3	12.2	12.9	14.3	10.4	14	16.1	11	10.6	6.9	14.4
TPP AND Non-technological innovators	35.6	35.8	34.4	30.6	28.3	28.9	30.2	30.9	25.5	30.4	27.3	28.8	28.9	29.3	22.9	24.2	22.6	23.7	23.3	23.9	18.9	13.5	13	12.3	10.4	12.9	8	8.6	4.4
TPP Innovators only	19.4	12.6	7.9	10.8	16.9	17.6	11	8.3	11.2	14.3	7	15.7	9.3	6.7	11.1	11.8	15.8	9	12.2	6	6.1	6.3	10.2	6.6	6	6.6	8.8	7.5	1.9

Source: Eurostat

3. What are the most innovative sectors?

Turning to the innovation rates by branch of activity, Figure 3 allows for a series of interesting observations. For clarity reasons, we just indicate the NACE codes of the sectors. The precise meaning of these codes is provided in Table A just below. First, the top three sectors with the highest technological innovation rates are '*Scientific research and development*' (72), '*Manufacture of petroleum, chemical, pharmaceutical, rubber and plastic products*' (19+) and '*Manufacture of basic metals*' (24). As far as the R&D sector is concerned, the result is unsurprising. The chemical and pharmaceutical industry is very important in Belgium (the aggregate under consideration represents approximately 9% of both turnover and employment in the Core NACE[2] sectors) and its high degree of innovativeness is therefore highly welcome. As far as basic metals industry is concerned, the sector has historical importance in Belgium and is facing crucial challenges. Innovation is therefore vital. The top three sectors with respect to non-technological innovation are *'Electricity, gas, steam and air conditioning supply*', *'Manufacture of petroleum, chemical, pharmaceutical, rubber and plastic products*' and *'Manufacture of basic metals*'. These two latter sectors also belong to the top three most technologically innovative sectors. This highlights the high degree of complementarity between these two forms of innovations, that has already been underlined (the correlation coefficient across sectors is 0.8 in our sample). Thus, the more frequent technological innovation in a given sector, the more frequent non-technological innovation as well.

Figure 3: Innovation rates – By sector (2010-2012)



Source: Belspo

[2] See Annex 1

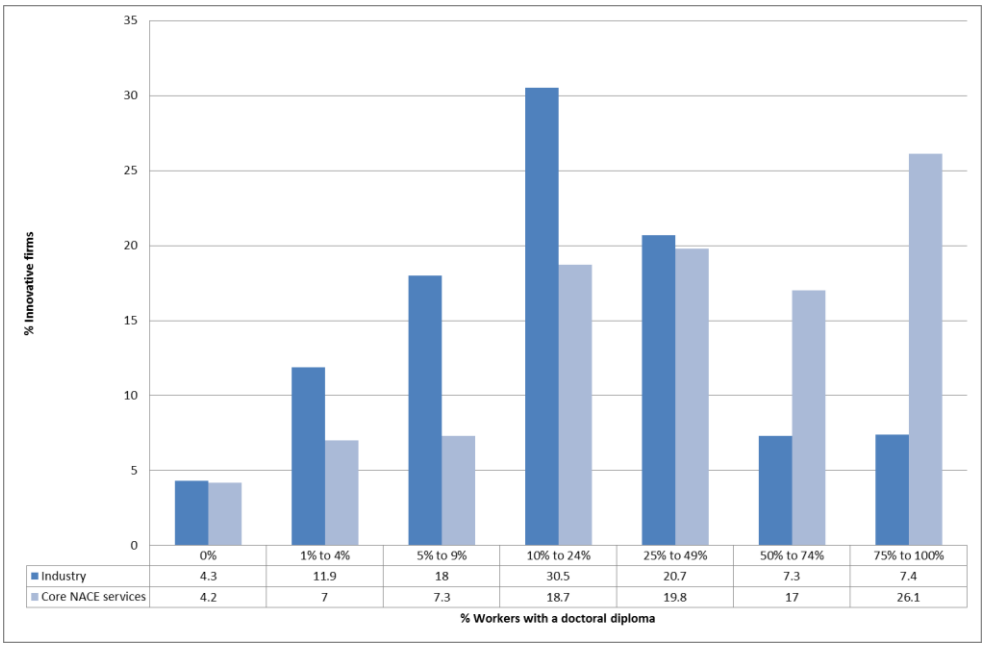
Table A. Selected sectors

Name	Nace Rev.2 Sections/Divisions	Description
Core NACE	Sections & divisions B-C-D-E-46-H-J-K-71-72-73	All mandatory sectors in the CIS
B	B	Mining and quarrying
10+	10 to 12	Manufacture of food products, beverages and tobacco
13+	13 to 15	Manufacture of textiles, wearing apparel, leather and related products
16+	16 to 18	Manufacture of wood, paper, printing and reproduction
19+	19 to 22	Manufacture of petroleum, chemical, pharmaceutical, rubber and plastic products
23	23	Manufacture of other non-metallic mineral products
24	24	Manufacture of basic metals
25+	25 to 30	Manufacture of fabricated metal products (except machinery and equipment); computer, electronic and optical products, electrical equipment; motor vehicles and other transport equipment
31+	31 to 33	Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment
D	D	Electricity, gas, steam and air conditioning supply
E	E	Water supply; sewerage, waste management and remediation activities
46	46	Wholesale trade, except of motor vehicles and motorcycles
H	H	Transportation and storage
J	J	Information and communication
K	K	Financial and insurance activities
71	71	Architectural and engineering activities; technical testing and analysis
72	72	Scientific research and development
73	73	Advertising and market research

B. Innovation and human capital

One of the most important inputs in the innovation process is the presence of a (highly) qualified workforce, especially where technological innovation is concerned. Figure 4 documents this and shows to what extent innovative firms employ doctorate holders. More precisely, it depicts the distribution of innovative firms according to the proportion doctorate holders they employ. We have separated the industry from the services. For instance, in the services sector, some 26% of innovative firms have between 75% and 100% of their workforce holding a doctoral diploma. In the industry sector, approximately 15% of the innovative firms have more than half of their workforce holding a doctoral diploma (the sum of the two dark blue bars at on the right side of the Figure). In both the industry and the services sector, less than 5% innovative firms employ no doctorate holders at all. There is a clear policy message emanating from Figure 4: to uphold innovation, governments should push on education and encourage the formation of a highly skilled workforce.

Figure 4: Innovation and human capital - Industry and services (2010-2012)



	0%	1% to 4%	5% to 9%	10% to 24%	25% to 49%	50% to 74%	75% to 100%
Industry	4.3	11.9	18	30.5	20.7	7.3	7.4
Core NACE services	4.2	7	7.3	18.7	19.8	17	26.1

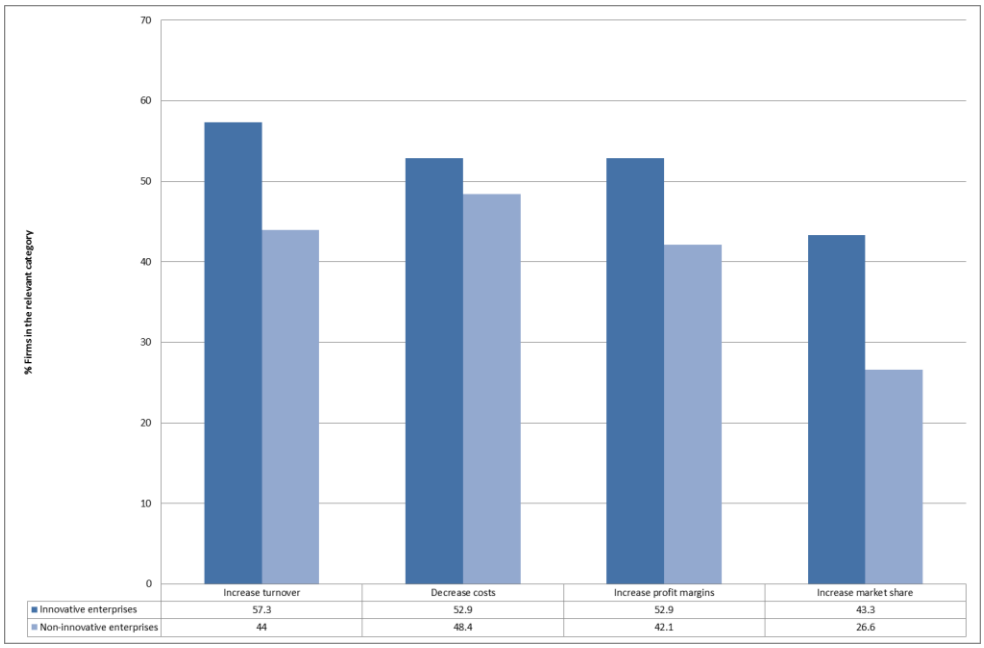
Source: Belspo

C. What do innovative enterprises aim at and how do they try to reach it? - Goals and strategies of innovators vs. non-innovators

1. What goals do firms pursue?

It is interesting to assess to what extent innovative enterprises pursue the same goals as non-innovative enterprises. To measure this, firms were asked to rate the importance of four main possible objectives: increase turnover, increase market share, decrease costs and increase profit margins. Figure 5 reports the percentage innovative and non-innovative firms that deemed these goals as 'highly important'. Accordingly, for innovative enterprises, the most important goal is to increase turnover. However, a majority of them also found that reducing costs and increase profit margin very important as well. The market share seems to be less of a concern. Non-innovative enterprises, on the other hand, mostly consider cost reduction as a very important goal. However, turnover and profit margins also appear to be important goals. Again, for these enterprises as well, market share issues do not appear to be their main concern.

Figure 5: Highly important goals of innovative and non-innovative firms (2010-2012)

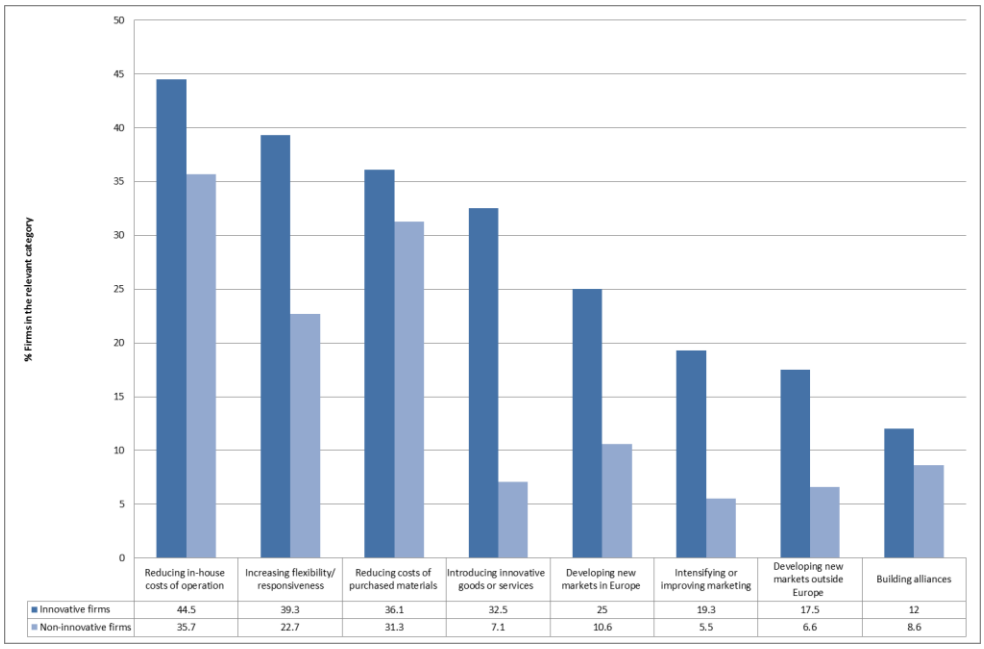


Source: Belspo

2. How do they reach their goals? - Highly important strategies

To reach their corporate objectives, firms may set up some strategies, which may differ according to whether they are innovative or not. They were asked to rate the importance of a number of possible strategies. Figure 6 reports the percentage firms that rated each proposed strategy as highly important. Amongst innovative firms, the most important strategies include cost reduction, especially operating costs, improving flexibility and the introduction of innovations. On the other hand, non-innovative firms mostly aim at implementing cost reduction strategies and, to a lesser extent improving their flexibility as well. Neither innovative, nor non-innovative firms often deem marketing-based strategies or the building of strategic alliances as highly important.

Figure 6: Highly important strategies for innovative and non-innovative firms (2010-2012)



	Reducing in-house costs of operation	Increasing flexibility/ responsiveness	Reducing costs of purchased materials	Introducing innovative goods or services	Developing new markets in Europe	Intensifying or improving marketing	Developing new markets outside Europe	Building alliances
Innovative firms	44.5	39.3	36.1	32.5	25	19.3	17.5	12
Non-innovative firms	35.7	22.7	31.3	7.1	10.6	5.5	6.6	8.6

Source: Belspo

D. Public procurement and innovation

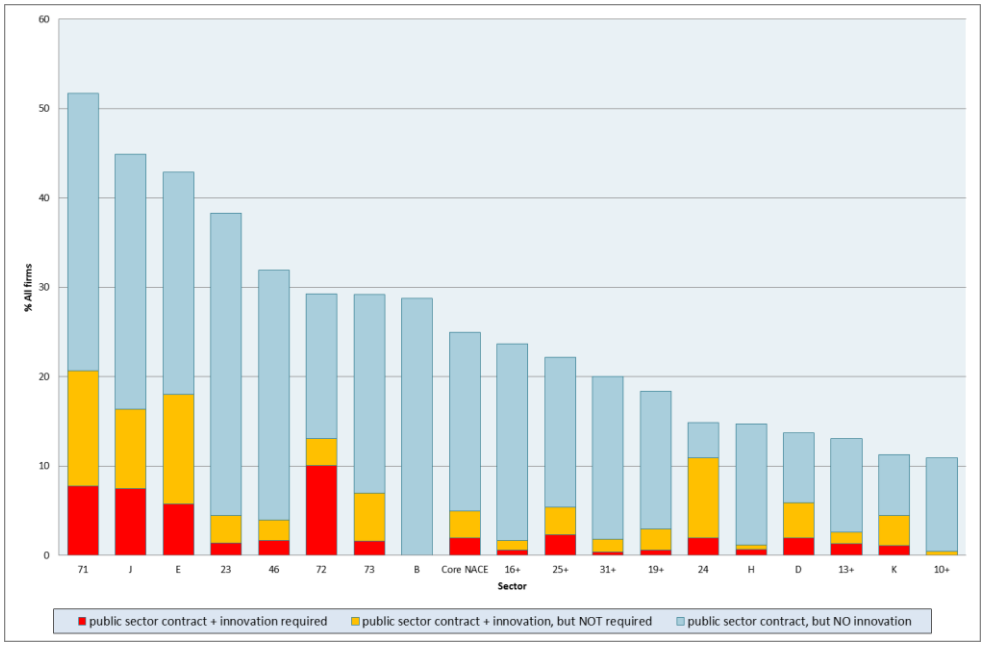
Among the many tools public authorities may use to foster innovation, one of them increasingly attracts attention: public procurement. That is, through targeted procurement policy and commercial contracts, they may induce private firms to introduce innovations. These innovations can be formally part of the contract (the government needs something that does not exist yet), or can be a by-product of the contract (at some point of time the firm needs to innovate in order to meet its obligations). However, many contracts with the public sector may also involve no innovation at all.

The indicator presented here measures the proportion of firms that have received public procurement contracts, broken down by whether innovation was required; innovation occurred but was not part of the contract; or whether no innovation at all was involved.

Figure 7 provides the results for Belgium, by branch of activity. The list of sectors is provided in Table A below. 0n average 25% of the firms have received public procurement contract and 5% of them have introduced innovations in relation with these contracts (that is, 20% of the contracts have led to the implementation of innovations). There is however a great variance around these figures, depending on the sector. In *'Architectural and engineering activities'* (71), approximately 50% of the firms have received public contracts, and in 20.9% of the firms, this led to the introduction of an innovation. In the *'Information and communication'* (J) and in the *'Water supply, waste management and remediation activities'* (E) sectors, more than 40% of the firms have received public contracts and respectively 16.4% and 18% of the firms in these industries have introduced an innovation consequently. On the other hand, in the *'Mining and quarrying'* sector (B), 28.8% of the firms have entered public procurement contract but no innovation was introduced in connection with these. Finally, only a small fraction of the firms in the '*Textile*' sector (13+), in the *'Food, beverages, and tobacco*' sector (10+) and in the *'Financial and insurance activities'* sector (K) have received public procurement contracts (though these contracts pushed many firms in the financial sector to innovate).

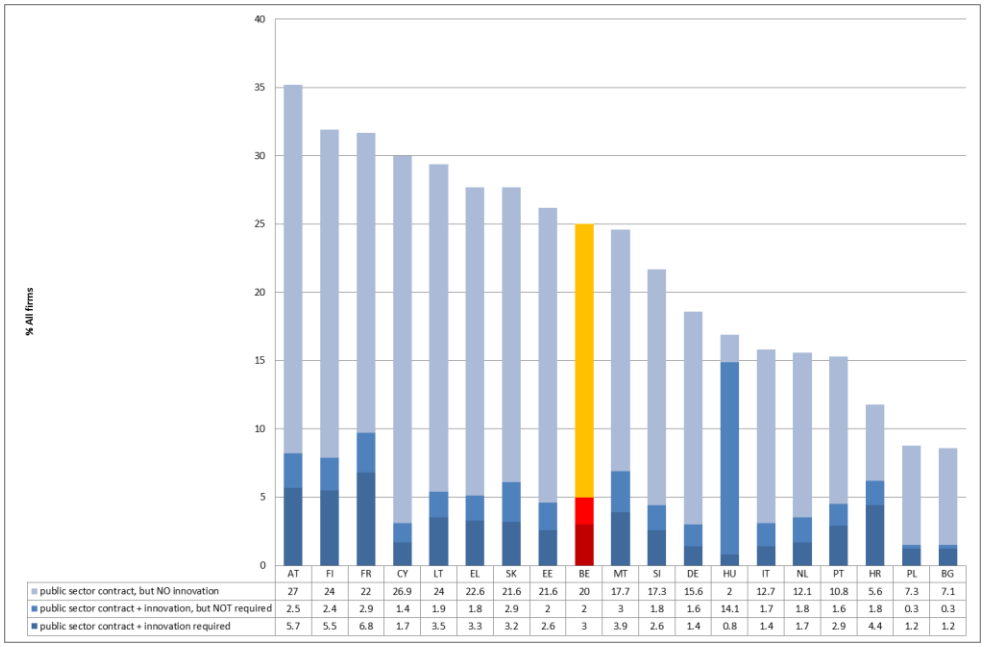
Figure 8 provides an international comparison, in order to assess how Belgium performs with regard of its main European neighbours. Belgium seems close to the European average. However there are large discrepancies around this average. In Austria, Finland and France, more than one-third of the firms have received public procurement contracts and in more than 5% of the cases, innovation was part of the contract. In Hungary, only 16.9% of the firms have received public procurement contracts, but in close to 15% of the cases, these led to the introduction of innovations (the overwhelming majority of which were not a priori part of the contract). Finally, in Poland and Bulgaria, less than 10% of the firms have received public procurement contracts.

Figure 7: Public procurement and innovation - By sector (2010-2012)



Source: Belspo

Figure 8: Public procurement and innovation - International comparison (2010-2012)



	AT	FI	FR	CY	LT	EL	SK	EE	BE	MT	SI	DE	HU	IT	NL	PT	HR	PL	BG
public sector contract, but NO innovation	27	24	22	26.9	24	22.6	21.6	21.6	20	17.7	17.3	15.6	2	12.7	12.1	10.8	5.6	7.3	7.1
public sector contract + innovation, but NOT required	2.5	2.4	2.9	1.4	1.9	1.8	2.9	2	2	3	1.8	1.6	14.1	1.7	1.8	1.6	1.8	0.3	0.3
public sector contract + innovation required	5.7	5.5	6.8	1.7	3.5	3.3	3.2	2.6	3	3.9	2.6	1.4	0.8	1.4	1.7	2.9	4.4	1.2	1.2

Source: Eurostat

Table A. Selected sectors

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73	73	Advertising and market research

III. TECHNOLOGICAL INNOVATION

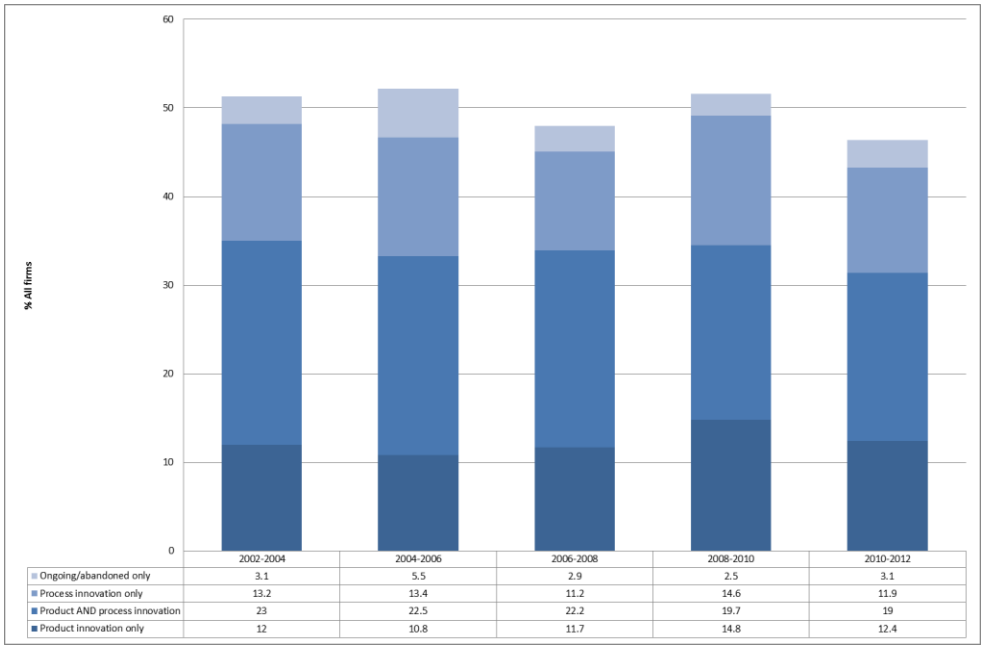
A. The technological innovation rate

Technological innovation is about product (goods or services) and process innovation. By analogy with innovation in the broad sense of the term, the *technological innovation rate* is defined as the percentage enterprises with having introduced technological innovations (including firms with still on-going or abandoned innovation projects).

1. How has technological innovation evolved during the last decade?

Figure 9 gives an overview of the evolution of the technological innovation rate[3] and its main components, i.e. product and process innovations, over the last decade. After a drop in 2006-2008, and a rebound in 2008-2010, the technological innovation rate dropped again in 2010-2012, in its two dimensions. Only 31.4% of all firms introduced product innovations, down from 34.5% in 2008-2010. Similarly, only 30.9% of all firms introduced process innovations, down from 34.3% in 2008-2010. The prevalence of mixed modes of innovation (product AND process) is also remarkable, as about 45% of the technological innovators have introduced both product and process innovations in 2010-2012.

Figure 9: Technological innovation rate - Evolution (2002-2012)



	2002-2004	2004-2006	2006-2008	2008-2010	2010-2012
Ongoing/abandoned only	3.1	5.5	2.9	2.5	3.1
Process innovation only	13.2	13.4	11.2	14.6	11.9
Product AND process innovation	23	22.5	22.2	19.7	19
Product innovation only	12	10.8	11.7	14.8	12.4

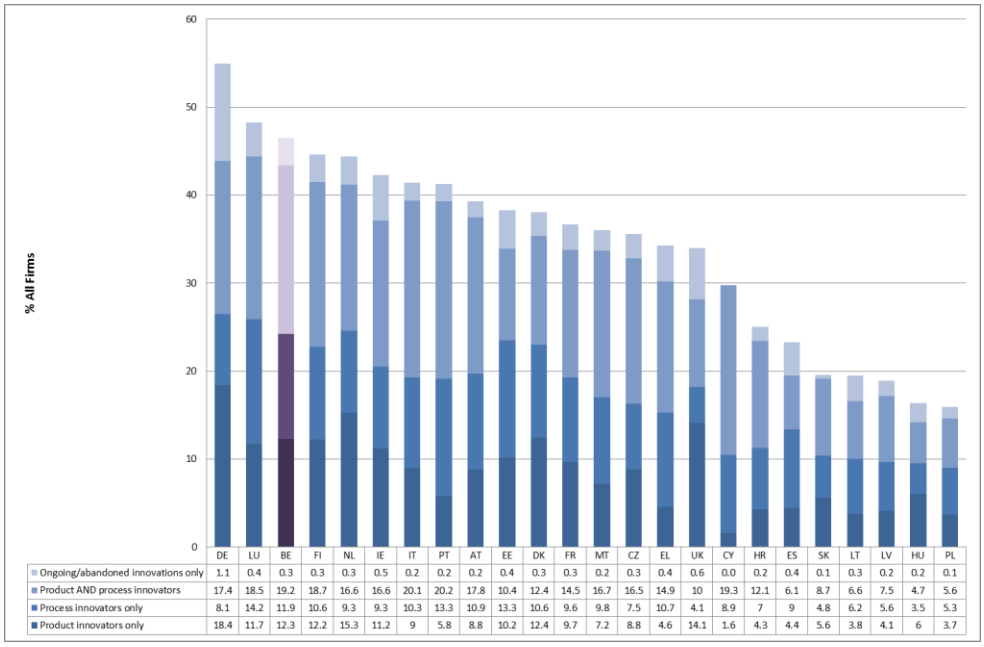
Source: Belspo

[3] These figures are based on a slightly restricted number of sectors, i.e. Core NACE activities according to Com.Reg. 1450/2004, to maintain inter-temporal comparability, see Annex 1 for more details.

2. How does Belgium compare internationally?

Figure 10 places Belgium in its European context and compares its performances with those of its neighbours. Belgium ranks in the top 3, just behind Germany and Luxembourg. With a technological innovation rate of 46.5% the country is well above the EU-28 average, which is 36% (not displayed on the Figure below). The lowest performances are to be found in Hungary and Poland. The proportions of pure product-, pure process-, and mixed innovators vary greatly across countries. In the UK, for instance, the relative share of mixed innovators is much lower than in Belgium.

Figure 10: Technological innovation rate - International comparison (2010-2012)



	DE	LU	BE	FI	NL	IE	IT	PT	AT	EE	DK	FR	MT	CZ	EL	UK	CY	HR	ES	SK	LT	LV	HU	PL
Ongoing/abandoned innovations only	1.1	0.4	0.3	0.3	0.3	0.5	0.2	0.2	0.2	0.4	0.3	0.3	0.2	0.3	0.4	0.6	0.0	0.2	0.4	0.1	0.3	0.2	0.2	0.1
Product AND process innovators	17.4	18.5	19.2	18.7	16.6	16.6	20.1	20.2	17.8	10.4	12.4	14.5	16.7	16.5	14.9	10	19.3	12.1	6.1	8.7	6.6	7.5	4.7	5.6
Process innovators only	8.1	14.2	11.9	10.6	9.3	9.3	10.3	13.3	10.9	13.3	10.6	9.6	9.8	7.5	10.7	4.1	8.9	7	9	4.8	6.2	5.6	3.5	5.3
Product innovators only	18.4	11.7	12.3	12.2	15.3	11.2	9	5.8	8.8	10.2	12.4	9.7	7.2	8.8	4.6	14.1	1.6	4.3	4.4	5.6	3.8	4.1	6	3.7

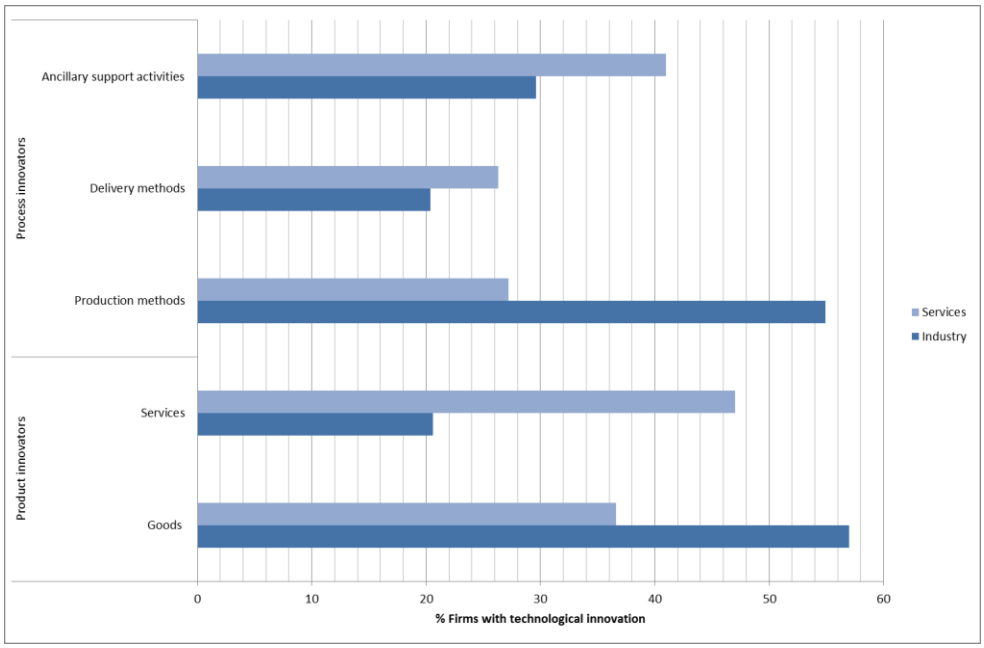
Source: Eurostat

3. What type of technological innovations?

The Oslo Manual, and consequently the CIS survey, considers two types of product innovations and three types of process innovations. Product innovations can be either goods innovations, or services innovations. Process innovations can take three forms: new or significantly improved production methods, delivery methods, or techniques, equipment and software in ancillary support activities.

Figure 11 shows to what extent technological innovators have introduced one of the innovation types mentioned above. The indicator is the percentage firms with technological innovation that have introduced one of these types of innovations. Accordingly there are some differences between the industry and the services sector. In the industry, the most commonly implemented types of innovations are new or significantly improved production methods and goods innovation. In the services sector, on the contrary, innovations in or techniques, equipment and software in ancillary support activities and services innovations are the most frequent innovations. However, it should be noted that 36.6% of the TPP innovative firms in the services sector have introduced goods innovations and conversely, 20.6% of the TPP innovative firms in the industry sector have introduced services innovation. This points out at the blurring frontiers between industry and services and at the complementarity between goods and services innovations (the introduction of a new good often calls for the introduction of new accompanying services and vice-versa).

Figure 11: Technological innovation – By type of innovation (2010-2012)

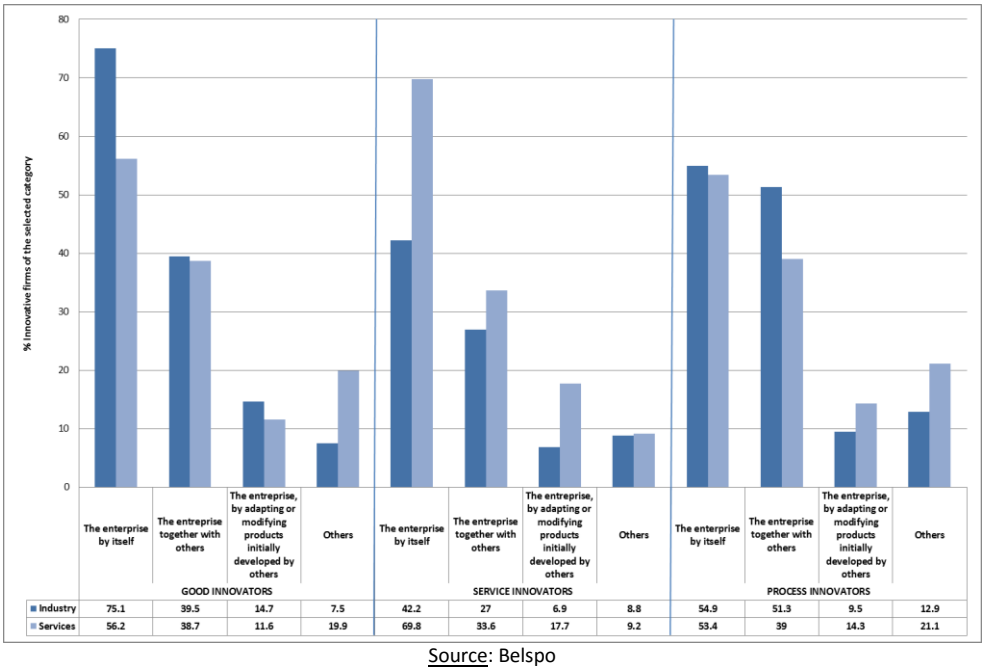


Source: Belspo

B. Who developed these innovations?

To understand how firms innovate, it is important to assess to what extent they were associated in the process of development of these innovations. Did the firm just take off the shelf something already existing? Did it copy and modify an existing product? Did it develop the innovation on its own or possibly in collaboration with other enterprises or institutions? Figure 12 brings an answer to these questions. It shows, for three types of innovators (goods innovators, services innovators, and process innovators), the extent to which they developed their innovations by themselves, or in collaboration with another organisation, or by adaptation of existing products or processes, or by just picking up something already on the market. Results show that for all three categories of innovators, the majority of them either developed their innovations on their own, or in collaboration with other bodies. But mere adaptation/modification or appropriation of existing products or processes seems to be a marginal behaviour.

Figure 12: Product and process innovations - Who developed these? (2010-2012)



	GOOD INNOVATORS				SERVICE INNOVATORS				PROCESS INNOVATORS			
	The enterprise by itself	The entreprise together with others	The entreprise, by adapting or modifying products initially developed by others	Others	The enterprise by itself	The entreprise together with others	The entreprise, by adapting or modifying products initially developed by others	Others	The enterprise by itself	The entreprise together with others	The entreprise, by adapting or modifying products initially developed by others	Others
Industry	75.1	39.5	14.7	7.5	42.2	27	6.9	8.8	54.9	51.3	9.5	12.9
Services	56.2	38.7	11.6	19.9	69.8	33.6	17.7	9.2	53.4	39	14.3	21.1

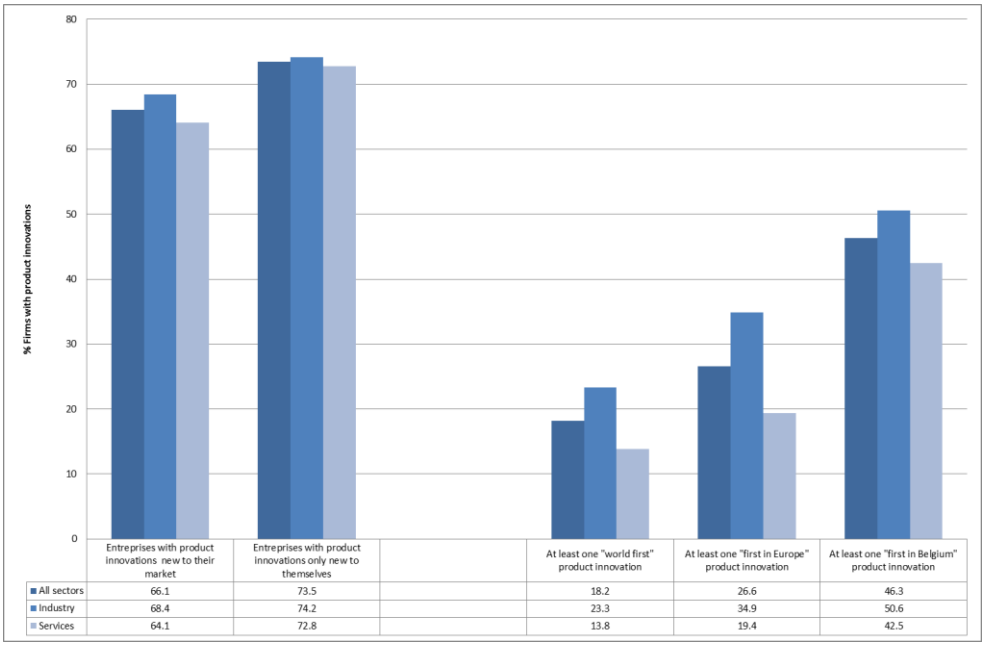
Source: Belspo

C. How novel are these innovations?

1. General panorama

As illustrated in the previous Section, even though a majority of technological innovators choose to develop themselves of in collaboration their innovations, some of them adapt, modify, en even just copy existing product or processes. A new product or process is considered as an innovation as soon as it is new to the firm, but it doesn't need to be new to the firm's market. If it is the case, if the innovation is indeed new to the market as well, then it can be considered as more 'radical'. Beyond this, the market itself can be used to assess the degree of novelty of product innovations: are they new to the world, to Europe, or just to Belgium? Figure 13 sheds some light on the degree of novelty of product innovations in Belgium. It shows the percentage of product innovators according to the degree of novelty of their innovations. Accordingly, more 'radical' innovations are not as frequent as less 'radical' ones. Some 46.3% of innovative firms have introduced at novelties that are new to Belgium whereas only 18.2% of them have introduced at least one innovation that is a 'world premiere'. However, it turns out that a majority of innovators (66.1%) have introduced an innovation that is new to their market, however defined.

Figure 13: Degree of novelty of product innovations - Industry and services (2010-2012)



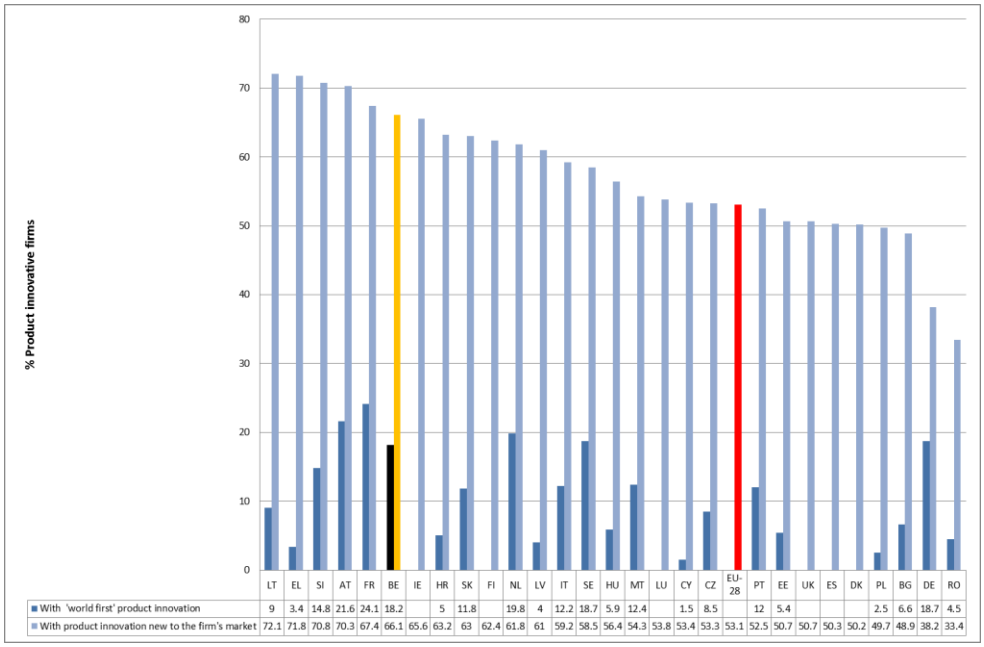
	Entreprises with product innovations new to their market	Entreprises with product innovations only new to themselves	At least one "world first" product innovation	At least one "first in Europe" product innovation	At least one "first in Belgium" product innovation
All sectors	66.1	73.5	18.2	26.6	46.3
Industry	68.4	74.2	23.3	34.9	50.6
Services	64.1	72.8	13.8	19.4	42.5

Source: Belspo

2. International comparison

Figure 14 compares Belgium with its European neighbours. We have only considered the 'radical innovation' variables, i.e. the introduction of product innovations that are new to the world or at least to the firm's market. For both variables, Belgium ranks 6th, and is well above the EU average. Some 18.2% of product innovative firms in Belgium have introduced at least one innovation that is new to the world, whereas the sample average is 10.9%, and 66% of them have introduced innovations that are new to their market (the EU average is 53%)

Figure 14: Degree of novelty of product innovations - International comparison (2010-2012)



	LT	EL	SI	AT	FR	BE	IE	HR	SK	FI	NL	LV	IT	SE	HU	MT	LU	CY	CZ	EU-28	PT	EE	UK	ES	DK	PL	BG	DE	RO
With 'world first' product innovation	9	3.4	14.8	21.6	24.1	18.2		5	11.8		19.8	4	12.2	18.7	5.9	12.4		1.5	8.5		12	5.4				2.5	6.6	18.7	4.5
With product innovation new to the firm's market	72.1	71.8	70.8	70.3	67.4	66.1	65.6	63.2	63	62.4	61.8	61	59.2	58.5	56.4	54.3	53.8	53.4	53.3	53.1	52.5	50.7	50.7	50.3	50.2	49.7	48.9	38.2	33.4

Source: Eurostat

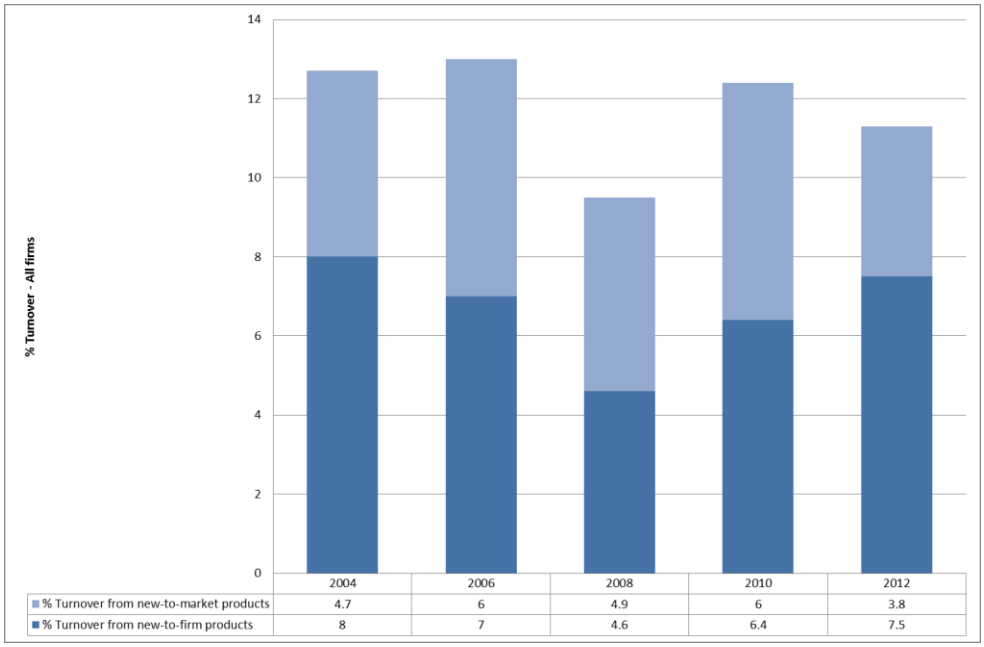
D. Turnover from innovation – Reaping the returns from innovation

The indicator under analysis in this section is ratio of turnover from product innovations to total turnover. It is used to measure the importance of innovation to the economy. It is also possible to refine this indicator according to the degree of novelty of innovations, and disentangle the turnover generated by new-to-firm-only product innovations from the one coming from new-to-market product innovations.

1. How has turnover from product innovations evolved?

Figure 15 shows the evolution of the turnover from innovative products for all firms[4]. Clearly, the economic crisis seems to have had a large impact, as the indicator dropped in 2008 to less than 10%, while it used to above 12% in the previous periods. However, it went back to its normal level in 2010, but then it shrank again somehow in 2012. The decrease is clearly due to turnover from new-to-market products, which decreased from 6% to 3.8% of total turnover. On the contrary, turnover from new-to-firm only innovative products rose from 6.4% to 7.5%.

Figure 15: Turnover from product innovations – Evolution 2004-2012



	2004	2006	2008	2010	2012
% Turnover from new-to-market products	4.7	6	4.9	6	3.8
% Turnover from new-to-firm products	8	7	4.6	6.4	7.5

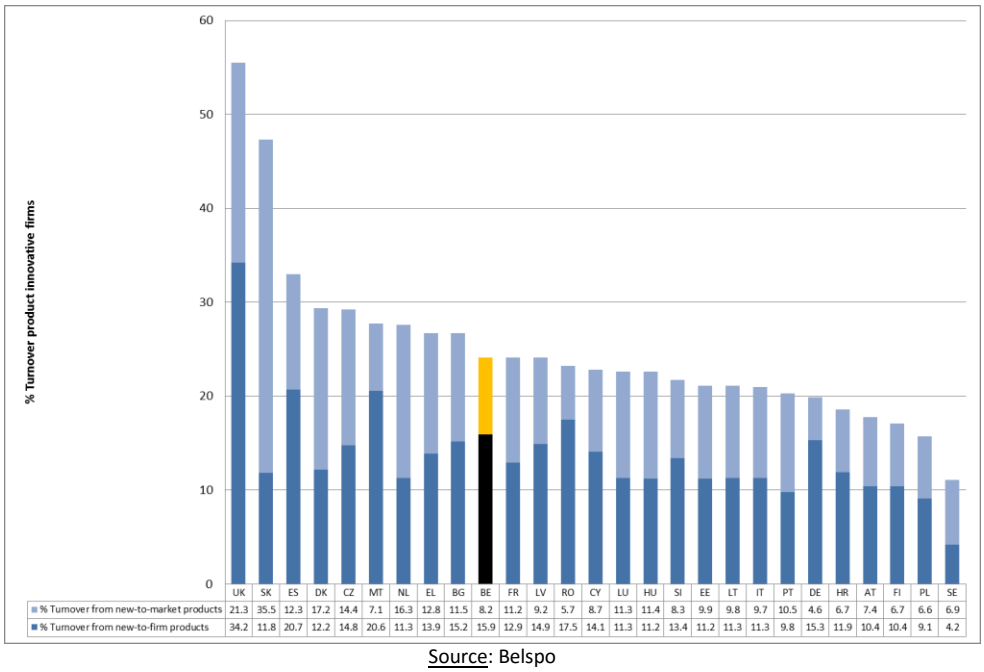
Source: Belspo

[4] These figures are based on a slightly restricted number of sectors, i.e. Core NACE activities according to Com.Reg. 1450/2004, to maintain inter-temporal comparability, see Annex 1 for more details.

2. International comparison

Figure 16 provides an international comparison for 2012. To get meaningful comparisons, we restrict the analysis to product innovative firms. Belgium scores less well than the average (the total turnover from innovative products is 24.1% in Belgium against a sample average around 24.9%) and can thus be considered as a 'follower'. This result can be explained by the weak share of turnover from new-to-market products. In Section III.C above, on the degree of novelty of innovations, it was shown that a large proportion of innovative firms in Belgium implement new-to-market innovations. Combining these two findings, a low turnover from new-to-market products but a large proportion of firms introducing new-to-market products, it seems than firms in Belgium have a problem in converting their innovative efforts in economically significant results.

Figure 16: Turnover from product innovations – International comparison (2012)



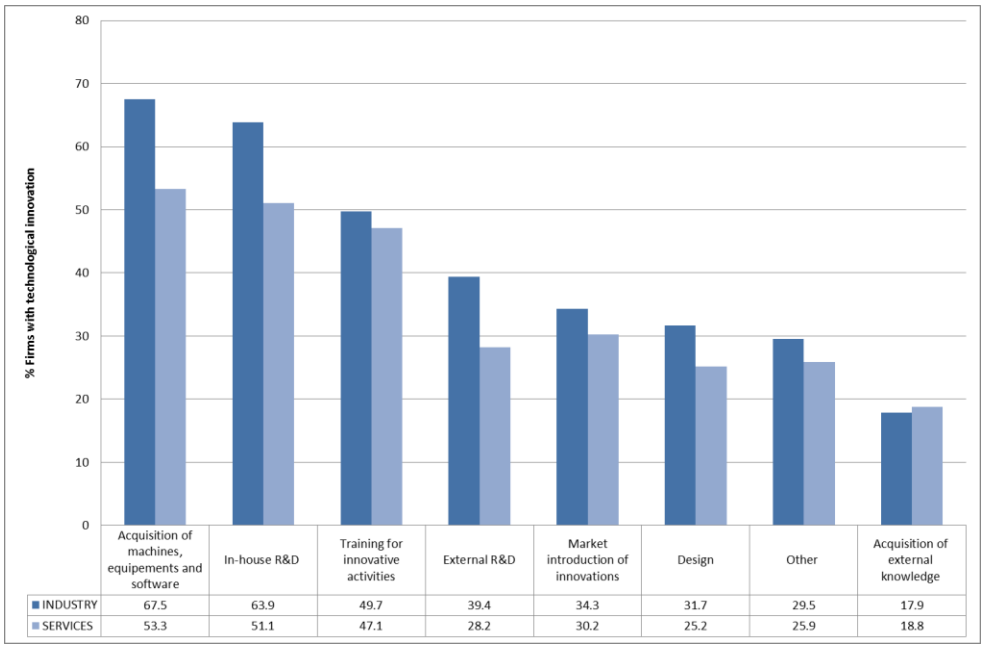
	UK	SK	ES	DK	CZ	MT	NL	EL	BG	BE	FR	LV	RO	CY	LU	HU	SI	EE	LT	IT	PT	DE	HR	AT	FI	PL	SE
% Turnover from new-to-market products	21.3	35.5	12.3	17.2	14.4	7.1	16.3	12.8	11.5	8.2	11.2	9.2	5.7	8.7	11.3	11.4	8.3	9.9	9.8	9.7	10.5	4.6	6.7	7.4	6.7	6.6	6.9
% Turnover from new-to-firm products	34.2	11.8	20.7	12.2	14.8	20.6	11.3	13.9	15.2	15.9	12.9	14.9	17.5	14.1	11.3	11.2	13.4	11.2	11.3	11.3	9.8	15.3	11.9	10.4	10.4	9.1	4.2

Source: Belspo

E. Innovation activities – What do technological innovators actually do?

What kind of activities do companies undertake in order to develop and implement their innovations? What are the most frequent practices? A natural first guess would be technical research and development (R&D). But innovation is a much broader concept, that does not necessarily entails R&D activities, and that may require engaging in a number of other actions. The CIS survey provides companies with a list of potential activities and asks them in which they engaged to develop their innovations. This list includes the following items: (i) intramural (internal) R&D, (ii) extramural R&D (i.e. R&D bought from an external contractor); (iii) purchase of machinery, software, or equipment for innovation purposes; (iv) acquisition of other external knowledge (existing know-how, copyrighted works, patented and non-patented inventions, etc.); (v) training for innovative activities; (vi) market introduction of innovations (including market research and launch advertising); (vii) design (i.e. activities to design or alter the shape or appearance of goods or services); and (viii) other non-specified activities (such as feasibility studies, testing, tooling up, industrial engineering, etc.). Figure 17 indicates the proportion of innovative firms that engaged in each of these activities. The most prevalent behaviour is the acquisition of machinery, closely followed by intramural R&D. These activities are conducted by more a majority of innovative firms. Close to 50% of innovators also engage in training for innovative activities.

Figure 17: Activities for technological innovation - Industry and services (2010-2012)



	Acquisition of machines, equipements and software	In-house R&D	Training for innovative activities	External R&D	Market introduction of innovations	Design	Other	Acquisition of external knowledge
INDUSTRY	67.5	63.9	49.7	39.4	34.3	31.7	29.5	17.9
SERVICES	53.3	51.1	47.1	28.2	30.2	25.2	25.9	18.8

Source: Belspo

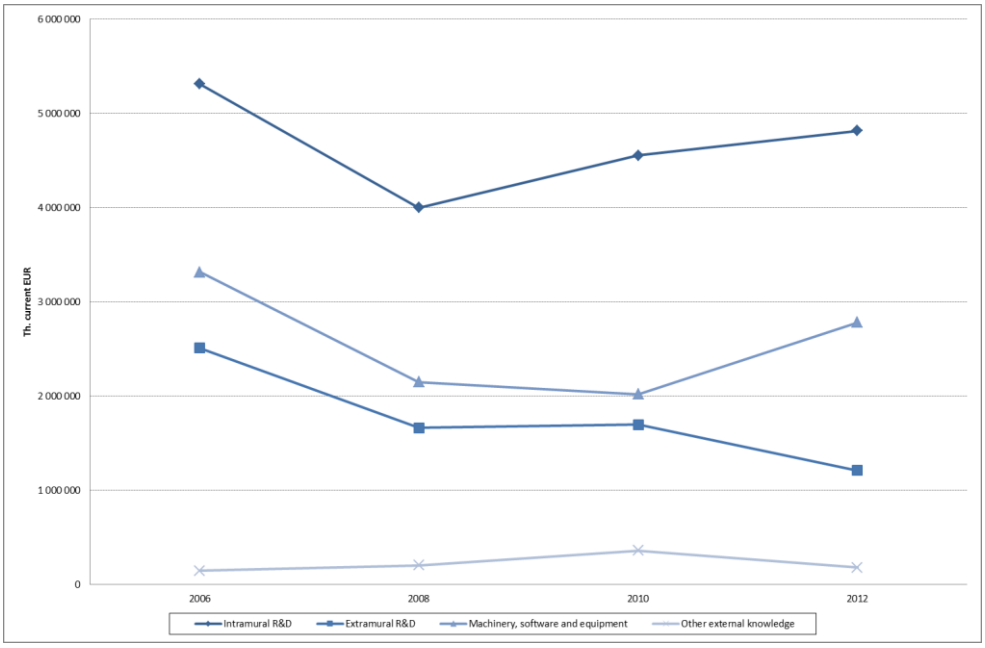
F. Innovation expenditures

How much do technologically innovative firms spend on innovation activities? The question is of paramount importance since a fundamental objective of innovation policy is to encourage companies to invest more (and better) in innovation. Another dimension of interest is the split between R&D-related and non-R&D innovation expenditures, as innovation is a far broader concept than just R&D, and the possible link between that split and innovation performances

1. Recent evolution

For comparability reasons, we only focus here on four specific items: (i) intramural R&D; (ii) extramural R&D; (iii) acquisition of machinery, software and equipment for innovation; and (iv) the acquisition of other external knowledge (patents, licences, etc.). Expenditures for the other innovation activities (design, training, etc.) were only included in the latest and forthcoming versions of the CIS, and therefore cannot be used for inter-temporal comparisons. Also, the figures for R&D investments differ from the official Belgian R&D figures[5], as both the methodology and coverage are different. Looking at the evolution over time[6], Figure 18 shows the effects of the crisis on all expenditure items (but for other external knowledge) in 2008, in the aftermath of a flourishing 2006. Then internal R&D expenditures bounced back in 2010 while external R&D expenditures stabilized and investments in machinery, etc. slightly decreased. Investments in other external knowledge slightly increased. In 2012, Internal R&D expenditures kept on increasing, though at a lower rate, while there's been a boom in investments in machinery, etc. Both external R&D expenditures and acquisition of other external knowledge, however, suffered a decline. In all periods under review, intramural R&D expenditures is the highest outlay, followed by investments in software, machinery and equipment for innovation.

Figure 18: Innovation expenditures – Evolution (2006-2012)



Source: Belspo

[5] Official R&D figures for Belgium can be found on the STIS website, at the following address: http://www.stis.belspo.be/en/statisticsRD.asp

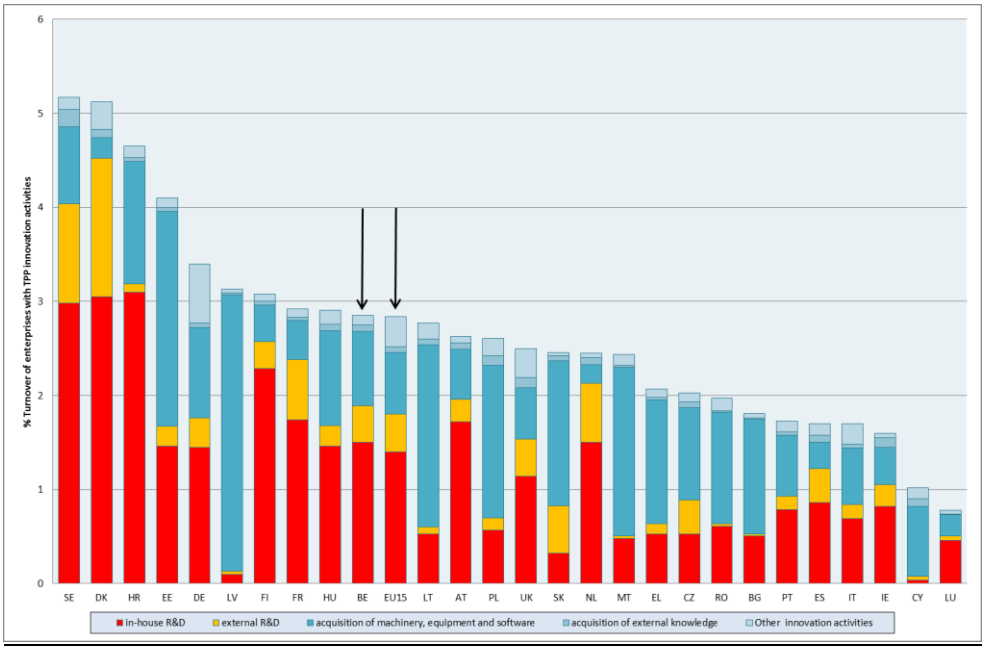
[6] These figures are based on a slightly restricted number of sectors, i.e. Core NACE activities according to Com. Reg. 1450/2004, to maintain inter-temporal comparability, see Annex 1 for more details.

2. *International comparison*

2.1. The innovation intensity

How does Belgium compare internationally? Do Belgian innovative firms invest more, or less, in innovation than their competitors in neighbouring countries? To document this with internationally comparable data, we compute an indicator called the *innovation intensity*, which is the ratio of innovation expenditures to total turnover, for innovative firms. This alleviates size effects (gross expenditures being normally larger in larger countries). We also discriminate between the various expenditure items. Results are depicted on Figure 19**.** Belgium is slightly above the EU-15 average and can be seen as a 'follower', being part of a group that includes, e.g. France, Hungary and Lithuania. The top 3 investors are Sweden, Denmark and to a lesser extent Croatia. Turning to the mix between the various kinds of expenditures, there appears to be a great deal of heterogeneity. To show this, we have coloured the two R&D-related items in red and orange and the other items in various shades of blue. Belgian firms, along with their counterparts in Sweden, Denmark, Finland, France, Austria and The Netherlands, invest more heavily in R&D. On the contrary, firms in e.g. Latvia, Lithuania, Poland, Slovakia, or the Czech Republic tend to put more emphasis on non-R&D innovation expenditures, and in particular on machinery and equipment.

Figure 19: Innovation intensity – International comparison (2012)

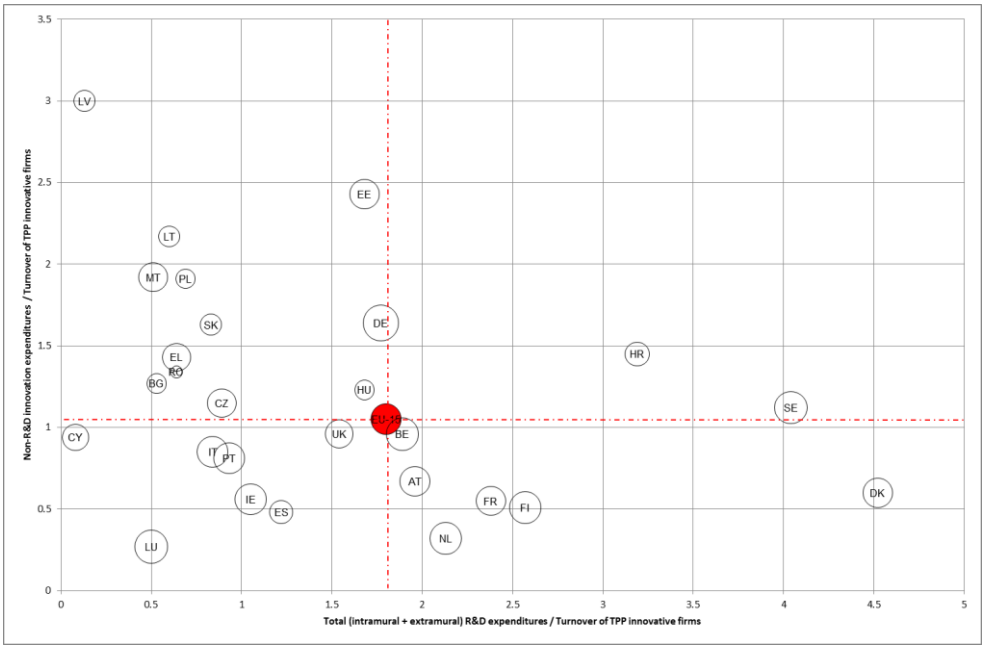


Source: Eurostat

2.2. R&D vs. Non-R&D innovators

In this Section, we try and build a typology of the various European countries, according to whether their firms invest relatively more in R&D-related items or in non-R&D items. Figure 20 shows the results. On the horizontal axis, we have the innovation intensity in R&D-related items, whereas the vertical axis is the innovation intensity in non-R&D items. To relate this to innovativeness, the size of the bullet corresponds to the technological innovation rate[7]. The two dotted lines represent the EU-15 average in both dimensions. Four groups of countries emerge from the analysis. In the upper-left quadrant, we have countries that, as compared to the EU-15, invest relatively more heavily in non-R&D items but less heavily in R&D-related items. Countries like, e.g. Latvia, Estonia, Lithuania, Poland, Slovakia or Malta are to be found in this group. In the lower left quadrant, we have countries that invest relatively less than the EU-15 average in both dimensions. That group includes Luxembourg, Ireland, Spain, Italy, Portugal, or Cyprus. On the contrary, the upper right quadrant gathers countries that invest relatively more than the EU-15 average in both dimensions. Only Croatia and Sweden belong to that group. The lower right quadrant encompasses countries that invest relatively more in R&D-related activities and less in non-R&D activities than the EU-15 average. The Netherlands, France, Finland and Denmark are part of this group. Finally, a set of countries that are close to the EU average in both dimensions can be told apart. These include Belgium, Austria, The United Kingdom Germany and Austria.

Figure 20. R&D vs. non-R&D investments in innovation - International comparison



Source: Eurostat

[7] Percentage firms with TPP innovations, see Section III.A. above.

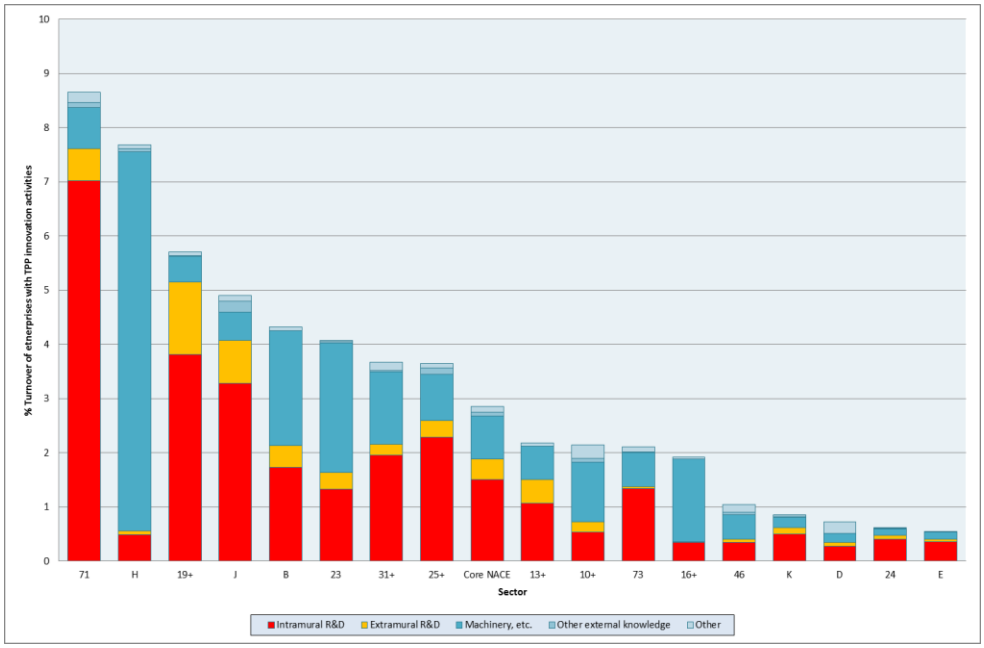
3. *By sector of activity*

What are the sectors that invest the most in innovation? Are there wide discrepancies between the various industries under consideration? To answer these questions, we perform the same kind of analysis as in Section 2 above.

3.1. The innovation intensity

Figure 21 shows the innovation intensity (ratio of innovation expenditures to turnover for TPP innovative firms), by branch of activity. The list of sectors under consideration is detailed in Table A below. We excluded the R&D sector, as innovative enterprises there invest 68.2% of their turnover in innovation, versus an average of 2.6% in the other sectors. Besides, the R&D sector is not representative, as it performs R&D on behalf of the other sectors. The top 3 spenders are *'Architectural and engineering activities; technical testing and analysis*' (71), *'Transportation and storage*' (H), and *'Manufacture of petroleum, chemical, pharmaceutical, rubber and plastic products*' (19+). There are however huge discrepancies in the mix between the various kind of expenditures. R&D related expenditures are coloured in red and orange, and the other expenditures are in shades of blue. It so appears that, for instance, in the 2nd most intensive sector ('*Transportation and storage*', H), the main bulk of expenditures lies in the acquisition of machinery, equipment and software.

Figure 21: Innovation intensity – By sector (2012)*



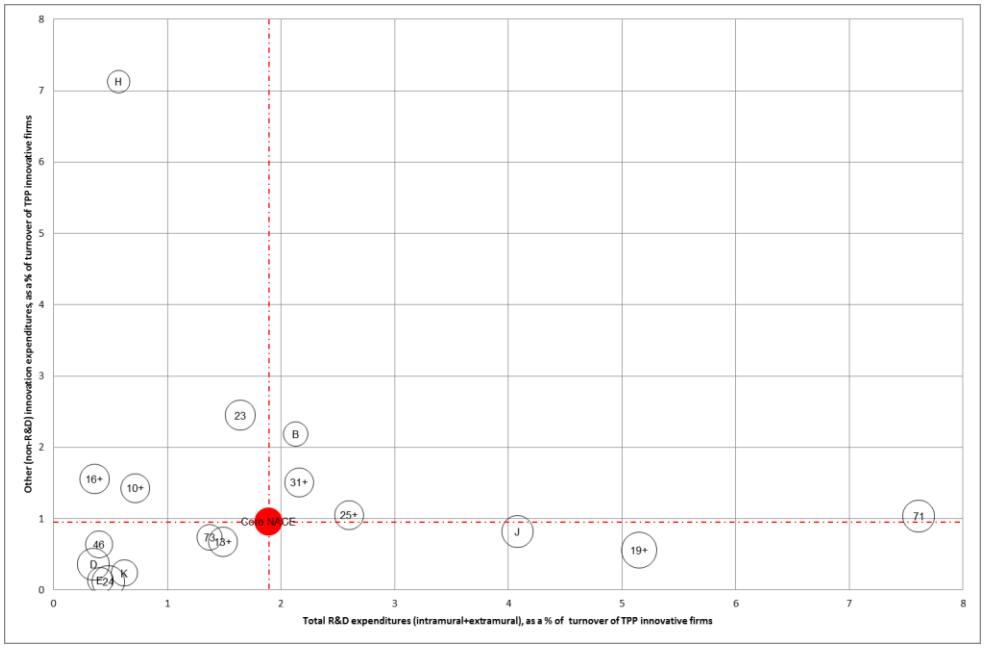
* Figures exclude the ' Scientific research and development' sector for sake of clarity

Source: Belspo

3.2. R&D vs. non-R&D innovators

As we did in Section 2.2 for the international comparison, we try and build a typology of the various sectors, according to whether their firms invest relatively more in R&D-related items or in non-R&D items. Figure 22 shows the results. The horizontal axis measures innovation intensity in R&D-related items, whereas the vertical axis is the innovation intensity in non-R&D items. To relate this to innovativeness, the size of the bullet corresponds to the technological innovation rate[8]. The two dotted lines represent the Belgian average in both dimensions (for Core NACE sectors). Four groups of countries emerge from the analysis. The upper-left quadrant gathers sectors that invest relatively more heavily in non-R&D items but less heavily in R&D-related items. The most noticeable of them is *'Transportation and storage'* (H). Sectors like *'Other non-metallic mineral products'* (23), *'Food, beverage and tobacco'* (10+) and *'Wood, paper, printing and reproduction'* (16+) also belong to that group but are closer to the average. In the lower left quadrant, we have sectors that invest relatively less than average in both dimensions. These are *'Wholesale trade'* (46) *'Electricity, gas, steam and air conditioning supply'* (D), *'Water supply; sewerage, waste management and remediation activities'* (E), *'Financial and insurance activities'* (K) and *'Basic metals'* (24). On the contrary, the upper right quadrant gathers countries that invest relatively more than the rest in both dimensions. *'Mining and quarrying'* (B), *'Furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment'* (31+), *'Fabricated metal products; computer, electronic and optical products, electrical equipment; motor vehicles and other transport equipment'* (25+) and *'Architectural and engineering activities; technical testing and analysis'* (71) are to be found in that group. The lower right quadrant encompasses countries that invest relatively more in R&D-related activities and less in non-R&D activities than the average. *'Information and communication'* (J) and *'Petroleum, chemical, pharmaceutical, rubber and plastic products'* (19+) are part of this group.

Figure 22. R&D vs. Non-R&D investments in innovation - By sector



Source: Belspo

[8] Percentage firms with TPP innovations, see Section III.A. above.

Table A. Selected sectors

Name	Nace Rev.2 Sections/Divisions	Description
Core NACE	Sections & divisions B-C-D-E-46-H-J-K-71-72-73	All mandatory sectors in the CIS
B	B	Mining and quarrying
10+	10 to 12	Manufacture of food products, beverages and tobacco
13+	13 to 15	Manufacture of textiles, wearing apparel, leather and related products
16+	16 to 18	Manufacture of wood, paper, printing and reproduction
19+	19 to 22	Manufacture of petroleum, chemical, pharmaceutical, rubber and plastic products
23	23	Manufacture of other non-metallic mineral products
24	24	Manufacture of basic metals
25+	25 to 30	Manufacture of fabricated metal products (except machinery and equipment); computer, electronic and optical products, electrical equipment; motor vehicles and other transport equipment
31+	31 to 33	Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment
D	D	Electricity, gas, steam and air conditioning supply
E	E	Water supply; sewerage, waste management and remediation activities
46	46	Wholesale trade, except of motor vehicles and motorcycles
H	H	Transportation and storage
J	J	Information and communication
K	K	Financial and insurance activities
71	71	Architectural and engineering activities; technical testing and analysis
72	72	Scientific research and development
73	73	Advertising and market research

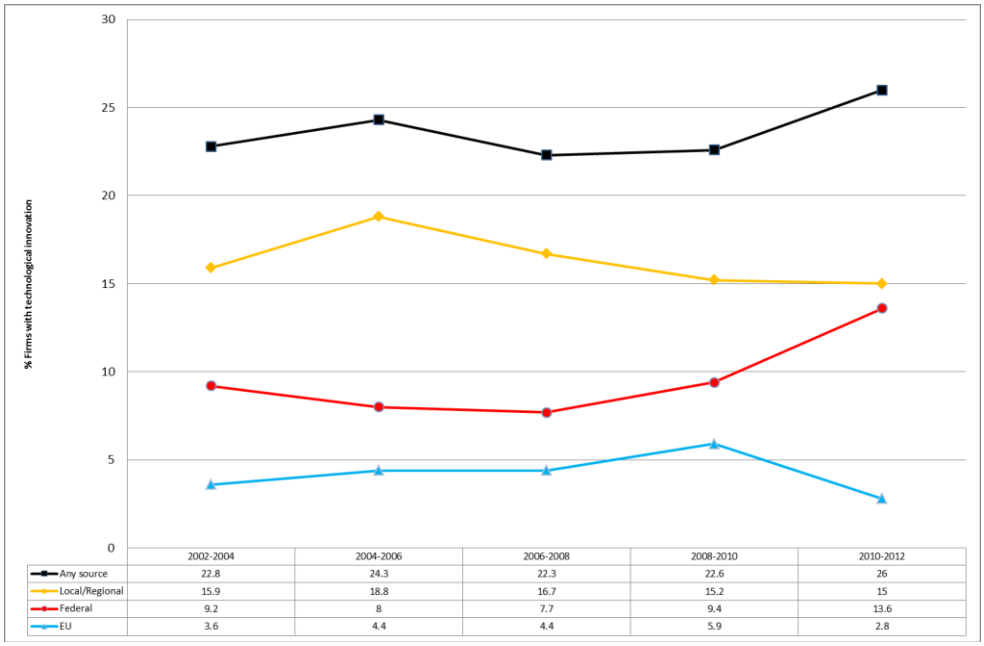
G. Public support to innovation - To what extent does the government help?

To what extent do public authorities help innovative firms in their endeavours? The indicator presented here measure the proportion (technologically) innovative firms having received any help, of any kind[9], from public authorities. There are three levels of power under consideration: local or regional authorities, the Federal authority, and the EU.

1. Recent evolution

Looking at the evolution of public support through time, it appears, from Figure 23, that after reaching a lowest point in 2006-2008, before the crisis, it increased strongly, mostly in the latest period (2010-2012). It seems that an ever growing number of enterprises are receiving support from the federal authority. This is most probably due to the partial withholding tax exemption for researchers, a very popular measure that was introduced in 2005 and that has gradually expanded since then. The most common level of support, however, is the regional level. Regions in Belgium have jurisdiction for most subsidy schemes.

Figure 23: Public support to innovation – Evolution (2002-2012)



	2002-2004	2004-2006	2006-2008	2008-2010	2010-2012
Any source	22.8	24.3	22.3	22.6	26
Local/Regional	15.9	18.8	16.7	15.2	15
Federal	9.2	8	7.7	9.4	13.6
EU	3.6	4.4	4.4	5.9	2.8

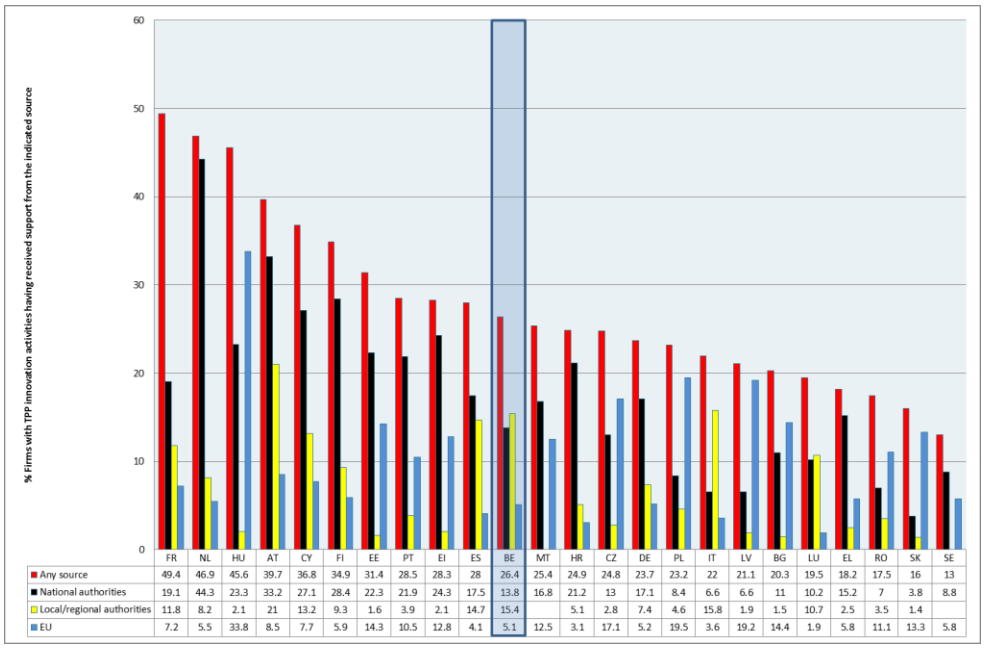
Source: Belspo

[9] Includes financial support via tax credits or deductions, grants, subsidised loans, and loan guarantees

2. International comparison

Figure 24 provides an international comparison with European countries for this indicator. Belgium scores in the middle of the distribution. The two most supportive countries are France and The Netherlands. Rather surprisingly, Sweden appears to be at the bottom of the distribution (but they have no indirect support like tax measures). In most countries, the central government is the dominant source of public support (France, The Netherlands, Austria, or Finland e.g.). However, in other countries like Belgium, but also Italy and Luxembourg, local or regional authorities dominate the picture. In the case of Belgium, this is understandable as most of the subsidy schemes for the private sector are in the hands of regional authorities. Finally, some countries seem to benefit very importantly from European public support. it is even the most common source of support in eastern-European countries like Hungary, The Czech Republic, Poland, Lithuania, Bulgaria, Romania, and Slovakia.

Figure 24: Public support to innovation – International comparison (2010-2012)



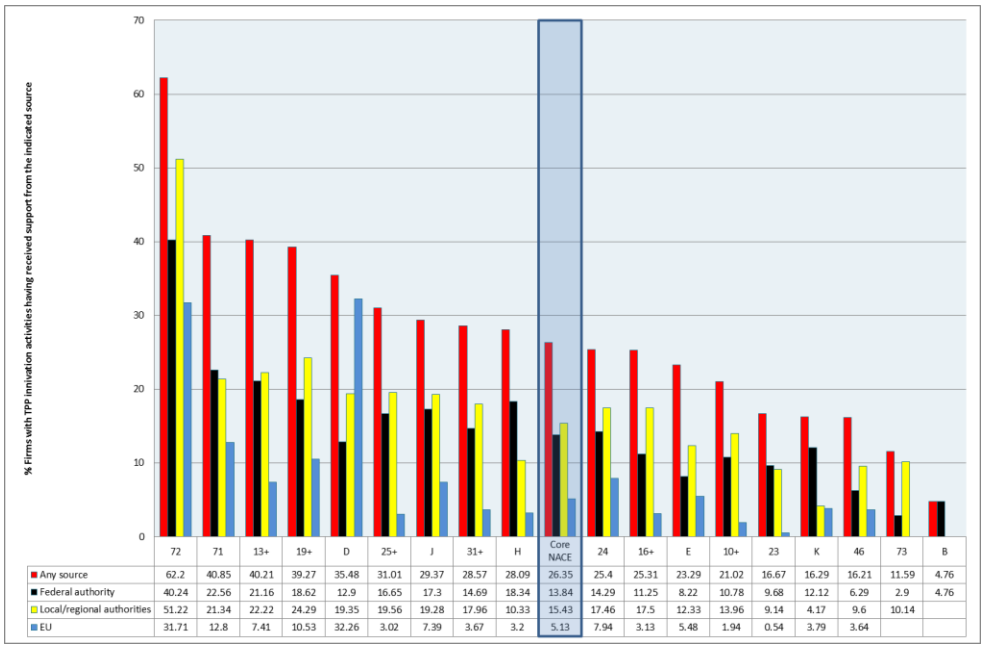
	FR	NL	HU	AT	CY	FI	EE	PT	EI	ES	BE	MT	HR	CZ	DE	PL	IT	LV	BG	LU	EL	RO	SK	SE
Any source	49.4	46.9	45.6	39.7	36.8	34.9	31.4	28.5	28.3	28	26.4	25.4	24.9	24.8	23.7	23.2	22	21.1	20.3	19.5	18.2	17.5	16	13
National authorities	19.1	44.3	23.3	33.2	27.1	28.4	22.3	21.9	24.3	17.5	13.8	16.8	21.2	13	17.1	8.4	6.6	6.6	11	10.2	15.2	7	3.8	8.8
Local/regional authorities	11.8	8.2	2.1	21	13.2	9.3	1.6	3.9	2.1	14.7	15.4		5.1	2.8	7.4	4.6	15.8	1.9	1.5	10.7	2.5	3.5	1.4	
EU	7.2	5.5	33.8	8.5	7.7	5.9	14.3	10.5	12.8	4.1	5.1	12.5	3.1	17.1	5.2	19.5	3.6	19.2	14.4	1.9	5.8	11.1	13.3	5.8

Source: Eurostat

3. By sector of activity

Some sectors receive more support, more attention from policy-makers, than others. Figure 25 sheds light on this issue. It shows the percentage innovative firms in a given sector[10] having received public support for their innovation activities, according to the level of government the support came from. All in all, the most often supported sector is *'Scientific research and development*' (72), with around 60% of innovative firms receiving public support for their activities. Then we find a group of three sectors with a support rate around 40%: ' *Architectural and engineering activities; technical testing and analysis*' (71), ' *textiles, wearing apparel, leather and related products*' (13+), and ' *Manufacture of petroleum, chemical, pharmaceutical, rubber and plastic products*' (19+). On the other hand, innovative firms in the *'Mining and quarrying'* (B), or in the *'Advertising and market research'* (73) sectors do not seem to receive much help from the public authorities. The degree of support might change according to the authority that grants it. In most sectors, regional authorities are the most frequent source of support. As already said, they have control over most subsidy schemes in the private sector. However, in the 'Transportation and storage' (H) and in the 'Finance and assurances' (K), the Federal authority appears as the most frequent source of support. Finally, the *'Electricity, steam, gas, and water supply sector'* (D) seems to attract disproportionate help from the European Union

Figure 25: Public support to innovation – By sector (2010-2012)



	72	71	13+	19+	D	25+	J	31+	H	Core NACE	24	16+	E	10+	23	K	46	73	B
Any source	62.2	40.85	40.21	39.27	35.48	31.01	29.37	28.57	28.09	26.35	25.4	25.31	23.29	21.02	16.67	16.29	16.21	11.59	4.76
Federal authority	40.24	22.56	21.16	18.62	12.9	16.65	17.3	14.69	18.34	13.84	14.29	11.25	8.22	10.78	9.68	12.12	6.29	2.9	4.76
Local/regional authorities	51.22	21.34	22.22	24.29	19.35	19.56	19.28	17.96	10.33	15.43	17.46	17.5	12.33	13.96	9.14	4.17	9.6	10.14	
EU	31.71	12.8	7.41	10.53	32.26	3.02	7.39	3.67	3.2	5.13	7.94	3.13	5.48	1.94	0.54	3.79	3.64		

Source: Belspo

[10] The list of sectors under consideration is provided in Table A on the next page.

Table A. Selected sectors

Name	Nace Rev.2 Sections/Divisions	Description
Core NACE	Sections & divisions B-C-D-E-46-H-J-K-71-72-73	All mandatory sectors in the CIS
B	B	Mining and quarrying
10+	10 to 12	Manufacture of food products, beverages and tobacco
13+	13 to 15	Manufacture of textiles, wearing apparel, leather and related products
16+	16 to 18	Manufacture of wood, paper, printing and reproduction
19+	19 to 22	Manufacture of petroleum, chemical, pharmaceutical, rubber and plastic products
23	23	Manufacture of other non-metallic mineral products
24	24	Manufacture of basic metals
25+	25 to 30	Manufacture of fabricated metal products (except machinery and equipment); computer, electronic and optical products, electrical equipment; motor vehicles and other transport equipment
31+	31 to 33	Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment
D	D	Electricity, gas, steam and air conditioning supply
E	E	Water supply; sewerage, waste management and remediation activities
46	46	Wholesale trade, except of motor vehicles and motorcycles
H	H	Transportation and storage
J	J	Information and communication
K	K	Financial and insurance activities
71	71	Architectural and engineering activities; technical testing and analysis
72	72	Scientific research and development
73	73	Advertising and market research

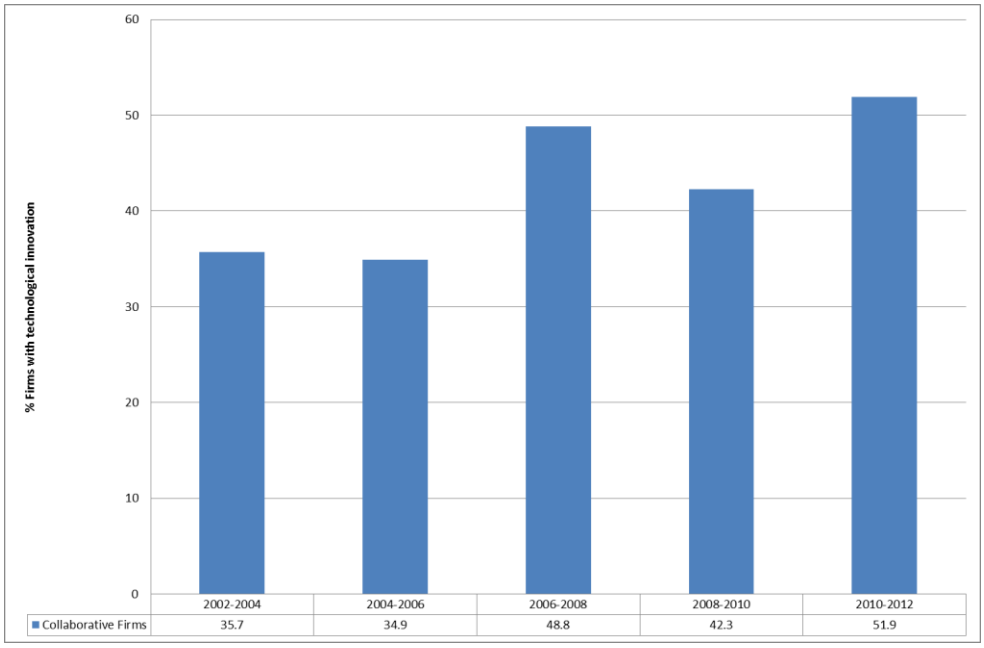
H. Cooperation for innovations - who are innovators working with?

In our contemporary world, characterized by ever-increasing technological complexity, where labour and assets - including knowledge - are more and more internationally divided, inter-organisational relations tend to play an increasingly crucial role. Cutting-edge knowledge necessary for innovation tends to be scattered across different actors and groups. Hence the need for innovative firms to collaborate with the external world in order to develop their innovations. To measure the importance of cooperation, we have computed the proportion of innovative firms that have entered cooperation agreements with external partners to develop their innovations.

1. Recent evolution

Do firms in Belgium increasingly engage in collaborative strategies to develop their innovations? Figure 26 shows the evolution of the percentage innovative firms collaborating with external actors to develop their innovations. Though there are some fluctuations, there seems to be a positive trend. According to the latest figures, more than half of innovative firms (51.9%) engage in collaborative strategies when it comes to developing their technological innovations.

Figure 26: Cooperation for innovation – Evolution (2002-2012)

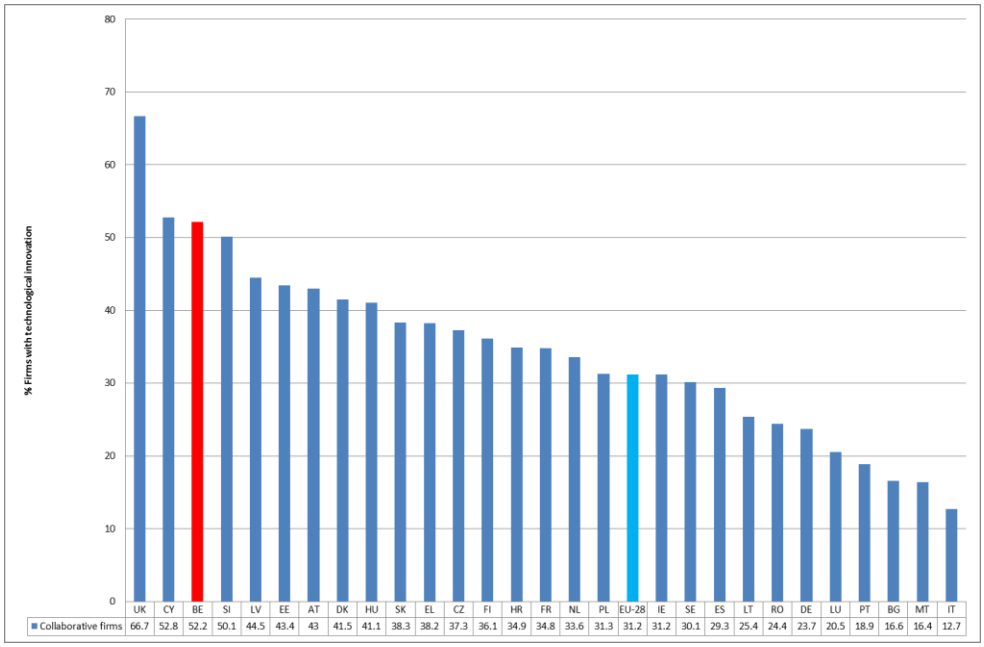


Source: Belspo

2. International comparison

Do innovative firms in Belgium collaborate more than in the other European countries? Figure 27 compares Belgium with the rest of Europe. It appears that firms in Belgium have the third largest propensity to cooperate. Belgium is one of the only four countries where more than half of the innovators have entered cooperation agreements. In comparison, the European average is only 31.2%.

Figure 27: Cooperation for innovation – International comparison (2010-2012)



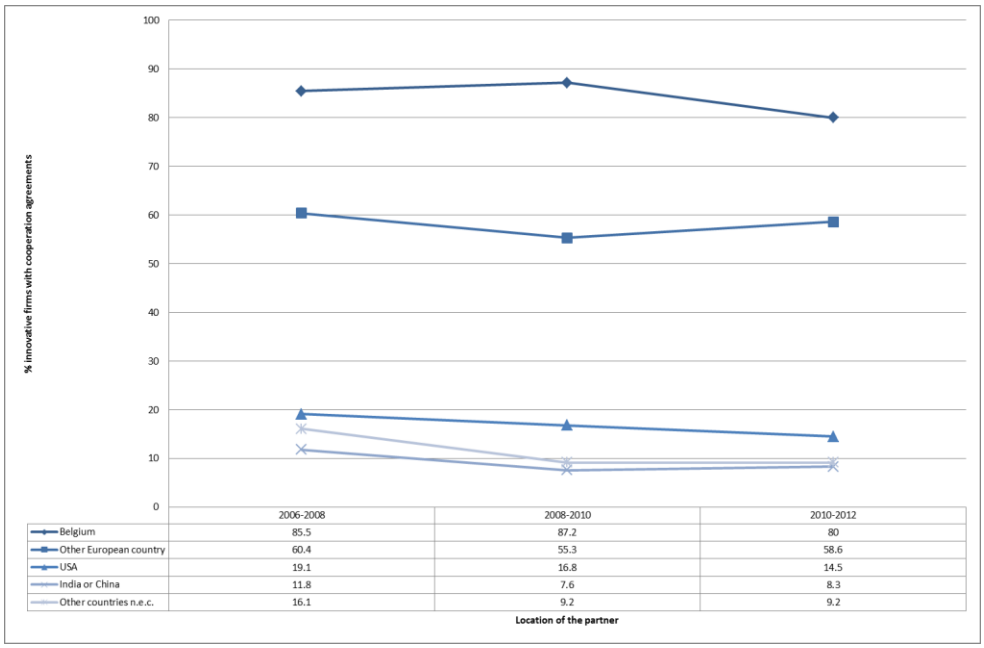
	UK	CY	BE	SI	LV	EE	AT	DK	HU	SK	EL	CZ	FI	HR	FR	NL	PL	EU-28	IE	SE	ES	LT	RO	DE	LU	PT	BG	MT	IT
Collaborative firms	66.7	52.8	52.2	50.1	44.5	43.4	43	41.5	41.1	38.3	38.2	37.3	36.1	34.9	34.8	33.6	31.3	31.2	31.2	30.1	29.3	25.4	24.4	23.7	20.5	18.9	16.6	16.4	12.7

Source: Eurostat

3. Where are the partners located?

In today's internationalized, "globalized", world, valuable partners can be found not only in the close vicinity but also all over the world. It is therefore interesting to examine where firms located in Belgium go to find their cooperation partners, and to check whether there is some evolution over time. Results are displayed on Figure 28 for 3 periods: 2006-2008, 2008-2010 and 2010-2012. Innovative firms in Belgium primarily find their partners in Belgium: some 80% innovative firms that have entered cooperation agreements over the period 2010-2012 rely on domestic partners. This might reflect the good quality of the Belgian economic and scientific structure, or simply a preference for proximity. European integration is also a tangible reality, as almost 60% of innovative firms that have collaborated, have done so with a partner located elsewhere in Europe. Partnerships with the USA are somewhat on the decline, going down from almost 20% in 2006-2008 to 14.5% in 2010-2012. Finally, 8.3% innovative firms that have entered cooperation agreements found a partner in China or in India.

Figure 28: Cooperation for innovation – By location of the partner (2006-2012)



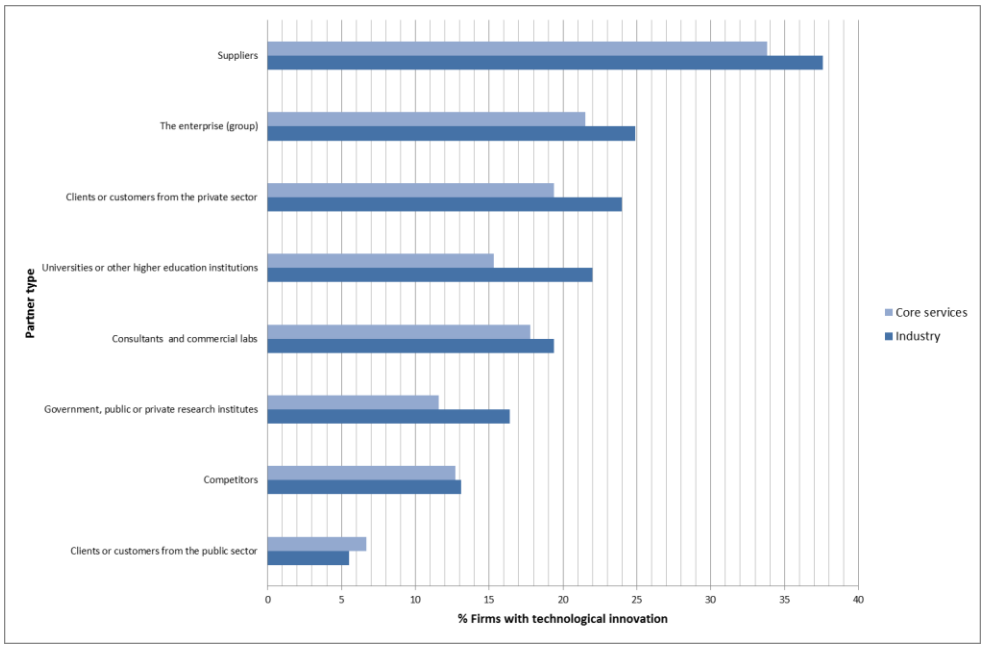
	2006-2008	2008-2010	2010-2012
Belgium	85.5	87.2	80
Other European country	60.4	55.3	58.6
USA	19.1	16.8	14.5
India or China	11.8	7.6	8.3
Other countries n.e.c.	16.1	9.2	9.2

Source: Eurostat

4. With what type of partner do they collaborate?

Another interesting question to ask is: with what type of cooperation partner are innovative firms working with? Figure 29 displays the results, broken down by industry vs. services. The two sectors do not seem to be very different in their pecking order. It appears that vertical business ties come on top of the list: suppliers, other enterprises within the group, and private clients. More than one third of innovative firms have for instance collaborated with suppliers to develop their innovations. At the lower end, clients from the public sector do not show up as highly demanded partners. As far as horizontal partnerships are concerned, universities and higher education institutions appear to be very popular, especially in the industry sector. Government, public and private research institutes, as well as competitors, lag behind.

Figure 29: Cooperation for innovation – By type of partner (2010-2012)

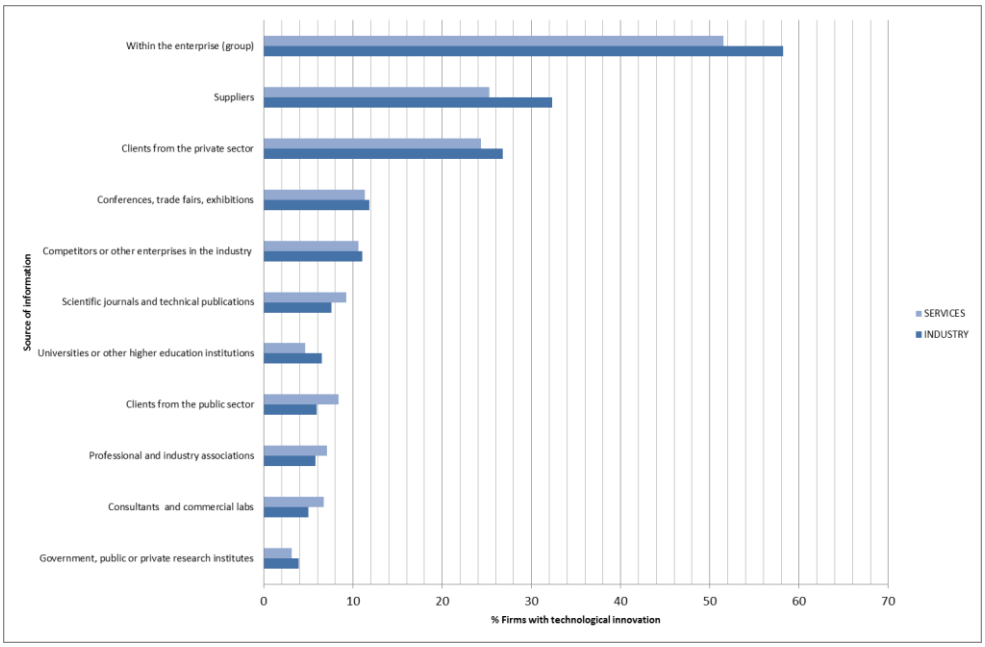


Source: Belspo

I. Sourcing ideas: important sources of information

Formal collaborations are an important tool for sourcing knowledge. But flows of ideas do not necessarily need formal ties. Information is often readily available through regular, day-to-day contacts. The CIS survey asks respondents what source of information they deem as "highly important" to make innovations. Figure 30 shows the results. Figures indicate, for each source of information, the proportion technological innovators that consider it as 'highly important'. The dominant source of information is of course within the enterprise or the group. The second most important source are close, vertical, business relations (clients from the private sector and suppliers). There is no real difference in the ranking of the sources between the industry sector and the services sector.

Figure 30: Highly important sources of information – Industry and services (2010-2012)

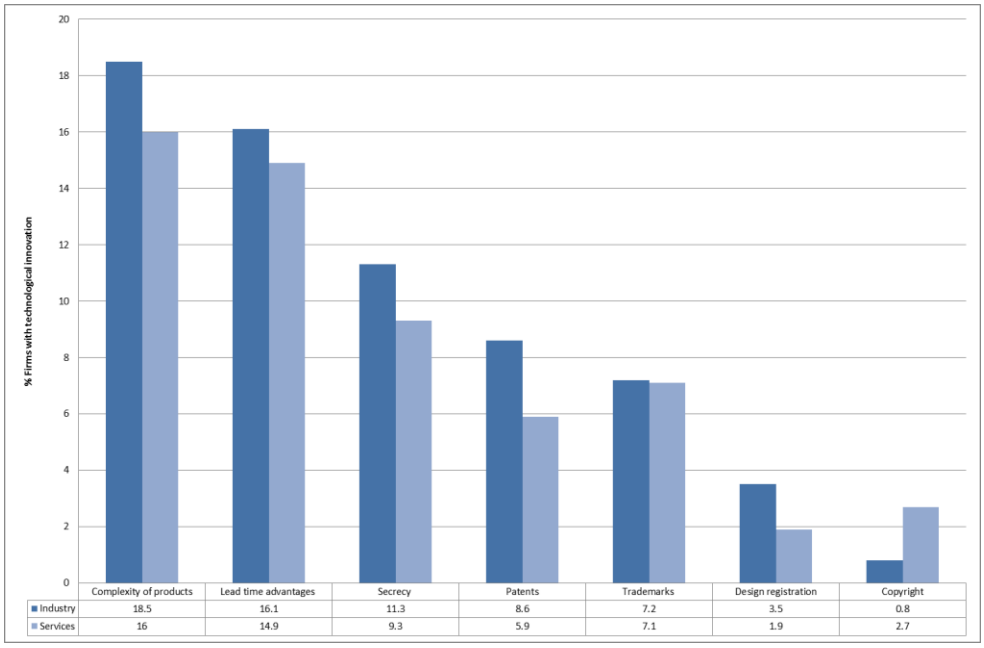


Source: Belspo

J. How to maintain or increase the competitiveness of technological innovations? - Protection methods

As knowledge can easily circulate, and innovations can be copied or imitated, firms may choose to protect their innovations and their intellectual property rights. There are two main types of protection methods: formal ones and informal ones. Formal protection methods include patents, design registration, copyright and trademarks. Informal protection methods are strategies aimed at deterring competitors from copying the innovations, such as lead time advantages, the complexity of goods or services, or secrecy (including non-disclosure agreements). Figure 31 shows the proportion of firms with technological innovations that have deemed one of the aforementioned protection methods as highly effective to maintain or increase the competitiveness of their innovations. Informal strategies come on top, and in particular the complexity of innovations and the fact to have some lead-time advantage. On the other hand, design registration and copyrights do not seem to be considered as highly effective methods.

Figure 31: Highly effective protection methods – Industry and services (2010-2012)



	Complexity of products	Lead time advantages	Secrecy	Patents	Trademarks	Design registration	Copyright
Industry	18.5	16.1	11.3	8.6	7.2	3.5	0.8
Services	16	14.9	9.3	5.9	7.1	1.9	2.7

Source: Belspo

IV. NON-TECHNOLOGICAL INNOVATION

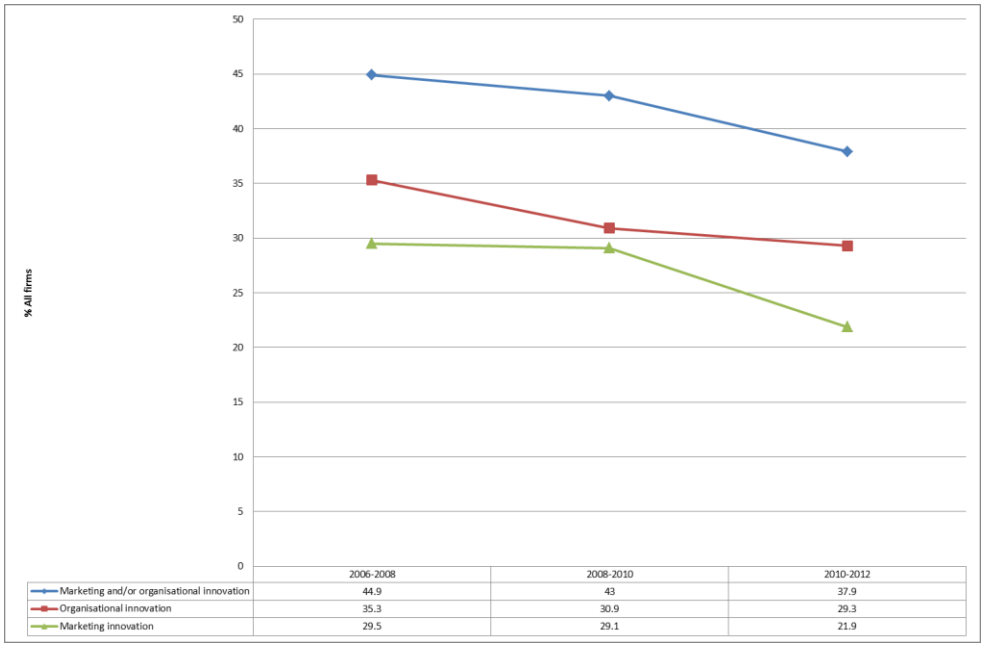
A. On the importance of non-technological innovation: the non-technological innovation rate

Innovation is not just about technological -product or process- innovation. There are other forms of innovation, namely organisational and marketing innovations. There are termed "*non-technological innovations*". The importance and evolution of such innovations have already been portrayed in Section II above. We now aim at giving a more precise overview of the CIS findings on non-technological innovation in Belgium.

1. How has non-technological innovation evolved through time?

As we do not have reliable data before 2006, our analysis starts with the period 2006-2008 and the beginning of the crisis. The data are shown in Figure 32. It appears that non-technological innovation has become less and less frequent. In the latest period, this is mostly due to a drop in the marketing innovation rate, which collapsed from 29.1% in 2008-2010 to 21.9% in 2010-2012. The organisational innovation rate has also slightly decreased, from 30.9% to 29.3% over the same time span.

Figure 32: Non-technological innovation rate – Evolution (2006-2012)



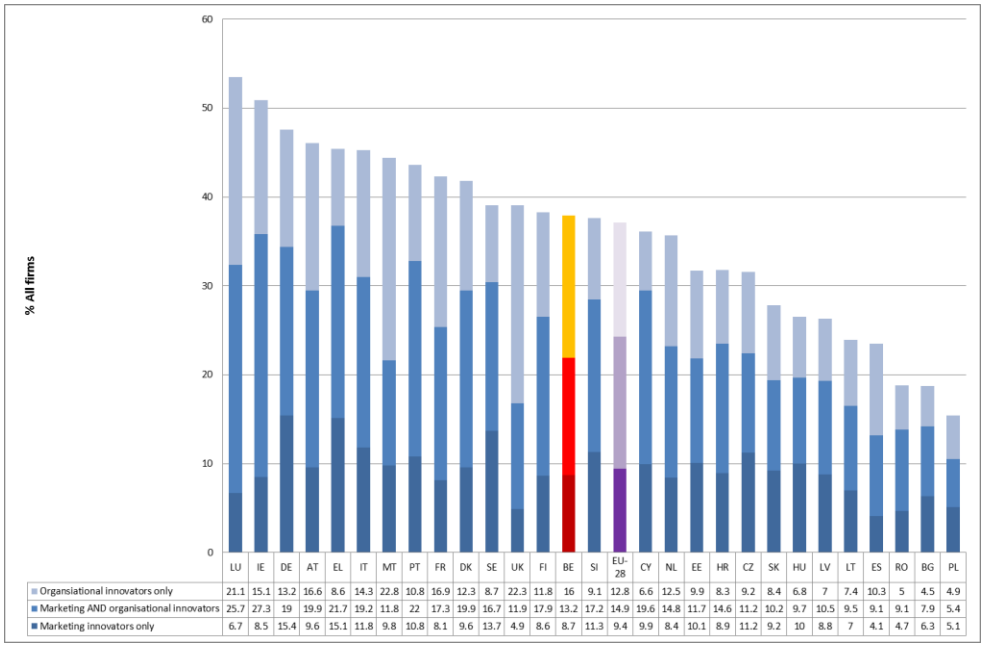
	2006-2008	2008-2010	2010-2012
Marketing and/or organisational innovation	44.9	43	37.9
Organisational innovation	35.3	30.9	29.3
Marketing innovation	29.5	29.1	21.9

Source: Belspo

2. How does Belgium compare to its European neighbours?

Figure 33 compares Belgium with its European partners. Belgium ranks in the middle of the distribution, close to the European average (37.9% vs. 37.1%). The country has a lower marketing innovation rate than the EU average (21.9% vs. 24.3%) but a higher organisational innovation rate (29.3% vs. 27.5%). On the top of the ladder, one finds Luxembourg and Ireland, with non-technological innovation rates over 50%. On the other side, Romania, Bulgaria and Poland have non-technological innovation rates under 20%.

Figure 33: Non-technological innovation rate - International comparison (2010-2012)



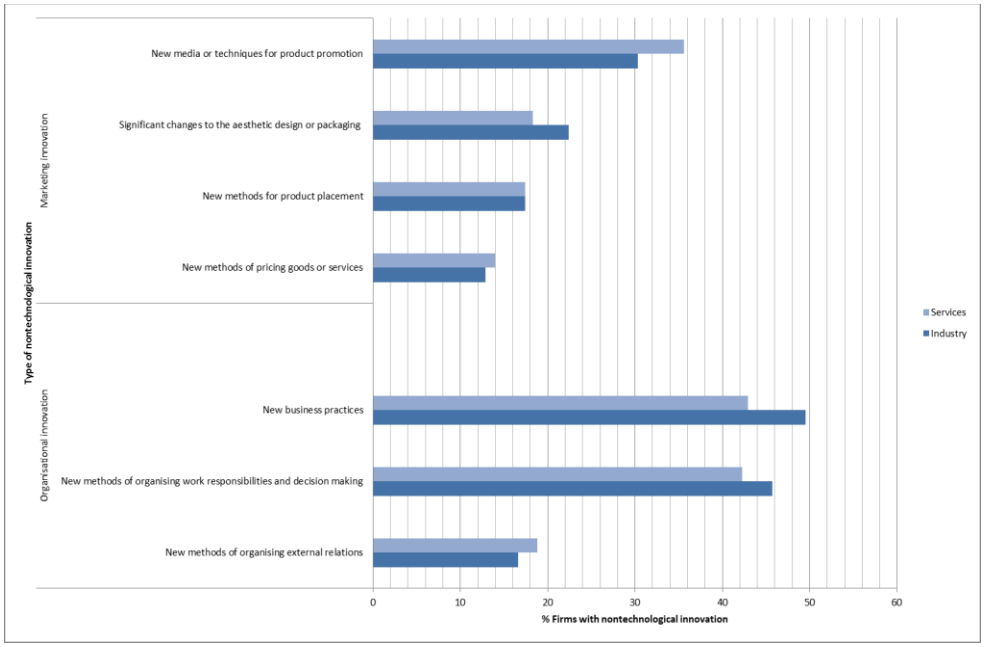
	LU	IE	DE	AT	EL	IT	MT	PT	FR	DK	SE	UK	FI	BE	SI	EU-28	CY	NL	EE	HR	CZ	SK	HU	LV	LT	ES	RO	BG	PL
Organsiational innovators only	21.1	15.1	13.2	16.6	8.6	14.3	22.8	10.8	16.9	12.3	8.7	22.3	11.8	16	9.1	12.8	6.6	12.5	9.9	8.3	9.2	8.4	6.8	7	7.4	10.3	5	4.5	4.9
Marketing AND organisational innovators	25.7	27.3	19	19.9	21.7	19.2	11.8	22	17.3	19.9	16.7	11.9	17.9	13.2	17.2	14.9	19.6	14.8	11.7	14.6	11.2	10.2	9.7	10.5	9.5	9.1	9.1	7.9	5.4
Marketing innovators only	6.7	8.5	15.4	9.6	15.1	11.8	9.8	10.8	8.1	9.6	13.7	4.9	8.6	8.7	11.3	9.4	9.9	8.4	10.1	8.9	11.2	9.2	10	8.8	7	4.1	4.7	6.3	5.1

Source: Belspo

3. What types of non-technological innovations?

The Oslo Manual (OECD, 2005), which is the ultimate reference when it comes to innovation surveys, consider three types of organisational innovation: (i) new business practices for organising procedures (i.e. supply chain management, business re-engineering, knowledge management, lean production, quality management, etc.), (ii) new methods of organising work responsibilities and decision making (i.e. first use of a new system of employee responsibilities, team work, decentralisation, integration or de-integration of departments, education/training systems, etc.) and (iii) new methods of organising external relations with other firms or public institutions (i.e. first use of alliances, partnerships, outsourcing or sub-contracting, etc.). The same Oslo Manual also considers four types of marketing innovation: (i) significant changes to the aesthetic design or packaging of a good or service (excluding changes that alter the product's functional or user characteristics, which are product innovations), (ii) new media or techniques for product promotion (i.e. the first time use of a new advertising media, a new brand image, introduction of loyalty cards, etc.), (iii) new methods for product placement or sales channels (i.e. first time use of franchising or distribution licenses, direct selling, exclusive retailing, new concepts for product presentation, etc.) and (iv) new methods of pricing goods or services (i.e. first time use of variable pricing by demand, discount systems, etc.).
Figure 34 shows to what extent non-technological innovators have introduced one of the innovation types mentioned above. The indicator is the percentage firms with non-technological innovation that have introduced one of these types of innovations. Accordingly the most popular types of non-technological innovations are the new business practices and the new methods for organising work. New media and techniques for product promotion is also a rather popular type of innovation.

Figure 34: Non-technological innovation – By type of innovation (2010-2012)



Source: Belspo

ANNEX 1. THE CIS SURVEY

The CIS survey is an official survey, whose legal base is the Commission Implementing Regulation (EU) no 995/2012, and the accompanying Methodological Recommendations.

The CIS survey is a voluntary survey among enterprises with market activities that employ more than 10 persons in a defined number of sectors. It is a stratified random sampling survey. Strata are defined according to two dimensions: the size class and the sector (at the NACE 2-digit level). In Belgium, as the survey is conducted independently in the three Regions, the NUTS1 code is also used as a stratification variable.

Three size classes are considered:

Size class	NUMBER OF EMPLOYEES
Small	10 to 49 employees
Medium	50 to 249 employees
Large	250 employees or more

Not all sectors of the economy are sampled, as the survey focuses on enterprises with market activities. The legal base foresees the following "core nace" sectors (and sampling scheme):

NACE Rev.2 Sections	Of which, the following NACE Rev.2 Divisions
B MINING AND QUARRYING	5: Mining of coal and lignite
	6: Extraction of crude petroleum and natural gas
	7: Mining of metal ores
	8: Other mining and quarrying
	9: Mining support service activities
C MANUFACTURING	10: Manufacture of food products
	11: Manufacture of beverages
	12: Manufacture of tobacco products
	13: Manufacture of textiles
	14: Manufacture of wearing apparel
	15: Manufacture of leather and related products
	16: Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
	17: Manufacture of paper and paper products
	18: Printing and reproduction of recorded media
	19: Manufacture of coke and refined petroleum products
	20: Manufacture of chemicals and chemical products
	21: Manufacture of basic pharmaceutical products and pharmaceutical preparations
	22: Manufacture of rubber and plastic products
	23: Manufacture of other non-metallic mineral products
	24: Manufacture of basic metals

	25: Manufacture of fabricated metal products, except machinery and equipment
	26: Manufacture of computer, electronic and optical products
	27: Manufacture of electrical equipment
	28: Manufacture of machinery and equipment n.e.c.
	29: Manufacture of motor vehicles, trailers and semi-trailers
	30: Manufacture of other transport equipment
	31: Manufacture of furniture
	32: Other manufacturing
	33: Repair and installation of machinery and equipment
D ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	35.1 Electric power generation, transmission and distribution
	35.2 Manufacture of gas; distribution of gaseous fuels through mains
	35.3 Steam and air conditioning supply
E WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES	36: Water collection, treatment and supply
	37: Sewerage
	38: Waste collection, treatment and disposal activities; materials recovery
	39: Remediation activities and other waste management services
G WHOLESALE AND RETAIL TRADE	46: Wholesale trade, except of motor vehicles and motorcycles
H TRANSPORTATION AND STORAGE	49: Land transport and transport via pipelines
	50: Water transport
	51: Air transport
	52: Warehousing and support activities for transportation
	53: Postal and courier activities
J INFORMATION AND COMMUNICATION	58: Publishing activities
	59: Motion picture, video and television programme production, sound recording and music publishing activities
	60: Programming and broadcasting activities
	61: Telecommunications
	62: Computer programming, consultancy and related activities
	63: Information service activities
K FINANCIAL AND INSURANCE ACTIVITIES	64: Financial service activities, except insurance and pension funding
	65: Insurance, reinsurance and pension funding, except compulsory social security
	66: Activities auxiliary to financial services and insurance activities
M PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	71: Architectural and engineering activities; technical testing and analysis
	72: Scientific research and development
	73: Advertising and market research

In the previous CIS waves, however, core Nace sectors did not include sectors 59, 60, 71 and 72 (the Regulation changed in 2012. The former regulation is referred to as " Com.Reg. 1450/2004" in this publication). Therefore, to maintain consistency, we did not include these as well either in the core Nace 2012 when performing inter-temporal analyses.

ANNEX 2. DEFINITIONS

In this Annex, we provide the proper and exact definitions of the concepts used, as they are stated in the Oslo Manual (hereafter OM):

Definition 1: ***Product and process innovations***

- A product innovation is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics (OM, §156)
- A process innovation is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software (OM, § 163).

The minimum entry level for an innovation is that it must be new to the firm. A product, process, marketing method or organisational method may already have been implemented by other firms, but if it is new to the firm (or in case of products and processes: significantly improved), then it is an innovation for that firm (OM, §207). Beyond this, the OM makes a distinction between innovations that are new to the market, and those that are new to the world (see below).

Definition 2: ***Innovation-active firms***

An innovation-active firm is one that has had innovation activities during the period under review, including those with on-going and abandoned activities. In other words, firms that have had innovation activities during the period under review, regardless of whether the activity resulted in the implementation of an innovation, are innovation-active (OM, § 215).

Definition 3: ***Innovations new to the market and new to the world***

- Innovations are new to the market when the firm is the first to introduce the innovation on its market. The market is simply defined as the firm and its competitors and it can include a geographic region or product line. The geographical scope of new to the market is thus subject to the firm's own view of its operating market and thus may include both domestic and international firms (OM, §209).
- An innovation is new to the world when the firm is the first to introduce the innovation for all markets and industries, domestic and international (OM, §210).

Definition 4: ***Innovation intensity***

The innovation intensity can be defined in two different ways. It is either the ratio between the total innovation expenditures and the total turnover of *all* firms in the relevant category, or the ratio between the total innovation expenditures and the total turnover of *innovation-active* firms in the relevant category

Definition 5: ***Intramural (internal) research and development***

Research and experimental development (R&D) comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications. Intramural R&D comprises all R&D performed within the enterprise. It includes both R&D intended to contribute to the development and implementation of product, process, marketing or organisational innovations and basic research that is not directly related to the development of a specific innovation. Note that intramural R&D also includes the acquisition of capital goods that is directly related to R&D (OM, §317 and §321).

Definition 6: ***Extramural (external) research and development***

Extramural R&D comprises the acquisition of R&D services. It also includes the acquisition of R&D services from units of multinational enterprises (MNEs) located abroad (MO, §322).

Definition 7: ***Acquisition of machinery, equipment and other capital goods***

Acquisition of capital goods, both those with improved technological performance and those with no improvement in technological performance that are required for the implementation of new or improved products or processes. This category only includes the acquisition of capital goods for innovation that is not included in R&D activities. Note that this category also includes acquisition of capital goods from foreign units of MNEs (which is not included in R&D) (OM, § 326).

Definition 8: ***Acquisition of other external knowledge***

Acquisition of technology and know-how in a number of forms and from a variety of sources in connection with the development and implementation of innovations. This also includes acquisitions from foreign units of MNEs. Acquisition of external knowledge and technology may be in the form of patents, non-patented inventions, licences, disclosures of know-how, trademarks, designs and patterns. This may also include computer services and other scientific and technical services for product and process innovation activities (OM, §323 à 325).

Definition 9: ***Marketing innovation***

A marketing innovation is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing (OM, §169)

Definition 10: ***Organisational innovation***

An organisational innovation is the implementation of a new organisational method in the firm's business practices, workplace organisation or external relations (OM, §177).

REFERENCES

OECD (2005), "*Oslo Manual: Guidelines for collecting and interpreting innovation data*", OECD, Paris.

RECOMMENDED CITATION
Belgian Science Policy Office (2015), "*Innovation in Belgium: results from the European innovation survey CIS2012*". Brussels, Belgium.