National Productivity Board

Annual report 2022

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Executive summary

The National Productivity Board is an independent institution responsible for monitoring productivity and competitiveness. It has been operational since May 2019 and consists of federal and regional experts. It was established at the request of the Council of the European Union in order to understand the causes of the decline in productivity growth in recent decades and to identify possible solutions.

Productivity growth is the most important driver of long-term income growth, which in turn determines not only the evolution of living standards but also the scope for a government to pursue policy. The financial sustainability of government finances is significantly affected by the rate of income growth.

The current energy crisis shows how important it is for the government to retain this scope for policy not only from an economic perspective, but also to respond to the social and environmental challenges we face. In addition to responding to the short-term challenges, it is therefore important for policy to ensure that productivity growth, already weak before the crisis, is boosted rather than exacerbated in the longer term.

DIAGNOSIS

National diagnostic

The coronavirus crisis has not had the same impact on the evolution of productivity as the 2008 financial and economic crisis. Growth in hourly labour productivity was in fact maintained between 2019 and 2021, in Belgium and in most European countries, notably owing to government measures to ease the conditions for recourse to temporary lay-offs. However, this sound performance is not enough to stem the downward trend in labour productivity growth observed since the late 1970s.

It is the internal dynamics of sectors that largely explain the evolution of hourly labour productivity, and hence it is also the slowdown in these dynamics that explains the slowdown in productivity growth. The reallocation of production resources between industries with different productivity levels (positive effect) or with different productivity growth rates (negative effect) hardly explains the evolution of aggregated productivity.

A comparison shows that it is market services, both in Belgium and in other countries, that have contributed most to the growth in aggregated productivity. This contribution is as much due to their productivity growth as to their increased relative size in the economy. This observation is consistent with the trend towards tertiarisation in developed economies. Only two countries, Germany and Austria, have recorded a positive contribution from industry, with productivity growth in industrial sectors sufficient to offset the reduced scale of industry in the economy. This observation points to differences in the severity of the de-industrialisation experienced by European economies.

If we look at the two periods without crisis, 2000-2007 and 2012-2019, we can refine this diagnostic by disaggregating by country concerned. The common feature - already shown above - shared by all the countries studied is the marked decline in the aggregate productivity figure during the period 2012-2019 when compared with the period 2000-2007. However, the evolution of the contributions of different sectors to this slowdown in aggregate productivity differs between Belgium and France, on the one hand, and Germany, Austria, Finland and the Netherlands, on the other. In Belgium, and in France in particular, we see that the negative contribution of industry over the period 2000-2007 became positive over the period 2012-2019, while in all other countries, industry's contribution to aggregate productivity growth fell from the first period to the second.

If we compare the growth rates for sectoral productivity during the period 2000-2019 with the two factors explaining their relative size - the share in the volume of employment and the relative deflator - we find that sectors whose productivity growth rates are higher than those of the economy overall are largely those whose share in the total volume of employment has declined (sharply) and whose deflator has increased (noticeably) less rapidly than that of the economy as a whole. This finding confirms fears that production resources are shifting towards the least dynamic activities in terms of productivity.

Regional diagnostic

The slowdown in aggregate labour productivity after the financial crisis affects all three regions but reflects differences in the evolution of sectoral contributions within the Belgian regions. Between the two crisis-free periods, 2003-2007 and 2012-2019, the decline in average annual productivity growth in Brussels and in Flanders can be explained by a general decline in the contribution of the sectors, the contribution of market services taking pride of place. In Wallonia, the contribution of the tertiary sector remained broadly stable, albeit starting from a lower level than in the other regions, while manufacturing industry began to make a positive contribution to average annual productivity growth again.

As is the case for Belgium as a whole, given an unchanged economic structure, it is internal productivity dynamics rather than the reallocation of production resources that mainly determine the evolution of the contribution different sectors make to the regions' aggregate labour productivity growth. In Brussels, the shift of production resources has generally been towards sectors where productivity levels and profits are relatively low. In Flanders and in Wallonia, jobs were shifted to sectors with high productivity levels but relatively low productivity gains.

Finally, a reference group of European regions with similar socio-economic characteristics was established for each Belgian region to see how labour productivity growth compares across economically related Belgian and European regions. Hourly labour productivity growth rates in the Belgian regions appear to be trending around the mid-point of the hierarchy of the reference regions, with the Flemish Region towards the higher end of the scale and the Walloon Region towards the lower end.

SIGNIFICANT LEVERS FOR PRODUCTIVITY GROWTH

Continued commitment to R&D and innovation

Maintain government support for R&D, but monitor its efficiency

Innovation is a crucial lever for productivity growth, and research and development (R&D) in turn makes a significant contribution to innovation. Internationally, Belgium scores very well in this area with an overall R&D intensity of 3.16% in 2019 of which 74% was conducted by businesses.

R&D not only has a direct impact on the company carrying out these activities, but also often has a positive impact on other companies and the rest of the economy (so called *spillover effects*). These spillover effects ensure that the benefits to society of private investment in R&D often exceed the benefits to the company carrying it out, a key argument in favour of public support for R&D. Nevertheless, it is important to ensure that R&D support measures achieve their goals as efficiently as possible, especially in the current budgetary context. After all, public funds spent supporting R&D cannot be used for other purposes. What is more, the fiscal cost of R&D support measures has risen sharply in recent years.

The effectiveness and efficiency of R&D support measures should ideally be judged on the basis of their economic impact. This requires not just looking at the impact on the output of the firm receiving the aid but also, and more importantly, at the multiplier effect of the additional R&D on other firms and the rest of the economy through spillover effects. However, such estimations are complex and fraught with methodological difficulties, making it impossible to draw unambiguous conclusions about the economic impact of specific measures on the basis of existing simulations.

However, existing studies do provide a clear picture of the input additionality of support measures, i.e. the impact of support on R&D expenditure. Ideally, R&D support encourages the beneficiary company to make additional R&D investments in addition to the funding received. In any case, we must avoid the situation in which all or part of the state support is used to finance R&D that the company would still have carried out in the absence of such support.

Existing evaluations demonstrate that (regional) R&D subsidies and partial withholding tax exemptions for R&D staff have a clear and favourable impact on R&D expenditure by beneficiary companies; these measures encourage beneficiaries to incur additional R&D spending over and above the public support received. Conversely, little robust evidence was found that the R&D tax credit and the deduction for patent income result in additional R&D expenditure beyond the support received. This last measure has since been replaced by the tax deduction for innovation income, a measure that could not yet be evaluated in 2019.

While the international literature shows that well-designed tax credits based on R&D expenditure can certainly be effective in stimulating R&D, there is less evidence for the effectiveness and efficiency of tax breaks for income from patented inventions or other intangibles (such as the innovation income deduction) in stimulating R&D. Consequently, the introduction of such measures is often justified differently, more specifically in terms of attracting foreign knowledge investment. Attracting or anchoring such investments can indeed generate many benefits for an economy, but we need to investigate the extent to which R&D support measures are the best way to achieve this goal, and how the potential benefits of such investments are actually achieved.

Finally, the various assessments of Belgian R&D support measures show a mismatch between federal fiscal measures through corporate tax deductions and direct regional support (through R&D subsidies, which the regions grant directly to companies). Where companies combine direct and indirect R&D support, these measures become less effective in stimulating R&D expenditure above a certain support level, suggesting that efficiency gains can be made by better aligning direct and indirect support measures.

R&D support must go hand in hand with policies for the diffusion of innovation.

Supporting R&D is one thing. In addition, it is also necessary to spread the results of this research across the economy as much as possible. However, innovation is not diffused automatically and, in addition, seems to be slowing down. There is evidence that the transition to a digital and knowledge-based economy has increased the barriers to widespread and rapid diffusion.

The slow-down of innovation diffusion may be an explanation for the widening gap that can be observed between cutting-edge companies and firms that lag behind. Research suggests that increasing the productivity of under-performers can nevertheless substantially increase aggregate productivity. Although not all technologies have the same diffusion capacity, it is important that policy pays sufficient attention to the process of innovation diffusion. This can be achieved by focusing on boosting the capacity of companies (including SMEs in more traditional sectors) to adopt relevant technologies, ensuring that there are sufficient incentives for the adoption of the new technologies and ensuring the smooth reallocation of resources.

To develop a better policy mix to support and diffuse innovation, the topic should be explored further.

The need for sufficient attention to the transition to a low-carbon economy

Although the impact of the transition to a low-carbon economy on labour productivity as we traditionally measure it is not entirely unambiguous, it is clear that climate change itself is a serious threat to labour productivity (certainly over the longer term). For instance, physical and social circumstances caused by climate change may make it more difficult to use the capital stock efficiently. What is more, the investments needed to address climate change (recovery and adaptation investments) may also have an adverse impact on the resources available for R&D over time, and such investments are also often less associated with learning effects than investments in new productive capital. In this sense, making the transition to a low-carbon economy is crucial for ensuring future productivity growth.

Furthermore, the climate transition challenges run parallel to the challenges we are currently seeing in terms of energy prices and energy security and independence. From this perspective, too, it is crucial to reduce dependence on fossil fuels as fast as possible. This is certainly true in a very energy-intensive country like Belgium; although energy consumption per inhabitant has fallen in recent years, it remains higher than average in the euro area and to our three neighbouring countries, inter alia, due to the high proportion of energy-intensive industries in the economy and relatively high household energy consumption. This high amount of energy consumption in Belgium is not offset by lower fossil energy use.

The energy crisis should therefore be harnessed to accelerate Belgium's transition to a low-carbon economy. Against this background, it is important to ensure that, in the event of government intervention, the price signal is preserved as much as possible and also guaranteed for the future. We must also ensure that short-term interventions do not create new lock-ins that will jeopardise the future. At the EU level, the Green Deal strategy is seeking to accelerate the transition to a low-carbon economy, including by making funds available through the 'Recovery and Resilience Facility' (RRF) and 'RePowerEU'. It is important for Belgium to coordinate its own initiatives with these EU measures as much as possible.

Generally speaking, innovation (in a broad sense) will play a crucial role in the transition to a low-carbon economy. However, there are several reasons, from a social perspective, why markets are under-investing in clean technologies and this justifies some directionality or steering in innovation policy. As indicated in the report, however, the design and governance of such a policy will be important, as well as its complementarity with the broader policy mix that extends beyond pure science and innovation policy.

The need for human capital

Innovation and digitisation are essential factors in driving up productivity. However, to achieve large productivity gains from these investments, sufficient human capital - particularly sufficient human STEM capital - is required in addition to new processes, products, and business models.

This is because we observe that the most productive firms employ a higher proportion of highly skilled and STEM employees. Increasing the proportion of highly educated STEM employees leads to high productivity gains, not only compared with raising the proportion of lower-skilled STEM employees, but also in comparison with a higher proportion of highly educated non-STEM employees.

Although the number of graduates in Belgium has increased steadily over the past decades and is above the EU28 average, the number of graduates in STEM subjects is below the EU28 average. The increasing difficulty Belgian companies are facing in attracting STEM profiles - including specialised ICT skills - is likely to have a significant adverse effect on productivity.

A policy aimed at promoting the adoption of the latest technologies and business practices will hence only lead to sustainable productivity gains if it is combined with measures to increase the supply and mobility of human (STEM) capital. Students should be encouraged to take STEM courses and STEM lifelong learning should be widely accessible. Particular attention should be paid to social inequality and the increased participation of young people from less privileged demographic groups and women. Similarly, we need to catch up quickly to compensate for the lost learning caused by the COVID pandemic, again particularly in terms of STEM skills. For without an adequate supply of (STEM) skills, companies will not be able to take full advantage of the digital revolution. This will result in significant long-term economic costs.

This report takes account of National Accounts data up to October 2022

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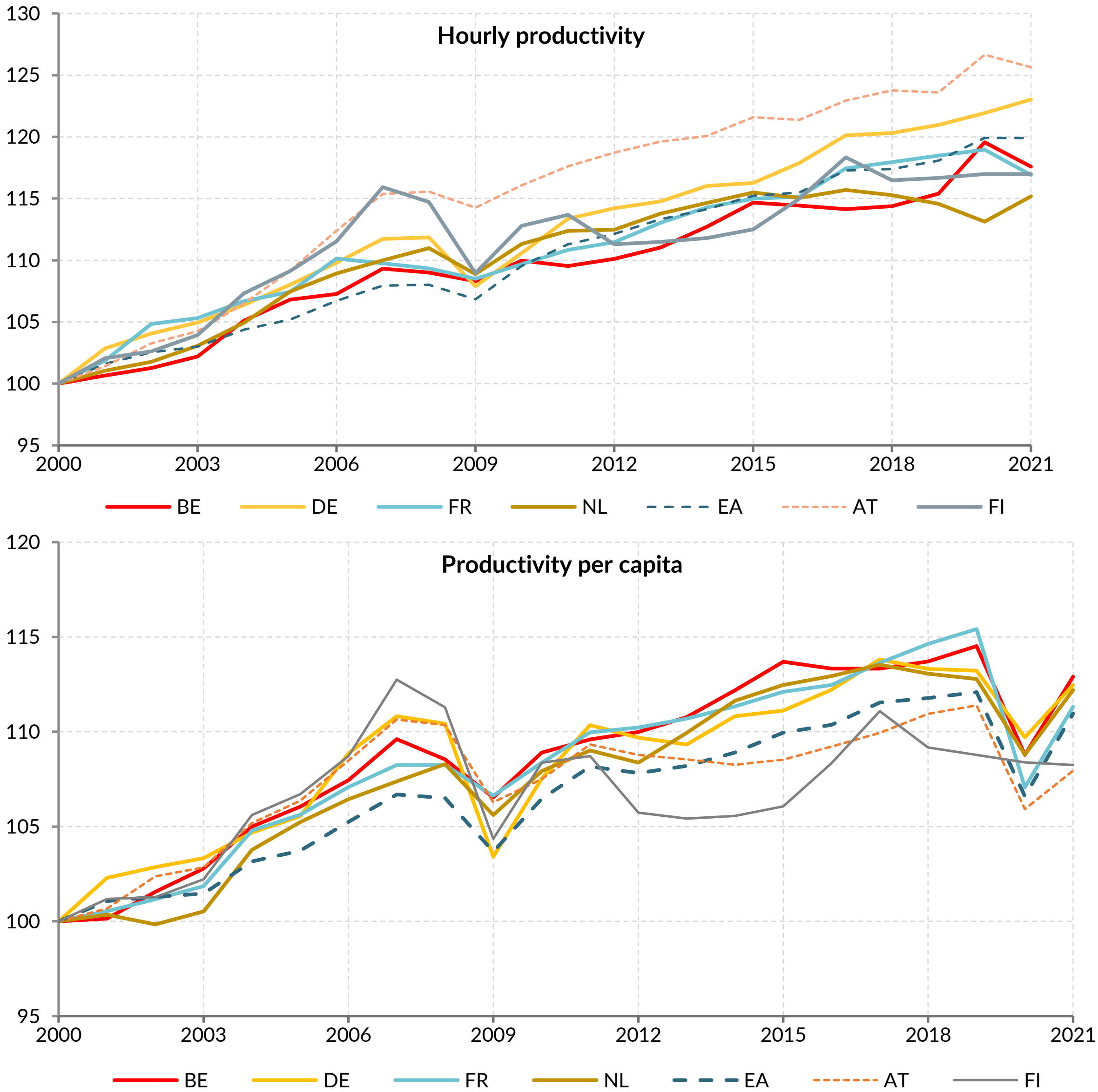
1. Findings

1.1. National diagnostic

1.1.1. The crises come in quick succession but their impact on productivity differs

The evolution of hourly labour productivity was affected in different ways by the corona crisis and the 2008 financial and economic crisis, both in Belgium and in the other comparable countries. In most European countries, hourly labour productivity stabilised or rose between 2019 and 2020, whereas it declined between 2008 and 2009, as illustrated in the upper graph in Figure 1. This is because most European countries took measures to counter job losses by allowing wider recourse to temporary lay-offs. As a result, hours worked decreased as fast or faster than value added in volume, and hourly productivity was maintained or increased. Consequently, the number of employees was hardly affected by the crisis, and per capita productivity fell sharply in 2020, as in 2009, as shown in the lower graph of Figure 1.

Figure 1: Changes in labour productivity, 2000 = 100



Source: Eurostat, September 2022 and National Accounts Institute (NAI), October 2022.

For the period 2000-2021 as a whole, the average annual growth rate of hourly labour productivity is below 1%, whether in Belgium, the euro area overall or our three main neighbours (Table 1). This continues the downward trend of productivity gains that had emerged in the late 1970s.

A comparison of the average annual growth rate of hourly productivity during the two non-crisis periods, 2000-2007 and 2012-2019, each lasting seven years, shows that the slowdown in productivity gains is continuing in all the countries concerned.

Table 1. Average annual growth of hourly productivity
In %

	2000-2021	2000-2007	2007-2012	2012-2019	2019-2021
Belgium	0.8	1.3	0.1	0.7	0.9
Euro area 19	0.9	1.1	0.8	0.7	0.8
Germany	1.0	1.6	0.4	0.8	0.9
France	0.7	1.3	0.3	0.9	-0.7
Netherlands	0.7	1.4	0.4	0.3	0.3
Austria	1.1	2.1	0.6	0.6	0.8
Finland	0.7	2.1	-0.8	0.7	0.1

Source: Eurostat, September 2022 and National Accounts Institute (NAI), October 2022.

A comparison of the evolution of hourly productivity in the major sectors of economic activity reveals that during the period 2000-2021 as a whole, manufacturing showed the highest productivity growth in Belgium, as it does in the three major neighbouring countries (Table 2). Despite this overall strong performance, manufacturing industry recorded the most marked slowdown in productivity growth between one non-crisis period and another, if we compare the 2000-2007 and 2012-2019 periods. The recent crisis period, 2019-2021, coincided with a reduction in productivity growth in the manufacturing industry in Belgium and to a greater extent in France, while growth continued to slow down in Germany. Only manufacturing in the Netherlands experienced an upturn in productivity growth.

Table 2. Average annual growth rate of hourly labour productivity by sector
In %

	Belgium	Germany	France	Netherlands
		2000-2021		
Total economy	0.8	1.0	0.7	0.7
Manufacturing	1.9	1.8	1.9	2.4
Market services	1.0	1.1	0.7	0.9
Non-market services	-0.1	0.0	0.5	-0.3
		2000-2007		
Total economy	1.3	1.6	1.3	1.4
Manufacturing	3.4	3.6	3.6	4.1
Market services	1.3	1.5	1.0	1.4
Non-market services	0.0	-0.2	0.8	-0.2
		2012-2019		
Total economy	0.7	0.8	0.9	0.3
Manufacturing	2.1	1.3	1.7	1.5
Market services	0.8	1.0	0.7	0.3
Non-market services	-0.2	-0.2	0.6	-0.3
		2019-2021		
Total economy	0.9	0.9	-0.7	0.3
Manufacturing	-0.8	0.8	-2.6	3.2
Market services	2.6	2.0	0.6	0.9
Non-market services	-0.4	-0.5	-1.4	-1.8

Note: manufacturing corresponds to heading C, market services cover headings G to N and non-market services cover headings O to U of NACE Rev2.
Source: Eurostat, September 2022 and National Accounts Institute (NAI), October 2022.

1.1.2. Productivity gains and sectoral contributions: importance of sectoral dynamics and the growing weight of services

There are several ways of breaking down productivity growth to ascertain the contribution of the different sectors. For most sectors, disaggregation results in an estimate when value added by volume is measured in chain-linked euros instead of fixed prices for a base year. Of course, the estimation of national accounts aggregates in chain-linked euro represents a methodological improvement allowing the evolution of the structure of the economy to be taken into account in the estimation of volumes. However, there is also a significant drawback due to the loss of additionality, since the value added in volume in terms of the economy as a whole is no longer equal to the sum of the value added of its constituent industries.

Following the publications of France Stratégie[1] and with a view to harmonising analysis methods across the European network of National Productivity Boards, the method proposed by Tang and Wang[2] in 2004 was chosen here to compare the sources of productivity growth between Canada and the United States. This method, known as the '*Generalised Exactly Additive Decomposition*', has the advantage of being valid for all aggregation indices (including the Laspeyres chain index, used in the Belgian national accounts), as well as being accurate for all the time periods covered, irrespective of their length, and remains unchanged when choosing

1 "Analyse sectorielle et régionale de la croissance de la productivité du travail dans les pays européens et aux États-Unis", P-L Girard, B. Le Hir and D. Mavridis, France Stratégie Working Paper no 2022-01, January 2022. "Dynamiques sectorielles et gains de productivité", P-L Girard, B. Le Hir and D. Mavridis, France Stratégie analytical note no 105, January 2022.

2 Sources of aggregate labour productivity growth in Canada and the Unites States, J. Tang and W. Wang, *Canadian Journal of Economics*, Vol. 37, No. 2, 421-444, May 2004.

the volume reference year. The downside, however, is a less intuitive interpretation of the relative size of the industries.

As demonstrated in the technical annex, under this approach, aggregate productivity is expressed as the weighted sum of sectoral productivity, whereby the weight of each industry is equal to its relative size in the economy. Aggregate productivity growth is thus the sum of three effects. 1) A "pure" effect of productivity growth in an industry, which is independent of any change in its relative size; 2) an effect that depends on the change in the relative size of the industry, which may be caused by a change in its share of the volume of employment, by a change in its relative deflator or by a combination of the two; and 3) by an interaction between productivity growth and a change in the relative size of the industry.

According to Tang and Wang (2004), the first effect is related to **intrasectoral** productivity dynamics; the second can be characterised as a Denison effect[3], insofar as it reflects the impact on aggregate productivity of input movements between industries with different **productivity levels**; and the third can be characterised as a Baumol effect, to the extent that it reflects the impact on aggregate productivity of input movements between industries whose **productivity growth figures** are different. The Denison effect is thus an estimate of the impact of the reallocation of inputs on the level, while the Baumol effect is an estimate of the impact of the reallocation of inputs on growth.

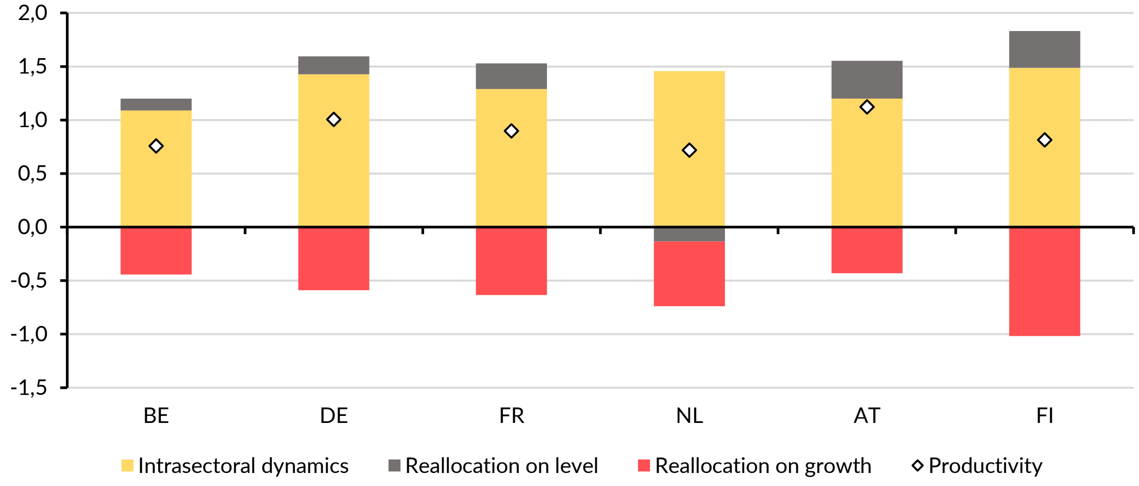
The result of this breakdown, carried out for Belgium and the comparing countries for the period 2000-2019[4], is shown in Figure 2. As in any growth disaggregation formula, the result depends on the level of disaggregation applied. For the purposes of this report, we have opted for a breakdown level of 38 industries (A38 of the national accounts).

In Belgium, as in the other countries studied, aggregate hourly labour productivity growth results mainly from the productivity dynamics of the industries that make up the economy. These dynamics are limited by the effect of the reallocation of inputs between industries whose productivity growth is different (Baumol effect), and which is negative in all countries. Conversely, the effect of the reallocation of inputs between industries with different productivity levels (Denison effect) is positive for all countries except the Netherlands, where it is slightly negative. We also note that the sectoral dynamics and the impact of reallocation on level in Belgium is rather weak compared to the other countries studied.

[3] Denison showed that the movement of factors of production from agriculture, where productivity levels were quite weak, to industry, where productivity levels were higher, could increase aggregate productivity even if productivity growth in the two industries was the same. This effect is sometimes also called the short-run effect, because the relocation of inputs increases aggregate productivity only during the period during which the relocation occurs.

[4] To avoid undue influence of the corona crisis on the outcome of the disaggregation, the analysis was limited to the period 2000-2019.

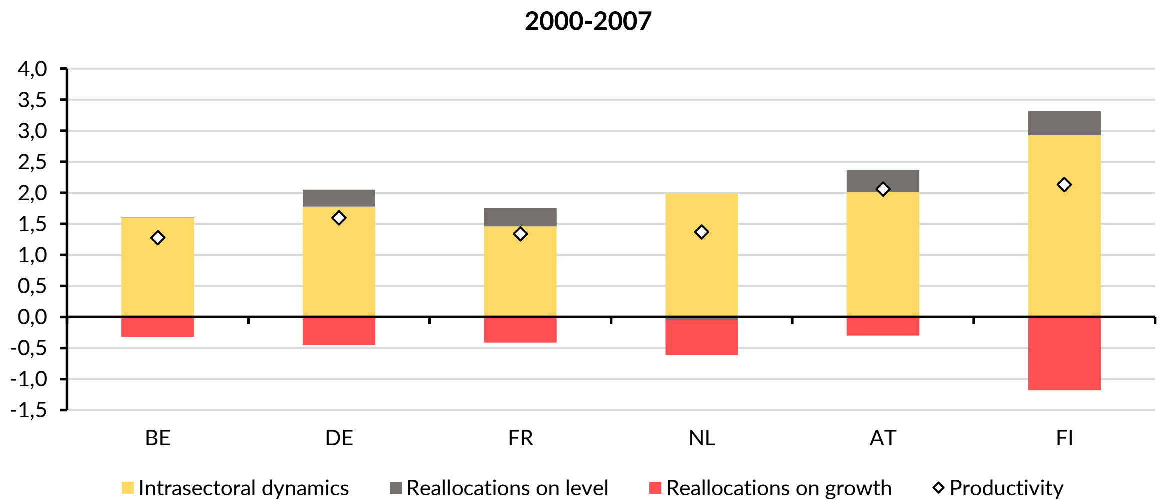
Figure 2: Breakdown of hourly labour productivity growth, 2000-2019, average annual growth rate
In %

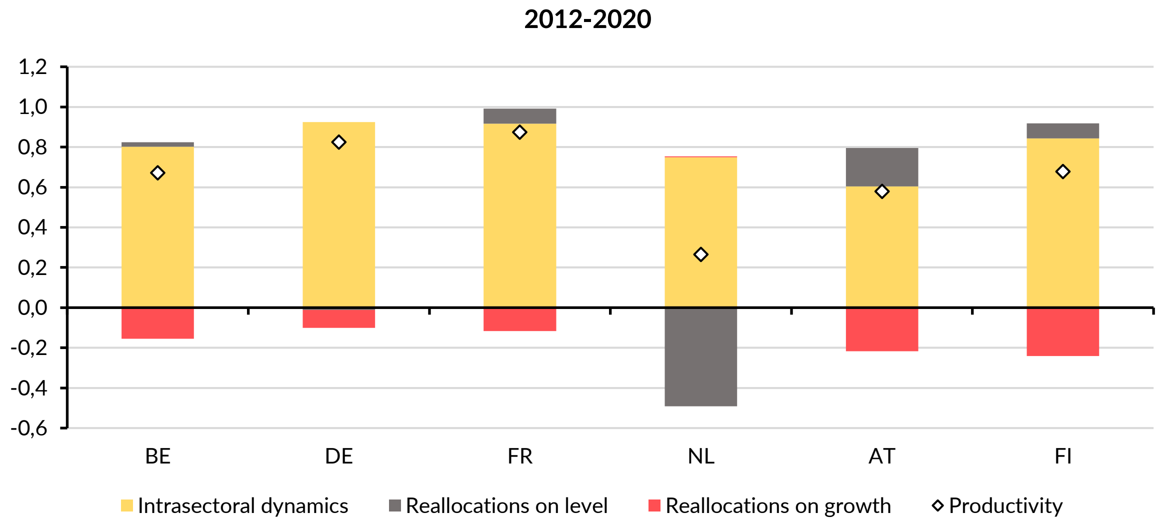


Source: Eurostat, September 2022 and National Accounts Institute (NAI), October 2022.

The same breakdown for the two non-crisis periods, 2000-2007 and 2012-2019, shows that the slowdown in productivity growth stems primarily from the slowdown in productivity dynamics at the corporate level (Figure 3). The negative effect of reallocation on the growth is clearly weaker for the period 2012-2019 than for the previous period. Except in Germany and the Netherlands, the impact of reallocation on the level declines but remains positive.

Figure 3: Breakdown of hourly labour productivity growth, 2000-2007 and 2012-2019, average annual growth rate
In %





Source: Eurostat, September 2022 and National Accounts Institute (NAI), October 2022.

This breakdown can also be used to show the contribution of the major sectors of activities in the total economy to aggregate productivity growth. Table 3 shows the result of the breakdown of productivity growth over the period 2000-2019 for the whole economy under five broad categories: the primary sector, manufacturing (broadly defined), construction, market services and non-market services. The first column (1) gives productivity growth for the period, the second (2) the contributions of the different categories of activities, disaggregated into the three previously presented components: pure impact (3), relative size (4) and the interaction between change of relative size and change of productivity (5).

The first conclusion that can be drawn from Table 3 is that in Belgium, as in the other countries in the comparison, market services contribute most to aggregate productivity growth (2), followed by non-market services. This contribution is explained by a positive "pure productivity effect " (3) and by the increase in their relative share in the economy (with the exception of the Netherlands, where the relative size effect is negative for market services (4)). This finding is consistent with the tertiarisation of developed economies, associated with the rise in living standards, which changes the composition of household spending in favour of services; with the ageing of the population, which drives up demand for personal services; and with the processes of externalisation and delocalisation by mainly industrial companies in their quest to minimise production costs.

The market services industries that contribute most to this trend are more or less the same in all the countries studied. In Belgium, these are legal, accounting and technical activities (M69-71), administrative and support services (N), real estate activities (L) and trade (G). In Germany, IT services (J62-63) have outpaced legal, accounting and technical services, while in France they are larger than trade. The Netherlands is the only country where real estate activities do not feature in the top four market services contributing most to aggregate productivity growth.

In France, Finland and the Netherlands, the most positive contributions in the non-market services category are delivered by the same two industries: healthcare (Q86), which is also the first industry in Austria, and residential care and social work (Q87-88), which is also the first industry in Germany, while in Belgium it is education (P) - which is also the second contributing industry in Germany and in Austria - and government (O).

Table 3. Breakdown of cumulative productivity growth for the period 2000-2019
In %

		Productivity growth (1)	Contribution			
			Total (2)	Pure impact (3)	Relative size (4)	Interaction (5)
BE	Total economy	15.4	15.4	22.2	2.2	-9.0
	Primary	5.8	-0.5	0.1	-0.5	0.0
	Industry	45.2	-4.0	8.9	-8.7	-4.2
	Construction	25.9	1.0	1.3	-0.3	-0.1
	Market services	17.2	13.7	12.3	5.5	-4.2
	Non-market services	-1.4	5.3	-0.4	6.2	-0.5
DE	Total economy	21.0	21.0	29.7	3.5	-12.3
	Primary	59.5	-0.1	0.7	-0.5	-0.3
	Industry	42.6	4.6	12.0	-2.9	-4.4
	Construction	-0.2	0.8	0.0	0.8	0.0
	Market services	19.1	9.8	15.7	1.0	-6.9
	Non-market services	1.1	5.7	1.4	5.0	-0.7
FR	Total economy	18.5	18.5	26.6	5.0	-13.1
	Primary	64.7	-0.3	1.5	-1.1	-0.7
	Industry	45.7	-2.5	10.5	-6.3	-6.7
	Construction	-16.8	1.9	-0.8	3.3	-0.6
	Market services	13.2	13.6	11.8	6.8	-4.9
	Non-market services	13.7	5.7	3.6	2.3	-0.1
NL	Total economy	14.6	14.6	29.5	-2.7	-12.2
	Primary	44.4	-0.5	1.1	-1.1	-0.5
	Industry	36.7	-2.0	8.2	-6.3	-3.9
	Construction	20.7	0.4	1.1	-0.6	-0.1
	Market services	17.6	9.8	18.6	-1.5	-7.3
	Non-market services	-1.5	6.9	0.5	6.8	-0.4
AT	Total economy	23.6	23.6	25.2	7.4	-9.1
	Primary	106.9	-0.4	2.0	-1.1	-1.2
	Industry	50.9	2.5	12.5	-5.1	-4.9
	Construction	-20.1	0.6	-1.5	2.6	-0.5
	Market services	21.1	15.9	11.7	6.2	-2.0
	Non-market services	0.4	5.0	0.5	4.8	-0.4
FI	Total economy	16.7	16.7	30.4	7.1	-20.8
	Primary	108.0	-0.2	3.6	-1.9	-2.0
	Industry	56.0	-6.4	16.7	-13.5	-9.6
	Construction	-4.9	2.5	-0.3	2.9	-0.1
	Market services	20.6	14.4	12.7	8.3	-6.6
	Non-market services	-15.5	6.4	-2.3	11.1	-2.5

Primary corresponds to NACE code A, Industry to codes B, C, D and E, Construction to code F, Market services to codes G to N and Non-market services to codes O to T.
Source: Eurostat, September 2022 and National Accounts Institute (NAI), October 2022.

The second conclusion is that only two countries, Germany and Austria, record a positive contribution from industry, since the pure productivity effect is sufficiently positive to offset the other two negative effects. In the remaining countries, the positive pure productivity effect is more than offset by the negative size (4) and interaction (5) effects, which translate into a negative contribution by industry to aggregate productivity growth.

In terms of industries, Belgium and France are distinguished by the low number of industrial sectors that make positive contributions to aggregate productivity growth. In Belgium, there are four such industries: agriculture and food (C10-12), pharmaceuticals (C21), other manufacturing (C31-33) and water and waste treatment (E); in

France there are only three (chemicals (C20), gas and electricity (D) and water and waste treatment (E)). Conversely, in Germany and Austria a majority of industries contribute positively to aggregate productivity growth (eight and nine sectors respectively). Finland, and to a lesser extent the Netherlands, stand out in that they also have several industries that make positive contributions to productivity growth (nine industries in Finland and six industries in the Netherlands), but these contributions are insufficient to compensate for the negative contributions of the other industries.

This finding also reflects the varying intensity of the deindustrialisation at work in these economies.

We can refine this diagnostic by looking at the two non-crisis periods, 2000-2007 and 2012-2019 (see descriptive annex), for the different countries. The common feature shared by all the countries studied, as already explained, is the marked decline in aggregate productivity growth during the period 2012-2019 when compared with the period 2000-2007. However, the evolution of the contributions of different sectors to this slowdown in total productivity differs between Belgium and France, on the one hand, and Germany, Austria, Finland and the Netherlands, on the other. In Belgium and especially in France, the contribution of industry, negative for the period 2000-2007 (-1.5% and -2.1% respectively) is positive for the period 2012-2019 (0.1% and 0.7% respectively), while in all other countries, the contribution of industry to aggregate productivity growth declined from one period to the next, with the extreme case of the Netherlands, where this contribution fell from 1.0% to -2.5%. The Netherlands is also the only country to record a negative contribution by industry for the period 2012-2019. In Belgium and in France, deindustrialisation therefore seems to be slowing.

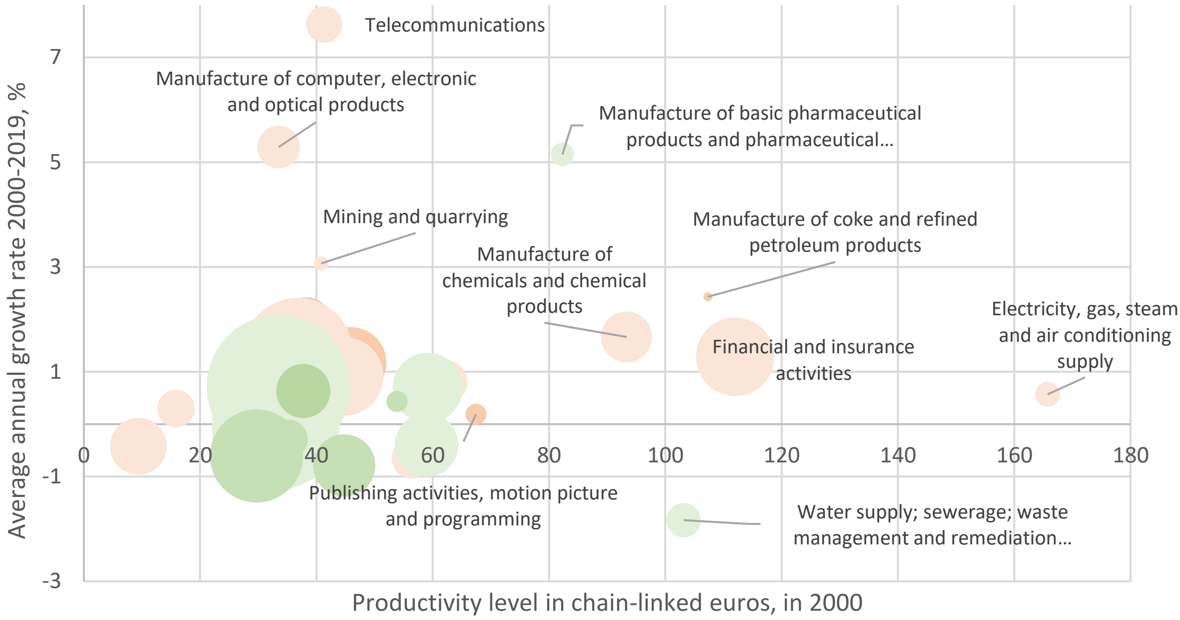
The contribution of the construction sector has also evolved differently from one country to another. Between the two periods under consideration, its contribution fell in Belgium, France, the Netherlands and Finland, but rose in Germany and Austria. Conversely, the contribution of market services decreased from one period to the next in all the countries studied, as did that of non-market services, with the exception of Germany, where it increased slightly.

In the breakdown of growth, the relative size of industries has moved in line with their share in the total volume of employment and the evolution of their value-added deflator relative to that of the economy as a whole. To simplify the interpretation of the evolution of relative size, it makes sense to analyse the two components separately. We should note, however, that the graphic analysis of the two components establishes no causal relationship with the correlation illustrated.

1.1.3. Productivity growth and growth of employment: often a difficult combination

It is also interesting to examine the extent to which the different industries in the economy have managed to combine hourly labour productivity growth with growth in the volume of employment. However, it must be remembered that, according to the economic literature, it is all the more difficult to achieve high productivity growth rates if the starting level is already high. Indeed, it is easier to match the technological frontier through imitation than to shift it through innovation. Figure 4 shows these different aspects for the 38 industries making up the Belgian economy, with on the x-axis the level of hourly productivity in 2000 measured as the ratio between the value added in chain-linked euro with reference year 2015 and the number of hours worked, and on the y-axis the average annual growth rate of hourly productivity for the period 2000-2019 in %. Each industry is represented by a green or red dot, whereby green means that its share in the volume of work in the total economy has increased, and red that it has decreased. The size of the dot shows the relative size of the increase or decrease (in percentage points).

Figure 4: Original productivity level, productivity growth rate and evolution of employment share, 2000-2019



Real estate activities (L) are not shown on the figure due to their exceptional high initial productivity level.
Source: Eurostat, September 2022 and National Accounts Institute (NAI), October 2022.

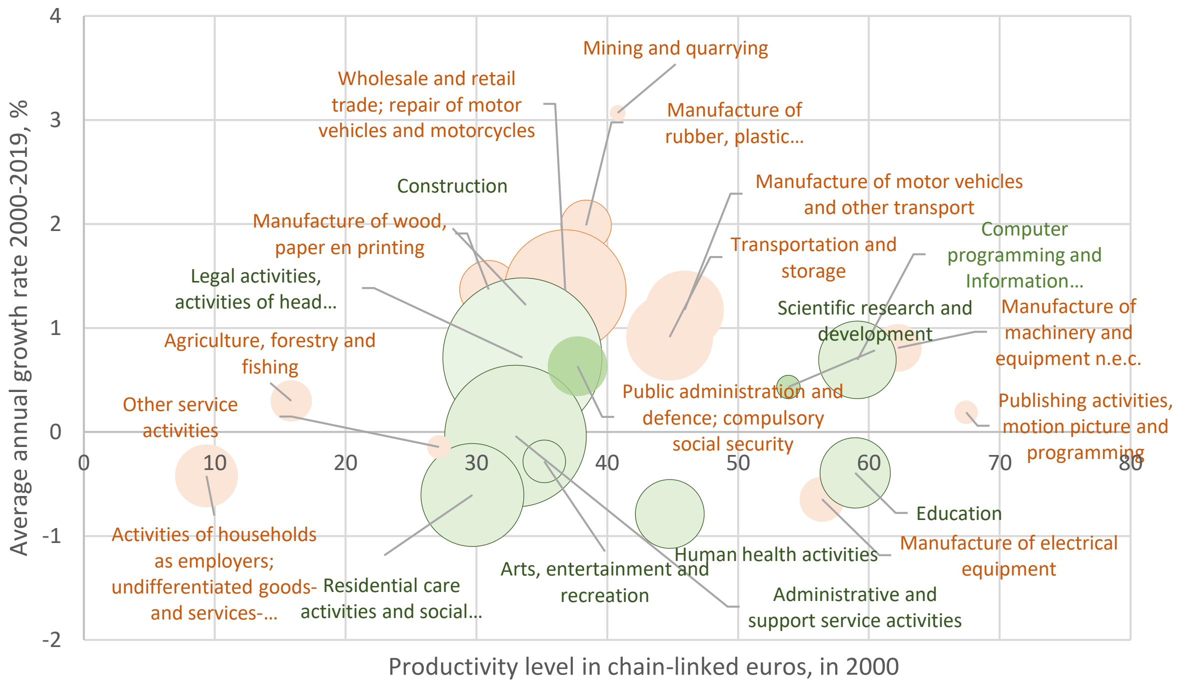
Figure 4 illustrates the spread of performance in terms of the level and growth rate of productivity across industries. In 2000, the economy as a whole had a productivity level of 44.75 chain-linked euro and the average annual growth rate of hourly productivity was 0.76% over the period 2000-2019.

Some industries have an extreme starting level of productivity - for example gas, electricity and steam production; or in terms of growth rate, as in the case of telecommunications[5]. The vast majority of these "extreme" industries experienced a more or less marked decline in their relative share of the economy's labour volume for the period under review.

Graph 5 excludes these extremes cases in order to focus on the part of the graph where the majority of industries are concentrated. From this graph we can conclude that most industries with an increasing relative share of labour volume (green dots) have a lower productivity level than the economy as a whole. Exceptions to this finding are some key industries among market services and non-market services in terms of employment (IT (J62-63), R&D (M72), education (P) and healthcare (Q86)) and water and waste treatment production (E) present in Figure 4. Two market services industries are conspicuous for the large increase in their share of employment (green dot diameters). These are legal, accounting and technical activities (M69-71), and administrative and support services (N).

[5] Real estate activities were removed from the graph because their productivity level in 2000 was extremely high due to the nature of their activities.

Figure 5: Original productivity level, productivity growth rate and evolution of employment share, 2000-2019, Zoom



The figure focuses on the majority of industries, excluding extreme performance in terms of the level or growth of hourly labour productivity.
Source: Eurostat, September 2022 and National Accounts Institute (NAI), October 2022.

The graph also shows that the dots corresponding to higher productivity growth than the economy as a whole are largely in red. There are only two exceptions to this observation: pharmaceuticals (C21) in Chart 4 and construction (F) but with a rather small diameter of their respective dots.

The two figures are thus compatible with Baumol's proposition, which predicts that production inputs will be predominantly absorbed by industries with low productivity growth and the negative interaction effect seen in Table 3.

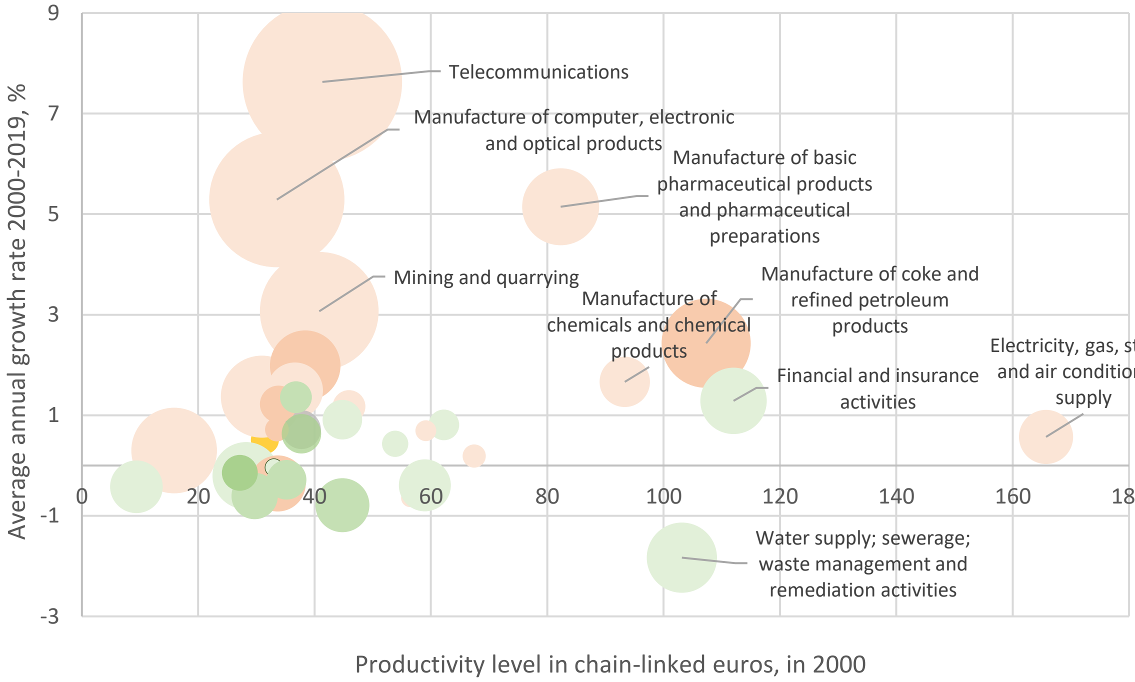
1.1.4. Productivity growth and relative price evolution: productivity gains coupled with flattening price evolution

The same method is followed using the evolution of the relative deflator of industries replacing the evolution of their share in labour volume, which allows us to explore how different sectors of the economy have leveraged their productivity gains.

Figure 6 illustrates this using the same dimensions as before for the 38 industries of the Belgian economy, with the level of hourly productivity in 2000 on the x-axis and the average annual growth rate of hourly productivity for the period 2000-2019 in % on the y-axis. Each industry is represented by a green or red dot, whereby green means that its relative deflator has increased and red that it has decreased, and where the size reflects the relative importance of this increase or decrease (in percentage points). If the dot is red, this indicates that prices have risen less rapidly in the industry than in the economy as a whole, this may be an indication that the productivity gains achieved have allowed for the production costs to be suppressed.

The industries with the highest productivity growth for the period in question are all industries in which the added-value deflator has clearly risen less fast than in the economy as a whole (not only are the dots red, but their diameter is larger than the other red dots).

Figure 6. Productivity level, average annual growth rate of productivity and evolution of relative deflator, 2000-2019

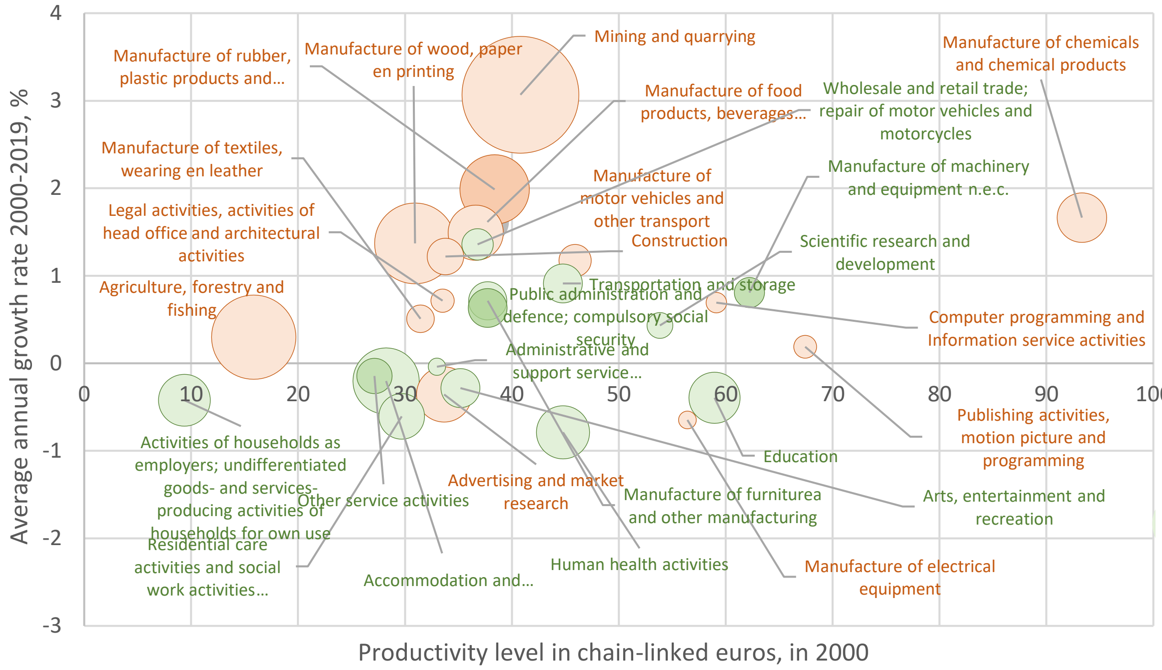


Real estate activities (L) are excluded from the graph due to their very high initial productivity level.
Source: Eurostat, September 2022 and National Accounts Institute (NAI), October 2022.

As for Figure 4, extreme values in terms of productivity growth rates or of productivity levels for some industries make it difficult to determine the position of the majority of industries. It is therefore helpful to exclude them in order to zoom in on the other industries as shown in Figure 7.

The same conclusion can be drawn from this graph. The industries with the highest productivity growth rates are shown with a red dot and hence a reduction in the relative deflator. Furthermore, the red dots are mostly related to industrial sectors, the only exceptions being service industries that are more business-oriented, such as publicity, liberal professions and technical and veterinary services (M73-75) and legal and accounting services (M69-71) or that relate to information and communication technology such as telecommunications (J61), computer services (J62-63) and publishing, film and video (J58-60). Conversely, green dots corresponding to an increase in the relative deflator are mainly associated with market service industries close to final demand (trade (G), hotels and restaurants (I), financial services (K)) and, in particular, with non-market services, where all industries are represented by a green dot.

Figure 7. Productivity level, average annual growth rate of productivity and evolution of relative deflator, 2000-2019, Zoom



The figure focuses on the majority of industries, excluding extreme performance in terms of the level or growth of hourly labour productivity.
Source: Eurostat, September 2022 and National Accounts Institute (NAI), October 2022.

There are only three industrial sectors whose deflator is rising faster than the economy as a whole (water and waste treatment (E), other manufacturing (C31-33) and machinery and equipment (C28)). This finding may help explain why the relative size effect is negative for industry as a whole in Table 3 (column 4).

Conclusions

In Belgium, as for the other countries that were examined, the productivity dynamics of industries largely accounts for the productivity growth of the overall economy. The effects of reallocation of inputs both between industries with different productivity levels (positive effect) and between industries with different productivity growth rates (negative effect) are very limited and diminish between the two non-crisis periods, 2000-2007 and 2012-2019.

Hence the slowdown in productivity growth in the overall economy over the last two decades is mainly due to the slowdown in productivity gains within industries.

Market services, and in particular some services that play a role in the intermediate consumption of other industries, such as IT services or legal, accounting and technical services, are the main contributors to productivity growth in the overall economy: the positive pure productivity effect is amplified by the increase in the relative size of these activities in the economy. Except in Germany and Austria, the contribution of industrial activities to aggregate productivity growth is negative, since the positive pure effect is dominated by the negative impact of the decline in their relative size. However, the period analysis shows that for Belgium and, in particular, France, this negative contribution falls and actually becomes positive between 2012 and 2019.

If we compare the growth rates for sectoral productivity for the period 2000-2019 with the two size factors - the share in the volume of employment and the relative deflator - we find that industries whose productivity growth rates are higher than in the economy overall are mainly those whose share in the total volume of employment has declined (sharply) and whose deflator has risen (markedly) less rapidly than that of the economy as a whole. This finding confirms Baumol's fear that the reallocation of inputs benefits the least dynamic activities in terms of productivity.

1.2. Regional diagnostic[6]

The regional diagnostic aims to analyse labour productivity data at the regional level to highlight, from this perspective, the dynamics previously explored at the national level. This regional analysis will take a dual approach: (1) a regional-level application of analyses from the national diagnostic on the one hand, and (2) the positioning of developments within Belgium through a comparison with a number of European regions, which will differ for each Belgian region, carried out on the basis of shared economic characteristics.

Methodology

The data

The regional diagnostic is based on data published in late January 2022 by the National Accounts Institute (NAI). As usual, value added had already been provisionally estimated for the last year (2020), but this was not done for labour volumes, which are only available for the year before (2019). All these statistical series start in 2003.

Additional assumptions

While the results are presented in line with major activity categories (manufacturing, construction, market services, non-market services and other), hourly productivity estimates are first undertaken for 38 industries (A38).

However, the hours worked series for the self-employed are only available for 10 industries (A10) in the regional accounts. For each region, we must therefore estimate the hours worked by the self-employed per A38 sector and the level of sectoral disaggregation that is published for employees. Hence, the following method was adopted: the average working hours of self-employed people per A38 sector is obtained by weighting the average number of working hours of employees in the same region, per A38 sector, in relation to the ratio between the average number or working hours of self-employed workers and employees, both evaluated per A10 sector. The results from these estimated parameters provide an estimate of the number of hours worked by self-employed workers per A38 sector[7]. In each region, the distribution per A38 sector resulting from this estimate is then used to disaggregate the volume of hours published for each A10 sector across the different A38 sectors that make it up.

It is also necessary to measure value added as a volume by sector. With the absence of any regional price information, regional value added as a volume is obtained, in both this analysis and the regional accounts[8], by using national deflation factors in detail across 64 industries (A64) and additional assumptions concerning the volume of public activities in these sectors. This approach enables us to take account of regional price discrepancies related to the structure of activities in the regional economies.

1.2.1. Analysis of productivity dynamics of the Belgian regions

On average, hourly labour productivity growth rates, for the entire period 2003-2019, differ little from one region to another. With an average annual growth rate of 0.9%, Flanders is ahead of Wallonia (0.7%) and the

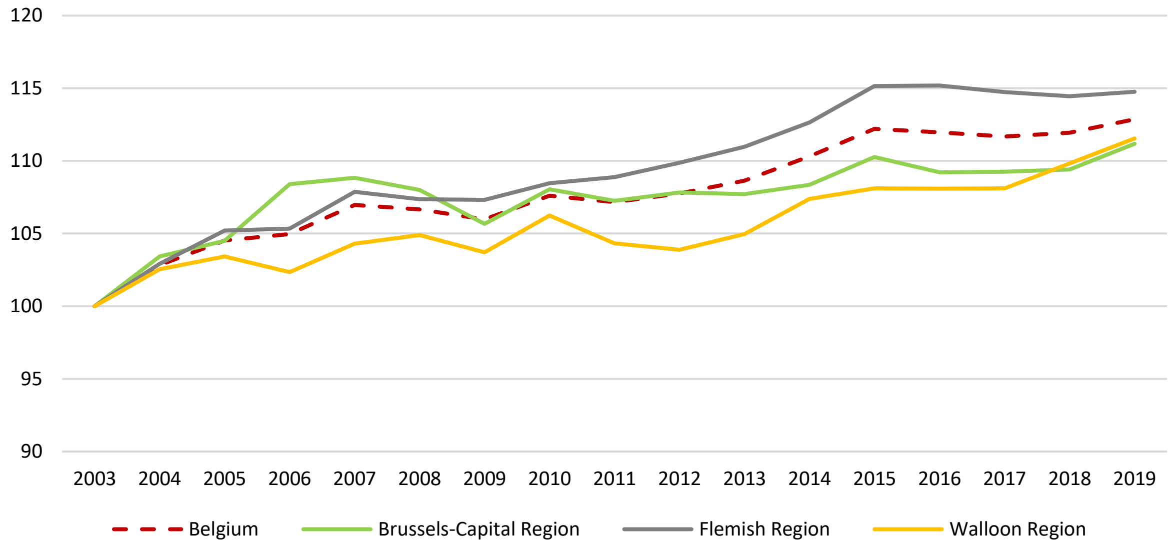
6 The analysis in this section was prepared by the Brussels Institute for Statistics and Analysis (BISA), the Institut wallon de l'évaluation, de la prospective et de la statistique (IWEPS) and Statistics Flanders.

7 An alternative estimation method, which consists of breaking down national series by region and per A38 business sector, yields similar results. These results were therefore not included in the analysis.

8 Nevertheless, the regional accounts published by the INR/ICN, however, currently only present an aggregated volume for the economy as a whole.

Brussels region (0.7%). Figure 8 shows how the average evolution of the different growth trajectories of labour productivity in the regions compares.

Figure 8. Evolution of hourly labour productivity
Index, 2003=100



Source: Regional accounts.

Slowdown in hourly labour productivity growth in the regions

Just as at the national level, a general downward trend in productivity growth has also been observed for several decades in the three Belgian regions (NPB, 2021). This downturn has persisted over the recent period, as evidenced by the slowdown in average annual hourly productivity growth measured over the two periods without a major crisis, namely 2003-2007 and 2012-2019 (Table 4).

Table 4. Average annual growth rate of hourly labour productivity
In %

	2003-2019	2003-2007	2007-2012	2012-2019
Belgium	0.8	1.7	0.1	0.7
Brussels Capital Region	0.7	2.1	-0.2	0.4
Flemish Region	0.9	1.9	0.4	0.6
Walloon Region	0.7	1.1	-0.1	1.0

Source: Regional accounts.

The declining increase in hourly productivity is most pronounced for the Brussels Region and Flanders, while average hourly productivity in Wallonia shows only a slight fall. This movement stems from underlying regional developments in economic activity and the varying volume of employment (Table 5). During the 2003-2007 period, the growth in activity in Brussels (2.2% per year on average) was accompanied by a very limited increase in the number of hours worked (0.1%), while the marked economic growth in Flanders and Wallonia (an average increase of 3.3% per year in Flanders and 2.7% per year in Wallonia) appeared to be greater in terms of hours worked in Flanders (1.4% per year on average) and even more so in Wallonia (1.6%). Over the period 2012-2019, the overall slowdown in average economic growth was similar in the Brussels Region and the Flemish Region with relative stability in the volume of hours worked. The increase in hours worked remained at 1.1% per year on average in Flanders and even rose slightly in Brussels (0.4% per year on average), but growth remained lower than in the other two regions. In Wallonia, in contrast, the growth in activity, which was similar to that in Flanders (1.7%), was accompanied by a weaker increase in the number of hours worked (0.7%).

Table 5. Average annual growth rate of value added (volume), labour volume and hourly labour productivity
In %

	Value added		Labour volume		Hourly productivity	
	2003-2007	2012-2019	2003-2007	2012-2019	2003-2007	2012-2019
Belgium	2.9	1.6	1.2	0.9	1.7	0.7
Brussels Capital Region	2.2	0.9	0.1	0.4	2.1	0.4
Flemish Region	3.3	1.7	1.4	1.1	1.9	0.6
Walloon Region	2.7	1.7	1.6	0.7	1.1	1.0

Source: Regional accounts.

Sectoral breakdown of productivity growth at regional level

The sectoral breakdown of labour productivity growth by major economic sectors shows that manufacturing in the three regions recorded significantly higher labour productivity gains than the other sectors during the entire 2003-2019 period. In Flanders and Wallonia, construction also recorded strong productivity growth. The increase in hourly productivity of market services in Wallonia lags behind the increases observed in Brussels and Flanders. These results are presented in Table 6.

Table 6. Average annual growth rate of hourly labour productivity by sector
In percentage points

	Belgium	Brussels Capital Region	Flemish Region	Walloon Region
		2003-2019		
Manufacturing	2.1	2.4	2.0	2.4
Construction	1.2	0.5	1.4	1.3
Market services	0.9	1.0	1.0	0.7
Non-market services	-0.1	0.3	-0.2	0.0
		2003-2007		
Manufacturing	3.9	7.4	3.6	3.8
Construction	3.1	4.3	3.1	3.3
Market services	1.7	2.3	2.0	0.8
Non-market services	0.2	0.8	0.1	0.0
		2012-2019		
Manufacturing	2.1	2.9	1.5	3.7
Construction	1.0	-0.3	1.2	1.0
Market services	0.8	0.8	0.9	1.1
Non-market services	-0.2	0.0	-0.5	0.1

Note: manufacturing corresponds to heading C, market services cover headings G to N and non-market services cover headings O to U of NACE Rev2.
Source: Regional accounts.

If we consider the recent evolution of sectoral productivity in the regions between one non-crisis period and the other, in other words comparing the periods 2003-2007 and 2012-2019, regional differences emerge (Table 6). The obvious slowdown in industrial productivity growth observed at national level is particularly striking in Brussels, where we see a big dip, but also in Flanders. Between 2012 and 2019, manufacturing in Wallonia seems to have broadly returned to productivity growth close to pre-financial crisis figures.
Wallonia further distinguishes itself from the other two regions with a slight recovery in productivity growth for market services, while the Brussels Region and the Flemish Region have also seen declining labour productivity growth in the tertiary market sector, although this is clearly higher than in Wallonia. On the other hand, productivity growth in the construction sector slowed significantly in all the three regions, and the industry even recorded a loss of productivity in the Brussels region.

The impact of the evolution of the productivity of key activities on the evolution of aggregate labour productivity depends not only on its evolution over time, but also on the economic structure of each region. Table 7 illustrates the sectoral composition of the regional economies in terms of value added and employment between 2003 and 2019. The economic weight of manufacturing, measured both in value added and in worked hours, declined in all three regions, although less significantly, while the share of market services rose, with the exception of worked hours in market services, which contracted in the Brussels Region. The contribution of non-market services to value added and to the number of worked hours, however, rose in Brussels, while remaining stable or falling slightly in Flanders[9] and in Wallonia.

Table 7. Evolution of the share in the total economy of key activities in nominal value added and hours worked, 2003 - 2009

	Manufacturing				**Market services**				**Non-market services**			
	Value added		**Worked hours**		**Value added**		**Worked hours**		**Value added**		**Worked hours**	
	2003	2019	2003	2019	2003	2019	2003	2019	2003	2019	2003	2019
Belgium	18.1	13.8	14.9	10.5	50.2	54.3	46.7	49.4	22.7	23.5	29.3	30.6
Brussels Capital Region	5.6	3.1	5.9	2.8	64.3	65.5	54.5	53.4	23.9	26.9	35.7	39.2
Flemish Region	22.6	16.3	17.9	12.4	48.1	54.2	46.8	51.0	19.8	20.0	25.2	26.7
Walloon Region	17.6	15.8	13.4	10.3	44.0	45.7	42.0	43.8	28.5	29.3	34.3	34.9

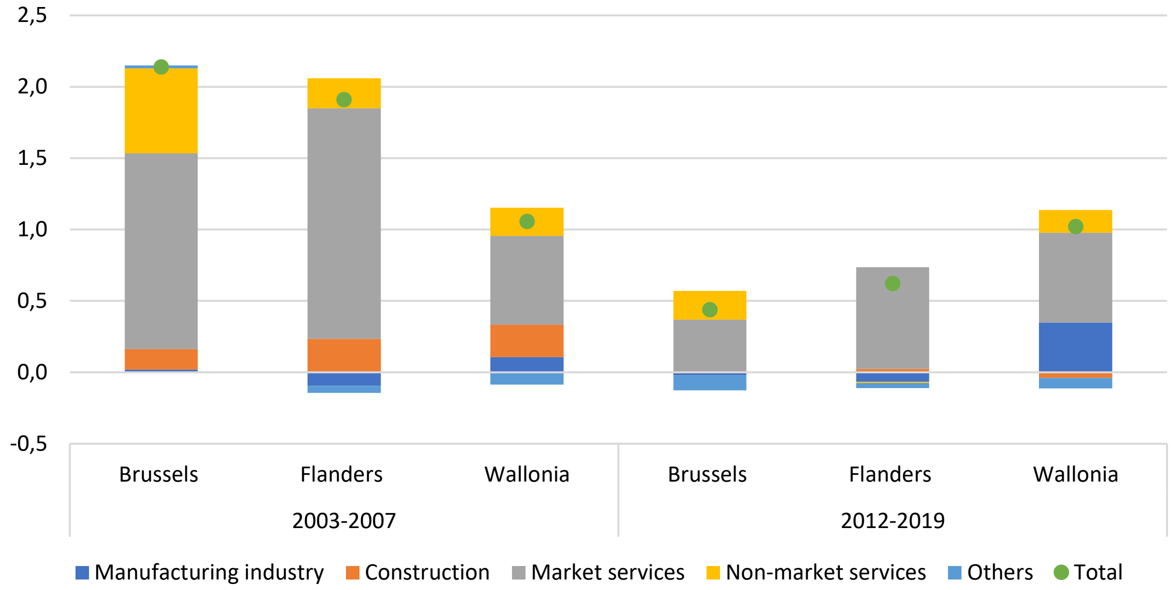
Note: manufacturing corresponds to heading C, market services cover headings G to N and non-market services cover headings O to U of NACE Rev2.
Source: Regional accounts.

Productivity gains and sectoral contributions

The disaggregation proposed by Tang and Wang (2004) allows us to consider the evolution of sectoral contributions to aggregate labour productivity growth. Over the entire period (2003-2019), labour productivity growth is largely driven by the development of market and non-market services. Manufacturing made a negative contribution to productivity growth in Flanders and Brussels, without contributing significantly to productivity growth in Wallonia, a sign of the over de-industrialisation of these economies. The contributions of the sectors to productivity over the two non-crisis periods, 2003-2007 and 2012-2019, are shown in Figure 9.

9 A large proportion of Flemish public services are located on the territory of the Brussels Capital Region. They therefore fall under "non-market services" in Brussels, and not in Flanders, reducing their relative share in the Flemish economy.

Figure 9. Sectoral contributions to the average annual growth of hourly labour productivity (annual average)
In percentage points



Note: manufacturing corresponds to heading C, market services cover headings G to N and non-market services cover headings O to U of NACE Rev2.
Source: Regional accounts.

The largest contributions to the productivity of the market sector in the three Belgian regions over the period 2003-2019 were made by administrative and support services (NN), legal, accounting and technical activities (MA) and IT services (JC). In Flanders and in Wallonia, labour productivity growth also benefited from activity in construction (FF) and pharmaceuticals (CF). This last sector delivered the largest contribution to productivity in Wallonia. In Brussels, labour productivity growth was boosted by the contribution of transport and storage services (HH). Apart from the Walloon and Flemish pharmaceutical industries, we observe, conversely, that the decreased employment weight of the remaining manufacturing industries, where productivity levels and productivity gains are high, has made a negative contribution to the evolution of regional productivity. The reallocation of jobs in trade (GG) in Brussels and to a lesser degree in Flanders, and in telecommunications (JB) in Brussels and in Wallonia, led to a further slowdown in productivity gains in these two regions.

During the period 2003-2007, the strong contribution of market services in the Brussels Region (+1.4 percentage points) is the result of relatively modest average growth in value added (2.5%) with no equivalent average increase in the labour volume (0.1%). In Wallonia, the increase in activity (2.7%) led to a stronger rise in employment (1.9%), limiting the industry's contribution to productivity growth (+0.6 percentage points, or pp). In Flanders the contribution of market services (+1.6 pp) stemmed from strong growth of value added (4.1%) compared with the rise in employment (2.1%).

The contribution of non-market services to the increase in aggregate productivity is significant in Brussels (0.60 pp), larger than the contribution of this sector in the Flemish (0.21 pp) and Walloon (0.20 pp) regions, due to a greater rise in worked hours in these two regions.

The contribution of manufacturing to the rise in labour productivity is negative in Flanders (-0.9 pp), virtually zero in Brussels (0.02 pp), and slightly positive in Wallonia (0.11 pp). The weak contribution of manufacturing can be explained by the evolution of employment and not by industrial productivity, where the global gains remained positive for the period.

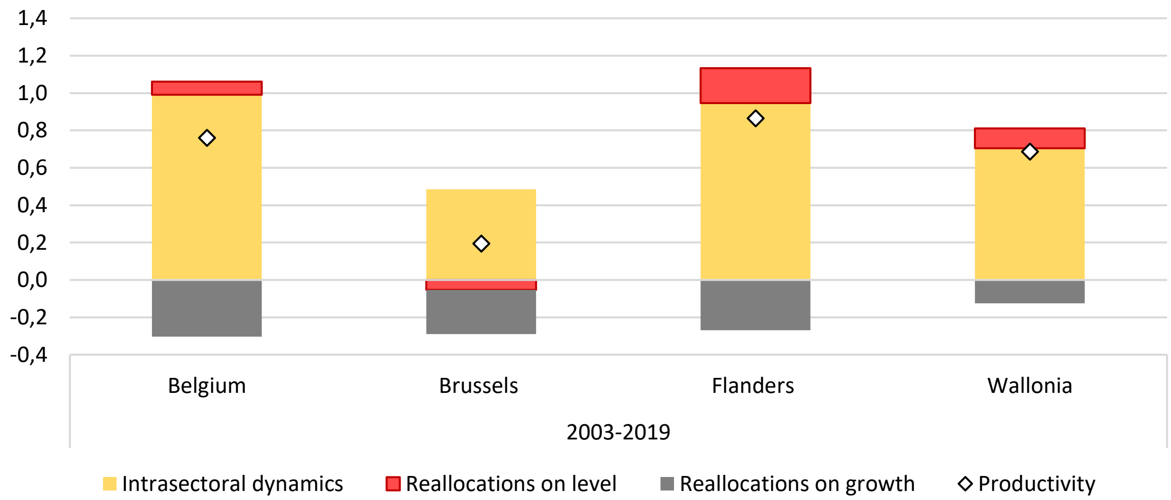
The contribution of the construction sector to aggregate labour productivity is roughly the same in Flanders (0.24 pp) and in Wallonia (0.23 pp), slightly higher than its contribution in Brussels (0.16 pp).

The recent slowdown in aggregate labour productivity reflects the differing evolution of sectoral contributions across the Belgian regions. Over the period 2012-2019, the decline in the average annual productivity growth rate in Brussels and in Flanders can be explained by a general decline in the contributions of the sectors, in particular the contribution of market services (which fell by 0.36 pp in Brussels and 0.71 pp in Flanders) and, to a lesser extent, of non-market services (0.20 pp in the capital and -0.01 pp in the Flemish Region). This development was exacerbated by the absent contribution of construction in the three regions. In Wallonia, the contribution of tertiary industries remained broadly stable, while manufacturing once again began to make a positive contribution (0.35 pp) to average annual productivity growth.

Breakdown of regional productivity gains between productivity effect and reallocation effect

Finally, the disaggregation of productivity growth proposed by Tang and Wang (2004) was applied at the regional scale. As previously explained, this method allows us to break down aggregate productivity growth by distinguishing between that which relates to real productivity growth within each sector and that which reflects a change in the sectoral structure of employment, in other words a movement of productive inputs between sectors with different levels or productivity growth (Girard et al., 2022). The results of this breakdown at regional level for the period 2003-2019, and for the two non-crisis subperiods 2003-2007 and 2012-2019, are shown in Figures 10 and 11[10]. As in the case of the national diagnostics, we opted for a breakdown by 38 industries (A.38 of the regional accounts).

Figure 10. Breakdown of average annual hourly labour productivity growth rate, 2003-2019
In %



Source: Regional accounts.

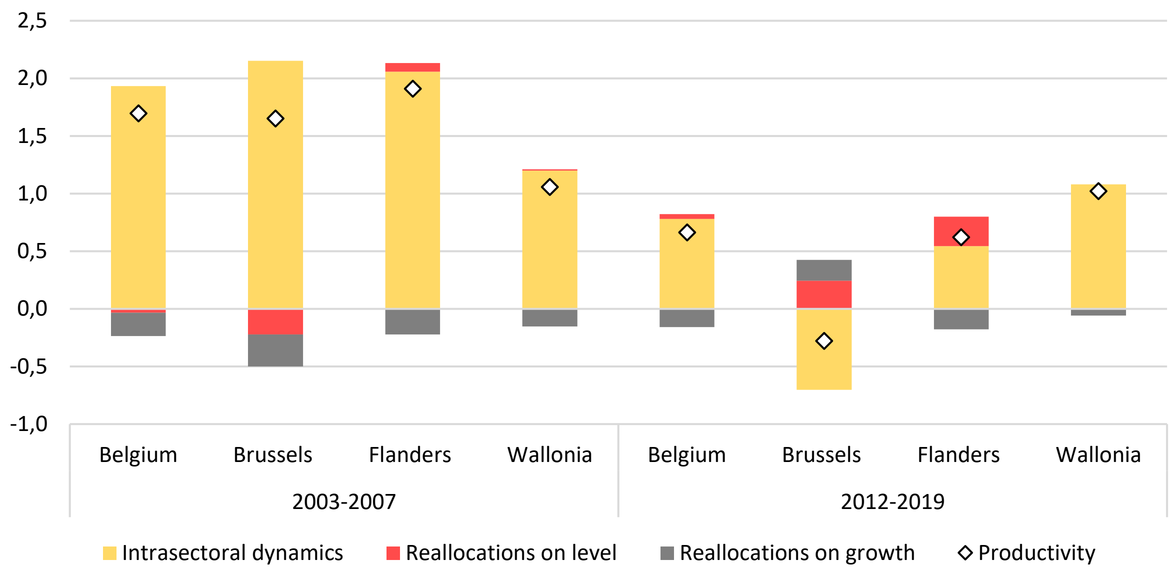
For the entire period 2003-2019, labour productivity growth in the three Belgian regions largely derived from productivity growth within industries. This dynamic was hampered by the effect of reallocations on growth, which was negative for all three regions and particularly pronounced in Brussels. The effect of reallocation between industries with differing hourly productivity levels is positive in Flanders and Wallonia and unfavourable in Brussels. Very generally, this suggests that in Flanders and Wallonia, jobs were reallocated to industries with high levels of productivity but where productivity gains are quite limited. In Brussels, the reallocation of production inputs has been towards sectors where productivity levels and gains are comparatively low.

When the same breakdown is applied to the two non-crisis periods, 2003-2007 and 2012-2019, it can be seen that the net slowdown in productivity gains in Brussels and Flanders is primarily explained by exhausted

[10] The breakdown of productivity gains is first estimated at the cumulative growth rate for the period under consideration. This is then translated into average annual growth, while the components are proportionally re-presented on the basis of this transformation.

productivity dynamics within industries. In Flanders, net reallocation dynamics improved, thanks to an increased reallocation effect on levels. In Brussels, the impact of sectoral reallocation remains unchanged, as the reduction in the negative impact of reallocation on growth is offset by the increase in the negative contribution of reallocation on levels. In Wallonia, the sharp decline in intrasectoral performance is partly offset by the reduced negative impact of reallocation on growth.

Figure 11. Breakdown of average annual hourly labour productivity growth rate
In %



Source: Regional accounts.

This breakdown also allows us to estimate the contribution of the major economic sectors to aggregate productivity growth. Table 8 shows the results of this breakdown for the entire period 2003-2019. The structure is identical to the national diagnostic table (above), from which the descriptors were taken. The first column (1) gives average annual productivity growth for the period, the second (2) indicates the contributions of the different categories of activities, disaggregated into the three previously presented components: the effect of "pure impact" (3), relative size effect (4) and the interaction between change of relative size and change of productivity (5). As explained, the pure productivity effect is related to intra-sectoral dynamics, the relative size effect is an estimate of the impact of reallocation on levels and the interaction shows the reallocation effect on growth.

Table 8. Breakdown of average annual productivity growth rate, 2003-2019
In %

		Prod. growth (1)	Total contribution (2)	Pure impact (3)	Relative size (4)	Interaction (5)
Belgium	Manufacturing	2.1	-0.2	0.4	-0.4	-0.1
	Construction	1.2	0.1	0.1	0.0	0.0
	Market services	0.9	0.7	0.6	0.2	-0.1
	Non-market services	-0.1	0.2	0.0	0.3	0.0
	Other	-0.1	0.0	0.0	0.0	0.0
	Total economy	0.8	0.8	1.0	0.1	-0.3
Brussels-Capital	Manufacturing	2.4	-0.1	0.2	-0.2	-0.2
	Construction	0.5	0.0	0.0	0.0	0.0
	Market services	1.0	0.5	1.5	-0.4	-0.6
	Non-market services	0.3	0.4	0.0	0.4	0.0
	Other	-4.4	-0.1	-0.1	0.0	0.0
	Total economy	0.7	0.7	1.7	-0.2	-0.8
Flanders	Manufacturing	2.0	-0.2	0.4	-0.5	-0.2
	Construction	1.4	0.1	0.1	0.0	0.0
	Market services	1.0	0.8	0.4	0.4	-0.1
	Non-market services	-0.2	0.2	0.0	0.3	0.0
	Other	1.0	0.0	0.0	0.0	0.0
	Total economy	0.9	0.9	0.9	0.2	-0.3
Wallonia	Manufacturing	2.4	0.0	0.3	-0.3	-0.1
	Construction	1.3	0.0	0.1	0.0	0.0
	Market services	0.7	0.4	0.3	0.1	0.0
	Non-market services	0.0	0.2	0.0	0.3	0.0
	Other	-0.4	0.0	0.0	0.0	0.0
	Total economy	0.7	0.7	0.7	0.1	-0.1

Note: manufacturing corresponds to heading C, market services cover headings G to N and non-market services cover headings O to U of NACE Rev2.
Source: Regional accounts.

Table 8 immediately shows the preponderance of the contribution of both market and non-market services to labour productivity gains in the regions, as is the case for Belgium as a whole. The contribution of market services is explained everywhere by a positive pure productivity effect (3) and, outside the Brussels-Capital Region, by the increase in their relative size (4) in the regional economies. In Brussels, the impact of the relative size and interaction effects (5) is negative. The contribution of non-market services comes mainly from an effect of the sector's increased relative size (4) in the three regions.

The breakdown of the contribution of manufacturing to aggregate productivity gains reveals that the pure productivity effect of the industry is dominated by a double negative size and interaction effect in Brussels and Flanders and only just offset by an unfavourable size effect in Wallonia. Hence the contribution of the sector is negative in Brussels and the Flemish Region, and equal to zero in the Walloon Region.

Finally, using the same method to break down aggregate labour productivity growth, we obtain a better understanding of the sectoral contributions to the slowdown in aggregate productivity observed for the period 2012-2019 compared with the period 2003-2007 (Annex 2). The results confirm the cross-regional differences in the sectoral evolution of productivity gain components. In the Brussels Region and in Flanders, the slowdown in aggregate productivity gains, mainly due to the falling contribution of market services and, to a lesser extent, non-market services, is the result of a reduction in the pure productivity effect and, except for the Brussels tertiary market sector, favourable relative size effects. In Brussels, the negative impact diminished due to the change in the relative size of the market services sector. In Wallonia, the contribution of market services remained broadly stable, supported by a slight uptick in the pure effect of productivity growth.

The contribution of manufacturing has also evolved differently from one Belgian region to another. This difference can be ascribed to the pure productivity effect, which has seen a slight rise in Wallonia while falling in Brussels and Flanders. However, the changes in the contribution of manufacturing to productivity in the three regions share a common feature: a reduction in the unfavourable effects caused by the change in the relative size of the sector. This result could signal a slowdown in the process of de-industrialisation.

1.2.2. Comparison of Belgian intra-regional productivity with European regions

A differentiation of the productivity analysis from Belgium to the regions yields interesting findings. Each Belgian region has its own characteristics. For example, the Brussels Region has a typical service economy, industry has a relatively large weight in the Flemish Region, which also has a more diversified economy, and the Walloon Region has experienced greater de-industrialisation in recent decades, but also the emergence of nascent industries such as pharmaceuticals.

The socio-economic structure of the three Belgian regions is sufficiently different to explore whether a comparison with 'similar' European regions might be of added value for each Belgian region. A comparison of the Belgian regions with European countries is not appropriate. Often, countries form a large geographical whole where inter-regional differences are ironed out.

In what follows, a set of five similar regions will first be determined for each Belgian region. The evolution of hourly productivity for each Belgian region and its five benchmark regions will then be discussed. Statistics Flanders provided a descriptive text to accompany the findings.

Methodology for identifying benchmark regions

The set of NUTS1 and NUTS2 regions form the basis for our European cross-regional comparison. The three Belgian regions (NUTS1) are therefore compared with regions from this classification (with a number of restrictions, see below).

By ‘comparable’ regions we mean regions with an as similar socio-economic structure as possible. The following variables are included in the analysis for this purpose; they all refer to 2003, as this is the starting year for the productivity equation, and also because the basic regional accounts data go back to that year. These variables are taken from Radło & Tomeczek’s (2022) “*Revue de la littérature sur les déterminants de la productivité du travail*”.

- Population density: this is an important basic variable in socio-economic positioning. Regions with high, or low, population density often share the same characteristics (e.g. urban areas have high population density and are more service-oriented; industrial activities are much less prevalent in areas with very low population density, and so on).
- Gross domestic product (GDP) per capita in euro purchasing power parities (PPP): this is a key variable for the wealth produced in a region and thus differentiates between 'rich' and 'poor' regions in terms of gross value added.
- Share of population aged 25-64 with a higher education qualification: this is one of the indicators underlying research and innovation potential. It is easier to have access to an ample supply of a well-trained workforce to conduct research, create innovative applications and implement them in the production process. It should be noted that other indicators in the field of innovation at regional level could not be included due to problems with data for all the necessary NUTS areas (R&D expenditure, number of patents per million inhabitants).
- Economic structure: the share of 11 industries in gross added value[11]. To check the degree of similarity, the Finger-Kreinin index is calculated from this structure. This captures how similar the distribution of GVA across industries is between one reference region and another. For each pair of observations for a Belgian region and another NUTS region the following calculation is made:

[11] These are the industries; B to E excluding C; C; F; G to I; J; K; L; M to N; O to Q; R to U.

$$FK_{ij} = -\sum_{k} min\left(\frac{VA_{ik}}{VA_i}; \frac{VA_{jk}}{VA_j}\right)$$

Where:

i is the Belgian region;

j is the other NUTS entity;

k is the industry;

VA is the gross value added.

The values for population density, GDP per capita and educational attainment are normalised with the Belgian region in question as the zero point. All variables are then standardised and totalled to obtain a score. This method enables the calculation of a composite index based on the four variables indicated above, each of which is assigned an identical weight. The five NUTS areas closest to the score for the Belgian region in question form the set of comparator regions.

However, some restrictions still apply. The calculation excludes:

- The other Belgian regions;
- Areas outside the euro area;
- NUTS areas that are not administrative entities (e.g. the Dutch NUTS-1 areas do not constitute an administrative category for that country)
- NUTS-1 areas with an underlying NUTS-2 area that has a score closer to the Belgian region in question;
- NUTS-2 areas in a NUTS-1 area that has a score closer to the Belgian region in question;
- More than one NUTS-2 area per country.

Determining the benchmark regions

For each region, the calculations result in a panel of regions with similar socio-economic profiles.

The panel for the Brussels-Capital Region consists of the following five regions:

- Vienna (AT13)
- Berlin (DE3)
- Utrecht (NL31)
- Hamburg (DE6)
- North Holland (NL32)

They are all areas that take in a capital city (Vienna, Berlin, North Holland) or a large city that dominates the entire NUTS (Utrecht, Hamburg). Prague (CZ01) also had a score close to Brussels, but was not selected because it is outside the euro area. Île-de-France (FR1) falls just outside the selection of five regions.

In terms of the 'density' variable, Vienna and Berlin come closest to Brussels. For 'GDP per capita', it is again Vienna, but also Hamburg, North Holland and Utrecht. The Dutch regions Utrecht and North Holland come closest to Brussels for the 'higher education' variable. And for 'industrial structure', the closest regions are once again the Dutch regions of Utrecht and North Holland, supplemented by Vienna.

The following regions make up the panel for the Flemish Region:

- North Brabant (NL41)
- Gelderland (NL22)
- Alsace (FRF1)
- Catalonia (ES51)
- Rhône-Alpes (FRK2)

A number of Swedish NUTS-2 and Dutch NUTS-1 areas were excluded since they are not administrative entities.

North Brabant and Gelderland are the closest to the Flemish Region in terms of 'population density'. For 'GDP per capita', this is Catalonia. For 'higher education' , the closest regions are Catalonia and the Dutch regions North Brabant and Gelderland. North Brabant and Gelderland are the closest to the Flemish Region in terms of 'population density'.

Finally, the panel for the Walloon Region looks like this:

- Saxony-Anhalt (DEE)
- Occitania (FRJ)
- Saxony (DED)
- Brittany (FRH)
- Friesland (NL12)

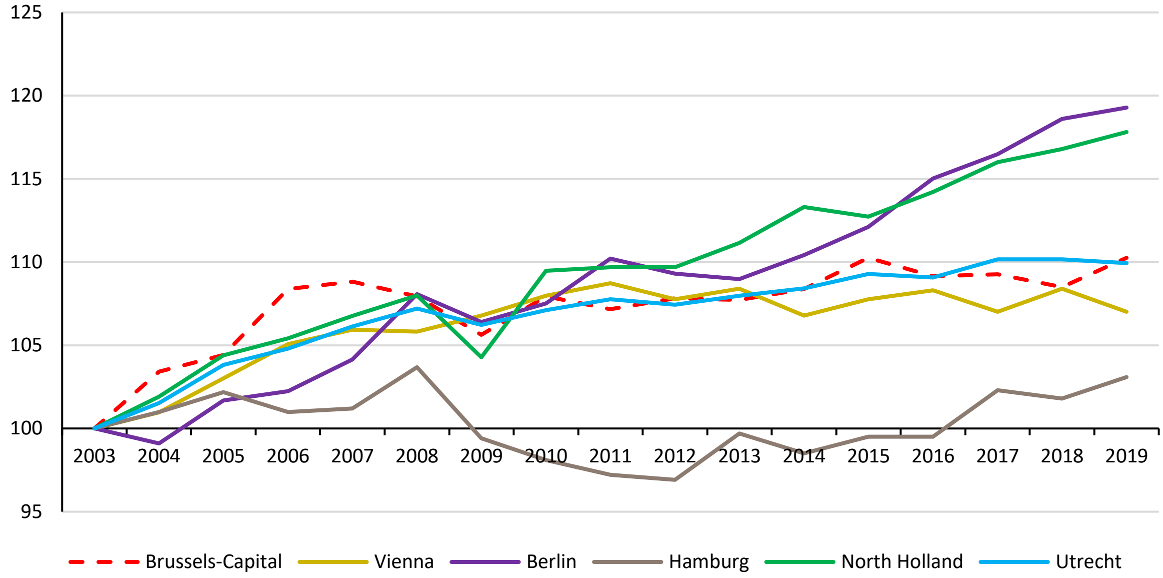
A decent number of French and Eastern German territories were also potential candidates.

In terms of 'population density', Friesland is the closest to the Walloon Region. For 'GDP per capita', Saxony and to a lesser extent Occitania come closest to the Walloon value. For the 'higher education' variable, the closest areas are Saxony-Anhalt and Occitania. And for 'industrial structure', the most similar areas are Saxony-Anhalt and Brittany.

Comparison of the evolution of hourly productivity

Once the panel of comparable regions for each Belgian region has been determined, we can examine the evolution of hourly productivity in each Belgian region and its respective comparator regions.
The data used is derived from the regional accounts published by the National Accounts Institute (INR/ICN). The starting year for the basic series is 2003. This attempts to match the starting year in the national analyses (2000) as closely as possible.

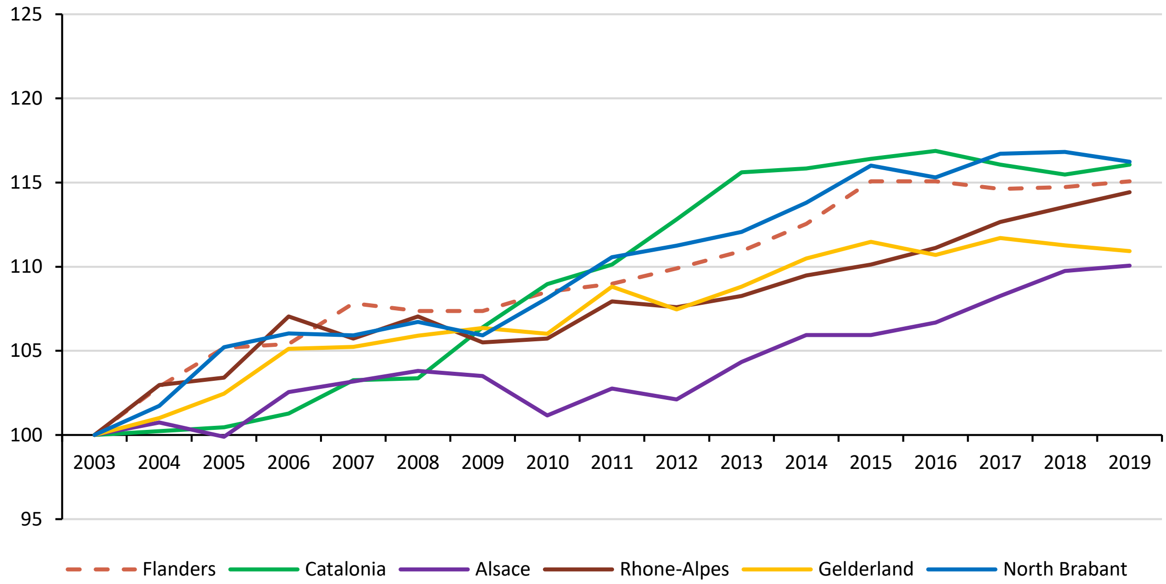
Figure 12. Real hourly productivity, Brussels Region and the set of comparable regions, 2003-2019
Index, 2003 = 100



Source: NAI, processing by FPB.

Real hourly productivity in Brussels rose between 2003 and 2007. Subsequently, hourly productivity remained more or less constant in real terms, the exceptions being 2009 (decline due to the financial and economic crisis) and the slight increases recorded in 2015 and 2019, the latest year available. The Brussels Region performed better than all the benchmark regions between 2003 and 2007 (Table 9 at the end). From 2010, Berlin and North Holland experienced the strongest productivity growth. The evolution in Utrecht and Vienna was quite similar to the Brussels Region from 2010 onwards. The trend in hourly productivity in Hamburg lagged behind the Brussels Region and the other benchmark regions. Overall, over the period 2003-2019, the Brussels Region was around the midpoint in the set of benchmark regions, with an average growth rate of 0.6% (Table 9).

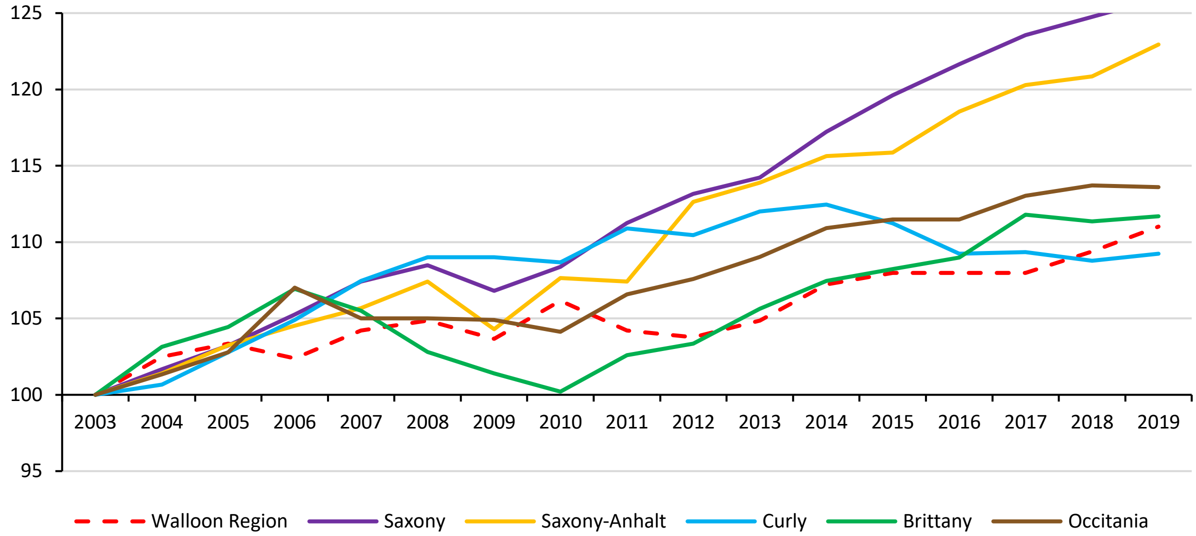
Figure 13. Real hourly productivity, Flemish Region and the set of comparable regions, 2003-2019
Index, 2003 = 100



Source: NAI, processing by FPB.

The Flemish Region, too, experienced the strongest growth between 2003 and 2007 (also Table 9), although this is mainly due to the year 2007. In 2009, hourly productivity saw little or no decline in the Flemish Region and the benchmark regions. Between 2010 and 2015, the Flemish Region recorded an upward trend in growth. This was even stronger in Catalonia and North Brabant. From 2016, the evolution of real hourly productivity remained roughly steady until 2019 in the Flemish Region and these two benchmark regions. It also remained constant in Gelderland, but this region finished below the Flemish Region in 2019. In the two French regions, Rhône-Alpes and Alsace, hourly productivity grew more strongly between 2016 and 2019 than elsewhere in this comparison. Their weaker growth performance between 2007 and 2012 means that these regions are not among top performers over the 2003-2019 period as a whole. Over 2003-2019, real hourly productivity growth in the Flemish Region stood at an average of +0.9%, close to Rhône-Alpes, Catalonia and North Brabant. In Alsace and Gelderland the rise was weaker in comparison (Table 9).

Figure 14. Real hourly productivity, Walloon Region and the set of comparable regions, 2003-2019
Index, 2003 = 100



Source: NAI, processing by FPB.

Hourly productivity in Wallonia rose between 2003 and 2010. This growth performance placed the Walloon Region at the midpoint among the benchmark regions. Between 2010 and 2014 there was a slight decline, while the other regions saw an upward trend. Between 2014 and 2019, Walloon hourly productivity rose again. This was also the case elsewhere, with the exception of Friesland, which saw a fall. Over the 2003-2019 period as a whole, growth was strongest in Saxony and Saxony-Anhalt. The performance of the Walloon Region and the remaining benchmark region was fairly similar. Over 2003-2019, Wallonia recorded average real growth of 0.7 %. This differs little from Occitania, Brittany and Friesland. Saxony and Saxony-Anhalt performed more strongly (Table 9).

Table 9. Average annual growth of hourly productivity in the Belgian regions and their respective sets of comparable regions, 2003-2007, 2012-2019 and 2003-2019
In %

Set	Code	Region	2003-2019	2003-2007	2012-2019
BX	BE1	Brussels Capital Region	0.6	2.2	0.3
BX	AT13	Vienna	0.4	1.5	-0.1
BX	DE3	Berlin	1.2	1.0	1.3
BX	DE6	Hamburg	0.2	0.3	0.9
BX	NL32	North Holland	1.1	1.7	1.1
BX	NL31	Utrecht	0.6	1.5	0.3
Set	Code	Region	2003-2019	2003-2007	2012-2019
VL	BE2	Flemish Region	0.9	2.0	0.7
VL	ES51	Catalonia	1.0	0.8	0.4

VL	FRF1	Alsace	0.6	0.8	1.1
VL	FRK2	Rhône-Alpes	0.9	1.4	0.9
VL	NL22	Gelderland	0.7	1.3	0.5
VL	NL41	North Brabant	1.0	1.5	0.6

Set	Code	Region	2003-2019	2003-2007	2012-2019
WA	BE3	Walloon Region	0.7	1.1	1.0
WA	DED	Saxony	1.6	1.9	1.6
WA	DEE	Saxony-Anhalt	1.4	1.4	1.3
WA	NL12	Friesland	0.6	1.9	-0.2
WA	FRH	Brittany	0.7	1.4	1.2
WA	FRJ	Occitania	0.9	1.3	0.8

Source: NAI.

1.2.3. Conclusion

The recent slowdown in aggregate labour productivity reflects the differing evolution of sectoral contributions across the Belgian regions. Between the two periods without crisis, 2003-2007 and 2012-2019, the decline in the average annual productivity growth rate in Brussels and in Flanders can be ascribed to a general decline in sectoral contributions, the contribution of market services, and to a lesser degree non-market services, taking pride of place. This development was exacerbated by the disappearance of the contribution of construction in the three regions. In Wallonia, the contribution of tertiary industries was broadly maintained, while manufacturing once again began to make a positive contribution to average annual productivity growth.

Given the unchanged economic structure, it is internal productivity dynamics that primarily determine the evolution of the contribution different sectors make to the regions' aggregate labour productivity growth. The effect of the reallocation of production inputs between industries with differing hourly productivity levels is positive in Flanders and Wallonia and negative in Brussels. In addition, these productivity dynamics are hampered by the effect of the reallocation of inputs between sectors whose productivity growth is different. The impact of reallocation on growth is unfavourable in Brussels. Very generally, this suggests that in Flanders and Wallonia, jobs were reallocated towards industries with high levels of productivity but where the productivity gain is quite limited. In Brussels, the reallocation of production inputs has generally been towards sectors where productivity levels and gains are comparatively low.

Finally, because the socio-economic structures of the Belgian regions are sufficiently different from each other, the evolution of hourly productivity in each Belgian region was compared with a set of five similar regions outside Belgium in each case.

This produces a different set for each of the three regions. The Brussels region - unsurprisingly - is generally more comparable with other capital regions. The purpose of designating these five comparable regions is to better 'calibrate' the evolution of hourly productivity in each Belgian region.

Finally, each region appears to score roughly at the midpoint among its benchmark regions for the real evolution of hourly productivity. The Flemish region emerges in a slightly stronger position in its group, the Walloon region slightly less so.

2. Significant levers for productivity growth

2.1. Continued commitment to R&D and innovation

R&D and innovation are processes crucial to productivity growth. Below, we take a more detailed look at how these processes could be further stimulated. We will first look more closely at the effectiveness and efficiency of financial support measures for R&D. But financial support measures for R&D are, of course, only one of the factors that have an impact on a country's R&D and innovation performance. Other factors such as the presence of skills, knowledge institutions with which to collaborate, innovation-friendly regulation, and sufficient competition (including among supply services) are also (at least equally) important. Furthermore, not only is the creation of new technologies important, but the dissemination of these technologies and knowledge is also viewed as an important source of economic value creation, as discussed in section 2.1.2.

2.1.1. Maintain government support for R&D, but monitor the efficiency of these measures

Both theoretical and empirical literature recognise that investment in R&D can make an important contribution to long-term economic growth (e.g. Romer, 1990; Aghion and Howitt, 1992; Coe et al., 2009). However, without government intervention, private investment in R&D will be lower than is optimal from a societal perspective. This is because investment in R&D is generally riskier than investment in physical capital, which makes life difficult for companies (especially young innovative companies) that often have more difficulty securing funding. However, the - probably great - importance of investment in R&D is that the latter often also generates spin-offs in terms of knowledge and technologies. Therefore, the social return on R&D investment is greater than the individual return, justifying state support for R&D (Schoonackers, 2019). In what follows, we focus on the support for business research and development.

Fiscal support for business R&D in particular has risen sharply in recent years

In Belgium, the three regions provide direct R&D support to companies (mainly by subsidies). At the federal level, several fiscal measures have been introduced to encourage R&D investments in companies. Since 2005, several schemes have been introduced under which companies can enjoy a partial exemption from withholding tax payments for researchers[12]. A number of fiscal support measures also exist for R&D, operating through corporate income tax. This allows Belgian companies to choose between a tax deduction and a tax credit for investments in R&D (tangible and intangible fixed assets and patents)[13]. And in 2008 a tax deduction for patent income was introduced, a measure that has been gradually replaced since 2016 (with a transitional phase until 2021) by new tax advantages for innovation income[14].

The figure below (panel A) shows that fiscal support in particular for companies has risen sharply in recent years. Panel B shows that the steep increase of the budgetary cost of fiscal support measures for R&D since 2015 is significantly explained a substantial rise in the budgetary cost of the tax deduction for patent income, a measure which was gradually withdrawn between 2016 and 2021. The new favourable regime for innovation revenue,

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12 This is an exemption for R&D staff collaborating with a research institution for research, R&D staff in YICs, R&D staff with a PhD in exact or applied sciences, (veterinary) medicine or civil engineering, R&D staff with a master's degree (excluding a master's in social sciences or humanities) and R&D staff with a bachelor's degree in certain fields.

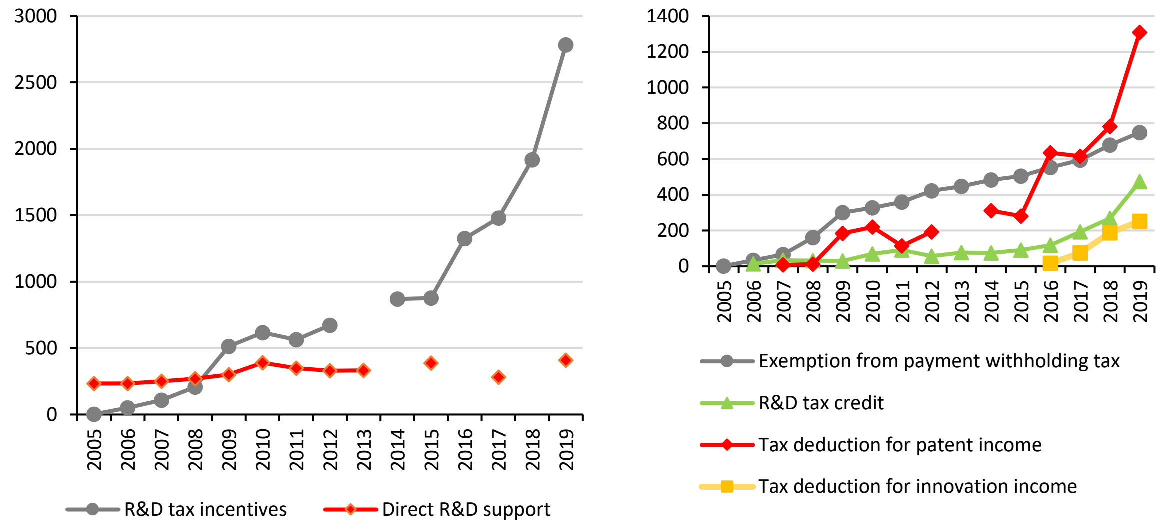
13 The tax credit is directly offset against the corporate tax due and is repayable after four years if not utilised. The tax deduction reduces taxable income and can be carried forward for an unlimited period if profits are too low to benefit. Most companies opt for the tax deduction rather than the tax credit, but the budgetary cost of the latter is significantly higher, indicating that it is mainly large companies that use the tax credit.

14 The innovation income tax deduction makes two important changes from the tax deduction for patent income, as follows. By taking into account the so-called 'nexus approach', this new measure monitors more strictly whether the company also creates value added in the country offering the favourable tax treatment. Secondly, the scope of the new innovation deduction has been extended to some additional intellectual property rights and revenues: in addition to patents and Supplementary Protection Certificates, other revenues from intellectual property rights are eligible, notably copyrighted computer programmes, plant breeders' rights, orphan drugs and certain types of data or market exclusivity granted by the government

although still much less significant in budgetary terms, saw a sharp increase in the first two years after its introduction.

Figure 15. Evolution of budgetary cost of R&D support measures

Budgetary cost of direct and fiscal support for corporate R&D expenditure, 2005-2019 (in million euro)	Budgetary cost of fiscal support measures for corporate R&D expenditure, 2005-2019 (in million euro)*



Note: *The figures for researchers' exemption from payment of withholding tax includes all schemes available in a given year, i.e. collaboration, YIC, PhDs, masters' degrees and, from 2018, bachelors' degrees.
The figures for the R&D tax deduction are not available individually and are therefore omitted from the figure, but the budgetary cost of this measure is much lower than for the R&D tax credit.
Source: Inventory of federal fiscal expenditure, FPS Finances.

Scant evidence of input additionality for fiscal support measures operating through corporate taxation

An earlier National Productivity Board report emphasised the importance of maintaining support for R&D while monitoring its effectiveness and efficiency. A common way to oversee the effectiveness and efficiency of support measures is by looking at input additionality, i.e. the impact of support on R&D expenditure. Ideally, R&D support encourages the beneficiary company to make additional R&D investments in addition to the funding received. In all cases, crowding-out should be avoided, i.e. a situation where (part of) the public support is used to finance R&D that the company would have carried out anyway, even without public support.

In 2019, Dumont (2019) conducted a third review of R&D tax support measures. For the period 2003-2015 the author found clear evidence of positive input additionality for the (regional) subsidy for R&D and for the partial payroll withholding tax exemption for R&D staff. In contrast, little robust evidence was found for the input additionality of a number of support measures operating through corporate taxation.

For example, Dumont (2019) found that for patent income tax deductions, input additionality does not differ significantly from zero. As indicated above, this measure has since been replaced by the tax deduction for innovation income. In 2019, the data were still too limited to evaluate this new measure, but in general, the evidence on the effectiveness and efficiency of patent boxes (measures that provide tax breaks for income from patented inventions or other intangibles, such as the patent deduction or the innovation deduction in Belgium) in incentivising R&D is less clear (e.g. EC, 2014; Bloom, Van Reenen and Williams, 2019). Indeed, these instruments only reward successful innovators who are already protected by the IP system (OECD, 2022, p. 13) and do little to reduce the ex-ante liquidity constraints faced by innovative firms (Hall and Lerner, 2010). They can also distort incentives for companies towards patentable innovations (OECD, 2022).

Nevertheless, over the past decade, several countries have decided to introduce a *patent box*. This has often been driven by the prospect of attracting foreign investment (Van de Velde and Cannas, 2021). In this context, the OECD (2022) points to the potentially adverse effects of such measures on tax competition. Among neighbouring countries, the Netherlands and France have also introduced such a measure, although it should be noted that the three countries that score best on the European Innovation Scoreboard (SE, FI and DK) have no patent box system.

Also for the tax credit for R&D, Dumont (2019) found no evidence of input additionality. However, well-designed tax credits based on R&D expenditure can certainly be effective in incentivising R&D (OECD, 2022). For large companies, Dumont (2019) in fact found a crowding-out effect for this measure. These results are in line with the findings of the OECD's microBeRD project, which indicates that the decreasing impact of tax credits by business size is actually a reflection of the fact that companies undertaking less R&D (often the smaller ones) are also more responsive to R&D tax incentives. Similarly, the OECD (2020) also found lower input additionality for companies in highly R&D-intensive industries.

This naturally raises the question of the extent to which a greater increase in R&D expenditure also translates into a stronger economic impact. Positive input additionality is indeed important, but not sufficient. Ultimately, it is important that the additional R&D leads to innovation that can subsequently result in economic growth.

Output additionality is important but harder to measure

The measure with the highest input additionalities does not necessarily guarantee the greatest economic value creation. For example, lower input additionality can be offset by a bigger R&D impact on the output of individual firms (direct output effect). But at least as importantly, a company's R&D expenditure can also have an impact on other companies and the rest of the economy. If this effect is positive, there are (knowledge) spillovers, the main argument for granting government support for R&D. Conversely, a company's R&D expenditure can also have a negative impact on other companies, especially in the case of business stealing effects or a patent race.[15]. Both the direct output effect as the (positive or negative) spillover effect must be taken into account to obtain a full picture of the wealth impact. Estimating these effects (i.e. estimating the output additionality of a measure) does present some challenges.

The first question is which output variable is the most relevant to consider. Output additionality tries to give a picture of the potential results of R&D activities, but for this purpose, several variables can be considered (e.g. turnover, profit, value added, productivity, or productivity growth). The conclusion often depends on the variable chosen. But apart from the choice of the output indicator, estimating output additionality is not easy either. A one-to-one correlation between the output and the input is often absent. Besides, years may pass before outcomes and impacts materialise. There are also significant selection problems when estimating output additionality[16]. And finally, estimating output additionality should take account of all the variables with a possible impact on output, including potential spillovers from foreign R&D which are very important for a small open economy like Belgium[17]. But the data for this are currently lacking.

In other words, the complexity and methodological problems involved in estimating output additionality mean that these figures must be interpreted with caution and make it difficult, on the basis of existing simulations, to draw unambiguous conclusions about the output additionality (direct effect as well as spillovers) of specific measures.

A lack of complementarity between federal and regional support measures

It is not only the effectiveness and efficiency of individual support measures that are important, but also their mutual complementarity. In this context, Dumont (2019) found a substitution effect between tax incentives and direct support: the input additionality of measures decreases when firms combine direct and indirect support measures. Bormans et al (2021) found comparable results, not only for input additionality, but also for output additionality.

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[15] In this case, one company gets the patent and the other companies' R&D investments are largely for nothing.

[16] The best-performing companies are also likely to undertake more R&D and thus receive more support. Failure to adequately control for this selection leads to conclusions about the economic impact of a measure that are not actually causal.

[17] If a variable for international spillovers is not included, the economic impact of domestic R&D is overestimated (which distorts estimates for output additionality).

International research suggests that, in principle, this need not be so; there are also studies that find (input) complementarity between direct and indirect support, although these are often studies working with binary variables (support or no support) rather than the amounts of support received. In the case of France, Ben Hassine et al (2020) found that when the analysis is conducted using the amounts of support received, the combination of support measured above a certain threshold results in a substitution effect. This suggests that the combination of large amounts of support causes substitution, rather than the combination of direct and indirect support per se. As the Court of Audit (2021) notes, Belgium is one of the few countries where there is no restriction on the public support for R&D that can be received by individual companies.

Impact of R&D support measures on anchoring superstar firms

As already noted, certain R&D support measures are also seen as a way to attract or strengthen foreign investment. Such businesses not only have a direct impact on the economy (through their share of national value added), but can also indirectly influence many other businesses through their links to domestic customers and suppliers.

Studies show that (especially fiscal) support measures for R&D effectively help determine a country's international attractiveness, although with some reservations:

- Public support seems to be especially important in the final stages of the decision-making process and cannot outweigh the adverse effects of (more) important factors (Belderbos et al, 2016);
- Lachaux et al (2020) found that R&D tax breaks have a beneficial impact on the location of innovation activities, but they saw no effect on the location of manufacturing activities and head offices. Nevertheless, the same study did observe a trend towards the co-location of innovation and production units in the same area.
- Besides taxation, many other factors play a role in anchoring investments, such as the level of production costs, the education level of the population, the quality of the regulatory framework, the presence of quality infrastructure, the ability of companies to expand, or the strength of local universities in research areas relevant to the investing multinational. What matters for anchoring is the overall package and its long-term consistency.

Financial support for R&D is just one factor in the broader innovation ecosystem

Finally, it should be noted that economic impact of R&D support is co-determined by a wide range of factors other than the support measures themselves. After all, economic impact is not achieved in a vacuum, but is the result of multiple interactions between interrelated factors and actors. In other words, not only the support measures themselves, but the entire ecosystem will be decisive. In this sense, factors such as the presence and mobility of skills, knowledge transfer policy, cluster policy, or competition policy also have a significant impact on the effectiveness of R&D support.

This insight has implications for evaluation policy which, in addition to assessing individual instruments, should be more systemic in nature. It would therefore be interesting to study some concrete O&I ecosystems in more detail to get a better idea of which factors are sound and which elements could perhaps be further strengthened.

2.1.2. Further engagement in innovation diffusion

Investments in R&D are one thing but it is also important to spread the results of this research across the rest of the economy as much as possible. However, innovation diffusion does not happen automatically and, in addition, seems to be slowing down.

Research shows that the rate at which firms below the technology frontier catch up with those at the technology frontier has fallen over time (Andrews, Criscuolo and Gal, 2016; Berlingieri et al., 2020). Berlingiere, G. et al. (2020) also found that the positive link between a firm's productivity growth and the distance to the technology frontier – a measure of the speed of technology diffusion – is weaker in digital and knowledge-intensive sectors; in general, sectors with a slower catch-up ratio invest relatively more in IT equipment, software and databases, rely more on IT-related inputs and also depend more on skilled labour capable of performing IT-related tasks. It therefore seems that the transition to a digital and knowledge-based economy has increased the barriers to widespread and rapid diffusion.

In this context, the particular nature of intangibles and digital technologies is often emphasised. Investments in intangibles are generally accompanied by high initial costs, high risks and uncertainties, and higher financial constraints. Investments in intangibles and digital technologies are also complementary: successful digitisation also demands extra investments in complementary assets. What is more, investments in intangible assets are often also marked by economies of scale and network effects. This can lead to a ‘winner-takes-most’ dynamic, raising an additional barrier to the diffusion of new technologies to laggard firms (OECD, 2021).

The slow-down of innovation diffusion may be an explanation for the widening gap that can be observed between cutting-edge companies and firms that lag behind[18]. Berlingiere, G. et al. (2020) studied the group of 40% least productive companies across 13 different countries, divided into a bottom group (the least productive 10%) and a group of low-productivity companies (with productivity levels between the 10th and 40th decile). They found that, on average, the 10% of least productive firms have a productivity level that is only 20% of that of the median company. The group of low-productivity companies have a productivity level hovering around 60% of the median firm. The results for Belgium are comparable with this OECD average. Targeting the ones that lack behind can substantially increase aggregate productivity however, according to researchers.[19]

For this reason, it is important for policy to pay sufficient attention to innovation diffusion. Such a policy must focus on boosting the capacity of companies to adopt relevant technologies, ensuring that the incentives are commensurate with the potential benefits of the adoption of the new technologies, and working towards strengthening market selection and the smooth reallocation of resources. For example, boosting workers' skills, easing financial constraints on investment in intangibles, and direct support for R&D can help slacking companies to catch up with those at the technology frontier. Overall, a multi-faceted policy approach is needed, targeting both potential users of new technologies - focusing on the demand for technology and knowledge - and their providers - focusing on the supply of technology, knowledge and innovation. Berlingiere, G. et al. (2020) summed it up as follows.

[18] Other possible explanations for the widening gap between frontier firms and lagging companies are: insufficient exit of low-productivity firms (or inadequate reallocation of production factors) and strong entry of new (low-productivity) firms with high growth potential. A key policy challenge, therefore, is to safeguard the reallocation process through the departure of structurally unsound firms, but also through the entry and growth of (new) enterprises.

[19] According to de Berlingieri et al. increasing the productivity of the bottom group and low-productivity companies to the median level would increase aggregate productivity by 2% and 6% on average, respectively.

Figure 16 Summary and classification of policy targeting promotion of technology and knowledge diffusion

	Objectives	Policy areas
Demand-side policies focused on potential adopters	Raise awareness about new technologies, their use and benefits	Awareness raising schemes Collaboration and networks Labour mobility Trade and GVC participation
	Develop firms' absorptive and investment capacity	Education system Training policies (especially for low-skilled) Financial support R&D support ICT infrastructures Data access
	Favour a positive return to adoption, reduce risks and uncertainties, strengthen selection and facilitate reallocation	Competition policies Entrepreneurship policies Insolvency regimes Technical standard-setting Addressing market failures (networks effects, technological lock-in)
Supply-side policies focused on potential innovators	Foster production and sharing of knowledge	Public research Science-industry linkages Collaboration Open innovation Comprehensive strategies for the development of general-purpose technologies
	Enable firms to experiment and bring innovations to the market	R&D support Entrepreneurship policies Financial support Intellectual-property systems ICT infrastructures Data access Test beds and regulatory sandboxes Open innovation

Source: Berlingieri et al. (2020), "Laggard firms, technology diffusion and its structural and policy determinants", https://doi.org/10.1787/281bd7a9-en.

What the exact mix of tools should look like will depend on the technology and the business or sector in question. To formulate policy recommendations in this area, more qualitative research is needed into particular innovation ecosystems.

2.2. *The need for sufficient attention to the transition to a low-carbon economy*

As indicated in previous NPB reports, the transition to a low-carbon economy is a priority. Climate change, after all, poses a significant threat to the prosperity and well-being of this and future generations. We are already feeling the effects, and they can be expected to become more frequent and extreme in the coming decades.

The impact of the transition to a low-carbon economy on labour productivity as we traditionally measure it is not entirely unambiguous. On the one hand, the transition can stimulate innovation, hence promoting productivity and growth (e.g. Porter and van der Linde, 1995), but on the other, the transition also requires costly infrastructure upgrades and makes carbon-intensive manufacturing technologies (and related skills) obsolete, which in turn adversely affects productivity. But it is clear that climate change itself will have an adverse impact on labour productivity (certainly over the longer term). This is because it can create conditions (physical, but also social, for example[20]) that make it more difficult to use capital stock effectively; the investments in adaptation needed to address climate change can have an adverse impact on the resources available for R&D; and investments in 'repair and replacement' (e.g. as a result of natural disasters) are also less likely to be accompanied by learning effects than investments in new productive capital (Batten, 2018). In this sense, making the transition to a climate-neutral economy is clearly important for ensuring future productivity growth.

[20] Climate change physically threatens capital stock, not least public infrastructure networks such as the transport, energy and water infrastructures that provide important production services to the private sector. But social and organisational capital too may suffer from climate change (e.g. through increased migration and conflicts).

Furthermore, the climate transition challenges often run parallel to the challenges we are currently experiencing in terms of energy prices and energy security and independence. From an energy security perspective, too, it is crucial to reduce dependence on fossil fuels as fast as possible and to guard against new lock-in effects that mortgage the future. This is certainly true in a very energy-intensive country like Belgium; although energy consumption per inhabitant has fallen in recent years, it remains higher than average in the euro area and than in the three neighbouring countries due, inter alia, to the high proportion of energy-intensive industry in the economy and relatively high household energy consumption. This high energy consumption in Belgium is not offset by lower fossil energy use.

The energy crisis should therefore be harnessed to accelerate Belgium's transition to a low-carbon economy[21]. Against this background, it is important to ensure that, in the event of government intervention, the price signal is preserved as much as possible and also guaranteed for the future. We must also ensure that short-term interventions do not create new lock-ins that will jeopardise the future.

Decarbonisation requires the support of green innovation

Achieving net zero by 2050 requires a complete transformation of manufacturing and consumption patterns. The scale of the challenge is immense and calls for a diversified policy mix. D'Arcangelo et al. (2022) distinguish three significant elements for a decarbonisation strategy: an explicit carbon price, standards and regulation (i.e. an implicit carbon price), along with a complementary policy focusing not directly on emissions reduction but rather on lowering the economic and social cost of this policy. Innovation policy is part of this last element, as innovation lowers the cost of reducing CO2 emissions and thereby strengthens public acceptance.

It is hard to overstate the importance of innovation in the transition to a low-carbon economy. The term innovation should be interpreted broadly here. It includes non-technological changes such as innovative business models (e.g. more circular business models) or changes in the routines and attitudes of companies and citizens. But technological innovation will also be a significant part of the answer. Partly through faster dissemination (and implementation) of existing technologies to and by companies and consumers, but also via the (further) development of new technologies. In its 2021 Global Energy Review, the International Energy Agency assumes that, by 2050, half of the reductions will come from technologies currently still at the demonstration or prototype stage (IEA, 2021).

However, there are several reasons why, from a social perspective, markets are under-investing in clean technologies. First, these technologies often incur greater externalities due to larger spillover effects and the impact on a wider variety of fields (Barbieri et al, 2020). Additionally, green technologies are often at an early stage of development, with higher levels of uncertainty and risk (Tagli-apietra and Veugelers, 2020) and are often more complex than non-green technologies (Barbieri et al, 2020). Another flaw in the research sector is the potential for locking in old, polluting technologies and their path dependence[22], making future production and innovation in clean sectors relatively less profitable (Aghion, Hemous and Veugelers, 2009). Finally, the development of green technologies is also often held back by coordination failures. Many green projects demand simultaneous investments in different parts of the value chain, which, in the case of complex, early-stage projects with high externalities and significant information asymmetries does not happen by itself (Lütkenhorst, 2014, p. 15). These arguments justify some steering in the support for investment in clean technologies.

To give an idea of the degree of steering of government support for R&D in Belgium compared with a number of reference countries, government budget appropriations for R&D (GBARD) are shown below by socio-economic objective, expressed as a percentage of GDP. The graph shows only those appropriation lines intended

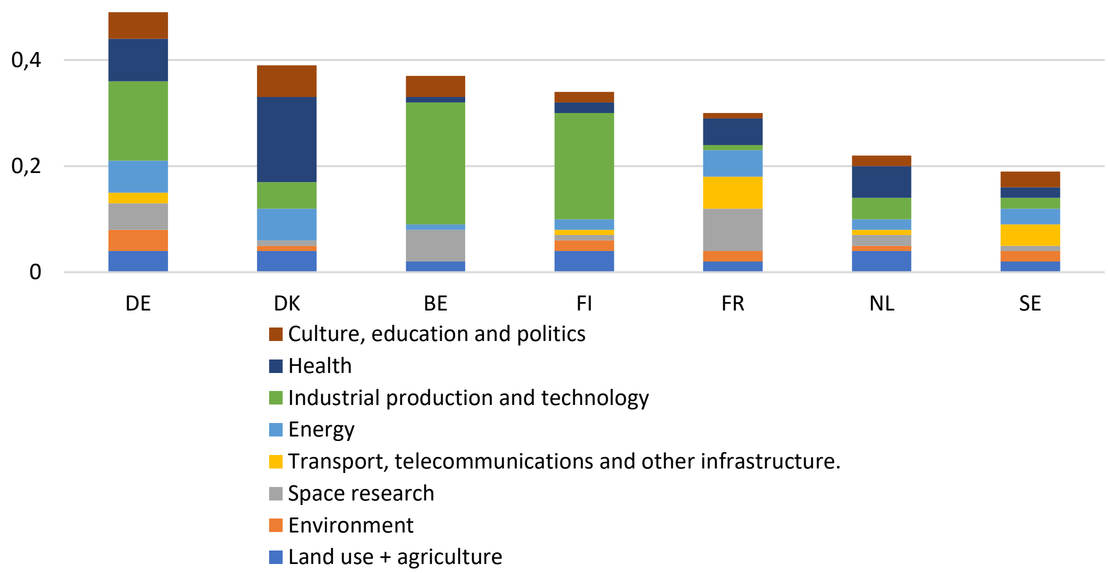
[21] The focus in the text that follows is on the transition to a low-carbon economy with a view to minimising climate change as much as possible. However, there is also a need to address adaptation to the climate change that is already in the pipeline. Even if greenhouse gas emissions were reduced to zero today, there will be some degree of climate change due to the effects of past emissions. It is therefore also important to minimise the harmful effects of climate change (such as rising sea levels, more extreme weather events, or increasing food insecurity) as much as possible.

[22] Companies with a history of 'dirty' innovation tend to continue along that path via incremental innovations, rather than opening up truly for new innovation pathways (Aghion et al, 2011).

to achieve a specific (civil) objective (NABS 1-11). Funds for general knowledge stimulus (NABS 12-13) and for defence are not included.

It is not easy to determine exactly which categories contribute to the development of clean tech. For example, 'industrial production and technology', the main category in Belgium, does not in principle include R&D related to industrial products or their manufacturing processes that are integral to other objectives (e.g. energy, space), but it does include all the research related to waste recycling. On the basis of the figures below, it seems that in Belgium only a small share of the government budget appropriations for R&D is directly allocated to either 'energy'[23] or 'environment'[24].

Figure 27. Budgetary appropriations for R&D targeting specific socio-economic objectives (NABS codes 1 to 11), 2021
In % of GDP



Note: 'Land use and agriculture' represents the sum of the categories ' Exploration and exploitation of the earth' and 'Agriculture'
'Culture, education and politics' is the sum of 'Culture, recreation, religion and mass media', 'Education' and 'Political and social systems, structures and processes'.
Source: Eurostat.

23 R&D related to pollution control and the elimination and prevention of all forms of pollution in all types of environments.

24 This category includes all R&D related to the production, storage, transportation, distribution and efficient use of all forms of energy; processes to increase the efficiency of energy production and distribution; and the study of energy conservation. It includes R&D into energy efficiency, CO_2 capture and storage; renewables; nuclear fission and fusion; hydrogen and fuel cells; other energy and storage technologies.

Design and governance of a green innovation policy are crucial…

Although there are therefore arguments for a certain directionality in supporting research into clean technologies, there are also a number of challenges in terms of implementing such a policy. First, the government must have the information capacity to correctly allocate public resources (i.e. an allocation towards projects with the highest socio-economic and climate benefits that would otherwise not be carried out). There is also the risk of political capture and rent-seeking by existing players. An answer must also be found to the problem of time inconsistency. Politicians' search for short-term successes does not always align with the need for a long-term horizon for achieving a consistent and sustainable green industrial policy.

Taking all these challenges into account, the way in which innovation policy is steered towards climate neutrality will therefore be crucial. Some key principles are as follows:

- Innovation policy should start from a particular issue (defined on the basis of a market failure that has arisen) and should not focus on specific sectors or technologies (picking the problem, not the solution). STI players should be given the freedom to decide on the best technological solutions to address the problem (OECD, 2021).

- Governments do not know in advance where market failures will occur and therefore need to shape policy in dialogue with the stakeholders. Rodrik (2014) refers to a process of institutionalised cooperation and dialogue. However, to mitigate risks of political capture and the provision of distorted information by stakeholders, transparency mechanisms will be very important (e.g. through road maps and clear government communication). Accountability is also an essential critical factor and requires clear targets and milestones against which a policy is evaluated and adjusted if necessary. (Tagli-apietra and Veugelers, 2020).

- It is important for the government to focus public resources on those projects with the greatest socio-economic and climate benefits that would not be realised without public support. From this perspective, particular attention should be paid to high-risk, early-stage technologies with potential for general-purpose breakthroughs (and thus with the greatest likelihood of spillovers to other companies/projects/technologies). Green innovation therefore requires a significant dose of risk-taking by public institutions and an acceptance that some initiatives are bound to fail (Tagli-apietra and Veugelers, 2020). The innovation projects supported should therefore be considered and managed at portfolio level.

- In light of the significant uncertainty and high risk of failure, experimentation will be crucial. Policy designed as a learning experiment can help reduce risk, provided it is closely monitored and adapted as new information emerges (Tagli-apietra and Veugelers, 2020, p. 32). Industrial policy/innovation policies based on such experiments should ensure that the focus is no longer on 'picking winners', but rather on 'letting losers go' (Hallegate et al. 2013).

- A successful industrial policy / mission-oriented innovation policy requires healthy competition. This significantly reduces the risk of government failure (Norberg-Bohm, 2002) and ensures that firms have sufficient incentives to innovate. For instance, Aghion et al. (2015) found empirical evidence that subsidies to firms can increase productivity provided that the firms concerned are in sectors that are sufficiently competitive and innovative. At the same time, care must be taken to ensure that targeted interventions do not distort competition and also provide sufficient incentives for new, young innovators to contest existing ecosystems.

- With a view to achieving sufficient critical mass and economies of scale, we should consider how to stimulate partnerships between research players within Belgium, and how national initiatives can be integrated into European or international projects. At the EU level, the Green Deal strategy is seeking to accelerate the transition to a low-carbon economy, including by making funds available through the Recovery and Resilience Facility (RRF) and RePowerEU. It is important for Belgium to coordinate its own initiatives with these EU measures as much as possible.

… and naturally the policy mix too

A mission-oriented innovation policy, such as one focused on the transition to a low-carbon economy, requires a mix of instruments.

In terms of R&D support, there is a need for a good mix of theme-based and theme-free (bottom-up) resources. Even within a mission-oriented innovation policy, it is important to retain sufficient thematically free (non-targeted) resources, both for companies and knowledge institutions. In fact, in the long term, such resources can give rise to radical innovations that allow societal challenges to be met (VARIO, 2022). For companies, however, it is true that fiscal support, which is typically freely available, has increased the most in recent years.

In addition, as already outlined above, there is also a need for instruments that go beyond pure science and innovation policy. It is not enough to develop new technologies, we also need business and consumers to adopt them. In general, a focus is needed not only on investment in research and development, but also on the creation of first markets (e.g. through a regulatory framework, public procurement, tax incentives, or public acceptance of certain technologies). The same applies to the presence of complementary and enabling infrastructure. This includes not only physical infrastructure (e.g. hydrogen infrastructure), but also institutional infrastructure (e.g. regulations guaranteeing openness to new entrants; health, environmental and safety regulations, etc.). Similarly, the creation of new ecosystems often requires matching and bringing together actors who are not yet networked. Last but not least, the skills must also be in place to produce and use the new technologies (section 2.3).

The necessary instruments are thus situated in different policy areas and at different policy levels. There is therefore a need for coordination and alignment, not only within Belgium, but also at European and international level. The climate issue, after all, requires a global approach.

2.3. The need for human capital

It is a stylised fact often reflected in the literature that while aggregate productivity grows slowly at best, company-level productivity growth still persists, but not for all firms. The most advanced companies are increasing their lead over 'lagging' companies and securing a bigger share of the cake.[25] This might well be due to the fact that those advanced companies can always benefit from the latest technologies and business practices, and other companies cannot.

One possible explanation for this is the use of intangible inputs, which complement tangible inputs (De Ridder 2020).[26] These concern co-investments in new processes, products, business models and human capital, which are usually intangible and poorly measured. If we take this further, a company that lacks (some of) the necessary human capital to complement productivity-enhancing investments will simply be unable to benefit from new technologies, even if it has sufficient resources to invest in the necessary assets. The issue of the availability of essential human capital may be even more relevant for countries (such as Belgium) with low labour mobility and a rather rigid labour market.

Since the COVID19-pandemic, the supply of human capital has become even more necessary. Indeed, the health crisis has highlighted the essential role of research and the ability of the workforce to adapt to a new environment or new technologies. The 'NextGenerationEU' recovery package rightly puts the emphasis firmly on research, innovation and digitisation. The need for skilled staff to deliver on those promises cannot be ignored. Romer (2000) has pointed out that stimulating the demand for innovation without addressing the supply of skilled workers will result in higher wages for the highly skilled rather than additional innovation.

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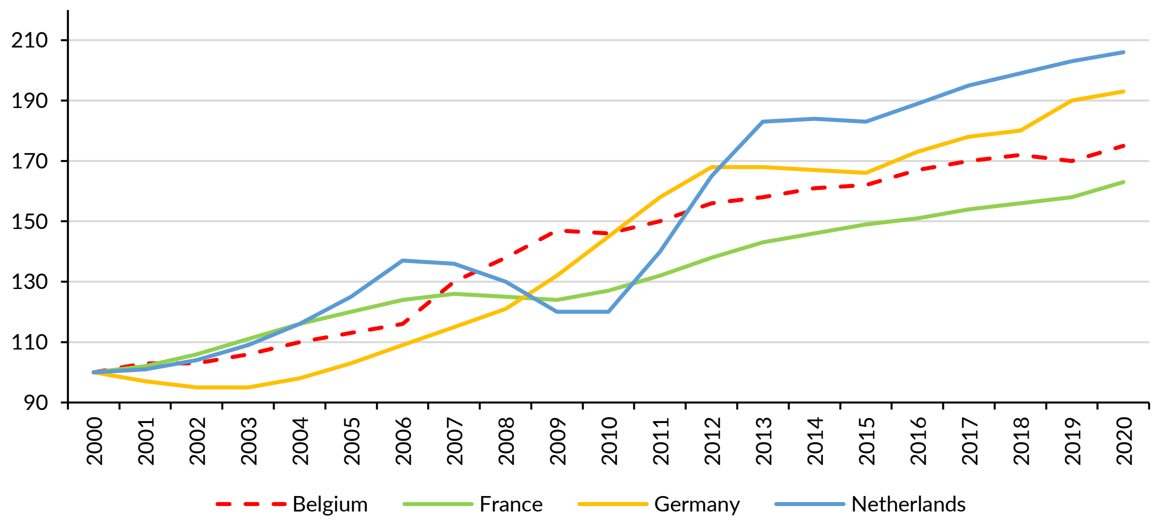
[25] For instance, Andrews et al. (2016) demonstrate an increasing difference between the companies operating at the upper end, 'the best', and 'the rest'. De Loecker et al. (2020) research into listed companies in the US and the increasing market power of enterprises. Akcigit and Ates (2019) note that there is less and less knowledge exchange between the most innovative firms and the rest. Autor et al (2020) discuss the phenomenon of 'superstar firms', whereby a small number of firms in an industry become very successful.

[26] Brynjolfsson et al. (2021) attribute the (initially) limited impact of new technologies on aggregate productivity to the fact that additional investment is needed to support the physical investment in technology.

The debate on whether more training really increases productivity or just reflects that increase has been going on for decades.[27] Previous research has suggested that higher education has a beneficial impact on company-level productivity growth that justifies the company paying a more educated employee a higher wage. Belgian data show a similar picture. Kampelmann and Rycx (2012) conclude that demanding a higher level of education not only has a positive impact on productivity growth at the company level, but that even an overqualified employee is also more productive in a job. Saks (2021) recently found that highly skilled workers earn about 27% more per hour than the low-skilled. Lebedinski and Vandenberghe (2014) found evidence that this relationship between education and individual wages is driven by a strong positive relationship between education and company-level productivity.

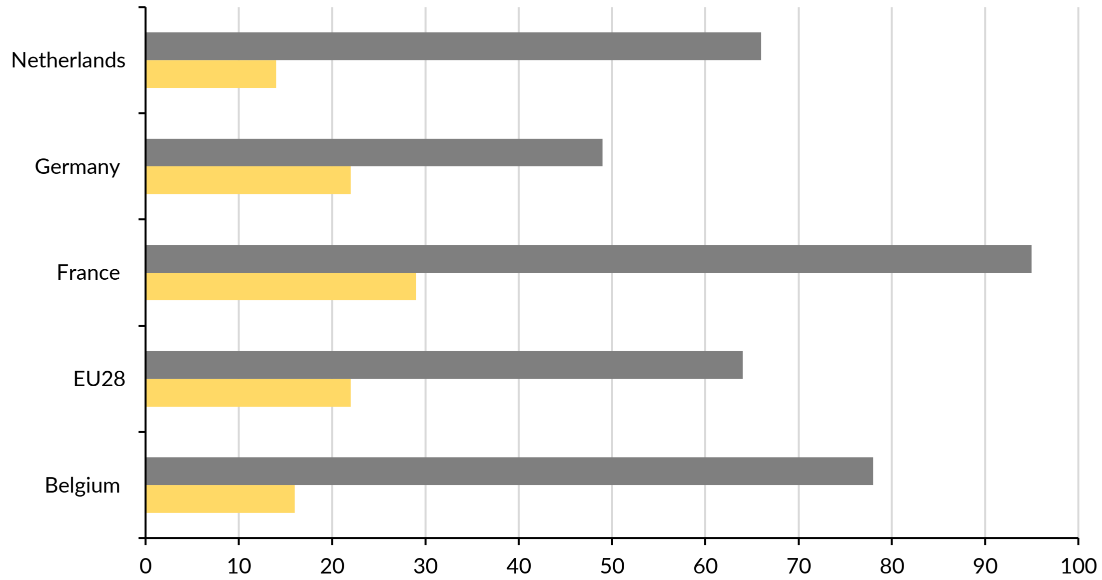
The supply of highly skilled workers has steadily increased over the past two decades (Figure 18A), both in Belgium (up 75%) and in neighbouring countries (up 50% to 100%). However, Figure 18B shows that although Belgium has a relatively high number graduates with tertiary education, rather few of those graduates had followed a STEM discipline. In Belgium the number of STEM graduates stands at ~16 per thousand in the population aged 20 to 29. For Germany and the EU as a whole, that figure is 22. At first glance, this seems at odds with the fact that Belgian companies clearly have a great need for the skills of IT specialists (Figure 19). As a result, more and more companies in Belgium are facing difficulties in finding IT staff (from ~35% in 2014 to 70% five years later). This does not only apply to Belgium. The EU as a whole is experiencing the same issue, although to a lesser extent thanks to larger numbers of STEM graduates (the percentage of companies with problems finding IT staff rose from ~35% in 2014 to 55% in 2019 at EU level).

Figure 18 Graduates in tertiary education (STEM)
Panel A: Graduates in tertiary education (all disciplines).
Number of graduates, 2000 = 100



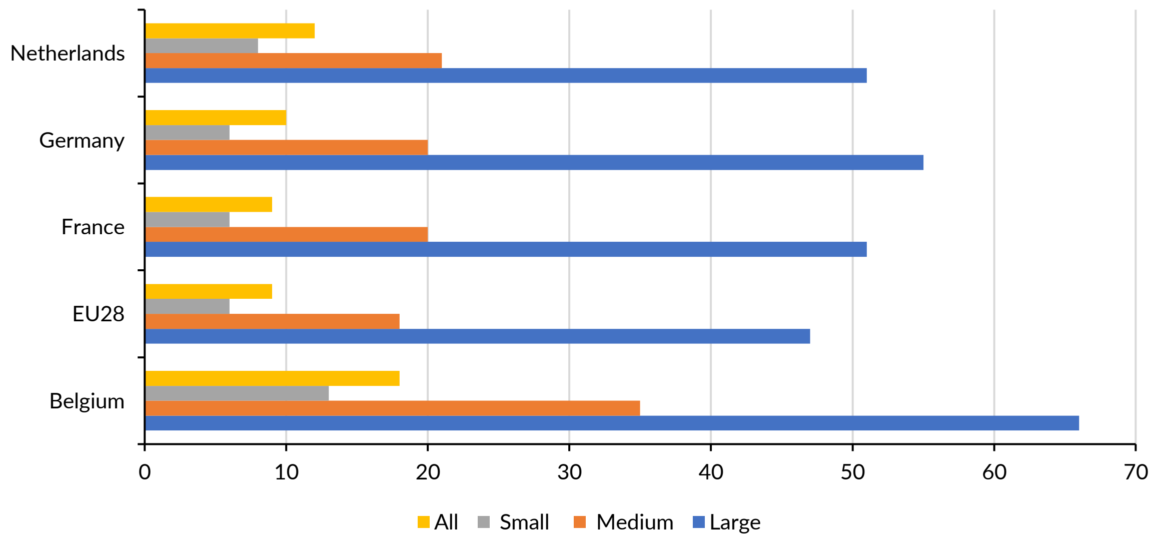
[27] For the US, for example, Fernald and Jones (2014) came to the conclusion that approximately 3/4 of growth since 1950 reflects an increase in education levels and more intensive research.

Panel B: Graduates in tertiary education as a proportion of the population (all disciplines and STEM disciplines). Graduates per 1000, population aged 20-29



Explanation: Panel A shows the absolute number of tertiary education graduates (2000 = 100), three-year moving average because the annual numbers are volatile. Panel B gives the figures for 2020, with the exception of the EU28, where the figures shown are those for 2019. STEM disciplines are defined as courses in science, mathematics, IT, engineering, manufacturing and construction.
Source: Eurostat.

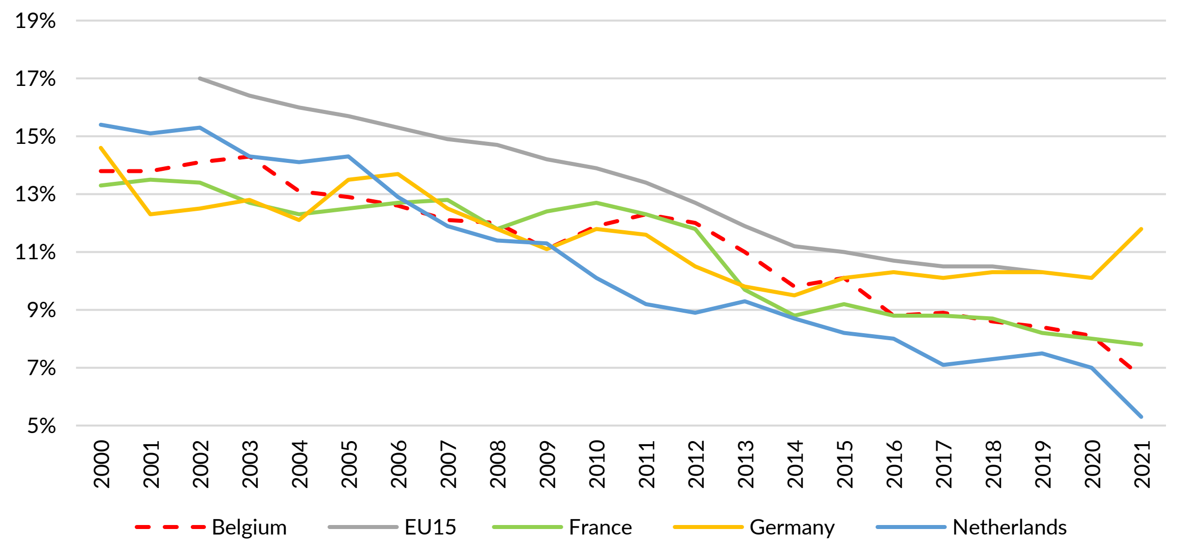
Figure 19 Companies and IT recruitment
Percentage of companies recruiting/trying to recruit staff for jobs requiring IT specialist skills, by company size



Explanation: Ditto for 2020.
Source: Eurostat.

The increased number of graduates in tertiary education is accompanied by a steady decline in the number of early school leavers (Figure 20). For Belgium, that number has fallen from ~14% in 2000 to ~7% in 2021. Neighbouring countries have a similar trend. Less than half of these early school leavers are in work. Opportunities for the least educated remain scarce, and in the wake of the COVID-19 pandemic, this will require extra attention. Maldonado and De Witte (2020) examined standardised test scores in the final year of primary school in Flanders and found significant learning loss for the 2020 cohort affected by school closures. Gambi and De Witte (2021) subsequently found that publicly-run summer schools have had a positive impact on the most vulnerable pupils, but the best pupils still need to make up the lost ground. Joskin (2022) warns that falling education levels could result in significant long-term economic costs. He argues that in recent years there had already been a decline in education levels, but that after the COVID-19 pandemic, these levels fell even further. So he too believes there is an urgent need to catch up. Guadalupea et al. (2022) and Martin et al. (2022) summarise past studies and evaluate how much an increase in human capital can boost productivity: for example, a 10 pp increase in PISA scores in maths would lead to a 0.2 points increase in GDP per capita growth. In a subsequent study, De Witte and Gambi (2021) found that vulnerable students tentatively begin to make up lost ground one year after the school closures. However, a year after the pandemic, the best-performing students saw their maths test scores decline significantly further. Additional measures to promote the learning achievements of the strongest performers are therefore recommended. It remains to be seen what longer-term impact school closures will have on human capital and school dropout rates.

Figure 20 Share of early school leavers
Early school leavers as % of population aged 18-24



Explanation: Percentage share of 18-24-year-olds who completed at most lower secondary education (that is, low-skilled by the definition used in this paper) and who followed no further education or training.
Source: Eurostat.

2.3.1. Human capital (STEM) and business outcomes

Education and skills do have a bearing on productivity. Figure 21A shows the skills profile in an advanced company, an average-performing company and a laggard in Belgium.[28] This shows that the more productive a company is, the more highly skilled workers it employs.[29] An advanced company typically has 5 to 10 percentage points more highly skilled employees than an average-performing company, while the gap relative to a lagging company is about 20 pp. The difference is less pronounced for medium-skilled workers, suggesting that the percentage of highly skilled workers is the dominant factor behind the results. The gap for highly skilled workers has not always been constant. Figure 21B shows that the gap between advanced and other companies has increased slightly, especially after the financial crisis period. Advanced companies were more successful in attracting and/or retaining highly skilled workers over the past decade, and have steadily widened the gap.

If we look specifically at STEM skills (Figure 21C), we find that more productive firms employ a higher percentage of (highly skilled) STEM workers. To obtain a better understanding of the impact of the IT revolution over the

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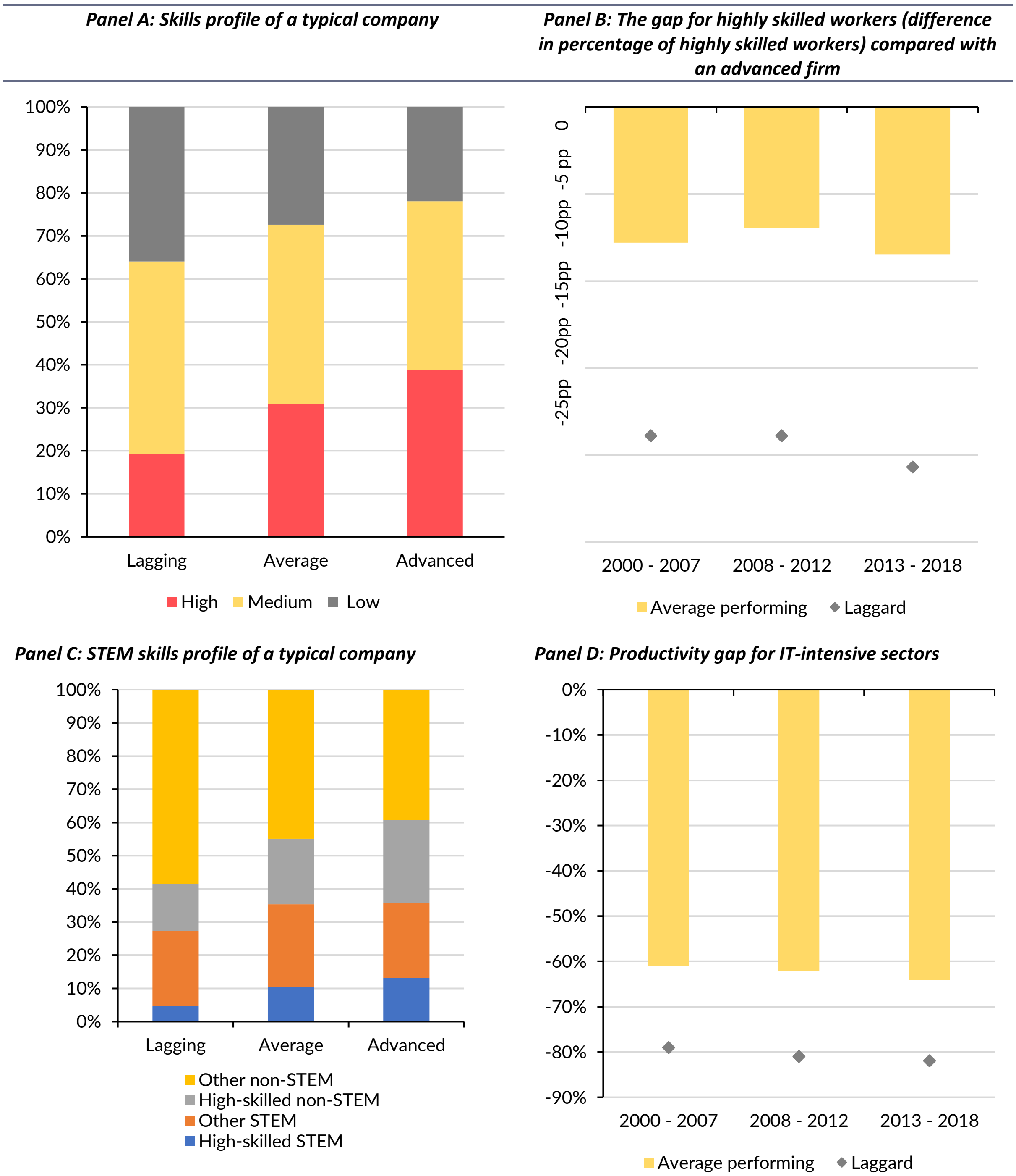
[28] Companies are classified by productivity group on the basis of their position in the productivity distribution of their two-digit NACE industry: best-performing or advanced companies (top 10%), average-performing companies (40% - 60%) and low-performing companies or "laggards" (bottom 10%).

[29] Workers are classified by skills group according to their level of education: low-skilled (lower secondary education or less), medium-skilled (upper secondary education and post-secondary non-tertiary education) or highly skilled (tertiary education). Employees with STEM skills are defined as those with a qualification in sciences (ISCED 4) or engineering (ISCED 5).

past decades, we also classify the different industries according to the extent to which they are IT-intensive[30]. In IT-intensive sectors, companies that had not successfully invested in IT knowledge and infrastructure were more likely to suffer from stagnating productivity. The graphs show that lagging companies, especially in IT-intensive services, are having a (very) hard time finding highly skilled STEM workers. Indeed, Figure 21D shows a significant and widening productivity gap between advanced and other companies in IT-intensive industries. A lagging company in an ICT-intensive industry is over 80% less productive than an advanced company.

Figure 21 (STEM) skills profile of a typical Belgian company for different productivity groups



[30] Classification by IT-intensive industry (Panel D) based on EU KLEMS Productivity and Growth Accounts at industry level for Belgium. The industries with the greatest contribution of IT capital and services to growth in value added are classified as IT-intensive. IT-intensive industries are NACE 19-21, 28, 35-39, 45-47, 58-63 and 73-82.

Explanation: Employment share of high, medium and low-skilled workers for laggards, average-performing firms and advanced firms, using simple averages for all two-digit industries and over time. A productivity group for industry x is excluded for the whole period if it consists of fewer than three firms in any year.
Classification by IT-intensive industry (Panel D) based on EU KLEMS Productivity and Growth Accounts at industry level for Belgium. The industries with the greatest contribution of IT capital and services to growth in value added are classified as IT-intensive. IT-intensive industries are NACE 19-21, 28, 35-39, 45-47, 58-63 and 73-82.
Source: Bijnens and Dhyne (2021).

2.3.2. The return on (STEM) human capital

The descriptive data in the previous section has already revealed that firms with a higher percentage of highly skilled workers are more productive. This finding is also backed up by an econometric analysis based on detailed Belgian employer-worker linked data conducted by Bijnens and Dhyne (2021). Figure 22 shows the calculated return on human capital.[31] For example, a value of 1 means that a 1 percentage point change in the percentage of highly skilled workers is associated with a 1% increase in productivity, if all other variables are maintained.

Figure 22A shows that the return on a highly skilled worker is about 0.6. However, productivity gains from increasing the percentage of highly skilled workers decrease over time. The yield fell from 0.65 for the period 2000-2007 to 0.54 for the period 2012-2018. As the supply and subsequently the percentage of highly skilled workers in employment increases over time, this suggests that the marginal gains from further increasing the share become smaller.

However, for STEM workers, whether high, medium or low-skilled, we observe the opposite effect (Figure 22B), with an increase in returns of 0.20 (2000-2007) to 0.26 (2012-2018). This emphasises the increasing role of STEM workers in boosting productivity at company level. Wider digitisation can be expected to continue this trend.

Combining insights into the returns on highly skilled workers and the returns on STEM workers, Bijnens and Dhyne (2021) have quantified the impact of shifts in skills within a firm. In the manufacturing industry in particular, the potential benefits of employing more STEM workers are significant. Let us take, for example, two manufacturing companies with 100 employees, 30 of whom are STEM employees working under the same conditions and in the same industry. At one company, those 30 STEM workers consist of 16 highly skilled and 14 medium and low-skilled workers, while at the other there are 15 highly skilled and 15 medium and low-skilled workers. Productivity in the first company will be on average 2% higher than in the second company. The productivity gain resulting from replacing a low-skilled non-STEM worker with a highly skilled non-STEM worker will be much smaller, at ~0.6%. If the highly skilled STEM employee replaces a non-STEM worker, the gain is even greater. An increase in the percentage of highly skilled STEM workers is therefore associated with significantly larger productivity gains than for STEM workers in general and for highly skilled non-STEM workers.

So while, in short, we definitely need more highly skilled workers to boost productivity, what we need most of all is more (highly skilled) STEM workers. The difficulties faced by Belgian companies in attracting IT specialists are therefore likely to have a strong adverse impact on productivity.

Policy measures designed to promote the adoption of the latest technologies and business practices in firms can only deliver large productivity gains if they are combined with measures to increase the supply and mobility of human (STEM) capital. Without an adequate supply of skills, companies will not be able to reap the full benefits of the digital revolution.

STEM education should be given special attention, taking into account the different stakeholders and measures and their interaction. Students should be further encouraged to take STEM courses. Meanwhile, specific attention should be paid to the pursuit of STEM subjects by women in secondary and tertiary education. Consideration should also be given to their career length and job content[32]. Furthermore, teaching STEM skills, and digital skills in particular, could be part of the curriculum for all disciplines and not just in the curriculum of specialised studies.

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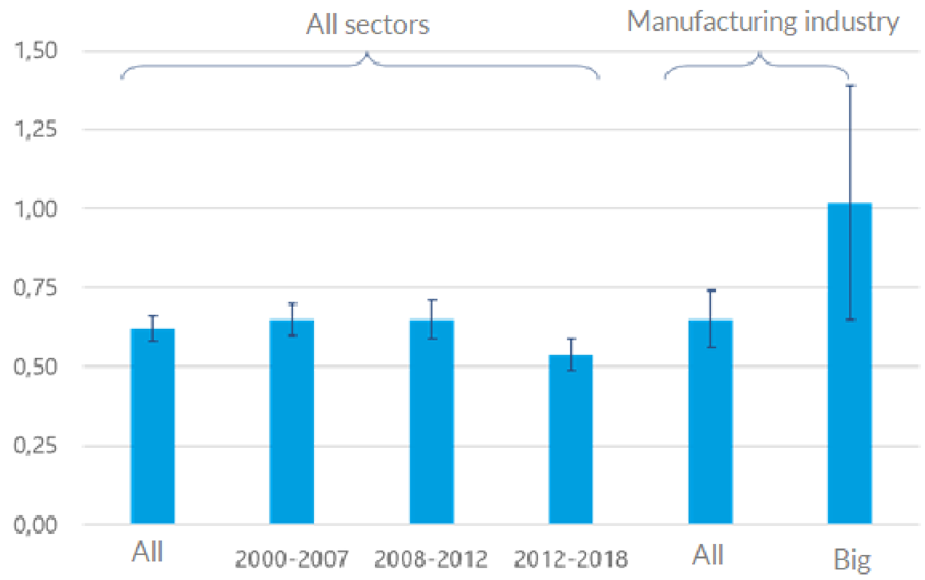
[31] The rate of return corresponds to the elasticity of productivity as a function of the percentage of employees with a given characteristic. More information about how elasticity is calculated can be found in Bijnens and Dhyne (2021).

[32] A global study suggests, for example, that women are under-represented in academic STEM research, but also that women who pursue academic careers publish scientific papers over a shorter period of time (Huang et al. 2020).

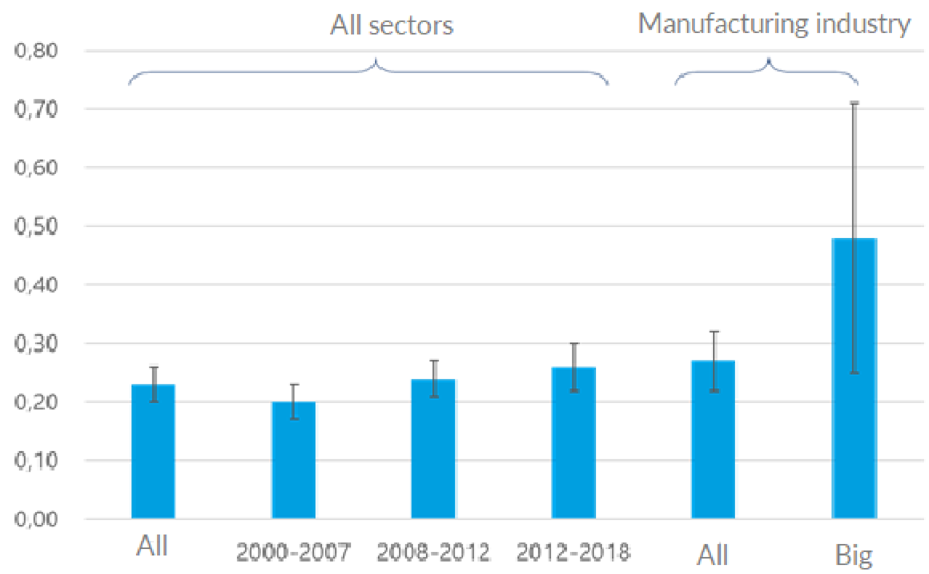
The loss of importance of certain educational disciplines in the absence of later job opportunities, and the subsequent disappearance of those disciplines, challenges the ability of our economies to meet certain future challenges, such as climate change.

The importance of employment opportunities as an incentive for universities to offer some specific courses, such as STEM, should also be considered. This also calls for a more general understanding and better coordination of objectives in different public policy areas to avoid a loss of student interest and/or disinvestment by universities in certain courses (such as nuclear research).

Figure 22 Belgian return on human capital by period and company size
Panel A: Returns on the productivity of highly skilled workers



Panel B: Returns on the productivity of STEM workers



Explanation: The curly brackets represent the 95% confidence intervals. Large companies are defined as those with more than 250 employees.
Source: Bijnens and Dhyne (2021).

3. Activity report

The Board

- **Establishment of the Board**

Following the report on Completing Europe's economic and monetary Union put together by the "five Presidents" (22 June 2015), the Council of the European Union approved on 20 September 2016 a recommendation encouraging the Member States to set up a National Productivity Board. Establishing such a board responds to a desire to permanently strengthen competitiveness so that economies are more resilient and can recover more quickly from economic shocks in future. The role of the productivity boards is to analyse competitiveness in the broad sense, to enrich basic knowledge and to inform the national debate, in order to strengthen the ownership of policies and reforms.
The National Productivity Board was officially established in Belgium on 14 May 2019, in accordance with the law of 25 November 2018 creating the National Productivity Council (published in the Belgian Official Journal on 7 December 2018) which transposes the European recommendation.

- **Mission of the Board**

The National Productivity Board is tasked with:

- the diagnosis and analysis of developments in productivity and competitiveness;
- analysis of policy challenges in the field of productivity and competitiveness;
- assessment of the effects of policy options in the above-mentioned fields.

To carry out its tasks, the National Productivity Board may contact the Productivity Boards of other Member States, communicate publicly on a timely basis, obtain appropriate access to information available from public administrations and consult stakeholders.
The National Productivity Board performs these tasks in the context of the European Semester, in particular by assisting the European Commission in data collection and by assisting governments in preparing the National Reform Programme.
The Board publishes an annual report.

- **Composition of the Board**

The National Productivity Board is headed by the Bureau consisting of:

- a chair, nominated by the secretariat of the Central Economic Council (CEC), and
- two vice-chairs, one nominated by the National Bank of Belgium (NBB) and the other by the Federal Planning Bureau (FPB).

The Bureau determines the agenda of meetings and the choice of topics to be studied by the Board. The National Productivity Board is composed of 12 members, six of whom are appointed at the federal level and six at the regional level:

- Siska Vandecandelaere (CRB)
- Luc Denayer (CEC)
- Catherine Fuss (NBB)
- Tim Hermans (NBB)
- Chantal Kegels (FPB)
- Joost Verlinden (FPB)
- Astrid Romain (Brussels Region)
- Koen Declercq (Brussels Region)
- Caroline Ven (Flemish Region)
- Joep Konings (Flemish Region)
- Marcus Dejardin (Walloon Region)

- Mikael Petitjean (Walloon Region)

The FPS Economy is responsible for the Board's secretariat.
The members of the Boards and secretariat reappointed by the King.

Activities 2022

- **Board meetings**

The National Productivity Board met six times, on:

- 17-01-2022 (video conference): Discussion of the contents of the 2022 report;
- 17-02-2022 (video conference): Discussion of the structure of the 2022 annual report;
- 04-05-2022 (video conference): Discussion of the content of the 2022 annual report;
- 20-06-2022 (video conference): Discussion of the texts of the 2022 annual report;
- 12-09-2022 (video conference): Discussion of the texts of the 2022 annual report (authors);
- 21-09-2022 (video conference): Discussion of the texts of the 2022 annual report;
- 21-10-2022 (video conference): Finalisation and approval of the 2022 annual report;

- **External activities**

In addition to the National Productivity Board meetings, a number of activities have been organised by external organisations and attended by Board members, in particular on:

- Presentation of the 2021 report to the social partners: 10-11-2021;
- Presentation of the 2021 report to the EPC: 10-12-2021;
- Presentation of the 2021 report to the SREPB: 18-03-2022
- Presentation of the 2021 report to the KUL: 11-03-2022
- Joint Conference of France Stratégie, the OECD, the European Commission and the French National Productivity Council on "Euro area productivity and competitiveness in the new challenging times": 30-06-2022;
- NPR presentation to the Botswanan delegation, "Bench-marking on productivity and competitive-ness": 19-10-2022.

Annexes

Annex 1. Method: Pliers and Wang model (2004)

If Y is the value added in chain-linked euros, Q is nominal value added, L is the volume of labour and P is the deflator for the aggregate economy and i is the index of industries ranging from 1 to 38, we can formulate aggregate productivity (X) as follows:

$$X = \frac{\sum_i Q_i}{PL} = \frac{\sum_i (\frac{Y_i P_i L_i}{L_i})}{PL} = \frac{\sum_i (P_i L_i X_i)}{PL}$$

Defining $p_i = \frac{P_i}{P}$ as the relative deflator for industry i and $l_i = \frac{L_i}{L}$ as the share of industry i in the volume of employment, and $s_i = p_i l_i$ as the share of labour adjusted by relative prices measuring the relative size of industry i, we can formulate the productivity of the total economy as follows:

$$X = \sum_i s_i X_i$$

The productivity of the total economy between t-n and t can be formulated as follows:

$$g(X) = \frac{X_t - X_{t-n}}{X_{t-n}} = \frac{\sum_i (s_{i,t} X_{i,t} - s_{i,t-n} X_{i,t-n})}{X_{t-n}} = \sum_i \frac{X_{i,t-n}}{X_{t-n}} [s_{i,t} g(X_i) + (s_{i,t} - s_{i,t-n})]$$

Defining $x_{i,t} = \frac{X_{i,t}}{X_t}$ as the relative productivity level of industry i over time t and $\Delta s_i = s_{i,t} - s_{i,t-n}$ as the change in the relative size of industry i between t-n and t, we can formulate the productivity growth of the overall economy as follows:

$$g(X) = \sum_i x_{i,t-n} [s_{i,t-n} g(X_i) + \Delta s_i + \Delta s_i g(X_i)]$$

Defining $w_{i,t-n} = x_{i,t-n} s_{i,t-n}$ as being also equal to the share of nominal value added for industry i in the nominal value added of the total economy at the beginning of the period (t-n), we can formulate the productivity growth of the total economy as follows:

$$g(X) = \sum_i w_{i,t-n} g(X_i) + \sum_i x_{i,t-n} \Delta s_i + \sum_i x_{i,t-n} \Delta s_i g(X_i)$$

So the first term on the right of the equation is the pure productivity effect, the second term is the effect of the change in relative size of industries (Denison effect) and the third term is the interaction effect between the change in relative size and productivity growth of industries (Baumol effect).

Descriptive annex: breakdown of productivity growth of the overall economy for the periods 2000-2007 and 2012-2019

The following table shows the results of the sector by sector breakdown of productivity growth in the total economy for the two crisis-free periods, 2000-2007 and 2012-2019.

		Prod. growth		Total contribution		Pure impact		Relative size		Interaction	
		2000-2007	2012-2019	2000-2007	2012-2019	2000-2007	2012-2019	2000-2007	2012-2019	2000-2007	2012-2019
BE	Total	9.3	4.8	9.3	4.8	11.6	5.7	0.0	0.2	-2.3	-1.1
	Primary	13.1	-17.6	-0.2	-0.1	0.2	-0.2	-0.4	0.1	0.0	0.0
	Industry	22.8	13.9	-1.5	0.1	5.1	2.0	-4.9	-1.8	-1.7	-0.2
	Construction	17.1	7.8	0.8	0.1	0.9	0.4	-0.1	-0.3	0.0	0.0
	MS	9.4	5.8	7.8	4.3	5.6	3.7	2.6	1.5	-0.5	-0.8
	NMS	0.0	-1.1	2.5	0.4	-0.2	-0.2	2.7	0.7	-0.1	-0.1
DE	Total	11.7	5.9	11.7	5.9	13.1	6.6	2.0	-0.1	-3.3	-0.6
	Primary	34.1	11.1	-0.1	0.0	0.4	0.1	-0.4	-0.1	-0.1	0.0
	Industry	25.1	9.4	3.9	0.6	6.8	2.3	-1.5	-1.5	-1.4	-0.2
	Construction	-3.4	-0.9	-0.8	0.7	-0.2	0.0	-0.6	0.8	0.0	0.0
	MS	10.7	6.9	7.2	2.8	6.2	4.2	2.7	-1.1	-1.7	-0.3
	NMS	-1.4	-1.3	1.6	1.9	-0.1	0.1	1.8	1.9	-0.1	-0.1
FR	Total	9.8	6.3	9.8	6.3	10.6	6.6	2.1	0.5	-3.0	-0.8
	Primary	18.8	20.1	-0.4	0.0	0.4	0.4	-0.7	-0.3	-0.1	-0.1
	Industry	25.8	9.4	-2.1	0.7	4.8	1.3	-5.1	-0.3	-1.8	-0.3
	Construction	-5.1	5.0	1.8	0.2	-0.2	0.3	2.1	-0.1	-0.1	0.0
	MS	6.9	4.7	7.6	4.7	4.0	3.6	4.4	1.4	-0.9	-0.4
	NMS	5.7	4.4	2.8	0.7	1.6	1.0	1.4	-0.3	-0.1	0.0
NL	Total	10.0	1.9	10.0	1.9	14.5	5.3	-0.4	-3.5	-4.1	0.0
	Primary	26.5	3.5	-0.3	0.0	0.7	0.1	-0.8	0.0	-0.2	0.0
	Industry	27.2	1.2	1.0	-2.5	6.2	-0.5	-3.4	-2.9	-1.8	0.9
	Construction	9.9	23.7	0.8	0.4	0.5	1.1	0.3	-0.5	0.0	-0.1
	MS	10.4	2.3	5.1	4.0	6.8	4.8	0.2	-0.2	-2.0	-0.6
	NMS	-1.2	-1.3	3.4	-0.1	0.2	-0.2	3.3	0.2	-0.2	-0.1
AT	Total	15.4	4.1	15.4	4.1	15.0	4.3	2.6	1.4	-2.2	-1.5
	Primary	28.9	31.2	0.0	-0.3	0.5	0.5	-0.4	-0.6	-0.1	-0.2
	Industry	28.8	12.0	3.5	0.1	7.3	2.3	-2.6	-1.3	-1.3	-0.8
	Construction	8.5	-9.7	0.4	0.5	0.6	-0.6	-0.2	1.2	0.0	-0.1
	MS	12.2	3.7	9.5	3.0	5.7	2.8	4.5	0.6	-0.7	-0.3
	NMS	3.4	-3.8	1.9	0.9	0.8	-0.6	1.3	1.5	-0.1	-0.1
FI	Total	15.9	4.8	15.9	4.8	21.9	6.0	2.8	0.5	-8.8	-1.7
	Primary	23.5	49.6	-0.2	0.2	0.8	1.3	-0.8	-0.8	-0.2	-0.4
	Industry	51.2	18.5	2.8	0.9	17.0	3.8	-7.9	-1.9	-6.4	-1.0
	Construction	-0.1	-5.1	1.6	1.0	0.0	-0.3	1.7	1.5	0.0	-0.1
	MS	11.3	3.7	7.8	3.5	5.0	1.9	4.5	1.7	-1.8	-0.1
	NMS	-5.7	-3.8	4.0	-0.7	-0.9	-0.7	5.3	0.1	-0.4	-0.1

Primary corresponds to NACE code A, Industry to codes B, C, D and E, Construction with code F, Market services (MS) to codes G to N and Non-market services (NMS) to codes O to T.

Source: Eurostat, September 2022 and National Accounts Institute (NAI), October 2022.

Annex 2. Breakdown of aggregated regional average annual productivity growth for the periods 2003-2007 and 2012-2019

The following table shows the results of the sectoral breakdown of the average annual growth rate of aggregate regional productivity for the two non-crisis periods, 2003-2007 and 2012-2019.

		Prod. growth		Total contribution							
						Pure impact		Relative size		Interaction	
		2000-2007	2012-2019	2000-2007	2012-2019	2000-2007	2012-2019	2000-2007	2012-2019	2000-2007	2012-2019
BE	Manuf.	3.9	2.1	0.0	0.0	0.7	0.3	-0.6	-0.2	-0.1	0.0
	Construction	3.1	1.0	0.2	0.0	0.2	0.1	0.1	0.0	0.0	0.0
	MS	1.7	0.8	1.3	0.6	1.0	0.5	0.3	0.2	0.0	-0.1
	NMS	0.2	-0.2	0.3	0.1	0.0	0.0	0.3	0.1	0.0	0.0
	Other	0.6	-1.2	0.0	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0
	Total	1.7	0.7	1.7	0.7	1.9	0.8	0.0	0.0	-0.2	-0.2
BXL	Manuf.	7.4	2.9	0.0	0.0	0.4	0.2	-0.3	-0.2	-0.1	0.0
	Construction	4.3	-0.3	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
	MS	2.3	0.8	1.4	0.4	2.2	1.0	-0.6	-0.4	-0.2	-0.2
	NMS	0.8	0.0	0.6	0.2	0.1	0.0	0.5	0.3	0.0	0.0
	Other	-1.0	-2.1	0.0	-0.1	0.0	0.0	0.1	-0.1	0.0	0.0
	Total	2.1	0.4	2.1	0.4	2.8	1.1	-0.3	-0.4	-0.4	-0.3
FL	Manuf.	7.4	1.5	-0.1	-0.1	0.9	0.2	-0.8	-0.2	-0.2	0.0
	Construction	4.3	1.2	0.2	0.0	0.2	0.1	0.1	0.0	0.0	0.0
	MS	2.3	0.9	1.6	0.7	1.0	0.4	0.6	0.5	0.0	-0.1
	NMS	0.8	-0.5	0.2	0.0	0.0	-0.1	0.2	0.1	0.0	0.0
	Other	-1.0	-0.4	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
	Total	2.1	0.6	1.9	0.6	2.1	0.5	0.1	0.3	-0.2	-0.2
WA	Manuf.	3.8	3.7	0.1	0.4	0.6	0.5	-0.4	-0.2	-0.1	0.0
	Construction	3.3	1.0	0.2	0.0	0.2	0.0	0.1	-0.1	0.0	0.0
	MS	0.8	1.1	0.6	0.6	0.4	0.5	0.2	0.2	0.0	0.0
	NMS	0.0	0.1	0.2	0.2	0.0	0.0	0.2	0.1	0.0	0.0
	Other	-0.6	-1.9	-0.1	-0.1	0.1	0.0	-0.1	0.0	0.0	0.0
	Total	1.1	1.0	1.1	1.0	1.2	1.1	0.0	0.0	-0.2	-0.1

Note: manufacturing corresponds to heading C, market services (MS) cover headings G to N and non-market services (NMS) cover headings O to U of NACE Rev2.

Source: Regional Accounts.

Annex 3. Advice of the Central Economic Council (CEC 2022-3280)

Table des matières

1. Saisine

L’article 4 de la loi du 25 novembre 2018 portant création du Conseil national de la productivité (CNP) prévoit dans son paragraphe 2 que les études et les rapports de cette institution puissent faire l'objet d'un débat au sein du Conseil central de l’économie (CCE), préalablement à leur publication. Si ce dernier souhaite formuler un avis, cet avis sera joint en annexe lors de la publication de l’étude ou du rapport. Le rapport annuel 2022 sur la productivité a été transmis au Conseil central de l’économie le 26 octobre 2022. Ce rapport a pour objectif de définir l’état de la connaissance sur la productivité et la compétitivité pour permettre d’en apprendre davantage sur les sources de la croissance de la productivité et d’identifier les causes éventuelles de son ralentissement.

Le projet d’avis, qui est le résultat des discussions menées au sein de la sous-commission « Conseil de la productivité » les 7 et 22 novembre 2022, a été approuvé en séance plénière le 21 décembre 2022.

2. Les concepts de compétitivité et de productivité dans une économie respectant les limites écologiques du bien-être

Dans la pensée économique courante, les gains de productivité représentent une condition nécessaire, mais non pas suffisante, de la prospérité de la population, du niveau de la cohésion sociale et du financement des investissements nécessaires à l’atteinte des objectifs environnementaux européens, soit la neutralité carbone à l’horizon 2050. Les gains de productivité peuvent être le fondement d’une amélioration des revenus réels et de baisses des prix relatifs. Grâce à ces derniers, les entreprises peuvent aussi maintenir leur rentabilité, laquelle est déterminante pour les investissements futurs. Ces différents éléments sont nécessaires pour un maintien de la compétitivité.

Aux yeux du CCE, la productivité, le progrès social et des politiques environnementales ambitieuses peuvent aller de pair, mais cela ne se fait pas spontanément. L'environnement détermine dans une large mesure les possibilités de créer des richesses pour les générations futures. Préserver la planète implique d’éviter l'épuisement des ressources naturelles et de sauvegarder la biodiversité, de lutter contre le changement climatique (et ses conséquences) et de promouvoir la qualité de l'environnement (air, eau et sol). Dans ce but, il faut œuvrer à la transformation du système économique vers une économie neutre en carbone et sobre en ressources (CCE 2020b).

La Belgique est aujourd’hui confrontée à des défis concernant la soutenabilité à moyen et à long termes de ses finances publiques, situation qui a été essentiellement aggravée cette dernière décennie par les crises financière, économique et sanitaire. Cela pourrait limiter les possibilités de recours à des instruments budgétaires dans le futur. Dès lors, la croissance de la productivité est aussi nécessaire pour dégager les marges budgétaires permettant d’élargir la palette des choix politiques possibles et ainsi relever les défis tels que le vieillissement de la population, la cohésion sociale (en particulier garantir la viabilité de notre système de protection sociale à long terme) et la transition écologique et numérique. Dans ses derniers rapports, le Comité d’étude sur le vieillissement a ainsi mis à chaque fois en évidence l’importance du contexte macroéconomique et plus particulièrement des gains de productivité lors de l’estimation du coût budgétaire du vieillissement. Une dette publique élevée et croissante est aussi susceptible d’accroître la vulnérabilité des politiques publiques, particulièrement en cas de hausse des taux d’intérêt et des primes de risque.

Dans son avis sur la gouvernance économique européenne (CCE 2022a), le CCE estime que la réforme du cadre budgétaire européen devrait induire une meilleure intégration de la gouvernance économique et budgétaire[33]. En effet, la gouvernance économique de l'UE a un impact majeur sur les politiques de finances publiques des États membres. Pour le CCE, il convient également de trouver un meilleur moyen de tenir compte des investissements afin que les investissements productifs, et donc la croissance future, soient moins pénalisés et que les objectifs climatiques ne soient pas compromis. À cette fin, une distinction doit être faite entre les investissements publics qui contribuent à la productivité et aux objectifs climatiques et les autres dépenses publiques. Les règles budgétaires doivent encourager, plutôt qu'inhiber, ce type d'investissement.

Pour le CCE (2021b), il est important de remarquer que les liens entre la productivité d'une part, et la prospérité, la cohésion sociale et l'environnement d'autre part fonctionnent dans les deux sens. En matière de cohésion sociale, même si le sujet reste controversé dans la littérature économique, de plus en plus d'études[34] tendent à indiquer que les inégalités auraient un impact négatif sur la croissance, du moins au-delà d'un certain seuil. Les multiples dimensions de l'inégalité sont étroitement liées et tendent à s'alimenter mutuellement. En particulier, les inégalités en matière d'opportunités ont non seulement des conséquences défavorables et potentiellement durables pour les générations actuelles, mais pèsent également sur les perspectives économiques futures. L'accessibilité et la qualité de l'enseignement sont essentielles à cet égard. Il est toutefois à noter que la Belgique figure parmi les pays où le niveau des inégalités de revenus, de même que l'écart salarial entre hommes et femmes, sont les plus contenus. Le risque de pauvreté pour les travailleurs est également bas, bien que les taux d'emploi soient comparativement faibles (Cordemans 2019). Assurer la prospérité de la population, renforcer la cohésion sociale et atteindre les objectifs environnementaux est donc également crucial pour accroître la productivité.

3. Constats

3.1. Diagnostic national

Dans ses différents rapports, le CNP a observé un ralentissement de la croissance de la productivité de l'économie totale en Belgique, comme dans les autres pays de comparaison, au cours des deux dernières décennies. La crise économique et financière de 2008 a renforcé ce ralentissement. Le CNP observe que la crise du COVID n'a pas eu à ce stade des effets similaires à ceux de la crise de 2008 sur la productivité, ce qui est positif. Le recours élargi à la possibilité de chômage temporaire a en effet permis une adaptation rapide des heures travaillées, ce qui a entrainé une hausse de la productivité horaire en 2020. Si l'on observe une forte baisse de la productivité horaire en 2021, la croissance moyenne de la productivité sur la période 2019-2021 se maintient à un niveau similaire, voire légèrement supérieur, à celui de la période précédente (2012-2019). La question se pose naturellement de savoir quel sera l'impact de la crise énergétique actuelle.

[33] La gouvernance économique européenne est composée de quatre piliers principaux. Le premier pilier est relatif à la surveillance multilatérale des déséquilibres budgétaires (le Pacte de stabilité et de croissance) – ce qui correspond à ce que nous entendons sous le vocable gouvernance budgétaire – ainsi que des déséquilibres macroéconomiques entre les États membres. Le deuxième pilier est relatif à la coordination des politiques socioéconomiques des États membres pour stimuler la croissance et l'emploi. Le troisième pilier est relatif à la réglementation et la supervision du secteur bancaire et financier (notamment l'Union bancaire). Le quatrième pilier est relatif aux instruments de gestion de crise et de solidarité en cas de mise en péril de la stabilité financière d'un État membre dont la monnaie est l'euro.

[34] Cingano (2014), Dabla-Norris et al. (2015).

Un processus de tertiarisation est à l'œuvre au sein des économies avancées. La décomposition de la croissance cumulée de la productivité sur la période 2000-2019 montre que la baisse de la taille de l'industrie a été particulièrement forte en Belgique[35], même si ce processus de désindustrialisation semble se ralentir en Belgique, selon le CNP. Ce constat met en lumière le besoin de disposer d'une politique/stratégie industrielle (cf. 5).

Le CCE salue les efforts entrepris par le CNP en vue d'analyser le niveau et la croissance de la productivité au sein des différentes branches d'activité, et de comparer ceux-ci avec la croissance de l'emploi et des prix. Il serait intéressant de réaliser un exercice similaire pour les pays de comparaison. Les écarts de croissance de productivité observés entre la Belgique et ses principaux pays voisins pourraient en effet s'expliquer par des niveaux de productivité inégaux au départ de l'analyse, en raison de la proximité de la frontière technologique[36] ou de différences en matière d'intensité capitalistique.

Selon le rapport du CNP, les branches qui affichent un taux de croissance de la productivité supérieur à celui de l'économie totale sont majoritairement des branches dont la part dans le volume d'emploi total s'est (fortement) réduite. Cette analyse témoigne de la difficulté de combiner une croissance élevée de la productivité et du travail en Belgique, un défi également mis en carte dans des travaux récents du CCE[37].

3.2. Diagnostic régional

Comme au niveau national, une tendance générale à la baisse de la croissance de la productivité a été observée par le CNP dans les trois Régions belges depuis plusieurs décennies. Sur l'ensemble de la période 2003-2019, les taux de croissance de la productivité horaire du travail diffèrent peu d'une Région à l'autre (0,9% en moyenne annuelle en Flandre, 0,7% dans les deux autres Régions).

Le CCE invite le CNP à présenter ses résultats aux différents Conseils économiques et sociaux régionaux du pays. Des domaines importants analysés par le CNP relèvent en effet de la responsabilité partielle ou exclusive des Régions ou des Communautés.

4. Leviers de la compétitivité

Le CNP a mis en avant une série de leviers importants en vue d'accroître la productivité : poursuivre les investissements dans la R&D et l'innovation, tout en améliorant la diffusion de l'innovation ; accorder une attention suffisante à la transition vers une économie à faible émission de carbone ; assurer une présence suffisante de capital humain.

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[35] L'industrie a ainsi contribué négativement à la croissance de la productivité agrégée en Belgique, en raison de la baisse de la taille relative de ce secteur dans l'économie. La contribution de l'industrie à la productivité a également été négative en France, aux Pays-Bas et en Finlande, mais dans une moindre mesure que la Belgique pour les deux premiers pays cités. Seules l'Allemagne et l'Autriche, enregistrent une contribution positive de l'industrie à la croissance de la productivité agrégée.

[36] La « frontière technologique » renvoie à l'utilisation de la meilleure technologie disponible (dans un certain domaine de production) à travers le monde. Un pays qui se situe en deçà de la frontière peut, par imitation des technologies existantes, accroître rapidement sa productivité. Un pays qui, en revanche, se situe sur la frontière technologique, doit s'employer à la déplacer par le développement d'innovations.

[37] Voir CCE 2022d.

Le processus d'innovation s'appuie sur le développement de vecteurs de l'innovation (l'intensification de la R&D, l'enseignement supérieur ...), mais aussi sur des institutions économiques qui favorisent la diffusion de l'innovation (l'ouverture des marchés à la concurrence et l'accès aux marchés étrangers, le développement d'instruments financiers qui permettent un meilleur financement de l'innovation, une organisation des marchés qui permet aux entreprises d'évoluer et de privilégier les produits ou processus les plus innovants, notamment via une réglementation propice à l'innovation[38]...). De plus, les pouvoirs publics doivent œuvrer à un environnement macroéconomique dans lequel les politiques économiques amortissent autant que possible les fluctuations conjoncturelles et privilégient le maintien de la croissance sur sa trajectoire potentielle, de telle sorte que l'incitation à innover ne soit pas contrainte par l'insuffisance des débouchés et par l'augmentation du risque lié à l'investissement et l'innovation.

3.3. R&D et innovation

Dans son rapport, le Conseil national de la productivité met l'accent sur l'importance de la R&D et de l'innovation en vue d'accroître la productivité, ainsi que sur les mesures de soutien appropriées.

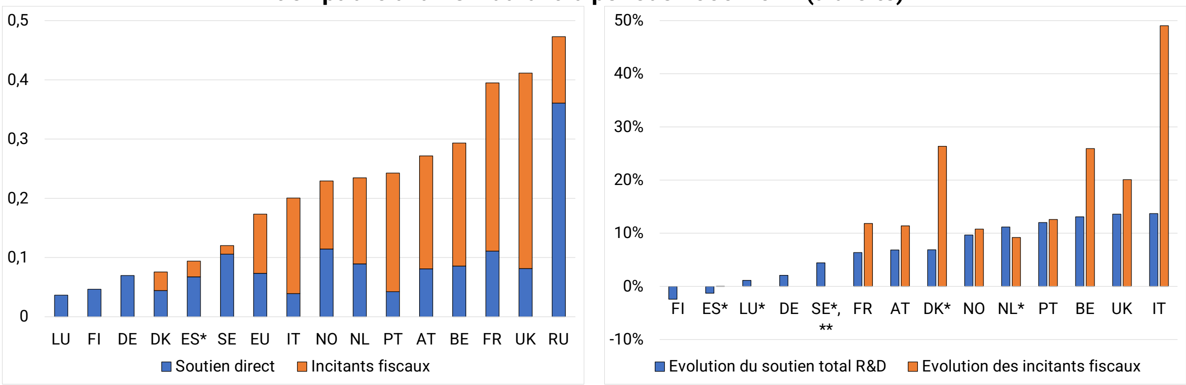
Pour le CCE, la Belgique dispose d'atouts en matière de recherche et d'innovation. Ainsi, le niveau de dépenses de R&D des entreprises est élevé en comparaison avec les autres pays européens, et ces dépenses ont augmenté de manière significative entre 2005 et 2017. L'intense coopération dans le domaine de l'innovation, les « innovaders » (centres sectoriels de recherche et de diffusion de l'innovation), l'ouverture internationale et la forte intégration de la Belgique dans les chaînes de valeur internationales sont également positives en vue d'assurer la diffusion de l'innovation (CCE 2021a). Dans l'European Innovation Scoreboard, qui fournit annuellement une évolution comparative des performances en matière de recherche et d'innovation pour les États membres de l'UE, la Commission européenne (2022) place également la Belgique dans le groupe des leaders de l'innovation en 2022, en compagnie des Pays-Bas, du Danemark, de la Finlande et de la Suède.

- ***Les politiques publiques en faveur de la R&D***

Le CNP indique qu'il est important de maintenir le soutien à la R&D, tout en veillant à son efficacité. Au niveau des politiques publiques, les Régions et le gouvernement fédéral encouragent les activités de R&D des entreprises en apportant une aide directe (principalement sous la forme de subventions) et indirecte via divers avantages fiscaux. Les **aides publiques totales en faveur de la R&D** – et en particulier l'aide indirecte – sont relativement importantes en Belgique en comparaison avec la majorité des pays européens, à l'exception de pays qui se focalisent très fortement sur le développement de leurs propres secteurs qui sont par nature R&D-intensifs, par exemple la France, la Russie et le Royaume-Uni (Graphique 4-1).

[38] Voir CCE 2020a.

Graphique 3-1 : Soutien public à la R&D en % du PIB en 2019 (à gauche) et variation annuelle moyenne du soutien public à la R&D durant la période 2006-2019 (à droite)



Note concernant le panneau A : Pour l'Espagne, les chiffres concernant les avantages fiscaux pour la R&D sont uniquement disponibles jusqu'en 2018.
Notes concernant le panneau B : * ES (2006-2018), LU (2007-19), SE (2007-19), DK (2007-19) et NL (2007-19). ** En Suède, les avantages fiscaux pour la R&D ont seulement été introduits en 2018. C'est pourquoi aucun chiffre n'a été donné concernant l'évolution des aides publiques à la R&D entre 2007-19.
Note générale : le chiffre correspondant au soutien fiscal à la R&D dans l'OCDE tient uniquement compte de l'aide applicable aux dépenses de R&D à proprement parler (c'est-à-dire les exonérations partielles de précompte professionnel sur les salaires du personnel de R&D et le crédit d'impôt alloué pour la R&D). La déduction fiscale pour revenus de brevets ou d'innovation n'est pas prise en compte dans les chiffres de l'OCDE.
Source : base de données de l'OCDE sur les incitations fiscales à la R&D.

Comme dans la plupart des pays membres de l'OCDE, le soutien à la R&D a fortement augmenté : au cours de la période 2006-2018, les aides accordées par les pays membres de l'OCDE ont augmenté de 123 %. En Belgique, au cours de la période 2006-2019, elles ont augmenté de 395 %. En 2006, cependant, il n'existait quasiment pas de politique de soutien globale (fédérale) à la R&D. Il est également à noter que dans les pays membres de l'OCDE, la part du soutien fiscal dans le mix de soutien total à la R&D a augmenté : là où le soutien fiscal ne s'élevait qu'à 17 % du soutien belge total à la R&D en 2006, il s'élevait à 71 % en 2019. Pour l'OCDE (2021), le soutien fiscal correspond à 56% du mix de soutien en 2018 contre 36% en 2006. Les autorités fédérales assument dès lors un rôle important en tant que soutien à la R&D. Les principales mesures fiscales d'aide fédérale indirecte sont les suivantes : la dispense partielle de versement de précompte professionnel pour les chercheurs (qui vise à stimuler l'emploi et donc la R&D effectifs en Belgique) ; le crédit d'impôt pour la R&D ; la déduction pour investissement en R&D (qui, comme le crédit d'impôt, aide à renforcer la capacité de R&D lorsqu'on s'engage dans de nouvelles activités ou qu'on étend ses activités existantes) ; la déduction pour revenus d'innovation (qui remplace l'ancienne déduction pour revenus de brevets, et récompense l'obtention et l'utilisation d'une R&D efficace en Belgique).

Concernant ces mesures de soutien, il est utile de rappeler que la Belgique doit faire face à des constats ou des recommandations répétés d'instances nationales (le Bureau fédéral du Plan (BfP), la Cour des comptes) et internationales (la Commission européenne, l'OCDE) quant à deux **pistes d'amélioration possibles**. La première piste concerne une meilleure efficacité des mesures de soutien à la R&D. La seconde concerne une meilleure valorisation des résultats de la R&D financée par les pouvoirs publics au niveau de l'activité économique et de l'emploi.

Dans son rapport de 2019 sur la Belgique, la Commission européenne (2019, p.57) plaide pour une évaluation approfondie de l'ensemble du système des incitants fiscaux en faveur de la R&D des sociétés au moyen d'une évaluation des dépenses. L'objectif est d'améliorer l'efficacité et la composition des dépenses publiques, de réduire la complexité du système fiscal et de remédier à l'érosion des bases d'imposition afin de créer une marge de manœuvre pour l'investissement. L'OCDE (2019a) a également recommandé d'améliorer l'efficacité des aides publiques à la R&D dans le cadre de son rapport sur le ralentissement de la croissance de la productivité belge.

D'après une étude du BfP (Dumont, 2019), les subventions (régionales) et les mesures de dispense partielle de versement de précompte professionnel génèrent des dépenses de R&D supplémentaires. À l'inverse, comme indiqué dans le rapport du CNP, il y a peu de preuves macroéconomiques qui indiqueraient que le crédit d'impôt pour dépenses de R&D et la déduction pour revenus de brevets incitent les sociétés à investir davantage dans la recherche. Dans le cadre de l'Action 5 du cadre inclusif relatif au plan d'action BEPS de l'OCDE, cette dernière mesure a été fortement adaptée en introduisant un lien direct et indispensable entre l'avantage fiscal et les activités de R&D en Belgique, à savoir une vraie substance en termes d'investissement, d'emploi et de dépenses de R&D. Reste à voir quel sera l'impact exact de cette mesure réformée. Il serait utile d'en faire une évaluation dans un avenir proche.

Il est à relever que la déduction pour brevets et la déduction pour l'innovation introduite en 2016 ne visent pas directement à accroître les dépenses de R&D en Belgique, mais plutôt à encourager la valorisation de la R&D en Belgique en stimulant la production innovante. L'évaluation correcte de l'impact économique des mesures de soutien n'est cependant pas simple.

Il est positif que les dépenses de R&D soient élevées dans certains secteurs, mais étant donné l'insuffisance de la diffusion de l'innovation dans le reste de l'économie, les dépenses se retrouvent concentrées dans un petit nombre de secteurs, ce qui pèse sur la croissance de la productivité. Les **jeunes entreprises** – qui bénéficient par ailleurs de mesures de soutien public[39], bien que ces dernières ne soient pas nécessairement directement ciblées sur la R&D[40] – jouent également un rôle essentiel dans la dynamique d'innovation, notamment sur le segment des innovations disruptives. Ce sont certaines de ces jeunes entreprises qui ont le meilleur potentiel de croissance (Schoonackers 2020). En dépit de ce fait, seule une petite part des dépenses totales de R&D provient des jeunes entreprises[41]. Ceci est notamment lié aux faiblesses de la Belgique en termes d'entrepreneuriat et de dynamisme des entreprises. Le rajeunissement de la population des entreprises belges est plus lent que dans les pays comparables. Mais on peut aussi se demander si les aides à la R&D sont suffisamment accessibles aux jeunes entreprises. Dans ses recommandations spécifiques à la Belgique, la Commission européenne (2020) appelle à une répartition plus large des investissements en R&D, y compris parmi les petites entreprises. En ce qui concerne la politique de soutien à la R&D en Belgique, l'OCDE (2019, p.30) souligne que le ciblage des jeunes entreprises avec un fort potentiel de croissance doit être amélioré.

[39] Telle que la dispense partielle de versement de précompte professionnel en faveur des jeunes entreprises innovantes.
[40] Par exemple les mesures ciblant les PME : le taux réduit d'impôt de société, le taux augmenté de déduction pour investissement et la réduction des cotisations sociales patronales pour les premiers engagements.
[41] Vennix (2019) montre que moins de 3 % des dépenses belges en R&D du secteur privé sont le fait des entreprises de moins de 5 ans.

Parmi les pistes d'amélioration possibles, il convient notamment d'encourager des jeunes entreprises à utiliser les moyens de soutien qui leur sont disponibles en renforçant l'accessibilité des services publics. Dans son rapport sur les différents incitants fiscaux visant à stimuler la R&D, la Cour des comptes (2021) a constaté qu'il y a une collaboration déficiente entre les services de contrôles du SPF Finances et les collaborateurs du SPF Programmation de la politique scientifique (Belspo). Cette situation se traduit par un manque de sécurité juridique et des charges administratives supplémentaires (y compris les frais juridiques) qui découragent sans doute les toutes petites entreprises sans expérience – contrairement aux plus grandes entreprises – pour estimer les risques financiers, fiscaux et juridiques. À la suite de ce rapport, le ministre des Finances a annoncé une réforme du cadre juridique de la dispense partielle de versement du précompte professionnel pour les chercheurs afin de renforcer la sécurité juridique, de clarifier les compétences respectives du SPF Finances et de Belspo, et de simplifier les obligations de rapportage. Il convient de souligner que le fait que les jeunes entreprises n'enregistrent souvent pas encore de profit et ne peuvent donc pas bénéficier du crédit d'impôt pour la R&D représente un facteur certainement tout aussi pertinent, si pas plus pertinent par rapport au fait qu'elles ne peuvent utiliser que trop peu les avantages fiscaux pour la R&D.

Enfin, la Cour des comptes (2021) constate que les niveaux politiques fédéral et régional ne se concertent et ne collaborent pas assez pour harmoniser et **coordonner leurs politiques en matière de R&D et d'innovation**. Il n'existe actuellement aucune obligation légale de coordonner les mesures d'aide à la R&D. Ainsi, les mesures d'aide fiscale fédérale et régionale à la R&D sont appliquées conjointement sans aucune coordination. La conférence interministérielle de la politique scientifique ne se réunit pratiquement jamais au niveau ministériel et, hormis en ce qui concerne la coopération internationale, elle ne coordonne guère les politiques scientifiques et d'innovation des différents niveaux de pouvoir.

Les études mentionnées ci-dessus se concentrent principalement sur l'impact des mesures de soutien à la R&D sur les dépenses de R&D (« additionnalité des inputs »). Il importe également que les dépenses supplémentaires en R&D conduisent à l'innovation et se traduisent par une création de valeur ajoutée et des emplois supplémentaires (« additionnalité des outputs »). Les mesures de soutien devraient idéalement être évaluées sur la base de leur impact économique (c'est-à-dire l'impact sur la production de l'entreprise bénéficiaire de l'aide mais aussi l'effet multiplicateur de la R&D supplémentaire sur le reste de l'économie par le biais des effets « spillovers »), mais divers freins méthodologiques compliquent une telle analyse.

Le BfP a récemment publié une quatrième évaluation des mesures d'aide à la R&D (Dumont, 2022). Le BfP viendra présenter cette étude au Conseil central de l'économie dans le courant du mois de janvier. Il est difficile pour le CCE de se prononcer à ce stade sur l'étude sans avoir pu en discuter avec son auteur, d'autant plus que la mesure de l'impact économique des mesures de soutien à la R&D reste complexe. Le Conseil souhaite analyser comment mieux cerner cette question dans un cadre académique, avec la volonté de revenir en ce sens vers le CNP dans un futur proche.

Les discussions menées au Conseil central de l'économie cherchent à affiner le diagnostic et les problèmes identifiés par les différentes instances – notamment via la publication d'un rapport sur la R&D et la valorisation de la R&D (CCE 2021a). Ces discussions doivent, le cas échéant, permettre la formulation, sous forme d'avis, de propositions de politiques économiques de soutien aux dépenses de R&D. Elles visent aussi à permettre de se prononcer quant à la mise en place des politiques économiques adéquates dans le but de valoriser au maximum les dépenses de R&D, c'est-à-dire de faire en sorte que ces dernières se traduisent le plus possible par de la valeur ajoutée et des emplois de qualité supplémentaires.

- ***L'importance de la diffusion de l'innovation***

À ce titre, une attention particulière doit être accordée à la manière dont la diffusion peut être stimulée. Si la création de nouvelles technologies est évidemment importante, la diffusion de ces technologies est également considérée comme une source importante de croissance de la productivité agrégée. La divergence croissante de la productivité entre les entreprises qui se trouvent à la frontière technologique mondiale – ce qui signifie qu'elles sont parmi les plus performantes de leur branche d'activité au niveau international – et celles qui sont à la traîne est souvent attribuée à un manque de diffusion des technologies et des connaissances développées à la frontière (CCE 2021a). Des recherches supplémentaires apparaissent nécessaires pour comprendre comment améliorer concrètement ce processus de diffusion de l'innovation. Un des axes essentiels – et qui est spécifique à la Belgique – est le rôle joué par les innovateurs, à savoir les centres de recherche collective et de diffusion de l'innovation (en particulier vers les PME) qui sont organisés au niveau sectoriel.

3.4. La transition vers une économie à faible émission de carbone et une utilisation durable des ressources naturelles

- ***Transition climatique et productivité***

Le CNP rappelle que la transition vers une économie à faible émission de carbone est une priorité. Le changement climatique constitue une menace importante pour la prospérité et le bien-être de la génération actuelle et des générations futures. Les effets se font déjà sentir aujourd'hui et on peut s'attendre à ce qu'ils deviennent plus fréquents et plus intenses au cours des prochaines décennies. Bien que l'impact de la transition vers une économie à faible émission de carbone sur la productivité du travail (telle qu'elle est habituellement mesurée) soit empiriquement ambigu, il est certain que le changement climatique lui-même (surtout à long terme) représente une menace majeure pour la croissance future de la productivité.

Pour combiner des gains de productivité et des politiques environnementales ambitieuses, il faut un cadre propice de **politiques publiques** qui doivent être bien conçues et cohérentes et garantir un « level playing field ». Promouvoir une gouvernance et des relations commerciales qui garantissent un « level playing field » pour les entreprises permet en effet d'éviter une concurrence déloyale avec des entreprises étrangères soumises à des législations moins contraignantes en matière (entre autres) de droits fondamentaux des travailleurs et des citoyens, ou encore de protection de la santé et de l'environnement.

Afin que les gains de productivité aient une influence positive sur l'environnement, il est entre autres nécessaire de se diriger vers une économie circulaire et une utilisation des ressources de plus en plus sobre. Les **investissements** sont importants à cet égard. En effet, la transition écologique que nous devons conduire va induire une obsolescence accélérée d'une part importante des équipements et du capital. Outre les investissements en capital physique, des investissements seront aussi nécessaires dans des innovations conduisant à des produits et services neutres en carbone ainsi que dans la formation aux nouveaux métiers de la transition climatique et de l'économie circulaire. La politique des pouvoirs publics se doit de remplir un rôle majeur de guidance en encourageant de tels investissements et, plus largement, en stimulant des modifications comportementales de tous les acteurs socio-économiques. La révision du Plan national Énergie-Climat (PNEC) en 2023 offre à la Belgique l'opportunité de définir des actions fortes en ligne avec ces objectifs. Le CCE et le CFDD se sont prononcés sur ce sujet dans le cadre de leur avis sur l'actualisation du Plan fédéral Énergie-Climat (CCE et CFDD 2022).

- ***Transition vers une économie circulaire***

Outre le changement climatique, il existe de nombreux autres défis au niveau écologique, comme la dégradation et la destruction des écosystèmes, l'appauvrissement de la biodiversité, la dégradation des ressources naturelles, la pénurie de matières premières ou la dépendance vis-à-vis des matières premières. La transition vers une économie circulaire - où les matières premières ne sont pas uniquement exploitées, mais circulent au maximum dans l'économie - peut aider à relever tous ces défis et offre de plus de nombreuses possibilités en matière d'innovation et de création de valeur ajoutée et d'emploi local.

Dans le passé, le CCE et le CFDD ont déjà formulé différentes recommandations concernant ce thème, notamment dans leur avis sur le plan d'action fédéral pour une économie circulaire 2021-2024 (CCE et CFDD 2021b). Les membres se sont engagés à assurer le suivi de la mise en œuvre de ce plan chaque année.

- ***Transition climatique et approvisionnement énergétique***

D'après le CNP, « les défis de la transition climatique sont parallèles aux défis de la sécurité et de l'indépendance énergétiques auxquels nous sommes confrontés. Du point de vue de la sécurité énergétique, il est crucial de réduire dès que possible la dépendance à l'égard des combustibles fossiles (…). La crise énergétique doit donc être mise à profit pour accélérer la transition vers une économie à faible émission de carbone en Belgique. Dans ce contexte, il est important qu'en cas d'intervention du gouvernement, le signal de prix soit préservé autant que possible et également garanti pour l'avenir ».

Pour le CCE, la transition climatique doit en effet permettre de réduire la dépendance aux énergies fossiles. À plus court terme, les pays européens ont fait face ces derniers mois à des difficultés d'**approvisionnement énergétique** et à une hausse importante des prix de l'énergie auxquelles ils s'efforcent de réagir, au niveau national et international. Pour le CCE, des mesures nationales non coordonnées pourraient affecter le fonctionnement du marché intérieur de l'énergie, mettant en péril la sécurité de l'approvisionnement et entraînant de nouvelles hausses de prix dans les États membres les plus touchés par la crise. Il est donc nécessaire de préserver la solidarité entre les États membres.

Si des mesures de modération des prix ou d'aides aux entreprises sont prises au niveau national, le principal risque est de perturber le « **level playing field** » entre les États membres. En l'absence d'une réponse budgétaire commune, les gouvernements disposant d'une plus grande marge de manœuvre budgétaire peuvent aider davantage leurs entreprises nationales. La compétitivité des entreprises des États membres ne pouvant déployer ce genre d'aide pourrait par conséquent se détériorer.

3.5. Éducation et formation

L'éducation et la formation tout au long de la vie mais aussi la santé sont des éléments essentiels dans le processus d'accumulation de capital humain. Or ce facteur est fondamental pour stimuler la productivité et la capacité d'innovation. L'enseignement et la formation œuvrent à une diminution des inadéquations sur le marché du travail, garantissent les opportunités sur le marché du travail, développent et élargissent les possibilités de carrière dans ce contexte de transition, facilitent l'activation et la mobilité professionnelle dans un secteur et entre les secteurs, contribuent à diminuer les pénuries sur le marché du travail et ont un rôle émancipateur pour chaque citoyen qui dépasse le cadre du marché du travail (développement personnel, démocratie, bien-être, participation citoyenne, arts et culture, etc.).

La **formation tout au long de la vie** est un élément clé afin de répondre aux besoins des entreprises et aux inquiétudes des travailleurs dans ce contexte de transition environnementale et de changements technologiques qui devraient entrainer une transformation qualitative et quantitative du marché du travail. Ce facteur est fondamental pour stimuler la productivité et la capacité d'innovation. La participation à la formation continue constitue une responsabilité partagée entre les employeurs, les travailleurs, le reste de la population et les pouvoirs publics.

Dans son rapport, le CNP met en exergue le besoin accru de travailleurs (hautement qualifiés) disposant de compétences en sciences et techniques (**STEM**[42]) pour stimuler la productivité. Les difficultés des entreprises belges à attirer des spécialistes en TIC sont donc susceptibles d'avoir un impact négatif important sur la productivité. Vu l'importance des orientations en sciences et techniques (STEM) – y compris les cycles courts portés sur la pratique – pour le marché du travail, il convient pour le CCE de chercher à rendre plus attrayant le choix de ces formations.

Les transitions climatique et numérique qui s'annoncent sont porteuses de nombreuses opportunités en termes d'emploi et de compétitivité mais il faut veiller à ce qu'elles n'aggravent pas les problèmes structurels de l'économie belge. L'**intégration des groupes à risque** sur le marché du travail constitue une thématique prioritaire.

Dans ce cadre, le CCE s'est penché dans un rapport récent (CCE 2022c) sur l'**insertion des jeunes sur le marché du travail** et l'impact de la crise du COVID-19 sur ce groupe de la population. D'une part, la fermeture des écoles a engendré une perte d'apprentissage pour les élèves. Pour le CCE, il convient de rester attentif aux indicateurs qui mettent en évidence les répercussions à long terme de la crise du COVID-19 sur les performances des élèves, comme le fléchissement de leurs aspirations en matière d'éducation ou, dans les cas plus extrêmes, le taux de décrochage scolaire.

D'autre part, la pandémie de COVID-19 et les mesures de confinement qui ont été appliquées pour contrer la propagation du virus ont impacté plus fortement l'insertion des jeunes sur le marché du travail, en raison de leur présence importante dans les secteurs les plus durement touchés par la crise, ainsi que de leur surreprésentation parmi les personnes au chômage temporaire[43]. La baisse du nombre d'offres d'emploi durant la pandémie, la suppression de nombreux stages[44] et jobs d'étudiants ont également réduit l'expérience professionnelle acquise par les jeunes et donc leurs chances de trouver un emploi. La crise a donc freiné le processus de « job matching » en début de carrière, soit le processus au cours duquel le jeune sortant de l'école a besoin de temps et d'efforts en vue de trouver un emploi correspondant à son profil. Ce processus de « job matching » se faisait déjà difficilement avant la crise pour certains groupes de jeunes – à savoir les jeunes peu qualifiés, les jeunes issus de l'immigration et les jeunes NEET[45] – qui passent par des périodes significatives de chômage et / ou d'inactivité au début de leur parcours professionnel. Or, le chômage de longue durée en début de carrière peut laisser des traces importantes ou « scarring effects » (cicatrices) qui marquent la suite de la carrière professionnelle. Le chômage peut notamment entraîner un sentiment de découragement qui perdure et une perte des connaissances et des compétences, mais aussi augmenter le risque de chômage à un âge plus avancé.

[42] Les orientations STEM sont définies comme des diplômes en sciences, mathématiques, informatique, ingénierie, fabrication et construction.

[43] Le chômage des jeunes est plus sensible en Belgique à la conjoncture économique que le chômage des autres groupes d'âge. Les jeunes sont en effet plus souvent occupés dans le cadre de contrats temporaires, qui dépendent davantage des fluctuations de l'activité économique.

[44] Durant la période des mesures sanitaires strictes, la formation de certains de ces jeunes a été interrompue, en raison de la suppression des cours, des stages ou d'autres formes d'apprentissage sur le lieu de travail. D'après les premières données analysées par le Bureau fédéral du Plan, il apparaît que le niveau d'éducation a baissé (davantage) en conséquence de la pandémie (Joskin, 2022). Il reste encore à voir quelles seront les conséquences précises pour le marché du travail.

[45] Le groupe de jeunes NEET (Not in Employment, Education or Training) contient les demandeurs d'emploi (non vulnérables) de courte durée ainsi que certains groupes vulnérables qui sont les plus éloignés du marché du travail, tels que les demandeurs d'emploi de longue durée et les inactifs (pour cause de responsabilités familiales, de maladie, d'invalidité, parce qu'ils sont découragés, etc.).

Plus globalement, en complément des freins à la mobilité géographique des travailleurs déjà identifiés par le passé en Belgique, la crise sanitaire a entravé la mobilité professionnelle[46], et celle-ci ne se rétablit pas immédiatement lors d'une relance économique. Ces divers facteurs contribuent à renforcer le **problème structurel d'inadéquation sur le marché du travail** observé au sein de l'économie belge. Au vu des tensions et des pénuries sur le marché du travail, les efforts visant l'amélioration de l'insertion professionnelle des jeunes revêtent une importance encore plus grande.

3.6. Thématiques complémentaires

Au vu des événements récents marqués par une crise sanitaire et une crise énergétique, le CCE souhaiterait également mettre en avant l'importance des chaines de valeur, de la concurrence et du dynamisme entrepreneurial comme leviers de la compétitivité. Au regard du marché potentiel important qu'il représente, l'e-commerce fait également l'objet d'une attention particulière.

Présence dans les chaines de valeur à fort potentiel d'innovation

À la demande des partenaires sociaux, le BfP a analysé les branches d'activité ayant augmenté leurs efforts de R&D au cours des dernières années pour déterminer si cette évolution est liée à la production domestique de nouveaux produits ou à la modification de la position de la Belgique dans les chaînes de valeur globales en faveur des activités de recherche et au détriment des activités de production. L'analyse fournit, pour l'industrie pharmaceutique, des indications d'une spécialisation de la Belgique dans la recherche et le développement et d'une dissociation partielle entre les activités de R&D et de production. Pour les autres branches étudiées, il y a davantage de preuves d'une colocalisation de la R&D et de la production en Belgique (Biatour et al., 2020).

Le CCE s'est par ailleurs penché sur la présence de la Belgique dans les chaînes de valeur caractérisées par une forte capacité d'innovation (CCE 2021a). La Belgique semble être technologiquement et/ou économiquement active dans un certain nombre de domaines à forte croissance (tels que la pharmacie, la biotechnologie et les technologies vertes liées aux processus de production industrielle). En revanche, notre pays semble être beaucoup moins présent dans les technologies et branches d'activité numériques de base. Il est important de ne pas manquer la vague numérique, d'autant plus que les technologies numériques sont dites à usage général, ce qui signifie qu'elles peuvent être utilisées dans presque toutes les branches d'activité – à la condition que ces technologies soient suffisamment diffusées dans l'ensemble de l'économie.

Pour le CCE, dans une économie, comme celle de la Belgique, qui se situe « à la frontière technologique », la capacité à innover en permanence est la condition de l'augmentation de la productivité et de la performance économique. La nécessité d'investir dans l'innovation s'applique à tous les secteurs : dans les secteurs à fort potentiel où l'intensité de la R&D et l'innovation sont « naturellement » élevées mais aussi dans les secteurs à maturité où la survie des entreprises dépend de leur capacité à innover.

[46] Lorsque la situation économique est incertaine, les travailleurs et les employeurs prennent moins de risques et la rotation entre les fonctions diminue, ce qui réduit les chances d'évolution professionnelle.

Transition numérique

L'application de nouvelles technologies numériques est importante non seulement pour la croissance de la productivité[47] mais aussi, à condition que le processus soit inclusif et juste, pour la prise en main d'un certain nombre de défis sociétaux (les soins de santé, la mobilité, l'atteinte de la neutralité carbone à l'horizon 2050). En effet, ce n'est que de cette façon que tous les acteurs seront disposés à collaborer à la transition numérique, une condition sine qua non du succès de celle-ci.

La numérisation a un impact prononcé sur les compétences et aptitudes recherchées, lesquelles ne correspondent pas toujours à l'offre de travail, ce qui provoque des tensions sur le marché du travail. Une politique qui mobilise tous les talents et veille à la concordance maximale entre l'offre et la demande de travail est donc nécessaire. Il sera important dans ce cadre de miser sur un enseignement, des formations et un apprentissage tout au long de la vie axés sur le développement de compétences durables et tournées vers l'avenir.

L'importance d'une infrastructure numérique rapide, sécurisée et fiable ne peut non plus être ignorée. De nombreux nouveaux développements technologiques en dépendent. Il s'agit non seulement d'infrastructures matérielles telles que les réseaux 5G et les réseaux à très haute capacité (VHCN) mais aussi d'actifs fixes immatériels comme les banques de données et la R&D. En outre, la transformation numérique requiert une culture imprégnée de l'importance et du potentiel des technologies numériques (CCE 2020c).

Comme le CNP (2020) l'a affirmé précédemment, la numérisation de la chaîne de valeur a été accélérée par la crise du COVID-19. Si les entreprises, quel que soit le secteur dans lequel elles opèrent, ne prennent pas de mesures dans le domaine de l'e-commerce, cela signifie que la valeur ajoutée s'échappera à l'étranger et que les possibilités de réaliser des économies d'échelle seront manquées. Le CCE s'est attaché dans un rapport récent (CCE 2022b) à cartographier le développement de l'e-commerce en Belgique au cours de ces dernières années. Si la Belgique fait partie des leaders européens en matière d'e-commerce B2BG[48], elle accuse un retard par rapport à ses voisins européens en matière de commerce électronique B2C[49]. Les entreprises belges éprouvent des difficultés à capter davantage de parts du marché européen de l'e-commerce B2C, en pleine croissance.

Dynamisme entrepreneurial

Le rapport annuel 2021 du CNP souligne le faible dynamisme entrepreneurial en Belgique en comparaison avec d'autres pays européens. Tant la création que la radiation et la croissance des entreprises y sont relativement faibles. Selon le rapport, la création d'entreprises ne semble pas particulièrement touchée par la crise du COVID-19 tandis que la radiation d'entreprises a même baissé. Il est important que des entreprises fondamentalement rentables ne disparaissent pas en raison d'un ralentissement économique temporaire, mais une paralysie du dynamisme entrepreneurial, qui empêcherait la création et l'expansion des entreprises, n'est pas souhaitable. Le CCE souligne l'importance de disposer d'un cadre réglementaire qui facilite l'entrée de nouvelles firmes à haut potentiel et la sortie ou la réorientation des firmes les moins efficaces, et qui permet aux entreprises de se développer et de mettre en place des conditions favorables à l'accroissement de l'efficacité.[50] À ce sujet se pose aussi la question de savoir si les réformes de la législation relative aux faillites de 2018 et 2021 ont eu un effet sur le dynamisme entrepreneurial.

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[47] Voir OCDE (2019b)
[48] Le terme B2BG fait référence aux ventes en ligne d'entreprises à entreprises et d'entreprises à autorités publiques.
[49] La vente électronique aux consommateurs finaux.
[50] Une réforme de la réglementation sur les faillites est entrée en vigueur en Belgique le 1er mai 2018. En 2021, le gouvernement fédéral a également procédé à une réforme visant à assouplir l'accès à la procédure de réorganisation judiciaire en Belgique.

Les conséquences de la guerre en Ukraine et de la crise énergétique ont aussi un impact négatif sur la situation financière des entreprises. Il est important que les entreprises qui étaient financièrement saines avant la crise ne disparaissent pas en raison de circonstances temporaires, ce qui entrainerait une perte inutile d'activité économique. Pour le CCE, la réhabilitation des entreprises en difficulté implique moins de coûts sociaux liés à la perte d'emplois que si seule une sortie était envisagée[51]. Pour les activités dont la rentabilité ne peut être rétablie de manière durable, les travailleurs et le capital touchés doivent alors le plus rapidement possible être replacés dans des entreprises nouvelles et existantes. La crise actuelle crée aussi des opportunités, comme une transition plus rapide vers une plus grande efficacité énergétique et vers des sources d'énergie alternatives, ce qui renforce le besoin d'un contexte favorable pour la création et l'expansion d'entreprises. C'est pourquoi le Conseil demande que le CNP établisse une analyse actualisée du dynamisme entrepreneurial des entreprises belges dans son prochain rapport annuel.

Concurrence

Les questions de concurrence et de concentration constituent une problématique importante eu égard notamment à l'impact négatif sur la concurrence de la concentration du pouvoir de marché ces dernières années aux mains de quelques acteurs, dont certaines plateformes en ligne mais aussi certains secteurs de services. Il subsiste des obstacles à la concurrence dans plusieurs secteurs de services, comme le rappellent régulièrement la Commission européenne (2020) et l'OCDE (2020). Ces problèmes de concurrence peuvent constituer un des facteurs explicatifs de la dispersion croissante des performances de productivité entre les entreprises les plus et les moins productives. Vu l'effet néfaste d'une concurrence entravée sur la productivité, le CCE demande que le CNP donne priorité à ce problème dans ses analyses futures.

Le CCE (2021b) plaide également pour un renforcement des moyens de l'Autorité belge de la concurrence, au vu de son rôle important dans la poursuite des pratiques anticoncurrentielles, dans le contrôle des principales opérations de concentration et de fusion et de la nouvelle compétence que celle-ci s'est vu octroyer en juin 2020 concernant les abus de position de dépendance économique (B2B) (loi du 4 avril 2019).

Dialogue social

Les données réunies notamment par l'OCDE attestent que les pays dans lesquels le dialogue social est solide se caractérisent souvent par de meilleures performances économiques et une répartition plus équitable des revenus (OCDE 2018 ; Dosi et al. 2020). Les dernières perspectives de l'emploi de l'OCDE (Araki et al. 2022) étudient plusieurs enjeux structurels qui présentent un intérêt pour le fonctionnement et l'inclusivité du marché du travail dans un certain nombre de pays, comme le phénomène de concentration qui crée une situation de monopsone sur le marché du travail. Le pouvoir de monopsone, défini comme une situation dans laquelle les salaires sont fixés en dessous de ce qui prévaudrait sur un marché plus concurrentiel, est comparable au pouvoir de monopole en ce qu'il engendre des pertes d'efficience économique et entraîne une baisse de la production de l'entreprise et de la qualité des emplois. La proportion de travailleurs en Belgique présents sur des marchés du travail qui sont modérément ou fortement concentrés est faible en comparaison avec les autres pays de l'OCDE étudiés.

[51] Dans la mesure du possible, la relance d'entreprises en difficulté, en particulier quand elles occupent une place importante dans la chaîne de valeur, est donc préférable à leur suppression. Lorsque cela n'est pas possible, l'État a un rôle à jouer dans la protection sociale et la réintégration des travailleurs concernés, en dialogue avec les représentants du monde de l'entreprise et du travail.

Il ressort des travaux d'Eurofound (2016) que des relations industrielles solides, efficaces et opérationnelles présentent les caractéristiques suivantes :

- ce sont des mécanismes efficaces impliquant les employeurs et les salariés dans la recherche de meilleures performances commerciales et de résultats équitables, conformément au principe de subsidiarité horizontale,
- ce sont des outils destinés à redistribuer les revenus et à atteindre la paix sociale,
- elles apportent un ensemble de valeurs collectives (telles que la confiance, la paix sociale et la cohésion), non seulement pour les acteurs pertinents, mais aussi pour la société dans son ensemble.

5. Plan de relance

Le 23 juin 2021, la Commission européenne a adopté une évaluation positive du Plan pour la reprise et la résilience (PRR) de la Belgique, qui permet à notre pays de bénéficier de la Facilité pour la reprise et la résilience[52]. En raison de la révision à la baisse du montant global attribué à la Belgique intervenue le 30 juin 2022, le plan national de la Belgique va devoir être adapté avant d'être à nouveau présenté à l'Union européenne. Le gouvernement fédéral, en accord avec les entités fédérées, rédige actuellement un plan d'investissement national adapté, qui tient notamment compte des risques d'exécution des projets, du respect des obligations européennes et d'autres critères méthodologiques spécifiques. Les versements européens auront lieu au fur et à mesure de l'état d'avancement des investissements prévus dans ce plan et seront autorisés lorsque la Belgique atteindra les jalons et les cibles décrits dans son plan.

Pour le CCE et le CFDD (2021a), le PRR doit s'inscrire dans une vision à long terme (incluant une stratégie de long terme pour les investissements publics) et servir à mener des politiques viables sur les plans financiers et budgétaire tout en accordant une attention suffisante à la gestion des risques (tant sanitaires qu'économiques et environnementaux). Cette vision large doit fixer l'orientation globale, s'inscrire dans un processus structurel de développement durable et assurer la cohérence entre les différents niveaux de pouvoir (fédéral, régional, européen). Elle nécessite une politique/stratégie industrielle intégrant les investissements en R&D, les investissements en matière de rénovation, d'énergie durable et de mobilité, la transition vers une économie circulaire et la transition numérique. Il convient également dans le cadre d'une telle politique de mener une réflexion sociétale sur l'indépendance stratégique de la Belgique par rapport à certains biens et services essentiels qui dépasse le cadre d'analyse de l'entreprise individuelle.

Le PRR ne comble que partiellement un retard en matière d'investissement en Belgique. Le CCE appelle à une augmentation structurelle des investissements publics à 4 % du PIB par an d'ici 2030. Le Conseil regrette par ailleurs l'absence de réforme destinée à permettre une meilleure coordination budgétaire entre les entités fédérées. Les investissements privés doivent eux aussi être encouragés. En effet, la combinaison des investissements publics et privés a un effet multiplicateur plus grand sur l'économie (CCE 2021b).

6. Travaux futurs du CNP

Améliorer la compréhension quant à l'évolution de la productivité et de la compétitivité en Belgique permet de mieux définir les politiques publiques susceptibles de stimuler la productivité ainsi que les conditions de leur mise en œuvre. La mise en exergue de la complémentarité et de la cohérence des politiques publiques par le CNP constitue sans aucun doute un apport important des travaux menés

[52] La Facilité pour la reprise et la résilience, cadrée par le Pacte vert pour l'Europe, poursuit quatre objectifs généraux : la promotion de la cohésion économique, sociale et territoriale de l'Union européenne, le renforcement de la résilience économique et sociale, l'atténuation de l'impact social et économique de la crise et le soutien à la transition écologique et à la transformation numérique.

par cette institution sur les déterminants de la productivité. À cet égard, le CNP doit pouvoir mener des analyses approfondies, notamment sur la base des demandes formulées par le CCE. Pour cela, il doit pouvoir faire appel à des experts externes. Le CCE demande que des **ressources** soient mises à la disposition du CNP à cette fin.

Le CCE estime utile que le CNP établisse un **programme de travail** sur plusieurs années et qu'il présente une vue sur l'avancement des travaux en cours, ainsi que sur les prochains travaux envisagés. Le CCE souhaite que le CNP traite de façon prioritaire les effets sur la productivité du télétravail, du processus de création et de disparition des entreprises (y compris la difficulté croissante pour les entreprises débutantes d'atteindre le niveau de productivité moyen des entreprises établies[53]) ainsi que du déficit de concurrence dans certains secteurs.

Selon le CCE, une revue de la littérature et/ou des analyses internationales pourraient également être réalisées concernant : (1) l'effet des inégalités sociales, du cadre politique et institutionnel, des compétences de la main-d'œuvre sur la productivité ; (2) l'impact des problèmes au niveau des chaines d'approvisionnement, de la hausse des coûts de l'énergie ou des matières premières sur la productivité ; (3) l'importance de l'indépendance stratégique par rapport à certains biens et services essentiels, et l'impact de celle-ci sur la productivité. (4) Il est souhaitable que le débat sur la croissance de la productivité durable dans les limites écologiques de notre planète soit également clarifié. Quel type de croissance de la productivité est possible dans le cadre d'une utilisation des matières premières durable tout en évitant le plus possible les externalités négatives ?

À moyen terme, le CCE demande que soient menées des analyses concernant : les causes et les conséquences de l'aggravation de la dispersion de la productivité entre les entreprises ; la productivité du capital ; les liens entre la productivité et les investissements ; les effets des nouvelles technologies sur la productivité ; la numérisation ; les moyens d'améliorer la diffusion de l'innovation ; la formation des travailleurs ; la gouvernance et le cadre réglementaire ; l'impact de la modernisation du droit des faillites.

[53] Ce constat a été réalisé dans le rapport 2021 du Conseil national de la productivité (2021, p.35).

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