Economic Review

June 2018

National Bank OF BELGIUM
Eurosystem

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Economic projections for Belgium – Spring 2018

Introduction

After having produced strong growth last year, the global economy seems to have lost some momentum around the turn of the year. According to the initial quarterly statistics, economic growth in many advanced countries declined sharply in the first quarter. Thus, the American economy slackened pace somewhat, though that is not unusual in a first quarter, and the British economy more or less stagnated. In Japan, activity actually recorded a clear contraction. In many countries, household consumption weakened. Although idiosyncratic factors played a role in some cases, a moderating growth cycle is not abnormal following a strong expansion in which unused production capacity has diminished. Furthermore, global growth was restrained by various factors. So far, announcements of protectionist measures only concern a small proportion of world trade, but they do raise doubts about the degree to which trade will continue to support global growth, and that uncertainty could weigh on investment. Also, commodity prices have increased, and rising inflation expectations, which also originate from the expansionary fiscal policy in an economy where capacity utilisation is already high, are driving up interest rates, especially in the United States. That rate rise is causing volatility on the financial markets. It also exacerbates the financing problems for various emerging economies with current account deficits due to shifts in international asset positions resulting from changes in relative returns.

In the euro area, following the vigorous expansion in 2017, activity also slackened pace, primarily as a result of weaker exports. Various analyses suggest that certain temporary factors, such as unusually inclement weather and strikes, may have held back growth to some degree, but the underlying growth rate also seems to have declined somewhat in comparison with the very strong quarterly average of 0.7 % in 2017. The slowdown in the euro area should not be viewed solely against the backdrop of the said global factors, such as the somewhat lower world growth and increasing trade restrictions, but may also be due to the more expensive euro, which continued to appreciate in the first quarter of this year.

The trend in confidence indicators and other short-term indicators in the second quarter, as known on 31 May when these estimates were completed, and the recent economic and geopolitical developments are difficult to interpret clearly. In April, the confidence indicators appeared to be bottoming out, but the relevant survey data deteriorated further in May. In addition, the risk of a major trade war between large economies seemed at first to have faded as a result of bilateral negotiations between the United States and China, but at the end of May additional economic sanctions and trade restrictions were announced, including for European exports, and that could depress international trade. The euro has also depreciated somewhat in the past few weeks, though that might equally reflect a downgrading of the relative growth prospects in the euro area. Finally, following the turbulence in the first quarter, the global financial markets are somewhat calmer again, but the oil price is still rising, which could, in the long run, erode household purchasing power and drive up the costs in energy-intensive industrial sectors.

Overall, the common assumptions adopted for these projections, of which the main ones are described in box 1, take the same view as most international institutions, i.e. they expect the global economy to continue growing strongly and

trade to expand robustly, though in the coming years trade growth will gradually slow down compared to global GDP growth, as in the previous projections. In addition, according to these assumptions, the oil price rise will come to an end and interest rates will only edge up gradually in the euro area. However, the risks for this baseline scenario are mainly on the downside. Further disruption of international trade or turbulence on the European financial markets could have a downward impact on growth.

According to the Eurosystem's new estimates – of which the spring projections described in this article form part – activity growth in the euro area will drop back to 2.1 % this year. That is lower than the March 2018 ECB estimates but more or less in line with the Eurosystem's latest autumn projections which were less optimistic. This downward revision is due solely to the worse than expected start to the year. The further outlook is more or less unchanged, with activity continuing to slow gradually, as in the previous projections, giving growth of just 1.7 % in 2020. The main reason for that is the aforesaid loss of dynamism in world trade with a resulting gradual slowing of foreign demand, but it is also due to supply constraints on the labour market which will depress growth still further in some major countries. This year, as in 2017, inflation in the euro area is being fuelled by rising energy prices. After adjustment for these and other volatile components, core inflation rises throughout the projection period, in accordance with the increasing domestic cost pressure, to reach 2 % by the end of 2020.

In the case of Belgium, the macroeconomic estimates were revised downwards slightly in relation to the autumn forecasts. According to the revised NAI statistics, the 0.3 % growth in the first quarter was somewhat lower than expected, and on the basis of leading indicators, short-term models suggest that the growth rate will remain more or less unchanged in the second quarter. However, taking account of the aforesaid common assumptions, and as in the euro area as a whole, the cyclical downturn will not be accentuated in the second half of the year. In comparison with the autumn forecasts, the growth path remains broadly unchanged from then on. Over 2018 as a whole, Belgian growth comes to 1.5 %, subsequently declining a little further up to 2020, in line with the autumn estimates, the main reasons being the cooling of the corporate investment cycle and the slackening pace of exports, only partly offset by the expected revival in private consumption. The negative growth gap which has existed between Belgium and the euro area since 2015 narrows slightly but does not disappear altogether during the projection period.

Employment growth had been very vigorous in recent quarters, being driven by labour cost moderation which renders labour less expensive and by labour market reforms which expanded the effective labour supply, but according to the latest quarterly statistics it lost some momentum in the second half of 2017. As the effects of these policy measures fade away, year-on-year job creation will slow further. That is also due to the increasing impact of supply constraints on the labour market – as is already apparent from the rising number of unfilled vacancies – so that it will become increasingly difficult for firms to find suitable staff. That tension on the labour market is one reason why the average working time – which has increased again recently – will continue to rise. The harmonised unemployment rate, which measures the actual number of job seekers on the basis of a survey, fell even further than expected at the end of 2017 to a very low level not seen since the start of the century. During the projection period, the unemployment rate remains more or less unchanged year-on-year : the further rise in the labour force, resulting partly from the measures to restrict early departure from the labour market, will roughly keep pace with job creation.

Inflation, which is put at 1.8 % this year, will subside slightly over the next two years on the assumption that oil prices level out. Core inflation does edge upwards over the projection period, though as in the past the higher labour costs will not be entirely passed on in prices, but will instead be accompanied by a narrowing of profit margins.

Finally, as regards public finances, the 2018 budget deficit will again be smaller than originally expected, namely 1 % of GDP, the same as in 2017. The main factor here is the new, substantial increase in advance payments by companies, in the context of the further rise in the charge imposed if advance payments are insufficient. However, this is a temporary factor which will lead to lower assessments when corporation tax is settled. During the projection period the budget deficit will therefore worsen, despite the further reduction in interest payments on the debt, and is estimated at 1.8 % by the end of the projection period. It should be remembered that, in accordance with the Eurosystem rules for such projection exercises, account is only taken of measures which, at the time of completion of the exercise, have been formally adopted by the government or which are very likely to be approved, and for which the details are sufficiently clear. In addition, the estimates of the budgetary impact of certain measures, such as those intended to combat fraud, may deviate from the amounts entered in the budget.

1. International environment and assumptions

1.1 World economy

On the back of flourishing trade, the world economy ended the year 2017 with an even higher than expected growth rate. However, in a climate of increased volatility on the financial markets and heightened geopolitical and commercial tensions, growth in most of the advanced economies was a little less vigorous in the first quarter of 2018. More generally, it is not unusual for the growth cycle to slow down after strong expansion during which unused production capacity has diminished.

In the advanced economies, the vigorous growth of activity in the United States subsided in the first quarter of this year, partly as a result of the slower pace of private consumption and exports and the decline in residential investment. Thanks to the steady job creation since October 2010, the unemployment rate was down to 3.8 % in May, its lowest level since April 2000. Against that backdrop of a tighter labour market, core inflation was running at 2 %. The Federal Reserve, which is normalising its monetary policy, increased its policy interest rates again in March. The impact on American growth of the easing of fiscal policy via increased expenditure and tax cuts for businesses and households is still very uncertain in view of the already very high level of capacity utilisation. However, most estimates, such as the one by the Congressional Budget Office, expect growth to accelerate temporarily to some degree, after which it will rapidly drop back, with inflation expectations increasing. That is also the scenario in the common international assumptions for these spring forecasts.

In Japan, following continuous growth in 2016 and 2017, the economy contracted again for the first time in the first quarter of this year. The main contribution to the loss of GDP came from negative changes in firms' inventories. Investment in housing also stagnated, after the Financial Services Agency had tightened the conditions for lending to households for the construction of apartments. More generally, the main factor supporting activity is exports rather than domestic demand, despite the continuously low unemployment rate.

The British economy more or less stagnated at the beginning of this year, but the bad weather in March was only a minor factor in that regard. Domestic demand was weak. Although unemployment is still very low, private consumption slowed further against the backdrop of high inflation, which is curbing purchasing power. Business investment declined, partly because of the uncertainty over the future relationship between the United Kingdom and the EU.

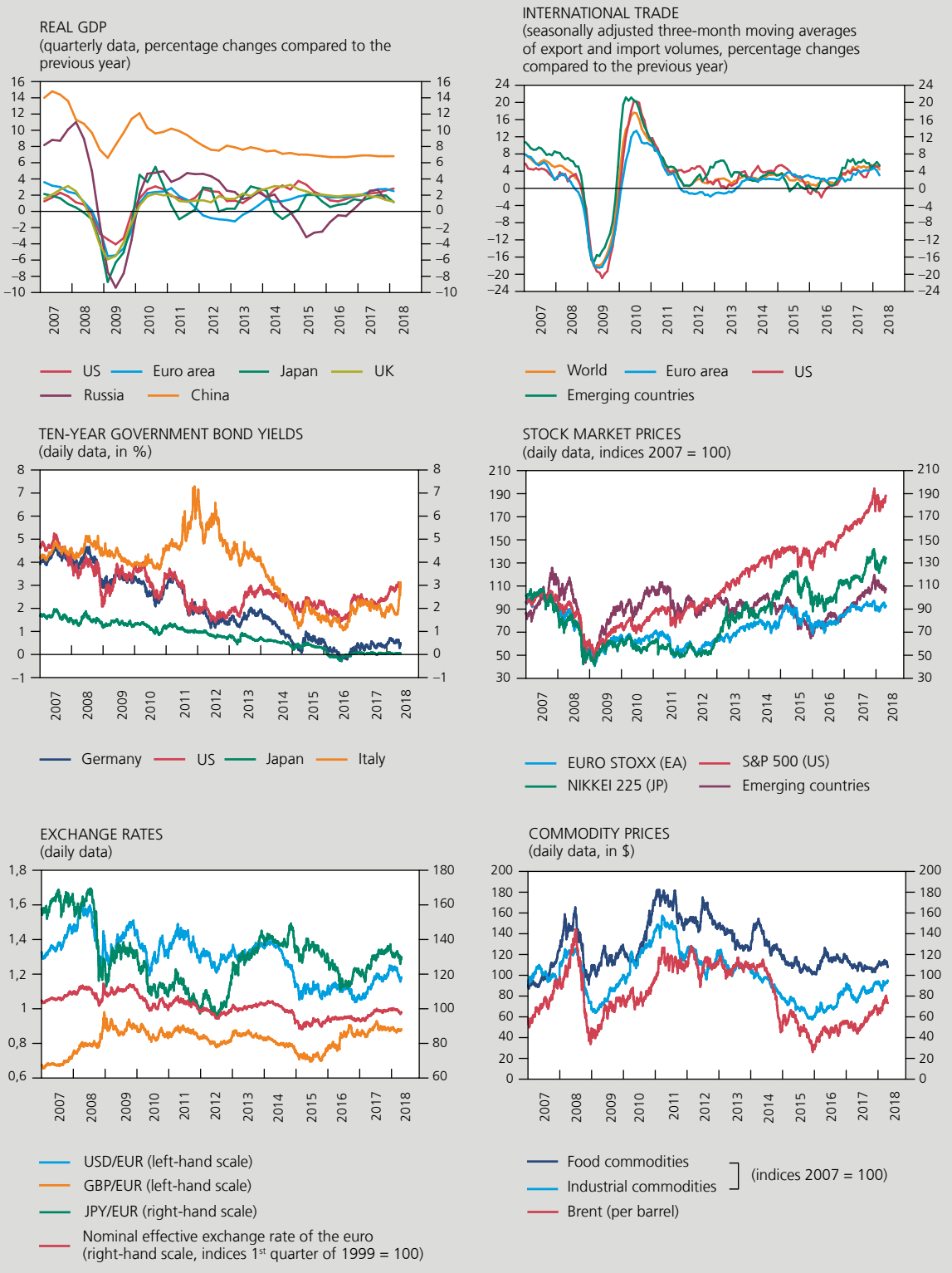
In the euro area, which performed strongly in 2017 with growth spreading across the various countries and sectors, activity also expanded less rapidly in the first quarter of 2018 (0.4 %, compared to 0.7 % in the preceding three quarters). Growth was down sharply in some major economies such as France, Germany and, to a lesser degree, the Netherlands, but remained strong in Spain. Adverse weather conditions, strikes, and other factors the impact of which is hard to quantify precisely depressed activity to some extent in certain countries, but cannot account for the whole of the decline. According to the first available statistics, that decline is due to a fall in exports, in which the strong appreciation of the euro may also have played a role in addition to the said global factors. Confidence indicators have generally weakened since the beginning of this year.

Strong job creation reduced unemployment in the euro area to 8.5 % in April, the lowest figure since the end of 2008. Inflation had remained very low for a long time, but in May it suddenly surged to almost 2 %. Although this is due mainly to higher oil prices, core inflation also increased, with a particularly steep rise in service sector prices.

The emerging economies were better able to hold their course: the oil-exporting countries benefited in particular from the higher oil prices. However, some countries with current account deficits, such as Argentina and Turkey, had to contend with increasing financing problems and a depreciation of their currency, partly as a result of the recent appreciation of the US dollar, leading to shifts in international asset positions. In that context, a more widespread capital flight will certainly weigh on the emerging countries' prospects.

Activity in the emerging countries was underpinned by vigorous growth in China and India and a continued gradual recovery in Brazil and Russia. The stronger than expected expansion of the Chinese economy in 2017, bolstered by robust export growth, continued during the first quarter of this year. With growth of 6.8 % year-on-year, activity in the first three months of this year continued to expand at the same pace as in the two preceding quarters, while also exceeding the

CHART 1 WORLD ECONOMY AND DEVELOPMENTS ON FINANCIAL AND COMMODITY MARKETS



Sources: CPB Wereldhandelsmonitor, OECD, Thomson Reuters.

government target of 6.5 %. Industrial output recovered following a relaxation of the measures to curb pollution during the winter months. In addition, investment in real estate remained strong despite measures by the authorities to cool the housing market. Although the People's Bank of China maintained a predominantly neutral stance, in the context of a high debt burden and continued credit expansion, the reserve requirements for banks were eased again at the end of April to facilitate access to credit for smaller businesses. In India, growth regained momentum from the end of the year, supported by a revival in investment and consumption, after the effects of the demonetisation (November 2016) and the harmonisation of taxes on goods and services (July 2017) had temporarily restrained growth during 2017.

In the commodity exporting countries the recovery from deep recessions continued. After a slowdown in the final quarter of 2017, the Russian economy picked up again in the first months of this year. Higher oil prices, increased confidence and the easing of monetary policy in the context of falling inflation underpinned both consumption and investment. However, the new American sanctions at the beginning of April triggered a further depreciation of the rouble and depressed the exports of large firms; which may induce a gloomier economic outlook. The Brazilian economy also continued to pick up in 2017 and the first months of 2018, despite the political tensions. Growth was driven by the dynamism of both foreign demand – in a favourable external environment – and domestic demand, with consumption benefiting in particular from the more relaxed monetary policy and better labour market conditions.

TABLE 1 PROJECTIONS FOR THE MAIN ECONOMIC AREAS

(percentage changes compared to the previous year, unless otherwise stated)

	2016	2017	2018 e	2019 e
Real GDP				
World	3.2	3.7	3.9	3.9
of which:				
Advanced countries	1.8	2.6	2.6	2.4
United States	1.5	2.3	2.9	2.7
Japan	0.9	1.7	1.3	1.1
European Union	2.0	2.4	2.3	2.0
of which: United Kingdom	1.9	1.8	1.5	1.2
Emerging countries	4.3	4.6	5.0	5.0
China	6.7	6.9	6.6	6.3
India	7.9	6.4	7.4	7.6
Russia	–0.2	1.5	1.7	1.6
Brazil	–3.5	1.0	2.4	2.6
p.m. World imports	*2.3*	*5.1*	*5.1*	*4.5*
Inflation (1)				
United States	1.3	2.1	2.2	2.2
Japan	–0.1	0.5	1.0	1.1
European Union	0.3	1.7	1.7	1.8
of which: United Kingdom	0.7	2.7	2.5	1.9
Unemployment (2)				
United States	4.9	4.4	4.0	3.5
Japan	3.1	2.8	2.7	2.6
European Union	8.6	7.6	7.1	6.7
of which: United Kingdom	4.8	4.4	4.4	4.6

Source: EC.
(1) Consumer price index.
(2) In % of the labour force.

World trade flows recorded strong growth last year, mainly reflecting the cyclical recovery in global demand and, more particularly, the revival of trade-intensive investment. Despite mounting trade tensions, the growth of world trade also seems to have continued at the start of this year, albeit at a somewhat slower pace. In the euro area in particular, exports declined against the backdrop of slower economic growth and the stronger euro.

On the financial markets, interest rates on government bonds in the United States continued rising to their highest level in four years, while in Germany and Japan interest rates are still at historically low levels. That mainly reflects the differing monetary policy stance, but is also due to the stronger rise in inflation expectations in the United States. In the euro area, however, interest rate differentials increased : uncertainty over the political situation and the announced budget plans significantly drove up the interest rate premium on Italian government bonds. While the rising interest rates, higher inflation expectations and uncertainty over the announced protectionist measures led to increased volatility on the stock markets, the steep falls, mainly in February, gave way to a recovery.

On the foreign exchange market, following a surge last year against the backdrop of the strong economic performance by the euro area and market expectations concerning a gradual tightening of monetary policy, the euro stabilised in effective terms this year. The somewhat larger movements in relation to the US dollar are due to the changing relative growth and inflation prospects for the United States and the euro area, in which the sharper growth slowdown in Europe recently was accompanied by a depreciation of the euro, whereas the euro had previously appreciated strongly. The recent financial turbulence over the political situation in Italy also depressed the exchange rate.

Finally, the oil price maintained the rise that had begun last year, actually climbing to around $ 80 per barrel in May, its highest level in more than three years. While the oil prices are buttressed by strong global demand, various factors on the supply side were also in play, such as the strict compliance with the supply restrictions announced by the OPEC and a number of non-OPEC countries, unplanned production outages in, amongst others, the North Sea, Libya and Venezuela and finally, the uncertainty over withdrawal by the United States from the nuclear agreement with Iran. At the end of May, however, the oil price dropped clearly, as some oil-producing countries suggested that they could step up their production in the future. Industrial commodity prices declined at the beginning of the year, partly because of the uncertainty over a possible trade war, but they subsequently recovered.

Box – Assumptions adopted for the projections

The macroeconomic projections for Belgium described in this article form part of the joint Eurosystem projections for the euro area. That projection exercise is based on a set of technical assumptions and forecasts for the international environment drawn up jointly by the participating institutions, namely the ECB and the national central banks of the euro area.

In the projections, it is assumed that future exchange rates will remain constant throughout the projection period at the average levels recorded in the last ten working days before the cut-off date of the assumptions, i.e. 23 May 2018. In the case of the US dollar, the exchange rate then stood at $ 1.18 to the euro. That implies that the euro has appreciated considerably compared to its average level in 2017.

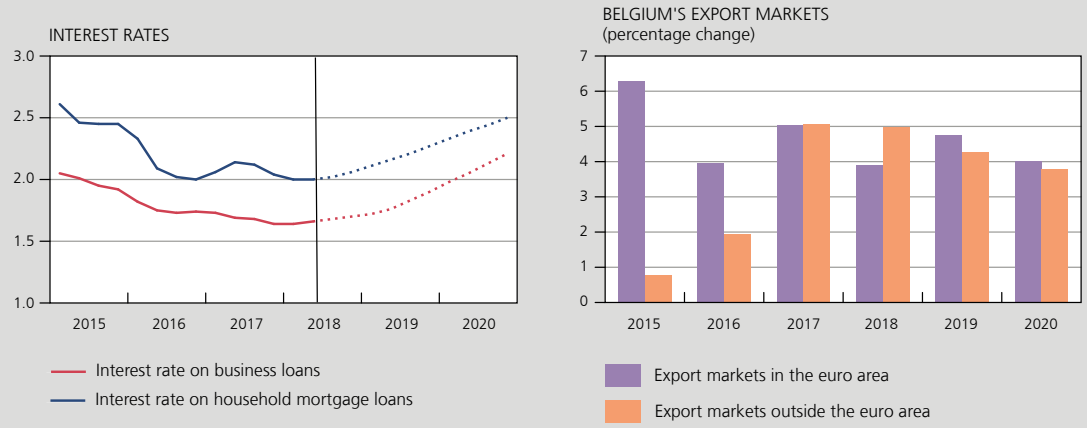
As usual, the assumptions concerning oil prices take account of market expectations as reflected in forward contracts on the international markets. After the recent steep price rise, the markets in mid-May 2018 were expecting the price per barrel of Brent crude to continue edging upwards in the third quarter of the year, but to fall steadily thereafter.

The interest rate assumptions are likewise based on market expectations. The three-month interbank deposit rate has been stable for almost two years now at around –30 basis points, but is expected to climb very gradually

and become positive again in 2020. The level of Belgian long-term interest rates is also projected to rise from an average of 0.9 % in 2018 to 1.4 % in 2020.

INTEREST RATES AND VOLUME GROWTH OF EXPORT MARKETS

(in %)



Source : Eurosystem.

The predicted movement in bank interest rates on business investment loans and household mortgage loans may diverge somewhat from the movement in market rates. For instance, the average mortgage interest rate is still very low, and it is unlikely to keep entirely in line with the upward movement in the long-term market interest rate : that rate is projected to increase from an average of 2.0 % in 2018 to 2.4 % towards the end of the projection period. The average interest rate on business loans, which is closer to the short-term segment, is also expected to rise relatively slowly over the projection period : in 2020, it is forecast at an average of 2.1 %, which is roughly 0.4 percentage points higher than the 2018 average.

As stated in chapter 1, the global economy produced a strong growth performance in 2017, with a particularly vigorous recovery in trade flows, which considerably outstripped GDP growth. According to the common assumptions, that gap will gradually narrow and world import growth will revert to a pace more in line with the expansion of global activity. Nevertheless, the annual growth of trade flows will remain very robust this year, partly as a result of the favourable spillover effect of the strong end to the year 2017. In 2018, the markets for Belgian exporters are predicted to expand by over 4 %. However, that growth will gradually weaken over the ensuing two years.

The trend in Belgian exports is determined not only by the growth of those markets, but also by the movement in market shares, and consequently by Belgium's competitiveness. The trend in prices that competitors charge on the export markets is a key factor in the cost aspects of that competitiveness. In 2018, the more expensive euro was reflected in a relatively small price rise among rival exporters outside the euro area. In the years ahead, assuming that the exchange rate remains constant, rising inflation in the euro area – but also elsewhere – will again exert stronger pressure on the prices of Belgian export competitors.

EUROSYSTEM PROJECTION ASSUMPTIONS

(in %, unless otherwise stated)

	2017	2018	2019	2020
		(annual averages)		
EUR/USD exchange rate	1.13	1.20	1.18	1.18
Oil price (US dollars per barrel)	54.4	74.5	73.5	68.7
Interest rate on three-month interbank deposits in euro	–0.3	–0.3	–0.2	0.2
Yield on ten-year Belgian government bonds	0.7	0.9	1.2	1.4
Business loan interest rate	1.7	1.7	1.8	2.1
Household mortgage interest rate	2.1	2.0	2.2	2.4
		(percentage changes)		
Belgium's relevant export markets	5.1	4.3	4.5	3.9
Export competitors' prices	2.0	0.3	2.3	2.0

Source: Eurosystem.

Overall, the adjustment of the assumptions compared to the latest autumn forecasts has a small, negative impact on Belgium's growth prospects. The small upward revision concerning the export markets is favourable to growth, but that beneficial effect is more than offset by the higher oil price and the somewhat more expensive euro, despite the recent depreciation.

1.2 Estimates for the euro area

The Eurosystem's current growth estimates for the euro area were downgraded in comparison with the March ECB forecasts. In many countries, including the biggest economies (Germany and France), activity growth fell short of expectations, particularly at the beginning of this year. According to the initial statistics on the subject, the growth slowdown is due mainly to a decline in exports.

However, except for this lower starting point, which will probably depress annual growth in 2018, the outlook for the euro area has remained more or less unchanged, as the international assumptions have only altered slightly. This year, the euro area's economy is predicted to grow by 2.1 % and to lose some of its momentum in the ensuing years. That slowdown is due to the presumed gradual weakening of the trade intensity of world growth, implying that import demand from countries outside the euro area will rise more slowly, but also to the fact that labour market supply constraints will increasingly hold back growth in certain countries. Despite the slowdown, however, activity growth is still expected to continue to outpace potential growth at the end of the projection period. In regard to the demand components, household consumption – which has risen since the beginning of 2018 and will barely slacken pace in the years ahead – is still providing substantial support for growth, as household incomes are increasing steadily, not only as a result of the continuing strong job creation, but also because real wages are picking up. However, in most countries that income growth is used to a somewhat greater degree to supplement reserves of savings, driving the saving ratio back up after its further fall in 2017.

According to the projections, inflation will accelerate a little more this summer to just over 2 %. That is due mainly to the higher oil prices. The presumed levelling out and gradual fall in those prices from the third quarter cause a sharp drop in

energy price inflation. However, that is offset by the rising domestic cost pressure. Thus, labour costs are set to rise, partly as a result of the disappearance of certain measures which previously moderated the growth of those costs in some countries, but more generally, as a result of mounting labour market tensions. Overall, inflation therefore remains at 1.7 % in each year of the projection period, though that masks a strong rise in core inflation, which will reach 2 % by the end of 2020.

The recent jobs growth was very vigorous, but as the shortage of suitable labour increases and activity slackens pace, job creation in the euro area will gradually lose momentum. Against the backdrop of increasing labour market tensions, the downward trend in average working time will be suspended temporarily, with a rise in the average number of hours worked helping to support the expansion of output in various countries. The labour force is still expanding, with the impact of ageing being moderated by increasing labour market participation, including among older workers. Nonetheless, the unemployment rate will also decline further to 7.3 %, its lowest level this century.

According to the forecasts, the euro area's average budget deficit, which had fallen to less than 1 % of GDP last year, will diminish further to 0.5 % of GDP in 2020. However, that improvement is due mainly to the cyclical upturn and the further decline in interest charges as a result of the unusually low level of interest rates. In contrast, the cyclically adjusted primary surplus will decrease slightly during the projection period, primarily because of the easing of fiscal policy in the form of reductions in charges or additional spending in various countries. The public debt ratio will continue to fall, thanks to the low interest rates: in 2020, the debt ratio will already have declined by more than 11 percentage points below its 2014 peak.

TABLE 2 EUROSYSTEM PROJECTIONS FOR THE EURO AREA

(percentage changes compared to the previous year, unless otherwise stated)

	2016	2017	2018 e	2019 e	2020 e
Real GDP	1.8	2.5	2.1	1.9	1.7
Private consumption	1.9	1.7	1.6	1.7	1.5
Public consumption	1.8	1.2	1.3	1.3	1.2
Gross fixed capital formation	4.5	3.3	4.2	3.3	2.8
Exports of goods and services	3.3	5.4	4.2	4.4	3.8
Imports of goods and services	4.8	4.6	4.1	4.7	4.0
Inflation (HICP)	0.2	1.5	1.7	1.7	1.7
Core inflation (1)	0.9	1.0	1.1	1.6	1.9
Domestic employment	1.4	1.6	1.4	1.1	0.8
Unemployment rate (2)	10.0	9.1	8.4	7.8	7.3
General government financing requirement (–) or capacity (3)	–1.5	–0.9	–0.7	–0.8	–0.5

Source: ECB.
(1) Measured by the HICP excluding food and energy.
(2) In % of the labour force.
(3) In % of GDP.

2. Activity and demand

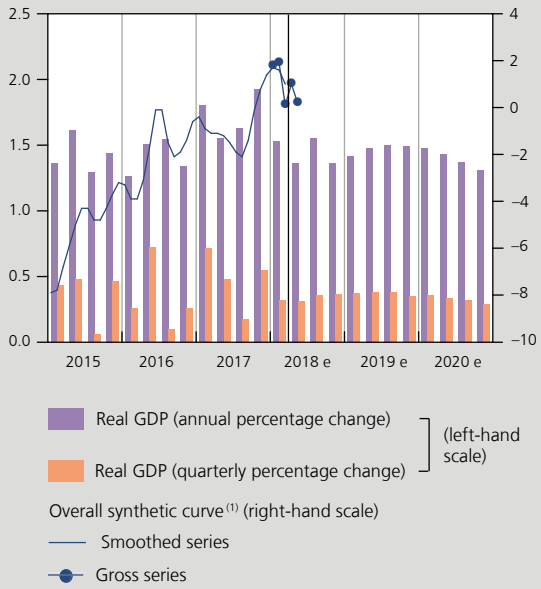
In 2017, the Belgian economy's growth rate increased to 1.7 %, clearly exceeding the figure for recent years and outpacing potential growth. On the expenditure side, growth was significantly boosted by the underlying expansion of investment, at least if an adjustment is made for the impact of specific major purchases of investment goods abroad by large multinationals at the end of 2016. On the production side, increased activity in services was the main contributor to growth, while added value in manufacturing industry was virtually unchanged.

In the first quarter of this year, growth dipped slightly as in other euro area countries, dropping to 0.3 % on a quarterly basis. The gradual decline in quarterly growth mirrors the trend in business confidence, which weakened at the

beginning of the year in more or less all sectors. Consumer confidence was rather volatile, but also seems to have been eroded somewhat since the end of the year. Overall, the leading indicators available at the cut-off date of the projections do not suggest any revival in the second quarter. The nowcasting models used at the Bank indicate that the growth rate will remain unchanged in that quarter, at 0.3 %. This implies that growth in the first half of the year will fall slightly short of the autumn forecasts, albeit to a lesser extent than in Germany and France, for example.

CHART 2 GDP AND BUSINESS CONFIDENCE

(data adjusted for seasonal and calendar effects, unless otherwise stated)



Sources: NAI, NBB.
(1) Non-calendar adjusted data.

On the basis of the common assumptions, the decline in the confidence indicators in the first half of the year is expected to be temporary, with no worsening of the growth slowdown. From the third quarter on, growth is predicted to strengthen somewhat to around 0.4 % on a quarterly basis. As in the previous forecasts, however, Belgium's annual growth is set to slow down a little to around 1.4 % in 2020. That reflects the deceleration in Belgium's export markets and normalisation of the growth of business investment. In addition, certainly towards the end of the projection period, economic growth will be held back by supply constraints, particularly in certain geographical or functional segments of the labour market.

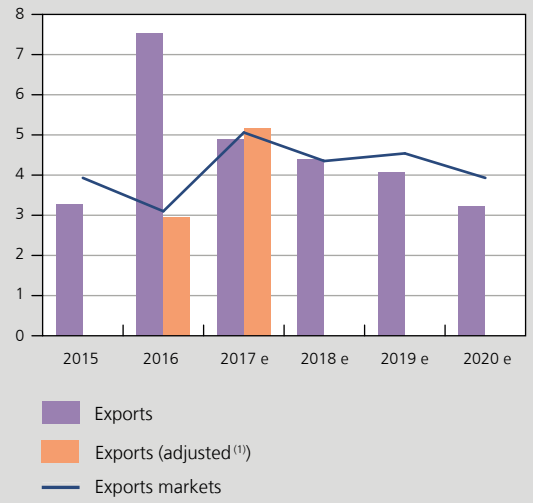
Over the projection period as a whole, just as in recent years, growth is still clearly supported by domestic demand, given that the growth contribution of net exports will be slightly negative on average. As usual, the technical assumptions for all quarters in the projection period are based on a growth-neutral contribution from changes in inventories, particularly in view of the great statistical uncertainty surrounding that concept.

Thanks partly to the strong improvement in cost competitiveness, the market shares of Belgian exporters remained more or less unchanged, on average, during the period from 2014 to 2017. According to the forecasts, exports will gradually trail behind the export markets during the projection period, so that market shares over the three years together will shrink by more than 1 %. That is due mainly to the domestic labour cost pressure which has now begun rising again, preventing any further improvement in cost competitiveness compared to other countries. Taking account of the recent appreciation of the euro, the loss of market shares for Belgian firms will be somewhat greater outside the euro area than within it.

The weakening of global demand is another factor causing a dip in export growth quarter-on-quarter, down to an average of 0.8 % in the final year of the projection period. On average, imports hold up somewhat better, underpinned by robust domestic demand, so that the growth contribution of net exports becomes slightly negative on a quarterly basis.

CHART 3 EXPORTS AND EXPORT MARKETS

(volume data adjusted for seasonal and calendar effects, percentage changes compared to the previous year)



Sources: NAI, NBB.

(1) Export growth adjusted for expenditure resulting solely from the 2016 reorganisation of the commercial activities of a large pharmaceutical company, in favour of subsidiaries based in Belgium, so that from the second quarter of 2016 more trade flows to and from Belgium are visible in the statistics. Since the upward effect is much the same for both imports and exports, there is no net impact on GDP but an adjustment is necessary for this statistical effect in order to examine the change in market shares.

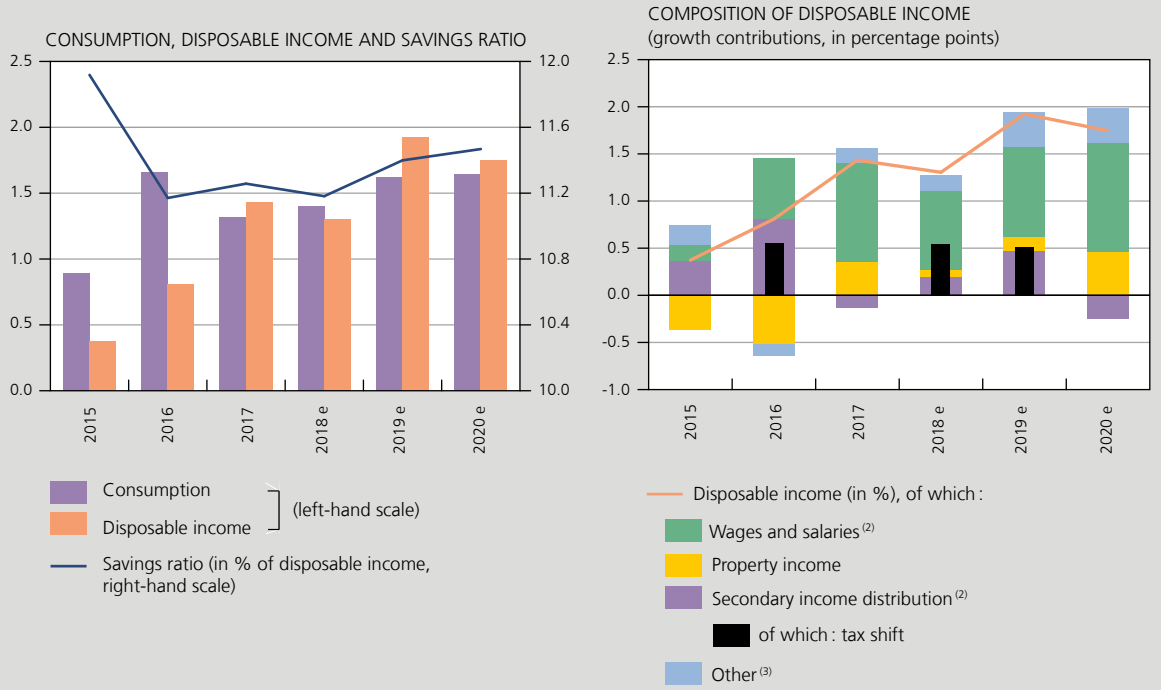
While exports thus gradually decelerate, the real growth of domestic demand remains fairly constant over the projection period, although the share represented by private consumption increases. However, the quarterly profile of household consumption is highly volatile, so that according to the current quarterly statistics, zero growth in the final quarter of 2017 was followed by strong expansion, particularly in the case of consumer durables, at the beginning of this year. After that, household consumption maintains relatively strong growth throughout the projection period, at an average of 0.4 % quarter-on-quarter. The main determinant here is the acceleration of labour incomes, driven by the growth of employment which, though losing some momentum, remains strong for quite some time, and – above all – the rise in real wages. Furthermore, household purchasing power is also bolstered by the additional tax cuts under the tax shift. In that connection, secondary income distribution drives up income growth particularly in 2019. In 2018, the favourable impact of the tax shift is still partly offset by such factors as the increase in certain federal levies on financial transactions and incomes.

Since last year, property incomes have also made a positive contribution to private income growth once again. In view of the relatively substantial financial assets of Belgian households, on average, the rise in interest rates will give a further boost to property incomes during the projection period. In 2020, however, income growth subsides somewhat, mainly because there will be no additional tax shift measures in that year and the positive contribution from secondary income distribution therefore disappears. Over the next three years, consumer purchasing power increases by a cumulative total of around 5 %. Taking account of the expected population growth, that corresponds to almost 3.5 % per person.

In 2018, year-on-year consumption growth still slightly outstrips the rise in incomes, which in real terms is also limited by the increase in oil prices. As a result, the savings ratio falls a little further, but in the ensuing years households will,

CHART 4 HOUSEHOLD CONSUMPTION AND DISPOSABLE INCOME[1]

(volume data, percentage changes compared to the previous year, unless otherwise stated)



Sources : NAI, NBB.

(1) Data deflated by the household consumption expenditure deflator.

(2) Excluding employers' social contributions.

(3) "Other" comprises the gross operating surplus and gross mixed income (of self-employed persons).

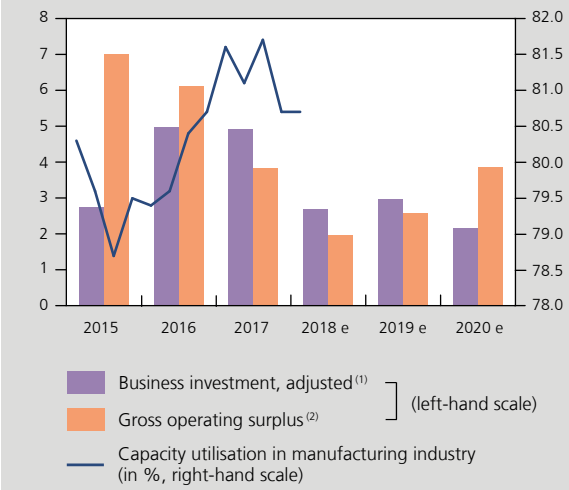
as usual, take time to adjust their expenditure in line with stronger income growth. In those years the rise in the savings ratio is also due to the limited increase in the share of disposable income represented by property income, of which relatively more is normally saved.

Apart from private consumption, private investment also continues to support growth, albeit to a diminishing degree. Excluding the distortion caused by certain specific purchases of investment goods abroad, which had driven up the 2016 investment figures, the expansion of business investment was particularly vigorous in 2017, with a volume rise of around 5 %. According to the initial quarterly statistics, however, business investment lost some momentum at the beginning of this year. The underlying investment determinants are still favourable in the future, thanks to the relaxed financing conditions, substantial cash reserves, a growing operating surplus, low interest rates and high capacity utilisation necessitating investment in expansion. The low growth figure in the first quarter is therefore not an indication : the current forecasts point to higher growth in the rest of the year. Nonetheless, the growth of business investment is expected to moderate gradually thereafter, reverting to a more normal pace closer to what is usually seen in this phase of the business cycle.

Household investment – either in the form of new building or renovation projects – should in theory still be stimulated by the low interest rate environment. Nonetheless, since mid-2016 the available quarterly statistics indicate that growth of such investment has been strikingly low (or even negative). That could be due to the declining influence of portfolio shifts, in view of the fairly stable level of market interest rates prevailing for some time. However, the current projections indicate a modest revival in investment in housing : over the projection period, that investment is set to rise by an average of 0.5 % on a quarterly basis.

CHART 5 BUSINESS INVESTMENT AND DETERMINANTS

(volume data, percentage changes compared to the previous year, unless otherwise stated)



Sources: NAI, NBB.

(1) Adjusted to take account of substantial purchases of specific investment goods abroad.

(2) In nominal terms.

Finally, as regards public expenditure, the growth of public consumption will be rather modest over the projection period as a whole. In contrast, public investment will, as usual, follow the pattern of the electoral cycle: after the acceleration in 2018, local investment will then subside rapidly in 2019. For 2020, account is taken of the launch of some major public investment projects, such as those concerning the Oosterweel link.

TABLE 3 GDP AND MAIN EXPENDITURE CATEGORIES

(seasonally adjusted volume data; percentage changes compared to the previous year, unless otherwise stated)

	2016	2017	2018 e	2019 e	2020 e
Household and NPI final consumption expenditure	1.7	1.3	1.4	1.6	1.6
General government final consumption expenditure	0.2	1.3	0.9	0.7	0.7
Gross fixed capital formation	3.8	0.7	2.6	2.3	2.3
general government	–1.5	2.0	6.6	–1.9	4.0
housing	2.6	0.3	0.7	2.2	1.9
business	4.9	0.7	2.7	3.0	2.2
p.m. Domestic expenditure excluding change in inventories (1)	*1.8*	*1.2*	*1.5*	*1.5*	*1.6*
Change in inventories (1)	0.2	0.1	–0.3	0.0	0.0
Net exports of goods and services (1)	–0.6	0.5	0.2	–0.1	–0.2
Exports of goods and services	7.5	4.9	4.4	4.1	3.2
Imports of goods and services	8.4	4.4	4.2	4.2	3.4
Gross domestic product	1.4	1.7	1.5	1.5	1.4

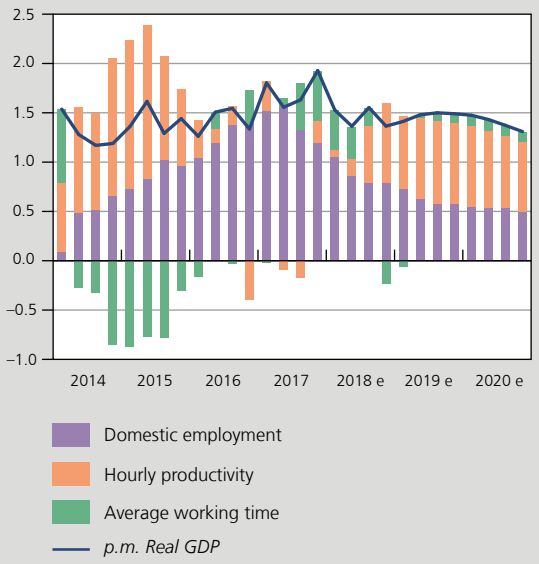
Sources: NAI, NBB.

(1) Contribution to the change in GDP compared to the previous year, in percentage points.

3. Labour market

CHART 6 DOMESTIC EMPLOYMENT, WORKING TIME AND PRODUCTIVITY

(contribution to GDP growth, percentage points, data adjusted for seasonal and calendar effects)



Sources: NAI, NBB.

In the past two years the growth of employment has been very vigorous, certainly in relation to GDP growth, with most jobs being created in the private sector, and particularly in the branches of activity sensitive to the business cycle. Within those branches, only financial activities and insurance saw their workforce decline in 2017, while industry and construction supported job creation. The sectors making the biggest contribution were business services, on the one hand, and trade, transport, hotels and restaurants, on the other hand. However, during the projection period the expansion of activity will gradually gain increasing support from renewed productivity growth and a steady rise in average working time.

In 2018, job creation is accordingly set to be weaker than in the two preceding years. Following a rise in the number of persons in work of 58 000 in 2016 and 65 000 in 2017, this year that figure is expected to increase by 41 000 units, and then by fewer each year up to 2020. That trend is due to the waning impact over the projection period of the policy measures introduced in recent years to stimulate net job creation, particularly wage moderation. In addition, GDP growth is expected to decelerate over the whole of the projection period, since it will decline to 1.4 % in 2020. Moreover, after three years of strong net job creation and falling unemployment, labour shortages in certain geographical and functional segments of the labour market could inhibit employment growth. During the period 2018-2020, 97 000 jobs are likely to be created.

The more moderate rise in the number of persons in work is expected to be accompanied by an increase in hourly productivity, which will again rise steadily from the second half of the current year, approaching the average recorded outside of the crisis period. The increase in average working time will also contribute to the deceleration of job creation. Despite the economic revival, average working time declined up to 2016, and is set to rise as a result of such factors as the abolition of allowances for time credit granted for no specific reason (introduced at the beginning of 2015), which had prompted many workers to reduce their working time temporarily before that scheme was abolished. In addition,

TABLE 4 LABOUR SUPPLY AND DEMAND

(seasonally adjusted data; change in thousands of persons, unless otherwise stated)

	2014	2015	2016	2017	2018 e	2019 e	2020 e
Total population	55	59	57	58	58	56	60
Working age population[1]	9	16	16	14	11	7	6
Labour force	33	21	32	38	15	24	22
Domestic employment	20	40	58	65	41	30	25
Employees	14	30	44	54	30	20	16
Branches sensitive to the business cycle[2]	–1	19	29	38	19	10	7
Public administration and education	8	2	2	4	1	0	0
Other services[3]	7	9	13	12	10	10	10
Self-employed	6	10	13	11	11	10	9
Unemployed job-seekers	14	–19	–26	–28	–26	–6	–4
p.m. Harmonised unemployment rate[4][5]	*8.6*	*8.6*	*7.9*	*7.1*	*6.7*	*6.7*	*6.8*
Harmonised employment rate[4][6]	*67.3*	*67.2*	*67.7*	*68.5*	*69.5*	*69.9*	*70.2*

Sources: DGS, FPB, NAI, NEO, NBB.

(1) I.e. the population aged from 15 to 64 years.

(2) Agriculture, industry, energy and water, construction, trade, hotels and restaurants, transport and communication, financial activities, property services and business services.

(3) Health, welfare, community, public social services, personal services and domestic services.

(4) On the basis of data from the labour force survey.

(5) Job seekers in % of the labour force aged 15-64 years.

(6) Persons in work in % of the total population of working age (20-64 years).

rising labour market tensions could further drive up average working time via the pressure to work more overtime or to reduce part-time working.

Within domestic employment, the growth in the number of employees is expected to weaken more rapidly than the growth in the numbers of self-employed, as the increase in the latter group is not curbed by the waning effect of wage moderation. Moreover, an increasing number of workers seem to be choosing that status, notably as a result of the improvements made in recent years to the self-employed social security scheme and to the scope for retired persons to combine their pension with a self-employed occupation.

Ageing is to some degree slowing the increase in the working age population, but the participation rate is still rising, partly on account of the measures to discourage early departure from the labour market which are boosting the growth of the labour force. However, that growth is being outpaced by employment expansion, so that the number of unemployed job seekers is still falling. In 2018 the figure will be 26 000 lower, on average, than a year earlier. Nevertheless, that decline will diminish greatly during the projection period, despite the contribution made by a large cohort of older unemployed persons gradually entering retirement. In 2020, the number of unemployed job seekers is put at 490 000 for the country as a whole. The harmonised unemployment rate, which measures actual availability for the labour market on the basis of survey data, and which may therefore deviate slightly from the number of unemployed job seekers registered with the RVA, has fallen very steeply in recent quarters. That rate is expected to fall further year-on-year in 2018 to 6.7 %, a level similar to that recorded at the beginning of the 2000s. It will thus approach its structural level, which can be regarded as an unemployment rate which is difficult to reduce further without a change in policy. Thereafter, the unemployment rate will remain fairly stable and rise slightly in 2020, as job creation loses momentum and the labour force continues to grow strongly.

4. Labour costs and prices

4.1 Labour costs

On the basis of the available information, real negotiated pay increases in 2017 did not exceed 0.2 %. In 2018 they are expected to rise to 0.8 %, which means that during the two years of the 2017-2018 central agreement they will remain a little below the 1.1 % wage norm agreed by the social partners. Taking account of the indexation effect which has risen very slightly, gross pay will therefore increase by more than last year. However, labour costs are moderated by the additional reductions in social contributions under the tax shift, but will still increase more than in 2017 with a rise of over 2 %.

The wage norm for 2019-2020 will not be negotiated until the end of this year. The technical assumption adopted in these projections reflects the rising tensions in certain labour market segments, predicting that the increase in the negotiated adjustments excluding indexation will accelerate to 1.7 % for this two-year period, and be slightly higher in the second year in view of the stylised facts concerning the implementation of such agreements. With more or less stable indexation and a small increase in the wage drift over the projection period as a whole, attributable mainly to older workers remaining in employment for longer, and to the tensions resulting from the shortage of workers in some branches, gross hourly pay in 2019 is set to accelerate in 2019 and then stabilise in 2020. Since there are no plans for any significant new reductions in social contributions, the same applies to labour costs per hour worked.

Thanks to the gradual restoration of productivity growth, the increase in unit labour costs will be slightly lower and remain relatively constant over the projection period. Although domestic cost pressure therefore diminishes somewhat in comparison with 2017, it remains much stronger than in the preceding years when labour cost moderation was more marked.

TABLE 5 COST AND PRICE INDICATORS

(percentage changes compared to the previous year, unless otherwise stated)

	2015	2016	2017	2018 e	2019 e	2020 e
Labour costs in the private sector[1]						
Labour costs per hour worked	0.1	–0.6	1.8	2.2	2.9	2.8
of which: Indexation	0.1	0.5	1.6	1.7	1.8	1.7
Labour productivity[2]	1.7	–0.6	–0.3	0.3	0.8	0.8
Unit labour costs	–1.6	0.1	2.1	1.8	2.0	2.0
p.m. Labour costs per hour worked according to the national accounts[3]	*0.2*	*–0.7*	*1.7*	*2.1*	*2.7*	*2.7*
Core inflation[4]	1.6	1.8	1.5	1.3	1.7	1.8
Energy	–8.0	–0.6	9.9	7.4	2.2	–1.0
Food	1.8	3.1	1.4	2.5	2.1	1.9
Total inflation (HICP)	0.6	1.8	2.2	2.1	1.9	1.6
p.m. Inflation according to the national consumer price index (NCPI)	*0.6*	*2.0*	*2.1*	*1.9*	*2.0*	*1.6*
Health index[5]	1.0	2.1	1.8	1.6	1.9	1.7

Sources: EC, FPS Employment, Labour and Social Dialogue, NAI, NBB.

(1) Labour costs per hour worked are not shown here according to the national accounts concept but according to a broader concept that also includes reductions in contributions for target groups and wage subsidies. That concept gives a better idea of the true labour cost for firms.

(2) Value added in volume per hour worked by employees and self-employed persons.

(3) Excluding wage subsidies and reductions in contributions for target groups.

(4) Measured by the HICP excluding food and energy.

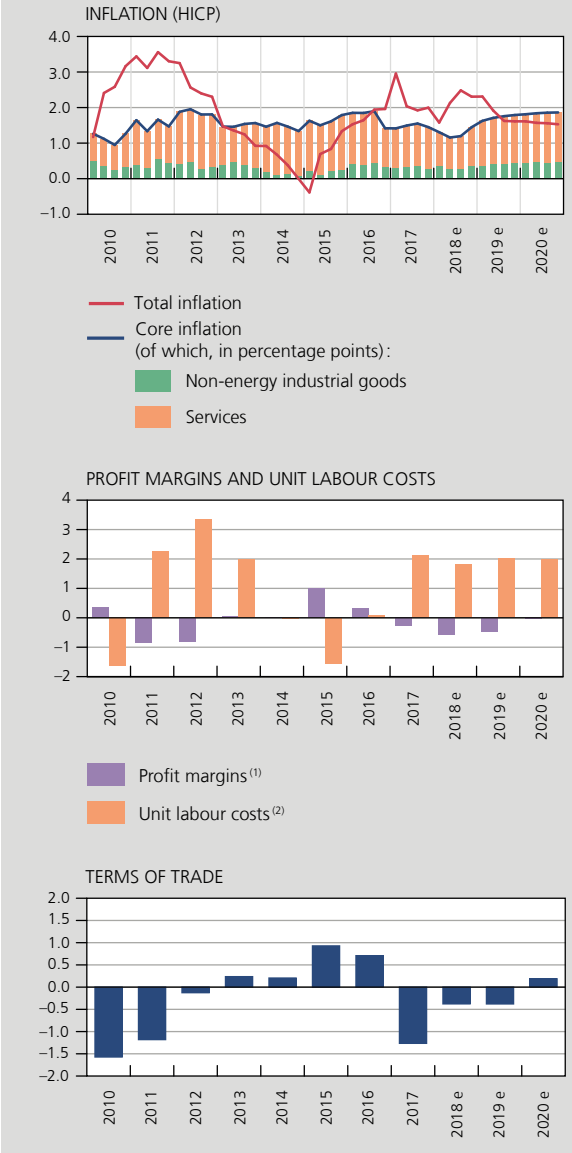
(5) Measured by the national consumer price index excluding tobacco, alcohol and motor fuel.

4.2 Prices

However, this increased cost pressure will only drive inflation up to a limited extent, as fluctuations in the growth of labour costs are generally partially absorbed in firms' profit margins and not passed on entirely in selling prices. That is also likely to be the case during the projection period: after profit margins had received a substantial boost in past years, since the lower labour costs were only very partially reflected in pricing, they are expected to be slightly negative up to 2019 and then to remain unchanged in 2020. The increase in core inflation, which excludes volatile components such as energy and food prices, therefore remains small during the projection period.

CHART 7 **INFLATION AND DETERMINANTS**

(percentage changes compared to the previous year, unless otherwise stated)



Sources: EC, NAI, NBB.

(1) Difference between annual growth of unit selling prices and unit production costs.

(2) Including wage subsidies and reductions for target groups. This concerns unit labour costs in the private sector.

In 2018, core inflation is actually predicted to weaken a little further. The main factor here is inflation in services, which is expected to fall to 1.6 %, its lowest level since 2010. That deceleration is largely due to one specific measure, namely the abolition of the radio and television licence fee in the Walloon Region in January of this year. However, other service categories have also recorded more modest price rises lately. For instance, since the end of last year the price movements of telecommunication services have clearly decelerated. The measures to boost competition between the various suppliers (such as the "Easy Switch" principle which makes it easier to switch between telecom operators) and the abolition of roaming charges in the European Union, both measures dating from the summer of 2017, doubtless made a contribution here. From 2019 onwards, rising labour costs will gradually propel services inflation higher again, to around 2.3 % in 2020. Inflation in non-energy industrial goods will also pick up gradually. Apart from the rising domestic cost pressure, the expected increase in inflation in other countries and among trading partners also plays a role. It makes imports more expensive and also enables Belgian firms to gear their prices to the higher prices charged by foreign competitors.

The terms of trade are set to deteriorate further this year and next, indicating a relatively larger price increase among the trading partners, caused mainly by the steep rise in oil prices.

That rise is only one factor influencing energy product prices. In 2018, energy inflation is actually expected to be slightly lower than last year, the main reason being the abolition – pursuant to a Constitutional Court judgment – of the energy tax on electricity consumption in the Flemish Region with effect from January. In addition, taking account of the Eurosystem's common assumptions mentioned earlier, the rate of oil price increases is set to slow down in 2018, mainly because oil prices are expected to start falling again from the summer. Consequently, energy inflation will be very low in 2019 and actually negative in 2020.

Conversely, food inflation will rise steeply in 2018 compared to the previous year. That applies to both processed and unprocessed foods. Tax is the main factor in the case of processed foods. First, the excise duty on tobacco increased more this year than in 2017. Also, in January, the tax on soft drinks – known as the "sugar tax" – was increased. That tax was introduced in January 2016 as part of the tax shift. From 2019, excise duties should no longer increase to the same degree and the rate of food inflation is expected to subside gradually.

All in all, total inflation is therefore expected to ease a little in 2018 and 2019 and decline further to 1.6 % in 2020. The reason is that the – albeit slow – increase in core inflation is entirely offset by the negative energy inflation and the moderation of food price rises.

The above analysis concerns the harmonised index of consumer prices (HICP), which permits comparison of inflation in European Member States. Inflation according to the national consumer price index (NCPI) may deviate slightly from the HICP owing to methodological differences. The NCPI is used to calculate the health index, i.e. the national index which excludes tobacco, alcoholic beverages and motor fuels. After stagnating in 2018, the health index is expected to rise in 2019 before decelerating again towards the end of the projection period. It is predicted that the threshold will next be exceeded in August 2018.

5. Public finances

5.1 General government balance

According to the data published by the NAI in April 2018, the Belgian government recorded a budget deficit of 1 % of GDP in 2017, a 1.4 percentage point improvement compared to 2016. Against the macroeconomic background described above, the general government budget deficit is expected to remain at that level in 2018 but will start rising again in 2019 and 2020.

The expected stabilisation of the budget balance in 2018 is due to the further decline in interest charges, while primary expenditure will edge upwards in relation to GDP. Revenue will remain more or less stable as a ratio of GDP, given that the reduction in charges on labour will be offset by a temporary increase in corporation tax revenues, because firms are paying a larger proportion of the tax due in advance.

TABLE 6 GENERAL GOVERNMENT ACCOUNTS
(in % of GDP)

	2017	2018 e	2019 e	2020 e
General government				
Revenue	51.3	51.4	50.4	50.2
Primary expenditure	49.9	50.1	50.1	50.0
Primary balance	1.4	1.3	0.3	0.2
Interest charges	2.5	2.2	2.1	2.0
Financing requirement (–) or capacity	**–1.0**	**–1.0**	**–1.8**	**–1.8**
Overall balance per sub-sector				
Federal government[(1)]	–1.2	–0.5	–1.7	–1.7
Social security	0.1	0.0	0.0	0.0
Communities and Regions[(1)]	0.0	–0.5	–0.1	–0.2
Local authorities	0.1	0.0	0.1	0.1

Sources: NAI, NBB.

(1) These figures include, from 2015, the advances on the regional additional percentages on personal income tax, although, according to the methodology of the ESA 2010, those advances are regarded as purely financial transactions and the regional additional percentages are only taken into account at the time of collection. The approach used here corresponds to that used for formulating the budget targets in the recommendations of the High Council of Finance's "Public Sector Borrowing Requirement" section or in the stability programmes.

In 2019 and 2020, the decline in interest charges will not counterbalance the drop in revenues, while primary expenditure will virtually stagnate. The main reason for the lower revenues is the reduction in corporation tax income resulting from lower assessments, which are the corollary to the shift in favour of advance payments in preceding years.

The deficits are expected to occur mainly at federal government level, but the Communities and Regions sub-sector will also continue to record a small deficit during the projection period. Conversely, the accounts of local government and social security should be more or less in balance. The downward revision of the "autonomy factor" for determining the regional additional percentages on personal income tax results in a one-off correction in 2018 for the excess taxes paid to the Regions since 2015, with a negative impact on the budget balance of the Communities and Regions and a positive impact on the federal government balance.

As usual, the projections assume that there will be no change in policy, and therefore only take account of budget measures which have already been announced and specified in sufficient detail.

5.2 Revenue

Public revenues will be more or less stable in 2018, but in 2019 and 2020 the fiscal and parafiscal pressure will decline by 0.9 and 0.2 percentage points of GDP respectively.

The tax burden on labour is declining as a result of the reduction in personal income tax in relation to GDP. In addition, a further cut in employers' contribution rates will lead to a decline in social contributions during the projection period.

In 2018, the steep rise in corporation tax revenues will offset the impact on public revenues of the lower levies on labour incomes. The advance payments by companies on the first due date of 10 April 2018 were up by 58 % against the first due date in 2017, when there had already been a substantial increase. The reason for this big rise is that the basic rate of the tax surcharge imposed in cases of insufficient advance payments was raised to 6.75 % from the 2018 income year. It therefore makes sense for companies to step up their advance payments, and to make the payments earlier in

TABLE 7 PUBLIC REVENUES
(in % of GDP)

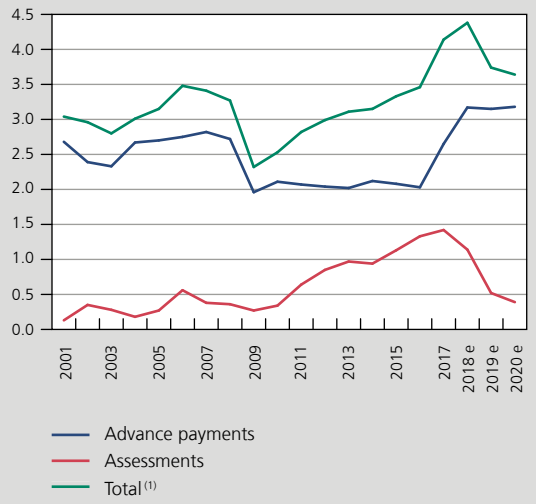
	2017	2018 e	2019 e	2020 e
Fiscal and parafiscal revenues	44.4	44.4	43.5	43.3
Levies applicable mainly to labour income	25.0	24.7	24.5	24.5
Personal income tax	11.1	10.9	10.7	10.8
Social contributions	13.9	13.8	13.8	13.7
Taxes on corporate profits	4.1	4.4	3.7	3.6
Levies on other incomes and on assets	4.1	4.2	4.1	4.1
Taxes on goods and services	11.2	11.2	11.1	11.1
of which:				
VAT	6.8	6.8	6.8	6.8
Excise duty	2.2	2.2	2.2	2.2
Non-fiscal and non-parafiscal revenues	6.9	6.9	6.9	6.8
Total revenues	51.3	51.4	50.4	50.2

Sources: NAI. NBB.

the year. The surge in advance payments leads to a temporary increase in revenues in 2018, since the amount collected via the assessments will decline in the years ahead. That explains the fall in corporation tax revenues in 2019 and 2020.

Finally, the levies on other incomes and on assets will increase in 2018 as a result of the entry into force of the tax on securities accounts and the increase in the rates of tax on stock market transactions, but in 2019 it will be depressed by the measures taken to activate savings.

CHART 8 CORPORATION TAX REVENUES
(in % of GDP)



Sources: NAI, NBB.
(1) Including other taxes, the main one being the withholding tax on income from movable property.

5.3 Primary expenditure

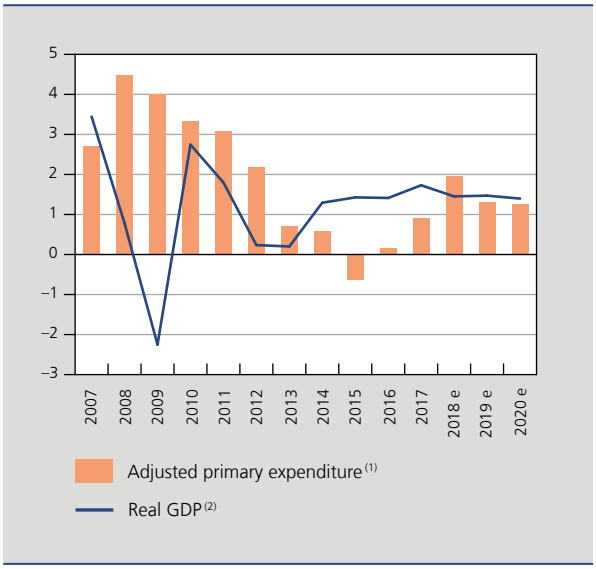
In the absence of new economy measures, the downward trend in primary expenditure as a ratio of GDP will come to a halt in 2018. The expenditure ratio will therefore hover around 50 % of GDP throughout the projection period. Consequently, expenditure will increase in nominal terms in line with economic activity.

Following adjustment for temporary factors, the cyclical impact and differences between inflation and indexation, real primary expenditure will rise by 2 % in 2018. In contrast to preceding years, that increase will therefore slightly exceed real GDP growth, partly because of public investment which will rise in the run-up to the impending municipal and provincial elections.

In 2019 and 2020, if there is no change of policy, the structural trend in public expenditure will closely track the trend in real GDP.

CHART 9 PRIMARY EXPENDITURE OF GENERAL GOVERNMENT AND GDP

(percentage changes compared to the previous year)



Sources : NAI, NBB.

(1) Primary expenditure deflated by the GDP deflator and adjusted for cyclical, one-off and fiscally neutral factors, and for the effect of indexation. The latter is due to the difference between the actual indexation (or the theoretical figure for 2015 and 2016, as a result of the approved index jump) of civil service pay and social benefits and the increase in the GDP deflator.

(2) Calendar adjusted data.

5.4 Debt

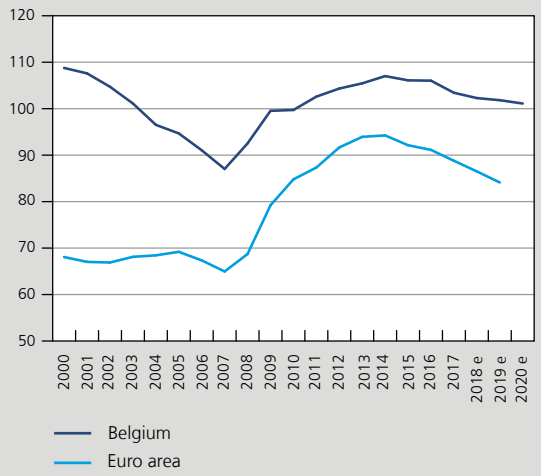
In 2017, the public debt declined to 103.4 % of GDP. The debt ratio will gradually decline further during the projection period.

In 2018, the debt ratio will fall by 1.1 percentage points. That is due solely to the downward impact of the endogenous factors, as nominal GDP growth will exceed the implicit interest rate on the public debt and the primary balance will remain decidedly positive. Exogenous factors are likely to exert an upward influence in view of the debt-increasing effect of the expansion of lending in connection with the social housing policy, and a number of factors relating to debt management.

Thereafter, the debt ratio will continue to gradually decline, again as a result of favourable interest rate-growth dynamics combined with – albeit small – primary surpluses. In 2020, towards the end of the projection period, the debt ratio is predicted at 101.1 % of GDP.

CHART 10 CONSOLIDATED GROSS DEBT OF GENERAL GOVERNMENT

(in % of GDP)



Sources: EC, NBB.

6. Differences compared to the previous projection exercise

Compared to the 2017 autumn forecasts, the current estimates have undergone various minor adjustments, even though there has been little change in the basic picture and the medium-term outlook. The estimates still point to a gradually cooling economy in which accelerating income growth nevertheless supports household consumption and core inflation is gradually driven up by domestic cost pressure. As in the previous estimates, the budget deficit also rises in the final projection years.

Economic growth was only revised in the short term. In 2017, growth was totally in line with our estimates, but in the first quarter of this year, following the adjustment of the flash estimate by the NAI at the end of May, it ultimately fell a little short of expectations. According to the nowcasting models, the same should apply for the second quarter. Thereafter, the growth rate was again close to the figure in the autumn forecasts, since the revision of the common assumptions by the Eurosystem had only a very limited impact on activity overall. The higher oil price will dampen purchasing power, but the effect on household consumption remains small. In all, annual growth has been adjusted downwards slightly for both 2018 and 2019.

Taking the projection period as a whole, the growth of domestic employment is also slightly weaker. That is due to the somewhat lower growth of activity, but is also partly connected with the upward revision of the trend in average working time: the number of hours worked per person is now set to edge upwards until the end of the projection period. That is in line with the recent trends in the revised labour market statistics, in which the slightly weaker than expected job creation is accompanied by an increase in average working time, possibly due to the mounting tensions on the labour market. The weaker job creation combined with labour market participation that is still rising, notably as a result of the recent reforms, means that the unemployment rate remains somewhat flatter in the first half of the projection period, albeit at a low level. Nevertheless, unemployment is well below the level in the autumn forecast owing to the latest observations which were (much) lower than expected.

In nominal terms, the inflation estimates for this year and for 2019 have undergone marked upward revision, but that is due almost entirely to the much higher oil price compared to the autumn forecasts. Conversely, core inflation has hardly been revised at all: the upward effect of higher oil prices on core inflation is virtually negated by the lower imported inflation as a result of the euro's appreciation. In the short term, core inflation for 2018 has actually been adjusted

downwards slightly, partly because of the recent monthly figures, which were lower than expected. Leaving aside the impact of indexation, the estimates for hourly pay are more or less unchanged.

The most striking change in this projection exercise concerns the budget figures, with the overall balance for 2018 showing a deficit of 1 % of GDP, the same as last year; that is 0.3 percentage points better than expected in the autumn projections. Once again, the reason lies in the (much) higher advance payments by companies as a result of the renewed increase in the tax surcharge imposed in cases of insufficient advance payments. However, much of that improvement is considered temporary, and will therefore disappear in later years. In addition, the estimates for pension benefits were also revised upwards on the basis of new data. Combined with the limited changes in the macroeconomic framework, that leads to a deterioration in the financing requirement in 2019 and 2020, compared to the autumn projections.

7. Conclusion and risk factor assessment

For Belgium, as indeed for the euro area, the Eurosystem's spring forecasts indicate a slight dip in growth in the years ahead. That is due to the cooling investment cycle and the deceleration of exports, the impact of which will not be entirely offset by the strengthening annual growth of household consumption.

That slower growth is also depicted in the forecasts of most other institutions. However, the spring projections are well below the latter forecasts. In comparing the various estimates, account must also be taken of their cut-off date and the information that could be included. In that respect, only the Federal Planning Bureau's Economic Budget of 7 June was able – like the current spring projections – to incorporate the first complete quarterly growth figures for the first quarter, and more particularly, the downward revision of growth compared to the earlier NAI flash estimate. In contrast to the growth estimates, the inflation forecasts are rather higher than those of other institutions. However, the main reason for that is that those older estimates had taken no account of the recent surge in the oil price.

TABLE 8 COMPARISON WITH THE ESTIMATES OF OTHER INSTITUTIONS
(in %)

Institution	Publication date	Real GDP growth			Inflation (HICP, unless otherwise stated)		
		2018	2019	2020	2018	2019	2020
Belgian Prime News	March 2018	1.9	1.6		1.7	1.7	
IMF	April 2018	1.9	1.7	1.5	1.6	1.8	1.8
Consensus Economics	May 2018	1.8	1.7		1.7	1.6	
EC	May 2018	1.8	1.7		1.6	1.6	
OECD	May 2018	1.7	1.7		1.8	1.8	
Federal Planning Bureau[(1)]	June 2018	1.6	1.6		2.0	1.7	
NBB	June 2018	1.5	1.5	1.4	2.1	1.9	1.6

(1) Economic budget for 2018-2019. The inflation figures refer to the NCPI.

As usual, the Eurosystem's spring forecasts are based on certain common assumptions. Since political and financial developments are often hard to predict, the uncertainty surrounding those assumptions may be greater than usual.

At international level, the risks to growth seem mainly on the downside. Apart from a possible continuing increase in the oil price, the main risk concerns the exacerbation or escalation of trade barriers which could dampen global growth. In addition, taking account of the latest short-term indicators, there is a possibility that the slowdown in the euro area could last longer than can be expected on the basis of the common assumptions. Of course, a less favourable international environment would also mean lower growth for the Belgian economy. In contrast, the purely domestic risks to the

growth estimates seem to be rather neutral overall. On the labour market, additional coordinated efforts to match the existing labour supply more closely to the unfilled vacancies could boost job creation to some degree, thus providing support for growth. There is also the possibility that business investment could maintain its current growth rate for a bit longer. In that respect, the estimates take account of the slight weakening of business confidence and the assumed narrowing of profit margins as a result of higher costs, but they also consider the business investment cycles seen in the past. However, a tight labour market combined with high capacity utilisation and continuing favourable financing options could lead to more labour-saving investment.

On the other hand, private consumption could be lower than currently expected, as the recent rise was weaker than suggested by the high level of consumer confidence and substantial jobs growth. It is possible, especially in a context of mounting uncertainty, that households may top up their reserve savings a little more, after the clear decline in the past year, so that consumption will trail further behind the estimated income growth. Finally, there is the risk that, now that labour costs have risen again since last year, the (structural) loss of market share is somewhat underestimated, so that the growth contribution of net exports could be slightly lower during the projection period. Of course, that also depends on international developments, and – more specifically – on world demand.

As regards inflation, too, the balance of purely domestic risks (i.e. excluding the possible impact of oil prices different from those foreseen in the common assumptions) looks fairly neutral.

Annex

PROJECTIONS FOR THE BELGIAN ECONOMY: SUMMARY OF THE MAIN RESULTS

(percentage changes compared to the previous year, unless otherwise stated)

	2016	2017	2018 e	2019 e	2020 e
Growth (calendar adjusted data)					
Real GDP	1.4	1.7	1.5	1.5	1.4
Contributions to growth:					
Domestic expenditure, excluding change in inventories	1.8	1.2	1.5	1.5	1.6
Net exports of goods and services	–0.6	0.5	0.2	–0.1	–0.2
Change in inventories	0.2	0.1	–0.3	0.0	0.0
Prices and costs					
Harmonised index of consumer prices	1.8	2.2	2.1	1.9	1.6
Health index	2.1	1.8	1.6	1.9	1.7
GDP deflator	1.6	1.7	1.3	1.5	1.8
Terms of trade	0.7	–1.3	–0.4	–0.4	0.2
Unit labour costs in the private sector[1]	0.1	2.1	1.8	2.0	2.0
Hourly labour costs in the private sector[1]	–0.6	1.8	2.2	2.9	2.8
Hourly productivity in the private sector	–0.6	–0.3	0.3	0.8	0.8
Labour market					
Domestic employment (annual average change in thousands of persons)	57.7	65.3	41.4	29.9	25.5
Total volume of labour[2]	1.3	1.7	1.1	0.7	0.6
Harmonised unemployment rate (in % of the labour force aged 15 years and over)	7.9	7.1	6.7	6.7	6.8
Incomes					
Real disposable income of individuals	0.8	1.4	1.3	1.9	1.7
Savings ratio of individuals (in % of disposable income)	11.2	11.3	11.2	11.4	11.5
Public finances					
Primary balance (in % of GDP)	0.4	1.4	1.3	0.3	0.2
General government balance (in % of GDP)	–2.5	–1.0	–1.0	–1.8	–1.8
Public debt (in % of GDP)	106.0	103.4	102.3	101.8	101.1
Current account (according to the balance of payments, in % of GDP)	0.1	–0.2	–0.3	–0.7	–0.7

Sources: DGS, EC, NAI, NBB.

(1) Including wage subsidies (mainly reductions in payroll tax) and targeted reductions in social contributions.

(2) Total number of hours worked in the economy.

Local government finances in Belgium

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Introduction

The purpose of this article is to offer a picture of the budget situation of local authorities in Belgium and the main financial challenges they face, as the October 2018 local elections loom.

Section 1 presents the local authority budget balance and debt situation. Section 2 describes the budgetary framework applicable to local authorities. Section 3 analyses the revenues and looks at the determinants of the municipal tax burden. Section 4 examines expenditure and the budgetary challenges that local authorities have to address. The article ends with a number of conclusions.

1. The local authority budget situation

This section examines the budget situation of local authorities in terms of the budget balance and the debt level. From a macroeconomic viewpoint, that situation is currently sound.

1.1 Budget balance

In the late 1970s and early 1980s, local authorities recorded substantial budget deficits. During that period, some cities faced serious financial problems.

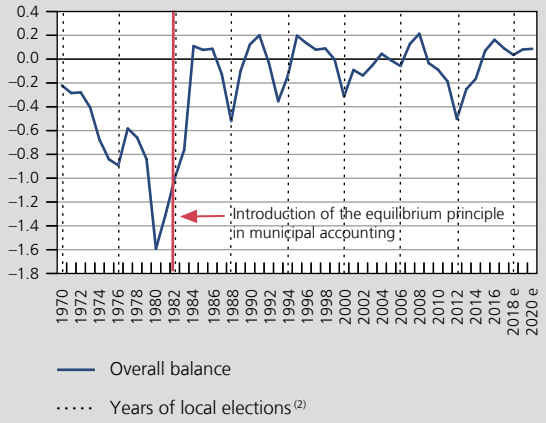
Following the introduction of a strict budget framework for the municipalities in 1982, described in more detail in section 2, the budget balance showed a marked improvement. Since the mid-1980s it has hovered around equilibrium.

Fluctuations in the budget balance depend partly on the government's electoral investment cycle. That cycle implies that investment expenditure generally increases in the year preceding the local elections, peaking during the election year and causing public finances to deteriorate. In the two years following those elections, investment expenditure usually declines so that local finances improve once again.

(*) The authors are grateful to Patrick Bisciari for his contribution to this article.

CHART 1 SINCE THE CONSOLIDATION OF THE EARLY 1980S, THE LOCAL AUTHORITY BUDGET BALANCE HAS HOVERED AROUND EQUILIBRIUM

(in % of GDP)[1]



Sources: NAI, NBB.

(1) In the chart, all data predating 1995 – for which the NAI does not publish statistics according to the ESA 2010 methodology – have been retropolated based on series obtained from the accounts of government compiled according to the ESA 1995.

(2) This applies to all charts in the article.

During 2012, which was a local election year, the deficit reached its highest level in a long time. The ensuing years saw a systematic improvement in local authority finances, restoring a balanced budget in 2015 and creating small surpluses in 2016 and 2017.

According to the Bank's most recent estimates, the local authority budget balance will slightly deteriorate in 2018 owing to the local elections. It should then pick up again and show a surplus – though only a small one – in 2019 and 2020.

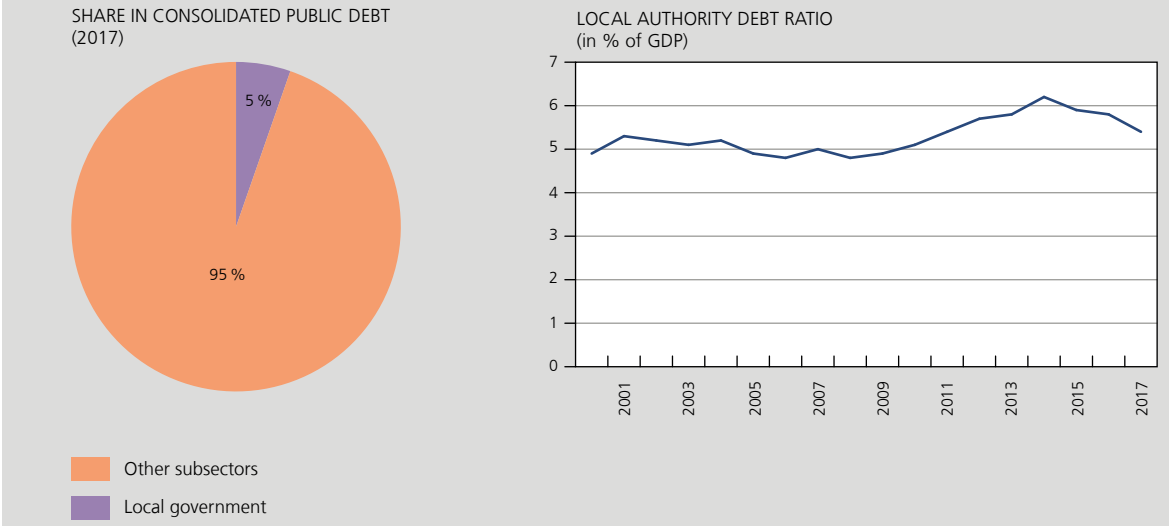
1.2 Debt ratio

After having fluctuated around 5 % of GDP in the first decade of this century, local authority debt reached 6.2 % of GDP in 2014; since then it has fallen slightly. In 2017, the debt ratio stood at 5.4 % of GDP. The local authorities' share in the general government debt – which still exceeds GDP – is therefore small.

With a view to sustainability, it is advisable to keep the local authorities' debt low, as their own revenues – namely those that they can increase autonomously – are relatively limited.

CHART 2 THE LOCAL AUTHORITY DEBT LEVEL IS LOW AND STABLE

(contribution to consolidated gross debt; in % of GDP, unless otherwise stated)



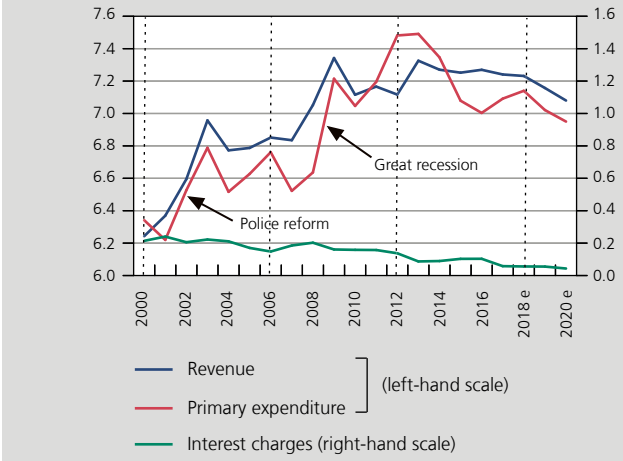
Source: NAI.

1.3 Revenue, primary expenditure and interest charges

From the turn of the century and up to 2013, revenue and primary expenditure have maintained a relatively similar upward trend.

CHART 3 PRIMARY EXPENDITURE HAS FALLEN DURING THE CURRENT LEGISLATURE, WHEREAS IT HAD PREVIOUSLY INCREASED

(in % of GDP)



Sources: NAI, NBB.

The sharp rise in revenue and primary expenditure in 2002 was due largely to the police service reform which led to the incorporation of a large number of former gendarmes in the local police. In 2009, the increase in revenue and primary expenditure in relation to GDP was attributable mainly to a numerator effect, as GDP had fallen during that recession year.

After the 2012 local elections, the increase in revenue and primary expenditure ceased. Primary expenditure peaked at 7.5 % of GDP in 2012 and 2013, but subsided significantly from 2014. This slowdown, combined with stabilisation of the revenue ratio, was the factor behind the recovery of the local authority budget balance and the creation of small surpluses in recent years.

The primary expenditure ratio ceased falling in 2017 and is not expected to decline further in 2018, on account of the local elections being held this year. It is predicted to resume its downward trend from 2019 onwards. After having stabilised in recent years, the revenue ratio is set to fall in the years ahead. One reason for that decline is the tax shift approved by the federal government, which also affects local authority revenues via the additional percentages on personal income tax.

Interest charges came to 0.1 % of GDP in 2017. Compared to their 2000 level they have more than halved in relation to GDP.

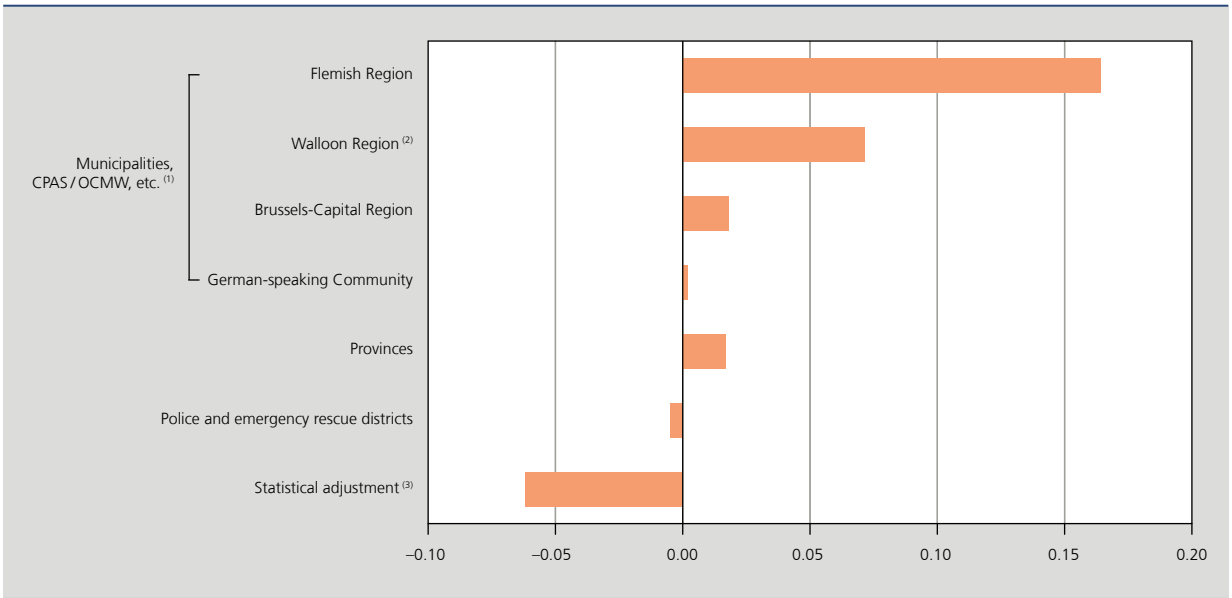
1.4 Budget balance of local government components

The local authority budget balance can be broken down by Region (separate figures are also available for the German-speaking Community, which forms a part of the Walloon Region) and by type of local authority. Local government comprises the municipalities, the CPAS/OCMW (Public Social Welfare Centres), provinces, police and emergency rescue districts, and other entities (such as the autonomous municipal undertakings which are classified in the general government sector).

Almost all components of local government recorded a balanced budget or a small surplus in 2016; only the police and emergency rescue districts had a very small deficit. The budget surplus in 2016 was attributable mainly to the

CHART 4 ALMOST ALL THE LOCAL GOVERNMENT COMPONENTS WERE IN BALANCE IN 2016

(2016 overall balance by region and by type of local authority, in % of GDP)



Sources: NAI, NBB.

(1) Mainly the autonomous municipal undertakings and local authority associations which are part of the general government sector.

(2) Except for the German-speaking Community.

(3) The statistical adjustment is due mainly to the timing of the imputation of taxes and the alignment of the transfers with the amounts stated in the federal government accounts and the accounts of the Communities and Regions.

substantial surplus recorded by the municipalities. In the case of local government by Region (and the German-speaking Community), the balance was also positive for all supervisory authorities.

The 2016 figures are a clear improvement compared to preceding years, as almost every local government component was still in deficit between 2011 and 2013.

2. The budgetary framework applicable to local government

2.1 The equilibrium principle

In 1982, a strict budgetary framework was imposed on local government in order to put an end to the high deficits of those days.

The equilibrium principle for the municipalities was introduced by a special decree which was subsequently incorporated in the Municipal Law (Article 252). That principle, which was to apply from 1988, obliges the municipalities to produce a balanced budget. In practice, this rule means that the overall total of both the ordinary budget and the extraordinary budget must be in balance.

The municipal accounts are in fact divided into two budgets: one for ordinary transactions and one for extraordinary transactions. Each budget comprises two balances, namely the balance for the actual year, which consists of the current year's revenue and expenditure, and an overall total which also takes account of the result for preceding years and any transfers. The balance of the overall total implies that the figures for the actual year do not necessarily have to balance every year, as any surpluses from preceding years can offset a deficit in the current year.

The ordinary budget comprises the municipality's recurrent revenue and expenditure, including capital repayment and interest charges on borrowings, while capital transactions such as investment projects and management of the municipality's assets are recorded in the extraordinary budget. The municipalities can only contract loans for extraordinary budget transactions; expenditure under the ordinary budget – i.e. including capital repayment and interest charges – must always be covered by their own revenue.

The law stipulates that the budget of other local authorities such as the police districts, emergency rescue districts and CPAS/OCMW, must likewise always balance. If their budget nevertheless goes into deficit, the municipality concerned has to correct that by means of grants so that the equilibrium principle is always respected.

2.2 Exercise of budgetary control by the Regions

Since the regionalisation of the Municipal Law and the Provincial Law[(1)] in 2002, the Regions have the power to exercise control over local government finances. As a result of that regionalisation, other rules and standards apply to the municipal accounts in the three Regions, and other criteria govern the equilibrium principle. Overall, the Regions have strengthened the local government budgetary framework in recent years.

2.2.1 Flemish Region

In the Flemish Region, it was decided to introduce a totally new system for the local budget, known as the "policy and management cycle" (*beleids- en beheerscyclus* – BBC). It has applied since 2014 to all local authorities in the Flemish Region, except for the police and emergency rescue districts, and replaces the familiar concepts of the ordinary and extraordinary budgets.

The aim of this new policy and management cycle is that local authorities should produce multiannual plans in which the policy objectives are linked to the financial resources. From now on, during the first year of the legislature,

(1) The regionalisation of the Municipal Law and the Provincial Law was approved in the Saint-Michel agreement (1993) and implemented in the Lambermont agreement (2001).

the municipalities, CPAS/OCMW and provinces draw up a multiannual plan covering a period from the second year of the current legislature to the first year of the next legislature. The first cycle therefore runs from 2014 to 2019 inclusive.

The state of financial equilibrium is an important element of the policy and management cycle and comprises two equilibrium criteria which must be respected : the annual equilibrium situation and the long-term structural equilibrium.

The annual equilibrium situation implies that the cash result (or available budgetary outcome) must be positive each year. The annual cash result is equal to the difference between the budgeted revenue and expenditure plus the results for preceding years but minus the unavailable funds.

The long-term structural equilibrium implies that the self-financing margin must be at least zero during the final year of the financial statement of the multiannual plan. This margin is calculated as the difference between the operating revenue and expenditure including the capital repayments and interest charges. If the margin is positive, the local authority can meet all its financial commitments out of its operating revenue and can therefore fund new investments without resorting to borrowing. As the margin takes no account of reserves created in the past, it is stricter than the equilibrium principle that previously applied. If the margin is negative during the final year of the planning period, the governor of the province may suspend the multiannual plan. An additional obligation applies to the CPAS/OCMW, for which the aggregate margins must be positive in each year of the planning period.

When drawing up the next policy and management cycle, which will begin in 2020, the result of an initial appraisal of the first cycle will be taken into account. Among other things, the financial equilibrium criteria were revised in the adjusted policy and management cycle decree. For instance, the check on the financial equilibrium situation (i.e. both the annual cash balance and the structural balance) will no longer be confined solely to the local government but must also be effected on a consolidated basis which will include, for example, entities connected with the municipalities such as the CPAS/OCMW, autonomous municipal undertakings and districts. In addition, the self-financing margin will be supplemented by an adjusted margin. Among other things, this adjusted version takes account of alternative forms of borrowing, such as "bullet" loans, which are repaid in full on the due date and therefore do not appear in the self-financing margin in intermediate years, which may distort the picture.

2.2.2 Walloon Region[1]

In the Walloon Region, the key principle to be respected is still the equilibrium of the overall total, as Article 252 of the Municipal Law was incorporated in the Local Democracy and Devolution Code. Since the drafting of the municipal budgets in 2014, the Walloon Region has introduced – via budget circulars – two new elements to promote sound public finances in the municipalities, namely the principle that the ordinary budget for the actual financial year must be in balance, and a limit on investment expenditure financed by borrowing.

The ordinary budget for the actual financial year, i.e. minus the result for preceding years or any reserves, had to balance in 2014. For 2014 a balanced budget was recommended but it became mandatory from the 2015 budget onwards. Municipalities which fail to respect that principle have to submit a convergence plan, specifying among other things when that balance is to be restored. Municipalities facing structural financial problems may also claim supplementary funding from the Region. In exchange for a management plan, they can obtain a long-term special loan from the Regional Municipal Aid Centre (CRAC). That management plan imposes a number of additional restrictions on the municipalities, e.g. regarding expenditure.

At the same time, an investment ceiling was introduced for investments funded by borrowing. This therefore does not apply to investments financed out of own funds or specific grants, and certain forms of investment are also exempt. This concerns in particular investments which generate savings at least equal to the financial costs, profitable investments which generate sufficient revenue to cover the cost of borrowing, or investments which are necessary to comply with health or safety standards. The investment ceiling is set at € 180 per capita per annum, or no more than the average cost of loan repayments over the past five years for municipalities whose ordinary budget for the actual financial year is in balance. Municipalities subject to a convergence plan must limit their investment expenditure based on borrowing to

(1) The budgetary framework explained below does not apply to the nine German-speaking municipalities, for which the German-speaking Community is the supervisory authority.

€ 165 per capita per annum. For municipalities subject to a management plan, the investment ceiling is set at € 100 or € 150 per capita per annum. That investment ceiling is calculated on a consolidated basis for the municipalities and for all their associated entities, such as the CPAS/OCMW. If that investment ceiling is not respected, the supervisory authority cannot approve the extraordinary budget unless exceptional circumstances apply.

With effect from 2018, the investment ceiling is now checked over a three-year period instead of on an annual basis. As the level of the ceiling remains unchanged, the effect of that flexibility is rather limited. Investments funded by borrowing during those three years must not exceed three times € 180 per capita, but the municipality is no longer tied to € 180 per capita in any one year.

The January 2018 investment plan of the Walloon Region's government also specifies that the investment ceiling system will be subject to review. The options include increased flexibility via calculation over six years, or abolition of the system.

2.2.3 Brussels-Capital Region

For municipalities in the Brussels-Capital Region, the equilibrium principle still applies in the form initially included in Article 252 of the Municipal Law. However, the annual circulars that the Region sends out when the municipal budgets are being drawn up set out a number of guidelines on certain revenues and expenditure. For instance, the circulars specify a maximum permitted growth rate for operating expenditure. For the extraordinary budget, according to the current guideline, new borrowing must be restricted to the expected capital repayments for the year, so that the overall municipal debt does not increase.

2.3 Result of the application of the budgetary framework for local government

The budgetary framework applicable to local government can be called strict. It has attributed to the positive budget balance that local authorities in general have recorded in recent years in the general government accounts drawn up according to the ESA 2010, even though the local authority accounting framework does not correspond exactly to that for the general government accounts. The fact that the strict budgetary framework in force for local authorities applies from the moment that their budget is drawn up has contributed to that outcome. If some of the expenditure included in the budget is more difficult to implement than expected, such as investments affected by delays, the actual expenditure is ultimately lower than expected. Finally, it is likely that some municipalities have already limited the expenditure in their budget so as to meet the new equilibrium criteria, such as the investment ceiling in the Walloon Region or the self-financing margin in the Flemish Region.

3. Local government revenues

3.1 Composition and trend

Local government revenues will come to 7.2 % of GDP in 2018. The transfers that local authorities receive from other levels of government form their main income stream and represent almost half of their total revenues. Tax revenues, consisting mainly of the additional percentages on personal income tax and property tax are another important source of income. The same is true of revenues from assets and other non-tax revenues, such as income from the sale of goods and services. These revenue categories are discussed in more detail below.

TABLE 1 LOCAL GOVERNMENT REVENUES

(in % of GDP, local election years)

	2000	2006	2012	2018 e
Total revenues	**6.2**	**6.9**	**7.1**	**7.2**
Tax revenues	1.8	2.2	2.1	2.2
Additional taxes (additional percentages)	1.6 (1)	1.9	1.9	1.9
Local taxes	0.2	0.3	0.2	0.2
Transfers from other public authorities	2.9	3.2	3.3	3.5
Federal government (2)	0.7	0.8	0.9	0.9
Communities and Regions	2.2	2.3	2.4	2.5
Non-tax revenues	1.6	1.5	1.7	1.6
Revenues from assets	0.5	0.4	0.3	0.2
Other, including sales of goods and services	1.1	1.2	1.4	1.4

Sources: NAI, NBB.
(1) In 2000, the additional personal income tax revenues were exceptionally low, mainly owing to a delay in the rate of assessments.
(2) Including social security.

3.2 Transfers from other general government subsectors

The transfers that local authorities receive from other general government subsectors depend largely on the decisions of those subsectors. It should be noted that these transfers have risen somewhat since the turn of the century. That rise is due partly to the growth rate of the Municipal Funds. In recent years there have also been some initiatives at both regional and federal level whereby transfers are used to offset the (budgetary) impact of certain decisions on local government finances.

3.2.1 Transfers from the Regions

Most of the transfers that local authorities receive come from the Regions, since the Municipal Fund was fully regionalised in 1989. Each Region (and – since 2005 – the German-speaking Community) applies its own growth rate to its Municipal Fund and allocates its resources among the municipalities according to its own rules.

In recent years, the Regions have adhered to the growth rates of their Municipal Funds which are set by decree or by order, and have not cut these allocations. In the Flemish Region, a growth rate of 3.5 % has applied since 2005, whereas in the Walloon Region (except for the German-speaking municipalities) the rate has been adjusted each year since 2010 on the basis of the estimated inflation in the budget year concerned plus 1 %, and in the Brussels-Capital Region, the growth rate has been set at a minimum of 2 % since 1999.

Only the German-speaking Community, which became the supervisory authority for the nine German-speaking municipalities in 2005 and which takes charge of their general financing, has cut back its Municipal Fund in recent years. Thus, the increase of 1 % above inflation laid down by decree was not applied in 2013 and in 2014.

The resources derived from the Municipal Funds are allocated to the municipalities according to some of their specific characteristics. Points taken into account include centrality, demographic variables and socioeconomic factors. In each region the funds are thus allocated in inverse proportion to the fiscal capacity of the municipality's residents in terms of the additional percentages on personal income tax and property tax. The municipalities can make free use of the resources that they receive from the Municipal Fund.

Conversely, in recent years the Flemish and Walloon Regions have both trimmed their Provincial Funds. In the Flemish Region, the 3.5 % growth rate laid down by decree was no longer applied from 2013. The basic amount was cut in 2014, and the Fund was abolished in 2015. The Walloon Region cut down its Provincial Fund resources in 2015. These reductions were associated with the transfer of responsibilities to the Region, and economies are also planned in 2018.

Apart from the Municipal and Provincial Funds, local authorities also receive a whole range of allocations and specific grants from the Communities and Regions. In the Flemish Region, various grants have been transferred to the general funding in recent years, under a decree regulating periodic planning and reporting obligations (Planlastendecreet). These grants now come under the Municipal Fund, but are not adjusted in line with the growth rate laid down in the decree and are awarded automatically to the local authorities. The Cities Fund was also incorporated in the Municipal Fund in order to limit the administrative expense for cities. In addition, in the Brussels-Capital Region it was decided to incorporate a number of specific allocations in the general allocation as part of the recent Municipal Fund reform.

3.2.2 Federal funding for legally compulsory expenditure

The main transfers from the federal government concern statutory tasks performed by certain local government components, in this case the CPAS/OCMW and the police and emergency rescue districts. These allocations generally only cover part of the true cost. Consequently, the municipalities often have to use their own funding to enable those entities to execute their tasks while presenting a balanced budget.

The CPAS/OCMW centres receive a federal grant to fund the payments that they make in connection with the right to social inclusion, in the form of an integration allowance and subsidised jobs[1]. In principle, the federal government refunds to the CPAS/OCMW 55 % of the amount paid out in integration allowances. That percentage may be increased if the municipality has a large number of claimants. A range of specific factors are taken into account in calculating the grant. For instance, the grant corresponding to the integration allowance comprises a compensation for the unemployment benefit reform. In recent years, account has also been taken of the increasing number of recognised refugees resulting from the asylum crisis. The CPAS/OCMW centres likewise receive total or partial reimbursement from the federal government for the support that they provide in connection with the right to social assistance, which consists essentially in providing (financial and material) support for asylum seekers and residence permit holders who are not on the population register.

The local police districts are funded by federal grants and municipal allocations. The federal grant actually comprises miscellaneous federal allocations. The largest is the basic allocation, which is distributed according to the "KUL" rule, a formula based on scientific research to define the police capacity that a police district needs. There are also various other social grants whereby the federal government bears certain costs relating to the salaries of former gendarmes. However, in recent years the federal government has not disbursed all the funds allocated to the police districts. For instance, there has been considerable delay in paying out part of the resources derived from the Road Safety Fund.

The emergency rescue districts which have been in operation since 2015 are also funded partly by the federal government. At the time of the reform which converted the fire services into emergency rescue districts, it was agreed that the districts should eventually be funded in equal shares out of federal government resources and municipal resources. In 2017, the municipalities provided 79 % of the finance, and the federal government 21 %. Although the breakdown is not yet 50:50, it represents an improvement compared to the situation prevailing before the fire service reform. At that time it is estimated that the municipalities provided 90 % of the finance and the federal government 10 %.

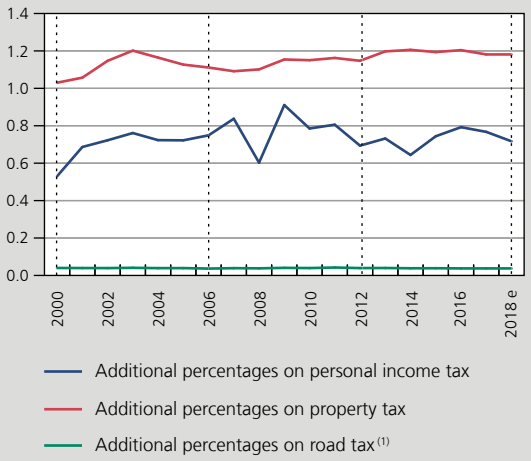
3.3 Additional taxes

Just over a quarter of local authority finance comes from tax revenues levied in the form of additional percentages. The municipalities, and the Brussels conurbation up to the 2017 tax year, thus levy additional percentages on personal income tax. Percentages added to the property tax are levied by the municipalities, the provinces and the Brussels conurbation. Finally, the municipalities also receive an additional 10 % on the road tax.

(1) Instead of paying an integration allowance, the CPAS/OCWM may also offer a job (granting a subsidy in the event of employment outside the CPAS/OCMW).

CHART 5 ADDITIONAL TAXES

(in % of GDP)



Sources : NAI, NBB.

(1) The percentage added to road tax is the same for all municipalities, which have no powers of decision on the subject.

The revenues from the additional percentages on personal income tax and property tax are affected by the tax rates and changes in the tax bases, but also by the speed of assessment.

3.3.1 Tax rates

On average, the rate of the additional tax levied on personal income by the municipalities has tended to rise in recent years. It has increased, in particular, in the years following the local elections. In the early 2000s, there was a marked rise in the average rate, probably owing to the personal income tax reform adopted by the federal government at that time, which reduced the tax base of the municipalities. However, there has been no significant reduction in the average rate prior to the local elections, so that the rate has risen steadily.

Under the recent tax reform by the Brussels-Capital Region, the additional percentages levied by the Brussels conurbation on personal income tax were cut to zero with effect from the 2017 tax year.

Overall, the rate of municipal surcharges on property tax has also tended to rise. Under the said tax reform, the additional percentages levied by the Brussels conurbation on property tax were increased with effect from the 2016 tax year. Under the provincial reform, the additional percentages on property tax levied by the Flemish provinces will be limited with effect from the 2018 tax year.

CHART 6 THE AVERAGE RATE OF ADDITIONAL MUNICIPAL TAXES HAS RISEN IN RECENT YEARS

(average rate charged by municipalities[1])

Source: FPS Finance.

(1) Unweighted average.

(2) Percentage rate calculated as the product of the regional property tax rate and the municipal surcharges.

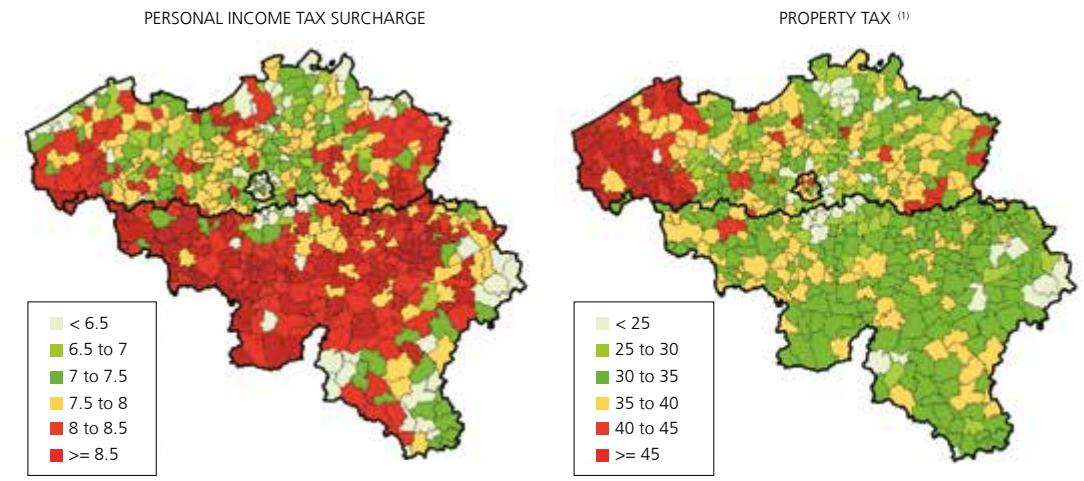
Box – Determinants of the rates of municipal additional percentages on personal income tax and property tax

The Belgian municipalities have full autonomy to decide on the rate of the additional percentages on personal income tax (income tax surcharge) and on property tax (property tax surcharge). The personal income tax surcharges are levied on the tax collected at federal level and – since 2015 – at regional level. The progressive character of the municipal surcharge on personal income tax is therefore the same as for higher levels of government. The municipal surcharges on property tax are levied on the regional tax which has the cadastral income as a tax base.

The municipalities' fiscal autonomy has led to very different decisions on the rates of income tax surcharge and property tax surcharge, as is evident from the distribution of those rates. In 2017, the income tax surcharge rates ranged between 0 % (in Knokke-Heist, De Panne and Koksijde) and 9 % (Mesen), the median being 7.7 %. The average rate per region was lowest in the Brussels-Capital Region and highest in the Walloon Region. The rates of property tax surcharge varied between 15 % (in Amblève) and 56.25 % (in Alveringem), the median being 32.5 %. The Walloon Region charged the lowest rates and the Brussels-Capital Region charged the highest. In regard to these two taxes, the Flemish Region is in an intermediate position. Where the income tax and property tax surcharge rates are concerned, there is some geographical correlation, with neighbouring municipalities often adopting similar rates.

What are the factors that determine whether municipalities adopt a higher or lower surcharge on income tax or property tax? First, we can examine the financial capacity of the population in relation to the respective taxes. In principle, we might expect that municipalities obtaining a lower per capita yield from each percentage point of the rate would adopt higher rates in order to maintain the level of revenues. However, empirical research on the Flemish Region shows that this correlation is of little or no significance in the case of the income tax surcharge, whereas there is a small but significant correlation in the case of the property tax surcharge (Merlevede et al, 2011).

MUNICIPAL RATES OF SURCHARGE ON PERSONAL INCOME TAX AND PROPERTY TAX
(tax year 2017)



Source: FPS Finance.
(1) This is the rate expressed as a percentage and calculated as the product of the regional rate of property tax and the municipal surcharges on that tax.

Thus, an extra per capita yield of one euro per percentage point of property tax rate – for an average yield of € 13 – results in a property tax rate which is around 0.3 percentage point lower. In that connection it should be noted that the allocations from the Municipal Funds already level out the tax capacity of the municipalities to some degree.

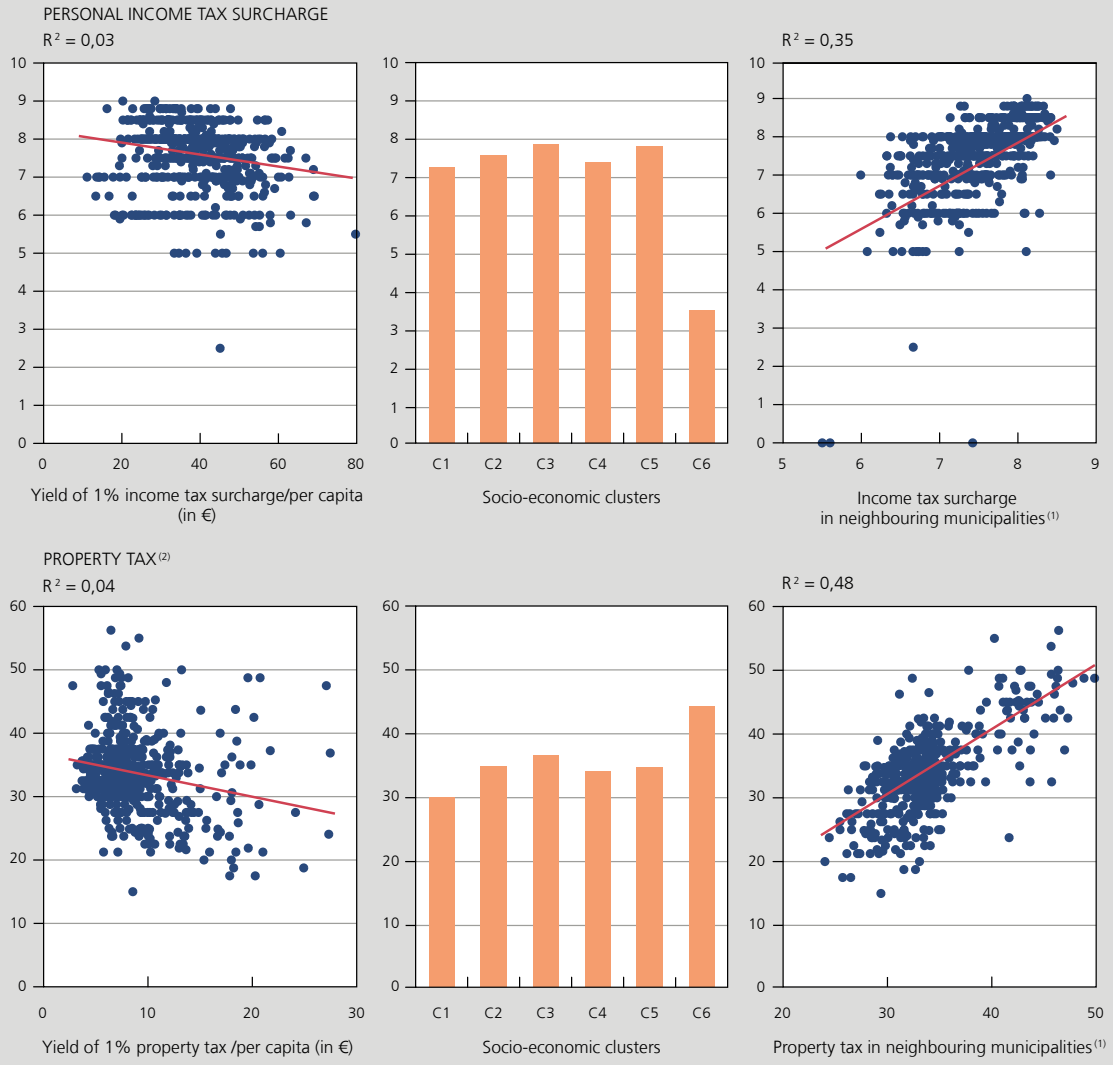
Next, other socio-economic factors influencing financial capacity or expenditure needs may determine the rates charged by each municipality. Thus, apart from the level of income, factors such as the composition of the population by age and nationality, population density, the level and nature of economic activity, and the residential, rural or urban character of the municipality or its central location may also play a role. On the basis of a range of socio-economic variables, Dessoy (2007) produced a typology of Belgian municipalities, grouping together municipalities with a similar socio-economic environment in categories which are as homogenous as possible. The result was six main clusters, the dominant characteristics of which are shown in the table below.

MAIN CLUSTERS DERIVED FROM THE SOCIO-ECONOMIC TYPOLOGY OF BELGIAN MUNICIPALITIES ACCORDING TO DESSOY (2007)

Clusters	Dominant characteristics
C1. Residential municipalities	High standard of living and low centrality
C2. Rural (or semi-rural) municipalities	Low degree of urbanisation and low centrality
C3. Semi-urban or conurbation municipalities	Low standard of living, high degree of urbanisation
C4. Municipalities with concentrated economic activities	Substantial industrial activity
C5. "Central" municipalities	High centrality
C6. Coastal municipalities	Substantial tourist activity

The cluster that differs most from the others is the coastal municipality cluster. These municipalities feature significant tourist activity and a high degree of external attractiveness. Their unique situation enables them to set an above-average rate of property tax surcharge and a below-average rate of personal income tax surcharge. In the case of the other clusters, the differences are generally small. On average, the residential municipalities adopt slightly lower rates, particularly for the property tax, because they combine a relatively high financial capacity with low centrality or a low level of facilities. Similarly, in municipalities with a high concentration of economic activities,

DETERMINANTS OF MUNICIPAL RATES OF SURCHARGE ON PERSONAL INCOME TAX AND PROPERTY TAX



Sources: Dessoy (2007), FPS Finance, municipalities, NAI.
(1) These are average rates for first and second order neighbouring municipalities.
(2) This is the rate expressed as a percentage and calculated as the proceeds from the regional property tax and the municipal surcharges on that tax.

the rates are somewhat lower than in other non-coastal municipalities. They can rely on income from industrial activity which is highly developed. Semi-urban or conurbation municipalities and "central" municipalities charge slightly above-average rates. Semi-urban municipalities combine a relatively low standard of living with a high degree of urbanisation, reflected in a concentration of population, built-up areas and traffic flows. The latter two groups have highly centralised facilities and a high level of external attractiveness.

Even taking account of the said socio-economic factors, there is still a considerable geographical correlation in rates of income tax and property tax surcharges. Empirical studies in various countries have shown that municipalities in close proximity to one another tend to mimic each other in regard to revenue and expenditure. There is convincing evidence that local authorities take account of one another. According to the "yardstick competition" model, some local authorities mimic the policy of others because, in the absence of additional or better information, local voters take the results achieved in neighbouring municipalities as the basis for assessing their authority's policy. This may lead to some municipalities copying the fiscal policy of others. For Belgium and for the Flemish Region, too, (see in particular Heyndels and Vuchelen, 1998, and Merlevede et al, 2011), a long-term significant positive causal link has been demonstrated between, respectively, income tax surcharge and property tax surcharge rates in neighbouring municipalities, whether or not second order neighbours are included. The existence of "yardstick competition" generally implies a more effective policy since voters also use information on neighbouring municipalities to assess their politicians, thus increasing the politicians' accountability.

3.3.2 Tax base developments

The tax base for additional taxes consists of the tax revenues on which the additional percentages are levied. The local authority tax base is therefore determined partly by the decisions of the authorities levying the basic tax. In the 1990s, the federal government's decision not to index the personal income tax scales thus had a positive influence on the additional personal income tax revenues, while the federal government's decision in 2015 to reduce the burden on labour via the tax shift had a negative impact.

According to calculations by FPS Finance, on a cumulative, ex ante basis, the decline in local authority revenues due to the tax shift will gradually increase to reach € 331 million in 2021. However, the tax shift will also have some positive effects, such as boosting employment, which will attenuate its negative ex ante impact.

It should be noted that the statutory and contract officials of local authorities do not qualify for the reduction in social security contributions under the tax shift, as that reduction was reserved for the private sector.

TABLE 2 THE TAX SHIFT WILL DEPRESS LOCAL AUTHORITY REVENUES

(cumulative ex ante impact on primary balance(1), in € million)

	2015	2016	2017	2018	2019	2020	2021
Federal government	59	–799	–178	–1 420	–2 940	–3 492	–3 317
Regions	0	–65	–323	–458	–680	–1 015	–1 138
Local authorities	**0**	**–14**	**–76**	**–131**	**–178**	**–279**	**–331**
General government	59	–878	–577	–2 009	–3 798	–4 786	–4 786

Sources: FPS Finance, NBB.
(1) This is a simulation by FPS Finance dating from December 2016, based on the SIRe microsimulation model.

In some cases, the authority levying the basic tax took account of the impact of its decisions on the local authority tax base. The municipalities thus receive an "endowment" to make up for the fact that many buildings in their territory are exempt from the property tax. In the Walloon Region, compensation was provided for the municipalities at the time of the property tax reform and the reduction in the taxation burden of businesses under the Marshall Plan. The Brussels-Capital Region also provided compensation for the abolition of the property tax on machinery and equipment.

3.3.3 Speed of assessment

The speed of assessment mainly influences variations in the revenue from the surcharges on personal income tax. If the assessments are much slower or faster in certain years, the revenue from the additional personal income tax will be considerably lower or higher respectively.

In the past, the speed of assessment and the composition of the assessments determined the transfers from the federal government to the municipalities. It was therefore hard for the municipalities to predict how much they would receive by way of surcharges on personal income tax, and the amounts fluctuated widely from one month to the next. However, a system of personal income tax advances for the municipalities was introduced in September 2017, so that they receive a certain sum each month. This system of advances gives the municipalities some financial security on a cash basis, but it has no impact on the government budget balance according to the ESA 2010. In the government accounts, the amounts actually assessed still determine the surcharge on personal income tax taken into account, and advances are regarded as purely financial transactions.

3.4 Local taxes

The Belgian Constitution grants fiscal autonomy to the municipalities and provinces. Local authorities exercise that right by raising various taxes, but these only represent a small part of their revenue.

Familiar examples of local taxes include the tax on motive force, the tax on second homes, various forms of advertising tax (taxes on billboards, distribution of advertising material, illuminated signs), the tax on derelict buildings and slums, and the tourist tax. The municipalities (and provinces) also levy numerous other taxes which do not generally yield very much. For instance, there are taxes on dogs, financial institutions, and cash dispensers, private swimming pools, film screenings, sporting events, boat hire, etc.

As the supervisory authorities, the Regions have tried to limit the burden of local taxes in recent years.

In the Flemish Region the Flemish government and the Flemish municipalities and provinces concluded a "Local Pact". In exchange for a number of tax commitments on the part of the municipalities, including the abolition of the tax on office space and on staff, and the promise not to levy new, flat-rate taxes on households until 2012, the Flemish government took over part of the municipal debt in 2008. The debt transfer was limited to € 100 per capita and totalled € 626 million.

The Walloon Region initially tried to ease the local tax burden by means of the circular entitled "Tax truce for Wallonia". That circular, which among other things specified a maximum rate for a number of taxes and abolition of certain local taxes, was cancelled by the Council of State in 2002 because it restricted the fiscal autonomy of the municipalities. In recent years, the Walloon Region's circulars on the preparation of the municipal budget have included guidelines on local taxes which can be interpreted as strong recommendations by the Region. They thus list the local taxes which may be charged, and recommend a maximum rate for each of them, including the additional taxes.

In 2007 the Brussels-Capital Region created a tax compensation fund which aimed to involve the municipalities in the region's economic development via municipal taxation. In order to qualify for an indemnity from the tax compensation fund, Brussels municipalities have to conclude a three-year contract with the Region in which, among other things, they undertake not to increase the existing taxes and not to introduce any new ones without consultation. The first thing that the tax compensation fund achieved was abolition of the taxes on motive force and on computer screens. It was recently decided to regionalise the "hotel tax" in order to replace various local taxes levied on tourist accomodation ; the

tax compensation fund indemnified the municipalities for the abolition of that tax in 2016, while they have agreed to limit the additional percentages that they may impose on that levy.

3.5 Non-tax revenues

The past two decades have seen a steady decline in local authorities' income from assets. On the one hand, local authorities have sold off a number of substantial shareholdings, notably in the energy sector, leading to the disappearance of the dividend flows that the shares generated. As well as that, the low interest rate environment has also depressed income from assets.

Other non-tax revenues consist mainly of the proceeds from sales of goods and services. These include an indemnity to cover various services provided by the CPAS/OCMW, e.g. in the form of meals, child care or home care. However, the indemnity meant to fund those services is often set from a social point of view and therefore does not necessarily cover the costs involved. The proceeds from various "charges" or payments intended to fund a service provided by the local authorities, such as the levies on parking fees, refuse collections bags or container parks, are also considered to be revenue derived from the sale of goods or services in the general government accounts.

4. Primary expenditure of local government

This section examines the main expenditure categories and a range of challenges that local authorities must address in order to keep their expenditure under control.

4.1 Composition and trend

The primary expenditure of local government is estimated at 7.1 % of GDP in 2018. The wage bill, which comprises the gross pay and social security contributions of statutory and contract officials, represents more than half of that figure. Other significant expenditure items are purchases of goods and services, investment and social benefits. Half of the social benefits come from the CPAS/OCMW, whether they are benefits in cash (mainly integration allowances) or in kind. The other half consists of pension expenditure. Business subsidies, other current transfers and other capital expenditure make up a small part of the expenditure.

TABLE 3 PRIMARY EXPENDITURE OF LOCAL GOVERNMENT
(in % of GDP, local election years)

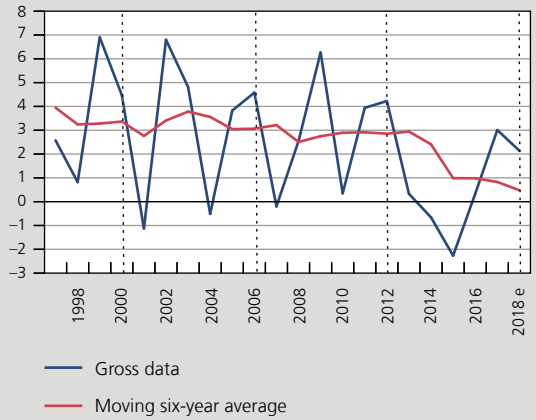
	2000	2006	2012	2018 e
Remuneration	3.4	3.7	4.1	3.9
Wages	2.4	2.6	2.8	2.6
Social security contributions	1.0	1.1	1.3	1.3
Current purchases of goods and services	1.0	1.0	1.1	1.2
Social benefits	0.6	0.7	0.8	0.8
Cash benefits	0.5	0.6	0.7	0.6
Benefits in kind	0.1	0.1	0.1	0.1
Business subsidies	0.0	0.2	0.1	0.2
Other current transfers	0.2	0.2	0.3	0.3
Gross fixed capital formation	1.0	0.9	1.0	0.8
Other capital expenditure	0.1	0.1	0.1	0.1
Total	**6.3**	**6.8**	**7.5**	**7.1**

Sources: NAI, NBB.

The pattern of primary expenditure of local authorities is very erratic. First, it features a six-year cycle – corresponding to the period of time between two municipal elections – generated by investment expenditure. In addition there is the effect of exceptional factors such as the police reform, which transferred numerous public sector jobs to the local authorities in 2002. However, it is possible to perceive the trend in local government expenditure with the aid of a moving average of primary expenditure growth calculated over six years. That moving average, which hovered around 3 % up to 2014, has now fallen. The decline seems to affect most expenditure categories, but is particularly marked in the case of public investment.

CHART 7 THE GROWTH OF PRIMARY EXPENDITURE HAS SLOWED

(percentage annual change in primary expenditure, data deflated by the GDP deflator)



Sources: NAI, NBB.

4.2 Investment expenditure

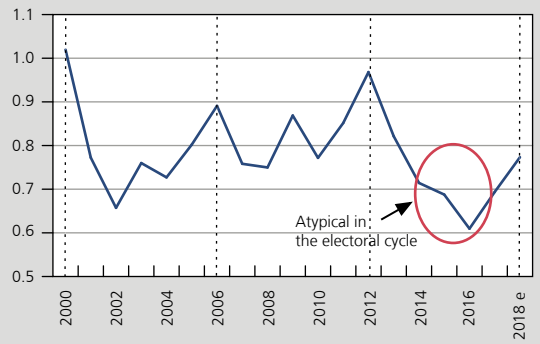
Local authority investment merits special attention. On average, it represents one-third of public investment in Belgium. This investment is relatively low at present, and therefore needs to be stimulated in view of the positive effect of this type of expenditure on potential growth.

Comparison of the profile during the current electoral cycle with that seen previously shows that public investment has been growing more slowly than usual for some years now. Local authority investment slackened pace as expected during the two years following the 2012 elections. After that, however, instead of regaining momentum as typically happens mid-term, it declined further in 2015 before dropping in 2016 to its lowest level in 30 years. In 2017, in the run-up to the autumn 2018 local elections, investment began to rise again. That growth is set to continue in 2018, but investment will be lower than in previous election years.

It already seems clear that local authority investment will have contracted during the electoral cycle that ends this year. The stricter budgetary rules introduced since 2014 by the regional supervisory authorities have probably played a part in that. While the reduction in investment favours the short-term consolidation of public finances, it is counter-productive in the longer term in view of the said impact on potential growth, because investment expands the capital stock, strengthening the economy's productive capacity.

CHART 8 LOCAL AUTHORITY INVESTMENT IS CURRENTLY RATHER LOW

(gross fixed capital formation, in % of GDP)



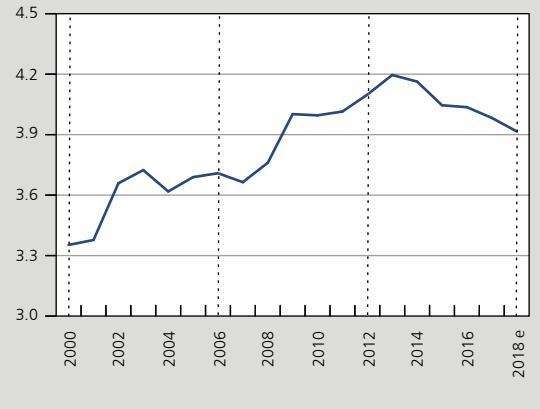
Sources: NAI, NBB.

4.3 Employment and pay

Local authority labour costs as a ratio of GDP increased almost continuously from 2000 to 2013, but since 2014 they have fallen slightly. The trend in labour costs is a result of such factors as employment trends and the reform concerning the funding of the pension scheme for statutory officials of local authorities. These two points will be examined in more detail below. In addition, the labour cost ratio was driven up by the drop in GDP in 2009, while the virtually zero growth of real GDP recorded in 2012 and 2013 also exerted upward pressure. Conversely, the index jump moderated labour costs in 2015 and 2016.

CHART 9 LABOUR COSTS INCREASED ALMOST CONTINUOUSLY UP TO THE START OF THE CURRENT LEGISLATURE

(compensation of employees, in % of GDP)



Sources: NAI, NBB.

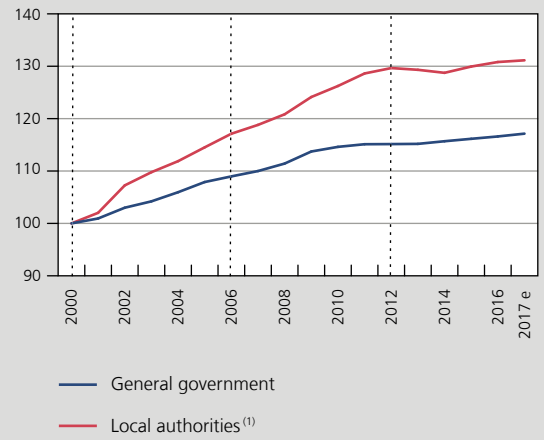
4.3.1 Trend in employment

In 2016, local authorities employed 317 000 persons, representing just over one-third of total employment in public authorities.

Local authority employment expanded strongly between the turn of the century, when employees numbered 243 000 persons, and the 2012 local elections. That expansion was a major factor in the increased labour costs. Since the start of the current legislature in 2013, however, the level of employment has stopped rising and appears to have stabilised.

CHART 10 AFTER RISING STEEPLY DURING THE PRECEDING PERIOD, EMPLOYMENT HAS REMAINED VIRTUALLY STABLE DURING THE CURRENT LEGISLATURE

(annual averages, 2000 = 100)



Sources: NAI, NBB.

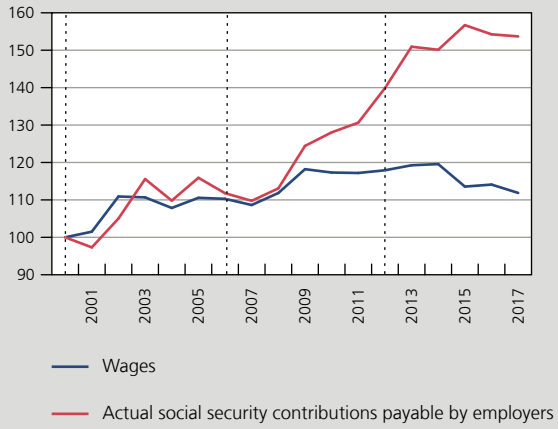
(1) Including persons brought into the labour market under Article 60 of the Organic Law on Public Social Welfare Centres of 8 July 1976.

4.3.2 Reform of the funding of the pension scheme of statutory officials of local authorities

If the components of labour costs, namely wages and employers' social security contributions, are examined separately, it is evident that it is mainly the social security contributions which have risen steeply in recent years. That is a direct consequence of the 2012 reform of the funding of the pension scheme for statutory officials of local authorities.

CHART 11 LABOUR COSTS WERE DRIVEN UP BY THE REFORM OF THE FUNDING OF THE PENSION SCHEME FOR STATUTORY OFFICIALS

(in % of GDP, 2000 = 100)



Sources: NAI, NBB.

Local authorities themselves finance the pensions for their statutory officials, until 2012 various schemes existed for this. The principal schemes were managed by the former National Social Security Office of the provincial and local authorities, and were financed on the basis of an apportionment system whereby a contribution levied on the wages of active statutory officials was used to finance the pensions of retired statutory officials. The contribution rates under these systems were no longer tenable, because the funding base was steadily shrinking while the number of pensioners was constantly increasing, partly as a result of population ageing.

There was also a shift from statutory posts to contract jobs in the local authorities, leading to a decrease in the funding base. Delayed statutory appointments – common practice in local authorities – were also a burden on the system, as the staff concerned were entitled to a pension as statutory officials, even though they had contributed hardly anything towards financing the statutory pension scheme during their career.

The funding of the pension scheme was radically reformed by the law of 24 October 2011, providing sustainable finance for the pensions of permanent staff of the provincial and local authorities and local police districts. A previous adjustment aimed at ensuring that the system was fiscally sustainable, notably by means of an initial increase in the contribution rates payable by local authorities – the basic contribution rate for the principal pension scheme (including the 7.5 % employee's contribution) was raised from 27.5 % in 2009 to 30 % in 2010 and 32 % in 2011 – had in fact proved insufficient. On 1 January 2012, the various pension schemes were merged in the Combined Pension Fund, financed on the basis of two principles: solidarity and accountability.

According to the principle of solidarity, at the end of a transitional period all the affiliated authorities pay the same basic rate of contribution to the Combined Pension Fund. Between 2012 and 2016, the basic contribution rates were gradually converted to a uniform basic contribution of 41.5 % (including the worker's 7.5 % contribution). However, the increase in the basic contribution rate was not the same for all local authorities, as some of them still had existing reserves, which tempered the rise in social contributions in their case. Since 2016, while some local authorities are still enjoying the benefit of reserves created previously, all the others are subject to a basic contribution rate of 41.5 %.

The steady rise in this basic contribution rate, starting before the 2012 reform, has increased the labour cost burden for local authorities in recent years. Moreover, since 2012 a number of local authorities, which used to provide pensions

themselves, are affiliated to the Combined Pension Fund and also pay social security contributions which contributed to the rise of labour costs in the general government accounts.

The accountability principle implies that local authorities whose pensions paid out by the Combined Pension Fund exceed the contribution that they pay into the fund must pay an accountability contribution. The purpose of that contribution is to ensure that the new funding system remains in balance. The contribution is calculated by taking the difference between the individual pension costs and the basic statutory contribution and multiplying that figure by an accountability coefficient which must be at least 50 %. In practice, the accountability coefficient for the years 2012 to 2015 inclusive was lower on account of recourse to the reserves of the former National Social Security Office of the provincial and local authorities, but since 2016 no further use has been made of any reserves. Local authorities which no longer have any statutory staff are fully accountable. They have to bear their pension costs themselves since they no longer contribute to the Combined Pension Fund. The first accountability contribution – relating to 2012 – was paid in 2013, triggering a rise in labour costs that year.

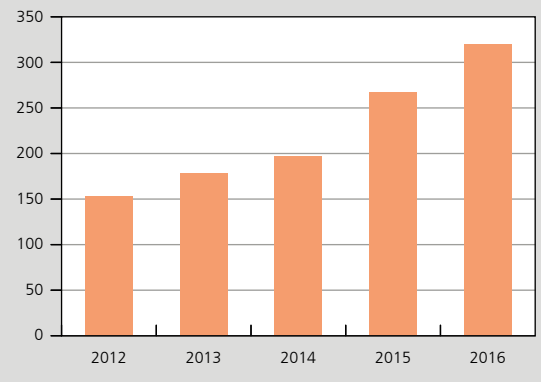
Via a knock-on effect, the pension reform has also contributed to the increase in the municipal allocation to the CPAS/OCMW and the police and emergency rescue districts in recent years. The pension reform is therefore exerting both direct and indirect pressure on municipal finances.

4.3.3 Pensions costs are set to increase further

In the years ahead, social contributions are expected to increase further, and that will also drive up the labour costs of local authorities. The uniform basic contribution rate that local authorities must pay into the Combined Pension Fund is set at 41.5 % up to and including 2020, but could subsequently rise again if the costs of population ageing increase.

In recent years the accountability contribution has increased steadily, and that rise is likely to continue in the coming years. Various factors play a role here. Some local authorities which do not as of yet pay any accountability contribution will have to do so in the future. Furthermore, local authorities already paying a contribution may have to pay a higher contribution as the gap widens between pension costs and the basic contribution paid. Finally, the accountability coefficient itself may also increase. For 2016 it still stood at 50 %, but is expected to rise in the future.

CHART 12 THE ACCOUNTABILITY CONTRIBUTION
(in € millions)



Source : Federal Pensions Service.

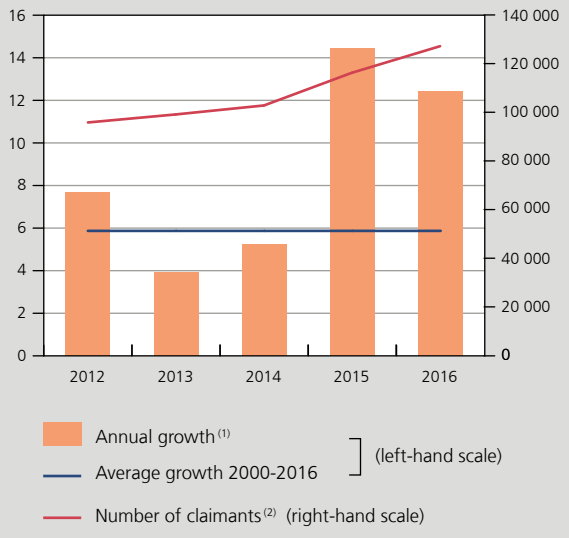
The federal parliament recently approved a law[1] which will also have repercussions on the financing of the Combined Pension Fund. Among other things, the law introduces hybrid careers for determining officials' pensions. This means that an official's pension will be paid only for the years in which the person worked as a statutory official; for years worked as a contract official, an employee's pension will be paid. For the local authorities, this adjustment will mean that statutory appointments of contract workers occurring at a late stage in a person's career will no longer place a burden on pension fund expenditure. The law also makes provision for a federal contribution to the Combined Pension Fund. Part of the proceeds from the wage moderation contribution that local authorities pay to social security will be refunded to them in the form of an allocation to the Combined Pension Fund. That allocation will amount to € 121 million per annum for the years 2018 to 2020. These factors should attenuate the rise in the accountability contribution expected in the coming years. Other elements of the law form an incentive to establish a supplementary pension for contract workers via a reduction in the accountability contribution (to be offset by authorities not eligible for that reduction, in order to ensure that the Combined Pension Fund remains in balance) and a change in the timing of the payment of the accountability contribution via a system of monthly advances during the current year.

4.4 Expenditure relating to the integration allowance

Integration allowances paid out by the CPAS/OCMW are an important local authority social benefit. In 2000, expenditure on the integration allowance represented 0.1 % of GDP, but it has gradually increased to 0.3 %. It has also risen in real terms during the current legislature. That rise is largely due to the constant increase in the numbers claiming the integration allowance.

CHART 13 EXPENDITURE ON THE INTEGRATION ALLOWANCE HAS SOARED RECENTLY

(percentage changes compared to the previous year, unless otherwise stated)



Sources: Federal Social Integration Planning Service, NAI, NBB.

(1) Expenditure adjusted for the actual indexation of social benefits (or theoretical indexation for 2015 and 2016, owing to the index jump).

(2) The average monthly number of integration allowance claimants.

(1) Law of 30 March 2018 disqualifying the services of non permanently appointed personnel from counting towards a public sector pension, amending the individual accountability of the provincial and local authorities within the Combined Pension Fund, adapting the rules on supplementary pensions, amending the arrangements for financing the Combined Pension Fund of the provincial and local authorities, and providing supplementary finance for the Combined Pension Fund of the provincial and local authorities.

In 2015 and 2016, the real growth of expenditure on the integration allowance was considerably higher than in preceding years, as a combination of several factors caused the numbers claiming the integration allowance to rise more sharply than before during those two years. Following the reform of the unemployment benefit system and the time limit on the employment support allowance with effect from 1 January 2015, many people who previously received other benefits now get an integration allowance. The 2015 asylum crisis also contributed to the increase in those two years via a rise in the number of recognised refugees who can claim an integration allowance. Also, since 1 December 2016, persons granted temporary residence under subsidiary protection have been entitled to an integration allowance, whereas they previously received the equivalent of an integration allowance under the right of social assistance.

Recent years have seen not only a rise in the number of recognised refugees receiving an integration allowance, but also a sharp increase in the number of student claimants.

4.5 Local authority efficiency gains

All levels of government have to aim at efficiency. Local authorities, too, must ensure that they perform their tasks as well as possible using the fewest possible resources. There are certainly still efficiency gains to be made at local government level. To achieve those gains, local authorities can improve their community services, cut their expenditure, or pursue those two aims combined.

Efficiency gains entail the adoption of a structural approach whereby local government tasks are analysed and choices are made. It is necessary to ascertain which levels of government can best perform which tasks, in order to avoid overlapping and exploit economies of scale. The operation of local public services must also be organised in the best possible way, in particular by making optimum use of IT applications and by simplifying procedures.

In recent years a number of measures have been taken at local level to boost efficiency via structural reform and the exploitation of economies of scale. The aim of these measures is to reform the operation of the provinces, to merge municipalities, and step up the collaboration between the CPAS/OCMW and the municipalities.

4.5.1 Reform of the provinces

The Flemish Region has for some years now been reforming the structure of its local authorities, the aim being to create a simple and efficient administrative system divided into a limited number of levels. In this connection, the list of tasks to be performed by the provinces has been shortened in recent years. Since 2014, the provinces have only been able to exercise person-related powers when those powers have been granted to them by decree. On 1 January 2018, the list of their tasks was shortened further and confined to territory-related powers. Except for provincial education, all person-related powers which were still exercised by the provinces were transferred to the Flemish Community or to the municipalities.

Since the list of their responsibilities has been reduced, the provinces also need fewer resources. The provincial fund was abolished in 2015, and since the 2018 tax year the provincial surcharges on the property tax have been subject to a maximum rate. In fact, the provincial surcharges were partially incorporated in the basic regional levy in order to fund the transferred powers: with effect from the 2018 tax year, the regional property tax rate will rise from 2.5 % to 3.97 % (1).

The Walloon Region has also revised the powers of the provinces. Provincial roads were transferred to the Region in 2015, and since then the provinces have also ceased to be responsible for housing policy and energy policy. This produced savings for the provincial fund. The new Walloon government, which took office in the summer of 2017, announced its intention to conduct a radical reform of the provinces. In that connection it will examine the best level of government for exercising the powers of the provinces. Provincial structures such as the provincial college or the provincial council are set to disappear or take on a different form.

(1) The increase in the basic rate of the surcharges also has repercussions on the municipalities. If they leave their surcharges unchanged, the revenue from the property tax increases in proportion to the rise in the basic levy. As at the time of the previous increase in the basic levy in the Flemish Region (from 1.25 % to 2.5 % in 1991), the municipalities should reduce their surcharges by a certain factor (1.588) so that the revenue that they derive from the property tax remains constant.

4.5.2 Merger of the municipalities

During the current legislature, the Flemish Region encouraged voluntary mergers between municipalities, as such mergers can help to achieve the aim of efficient management via economies of scale. The municipalities which will merge on 1 January 2019 and which took the formal decision before 1 January 2018 were given the incentive of a financial bonus in the form of assumption of their debt up to € 500 per capita, subject to a maximum of € 20 million per merger. The merged municipalities also received a guarantee that their share in the Municipal Fund would not be less than the sum of their shares in the year preceding the merger. In addition, they will be able to appoint a greater than normal number of representatives for two legislatures. Fifteen Flemish municipalities accepted this offer and decided to merge on 1 January 2019. Although mergers are still possible, the financial bonus in the form of debt assumption will no longer be granted.

In its July 2017 agreement, the Walloon government also announced that it would encourage voluntary mergers between municipalities. The Walloon Region is to introduce a financial incentive and provide regulatory, administrative and technical support.

Finally, in regard to efficiency gains and economies of scale, some (Flemish) police districts have also merged and the municipalities have also established more intermunicipal partnerships in recent years. For instance, they have created care institutions covering multiple municipalities.

4.5.3 Increasing collaboration between the CPAS/OCMW and the municipalities

The Flemish Region wants to unify social policy at local level. For that purpose the CPAS/OCMW centres will be integrated into the municipalities wherever possible from 1 January 2019 onwards, taking account of their separate legal personalities. It has emerged that full integration in which the CPAS/OCMW centres cease to be separate legal entities was not legally feasible, as some tasks – such as the payment of integration allowances – are specifically devolved to the CPAS/OCMW in federal legislation and cannot currently be taken over by the municipalities.

The two entities will be integrated in a number of spheres. At political level, members of the municipal council will automatically become members of the CPAS/OCMW council at the start of the new legislature, so that the same people will devise the local social policy. The CPAS/OCMW permanent bureau will correspond to the municipal executive. In administrative terms, the staff of the municipality and the CPAS/OCMW will be managed in the same way and will come under the same general and financial directors. In addition, the CPAS/OCMW and the municipalities will form a single unit in the next policy and management cycle, and will therefore have to work together to draft their multiannual plan. Compliance with the equilibrium criteria will now be checked at overall level, rather than separately at CPAS/OCMW and municipality level.

In the Walloon Region, the government stated its intention of facilitating closer collaboration between the municipalities and the CPAS/OCMW on a voluntary basis. Better use could be made of a number of synergies, e.g. by sharing certain support services concerning IT, for example. The circular on the drafting of the 2018 municipal budgets called on the municipalities to make maximum use of existing synergies.

In the Brussels-Capital Region, a merger between the CPAS/OCMW and the municipalities does not appear to be on the agenda at present. In its July 2014 policy statement, the United College of the Joint Community Commission planned to make the CPAS/OCMW the spearhead of local social policy. For that purpose, additional staff and resources were to be made available. However, the aim is to make use of synergies between the CPAS/OCMW centres, notably in regard to computerisation.

Conclusion

Belgian local authorities' finances are sound. Their budgets are practically in balance, or recorded small surpluses and this for nearly all components of the local government. Moreover, the debts of this subsector of general government are relatively small.

The budgetary supervision exercised over local authorities has contributed to this favourable financial position, In the 1980s, the equilibrium principle was introduced for municipal finances, and that eliminated the deficits. Since then, the Regions have taken over responsibility for budgetary supervision and have made a number of additions and revisions which have strengthened the budgetary framework a little more. That may account for the relatively low level of local authority investment expenditure, in comparison with previous electoral cycles.

However, local authorities face a number of financial challenges. Those challenges include the increased cost of financing their statutory officials' pensions and the growing use of integration allowances and social services. Numerous other factors will also exert upward pressure on expenditure or downward pressure on revenues.

In order to address these challenges, the central concern must be to increase local government efficiency. Steps were taken recently in that direction, but in the years ahead it is vital to maintain the efforts to improve the quality of community services and to maintain strict control over expenditure.

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Can China avoid the middle-income trap ?

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D. Essers
E. Vincent (*)

Introduction

China's economic development is the success story of recent decades, but Chinese growth has lost momentum in the past few years. Such a slowdown is common as a country's wealth increases, and China is now generally considered to be a middle-income country : the average Chinese citizen's purchasing power (1) is now about a quarter of that of the average American. Since 2010, China has been the second largest economy in the world – after the United States – on the basis of nominal GDP, or the third largest if the current European Union is taken as a whole. The country owes its position partly to its huge population.

Against that backdrop, future economic developments in China are vitally important for the state of the global economy. The slightest sign of a possible hard landing for the Chinese economy can spark nervousness on the financial markets and erode global confidence, as the recent past has already demonstrated. If the country would then fail to get its economy back on track, it could fall into the "middle-income trap". Nonetheless, in the positive scenario of a continuing gradual growth slowdown without a crisis, China could become the largest economy in the world by around 2030. That would imply substantial shifts and create new challenges for the current world order.

This article begins by illustrating the "middle-income trap" concept. Next it examines China's principal vulnerabilities which increase the risk of a sharp fall in growth, and then China's strengths that could enable the country to continue its convergence towards high-income countries. However, China's development strategy can expect ever less support from the international environment, as is evident from the recent trade war with the United States and the growing opposition to Chinese investment in the United States and Europe. The article therefore also takes a look at the mounting tensions, before concluding.

1. The "middle-income trap" concept

The recent slackening of the growth rate – down from an average of over 10 % between 1980 and 2010 to an average of around 7 % in the past few years – has raised the question of whether China is at risk of falling into the middle-income trap. The concept of the middle-income trap originated from the observation that a number of countries have remained

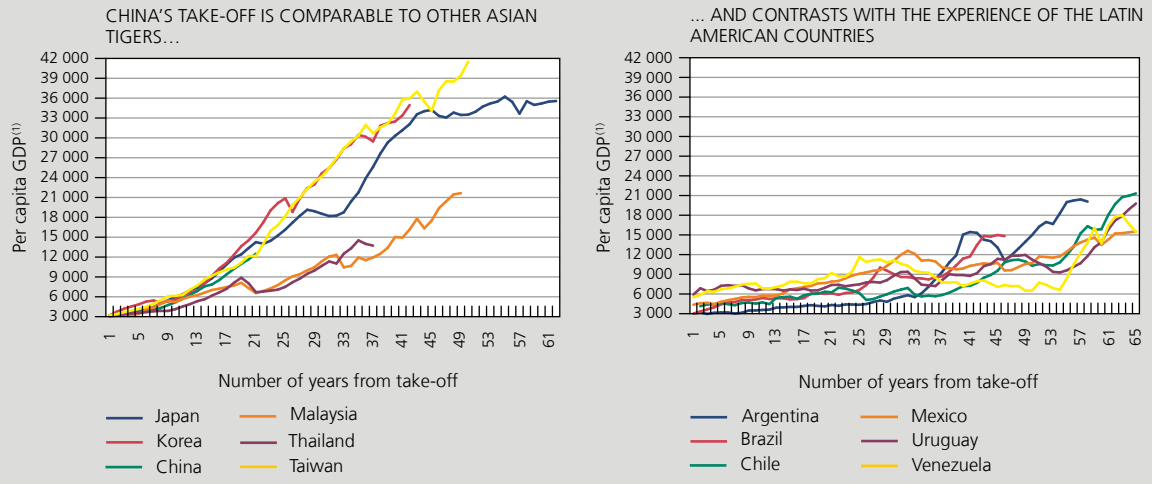
(*) The authors would like to thank Paul Butzen (NBB) and members of the ECB China Expert Network for their input and useful comments.
(1) The criterion for calculating purchasing power is per capita GDP in terms of purchasing power parity (2011, US dollars). In this article, per capita GDP is always expressed in terms of purchasing power parity.

for a protracted period (50 years) in the category of middle-income countries based on their per capita GDP, and have not joined the group of advanced countries. This indicates that the transition from a middle-income to a high-income country is much more difficult than the first development phase, from a low-income to a middle-income country.

The reason for this is that, over time, the drivers of the initial growth model disappear, while it is more difficult to establish a new growth strategy. During the economic take-off phase, growth is driven by the employment of abundant, cheap labour as a result of the switch from agriculture to jobs in manufacturing and services, and by the attraction of foreign direct investment, aimed at the development of exports and the transfer of technology. As the labour reserves are being exhausted and basic technologies are acquired, a country has to focus increasingly on sustaining productivity growth within sectors. To achieve that, it is necessary to switch to higher value added products by means of indigenous innovation and industrial upgrading. That also requires the support of structural reforms and investment in education and infrastructure. For many countries, such a process is very gradual, so that they are very slow to converge towards the advanced countries.

By analogy with Aiyar *et al.* (2013), we define the take-off as the year in which a country's per capita GDP first exceeds $ 3 000. Latin American countries achieved that income level sooner than Asian countries, with the exception of Japan. But the first- generation Asian tigers[1] (South Korea and Taiwan) have since achieved a much higher per capita GDP and are now ranked among the advanced countries. These countries show that the middle-income trap can be avoided. In contrast, the Latin American countries are examples of slow convergence and one can argue they have fallen into the middle-income trap.

CHART 1 CHINA'S TAKE-OFF IS SPECTACULAR, BUT THERE IS STILL A LONG WAY TO GO



Sources: Penn World Tables 9.0, own calculations.
(1) Real GDP in US dollars, based on purchasing power parities, base = 2011.

The take-offs of Malaysia and Thailand, and more recently that of China, too, closely resemble the take-offs of the most successful Asian countries, but it is too soon to draw any definite conclusions. Empirical studies on the middle-income trap have shown that middle-income countries more frequently experience a marked growth slowdown than the wealthiest countries. Eichengreen *et al.* (2011 and 2013) define a marked slowdown as a decline in the growth of per capita GDP of at least 2 percentage points between two consecutive seven-year periods. A replication of that study based on more recent data confirms that the risk of a sudden slump in growth peaks at a level of per capita GDP

(1) Singapore and Hong Kong are also among the first wave of Asian tigers, but since they are small countries that are not really comparable to China, we have not taken them into account.

between $ 10 000 and $ 11 000, and that the risk remains significant up to a level of $ 20 000 (Dieppe *et al.*, 2018). In 2014, China's per capita GDP was approximately $ 12 500, a level comparable to that of Japan, Taiwan and Malaysia on the eve of their first growth slowdown. As already mentioned, China's economic expansion has also slackened pace considerably in recent years. However, that gradual slowdown certainly does not constitute a hard landing which would increase the likelihood of the doom scenario of a middle-income trap. Indeed, the Chinese economy is still growing faster than any of the advanced economies and is steadily continuing its income convergence.

2. The main economic vulnerabilities in today's China

However, there is also a downside to the vigorous economic growth of recent decades. Adverse secondary effects include a very large proportion of (ever less profitable) investment in GDP to the detriment of consumption, a high debt ratio due to the rapid expansion of the financial system, a relatively underdeveloped service sector, surplus production capacity in various sectors of manufacturing, growing income inequality, a highly energy-intensive production structure and increasing stress on the natural environment from pollution. Correction of these imbalances, which is essential to maintain the country's financial and political stability, will weigh on future growth. In addition, China faces adverse demographic trends. Below we discuss some of these factors in more detail.

China's growth model is in various ways similar to that of its successful Asian predecessors, e.g. in its strong focus on exports, which have long been supported by an undervalued exchange rate. Moreover, the rapid export growth has benefited from inward foreign direct investment in specially created economic zones, and from massive domestic investment in the expansion of industrial production capacity and in support infrastructure and urbanisation. The government has also played a key role in that process. In comparison with pure market economies, the Chinese government has more options and instruments available to steer the economy. It maintains control over strategic sectors (communication and transport networks, financial sector, (social) media) via public ownership, substantial public support, implicit State guarantees, strict controls, and networks linking the private sector and the Communist Party (the most successful business leaders are Party members), and it continues to own all the land.

In the wake of the global financial crisis, this investment-based growth strategy was further intensified with a massive monetary and fiscal stimulus programme, which mainly took the form of yet more investment in infrastructure and real estate, triggering a housing market bubble. As a result, China's gross investment ratio peaked at 47.3 % of GDP in 2011. Several Asian countries – and Germany, too – recorded similar peaks at an earlier development stage.

In comparison with other countries, China stands out as having an extremely unbalanced expenditure structure, with a gross investment ratio of 46 % of GDP in 2014 and a consumption ratio of only 37 % of GDP. The low share of consumption in China reflects the traditionally high household saving ratio, which remained stable at around 25 % between 1990 and 2015. This in turn can be explained by the lack of an adequate social security safety net, the existence of a demographic dividend[(1)] up to 2010, and a repressive financial system with low, State-imposed ceilings on deposit interest rates (abolished in 2015), an initially limited offer of savings products, and strict capital controls. The adverse secondary effects already mentioned, which will be discussed in more detail below, indicated that the limits of the current growth strategy had been reached and rebalancing was becoming increasingly necessary. Since 2011, the pace of investment has slowed somewhat, and the government has also adopted measures to support consumption, such as a rise in (minimum) wages and expansion of the social security safety net. Among other things, these measures have enabled consumption to become a more significant driver of growth than capital formation, and the gradual rebalancing process has begun.

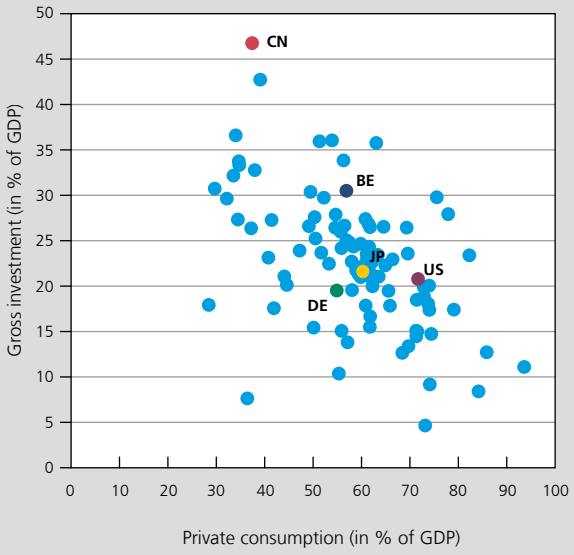
The experience of other countries where rebalancing[(2)] away from investment has taken place shows that the transition to a more moderate pace of investment has generally not been immediately offset by a marked increase in consumption, so that a growth slowdown has proved inevitable (Lodge, 2013). In the specific case of China, recent studies[(3)] indicate

(1) Economic take-off is often accompanied by a decline in fertility and a rise in average life expectancy. Before such time where smaller population cohorts become of working age, there is a demographic window of opportunity in which the percentage of people of working age increases and the dependency rate declines. This is known as the "demographic dividend". In so far as workers save and inactives do not, the demographic dividend leads to a higher savings ratio.

(2) Rebalancing is defined as a situation where there is a fall of at least 4 percentage points in the average share of investment in GDP between two consecutive seven-year periods.

(3) See Chivakul and Kassner (2018) and Ma *et al.* (2016).

CHART 2 LIMITS OF THE CURRENT GROWTH STRATEGY: EXPENDITURE IMBALANCES
(2014)



GROSS INVESTMENT PEAK

Country	% of GDP	Peak year
China	47.3	2011
Japan	40.6	1973
Korea	43.0	1979
Malaysia	50.4	1995
Thailand	49.0	1996
Belgium	31.9	1964
Germany	43.1	1960
United States	28.6	1984

Source: Penn World Tables 9.0.

that, at first instance, slower investment growth will probably have a negative impact on consumption dynamics via the income effect, given that investment is a major source of employment, particularly in infrastructure and real estate. A second potential negative effect would arise if a slackening pace of investment led to less favourable future prospects. Moreover, the high degree of income inequality[(1)] may put a brake on more vigorous consumption. It is mainly the poorest provinces that remain heavily dependent on investment as the engine of growth.

Furthermore, in China we also find a close link between expenditure imbalances and production imbalances. Relative to its level of economic development, China is characterised by a relatively large share of manufacturing in output (43 % of GDP in 2014) and a relatively low proportion of services (48 % of GDP in 2014). A comparable output structure can be observed in some other Asian countries (Indonesia, Malaysia and Thailand) which also pursue an export-centred growth strategy. The rebalancing in China is therefore taking place on both sides in parallel. As services are generally more job-intensive than manufacturing, the shift towards consumption and a service society may be accompanied by net job creation, despite the resulting growth slowdown.

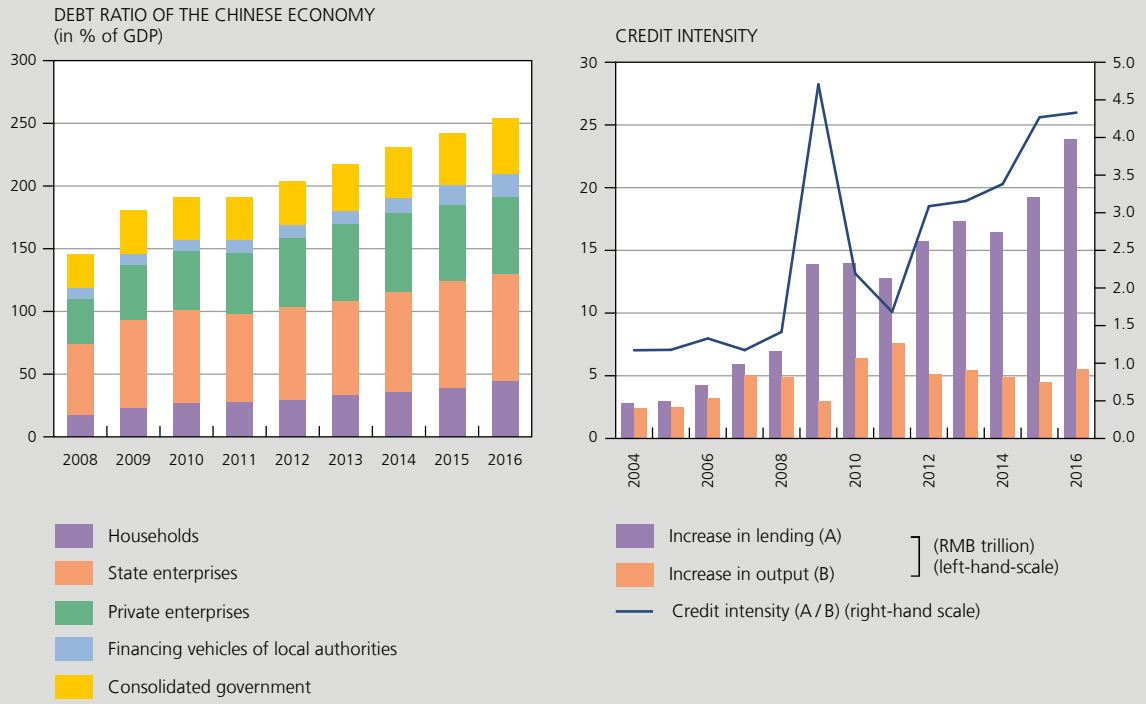
Concerns about China's financial stability have also increased in recent years, as the rapid accumulation of capital has been accompanied by an equally rapid increase in the debt ratio of the non-financial sector, up from 150 % of GDP in 2008 to 250 % of GDP in 2016. This debt expansion is concentrated mainly in the non-financial corporate sector, which also encompasses State-owned enterprises and local authority financing vehicles[(2)]. Such rapid credit expansion is cause for concern, as the experience of other countries has shown that it quite often precedes a financial crisis. Even if such a crisis can be averted, a gradual unwinding of the credit cycle often leads to a sharp growth slowdown. Moreover, the debt ratio of the Chinese economy is high for a middle-income country.

Since the global financial crisis the credit intensity of Chinese growth has increased markedly. This declining return on investment indicates that new loans are being granted to fund investment projects which are ever less profitable,

(1) The Gini coefficient for China was 47 % in 2015; the corresponding value ranges between 25 % and 40 % for the advanced countries and other developing Asian countries (South Korea, Malaysia, Thailand), but is almost 50 % for India.
(2) Local authority investment is generally financed off balance sheet by means of special purpose vehicles.

including real estate projects in "smaller" cities. State-owned enterprises are preferential partners in loan contracts because they have implicit State guarantees and are therefore regarded as less risky. They have played a dominant role in the rapid expansion of Chinese infrastructure and have extended their activities to real estate, particularly since the global financial crisis. They also remain strongly represented in heavy manufacturing, which currently faces excess production capacity. For these reasons, State-owned enterprises are less profitable than private enterprises, and the gap between them has widened considerably since the 2007 crisis.

CHART 3 A HIGH DEBT RATIO AND RAPID CREDIT EXPANSION PRESENT A RISK FOR CHINESE GROWTH



Sources: CEIC, IMF, own calculations.

Finally, the rapid development of the Chinese financial sector also gives rise to financial risks (IMF, 2017b). That expansion is taking place both at the level of traditional banks, particularly those of medium size which are generally more vulnerable than the "Big 5" commercial banks[1], and in the "shadow" banking sector. Ehlers *et al.* (2018) define shadow banks on the basis of their main characteristics (specific to China), namely (a) they are literally institutions which grant loans in the shadow of the commercial banks, in order to circumvent the regulations, and which concentrate on riskier sectors such as real estate, local authorities, private enterprises and SMEs; (b) they raise finance by issuing risky investment instruments; (c) in so doing they enjoy implicit or explicit guarantees provided by the commercial banks with which they are associated; (d) the interlinkages between traditional banks and shadow banks are rather obscure; and (e) they make less use of complex financial techniques than their counterparts in the advanced countries. Hence, Chinese financial development has been accompanied by an increasing complexity of the financial system and a rise in the associated risks.

The Chinese government is aware of these risks and is now giving high priority to financial stability. In recent years, numerous measures have been taken to discourage risky practices, increase transparency, and strengthen the supervision

(1) The "Big 5" commercial banks are the Industrial and Commercial Bank of China (ICBC), China Construction Bank (CCB), Bank of China (BOC), Agricultural Bank of China (ABC) and Bank of Communication (BOCOM). The first four are traditional government banks, while in the case of BOCOM, the central government holds a majority stake and HSBC (strategic partner) has a minority stake. These five institutions are listed on the stock market and are among the largest banks in the world.

of shadow banks. Consequently, credit growth has now subsided to its lowest level since 2015. However, the financial excesses are closely connected with the expenditure imbalances in favour of investment, implying that a simultaneous approach is required. Various media report that the central government is adopting measures to discourage debt-financed local authority investment projects. It remains to be seen whether that strategy will be maintained if the real economy experiences a sharper than expected slowdown.

A final very important factor expected to weigh on China's potential growth in the future is the rapid ageing of the population, due partly to the government's one-child policy. In China, the share of the population of working age (15-64 years) in the total population peaked in 2010. At that time, Chinese per capita GDP was barely 20 % of that of the United States: never before has a country's population entered the ageing phase at such a low level of convergence[1]. According to IMF estimates (IMF, 2017a), in the next three decades this demographic transition will result in an annual average decline in Chinese growth of almost 1 percentage point. The disappearance of the demographic dividend and the speed of China's population ageing mean that, in order to achieve further convergence with the income levels of the advanced countries, China will have to adapt its policy much more quickly by focusing on boosting productivity, in particular by replacing low-skilled older workers with a smaller number of highly skilled younger workers, and on expanding its social security safety net.

3. China's current strengths

Despite the said factors hampering growth, China is fortunate to have a number of strengths which may facilitate its transition to a growth model based on productivity gains. The opening up of the country to international trade and foreign direct investment have contributed to a relatively favourable composition of its export basket, with high-tech products representing an ever-increasing share. The old growth strategy also led to a rapid improvement in the supporting infrastructure. What is more, under the powerful authority of its president Xi Jinping, China has developed a vision for the future which should ensure that, by 2050, it becomes an advanced economy with significant global influence. That vision, known as "Thought on Socialism with Chinese Characteristics for a New Era" was recently incorporated in the Chinese constitution. It comprises an aggressive industrial policy translated into multi-year plans with binding targets at all levels (central government, local authorities and all industrial sectors). As well as pursuing the essential rebalancing, the main targets set in these plans concern the upgrading of Chinese industry, bringing it to the top end of the spectrum, and the pursuit of international integration via trade, foreign investment and the opening up of the neighbouring regions in the context of the new Silk Road (Belt and Road Initiative).

Economic research has already repeatedly demonstrated the importance of countries' export structure for long-term growth. More specifically, the production of sophisticated goods (and services) can trigger a process of learning and innovation, and thus stimulate increased productivity. Here, the degree of product sophistication is defined on the basis of the PRODY index[2] of Hausmann *et al.* (2007). That intuitive index is calculated as the weighted average per capita GDP (Y_c) of countries exporting a given product (k), in which a country with a greater revealed comparative advantage[3] in exporting product k is accorded a higher weight.

$$PRODY_k = \sum_c \frac{(x_{ck}/X_c)}{\Sigma_c (x_{ck}/X_c)} Y_c$$

The underlying idea is that rich countries specialise in exporting sophisticated products, while poor countries concentrate on simple, labour-intensive goods. On the basis of United Nations trade data and our own calculations, we find that China's export basket was fairly diversified over the period 2000-2016 and comprised products/sectors with low, moderate and high levels of sophistication (cf. horizontal axis). Moreover, it is mainly in the sectors with a moderate to high degree of sophistication – such as telecommunications equipment, transistors and valves,

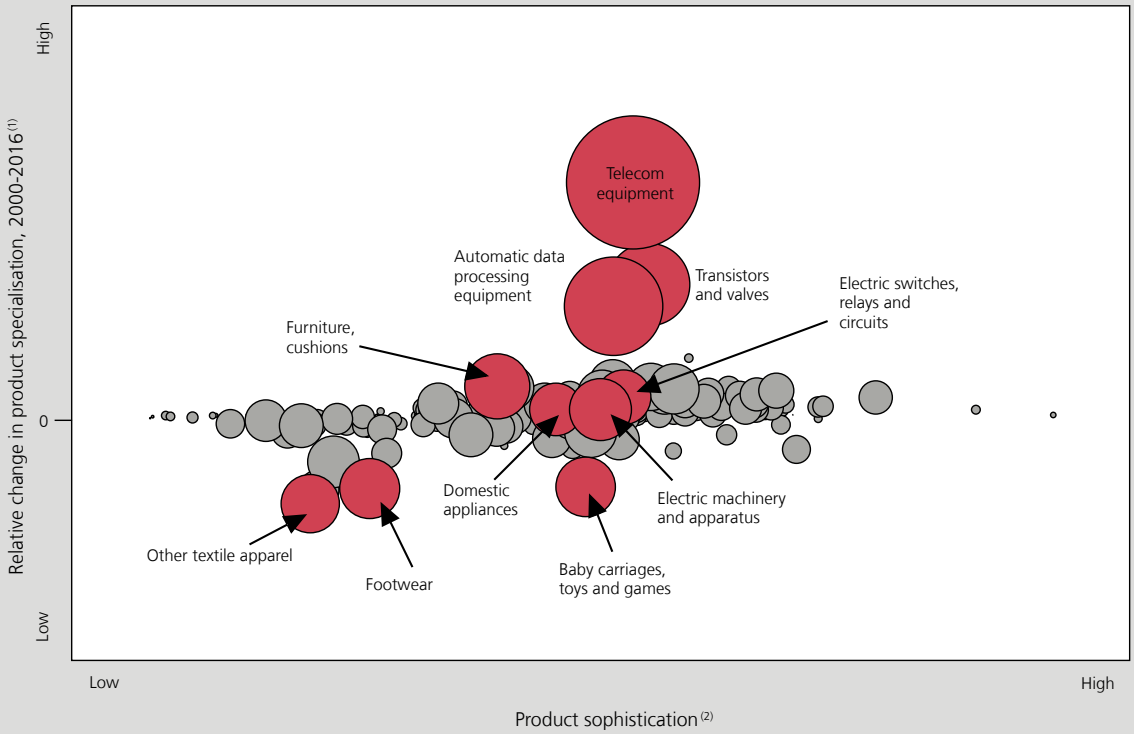
(1) For comparison, in Europe (in France, Germany, Italy and Belgium) and in Japan, the share of the population of working age peaked in about 1990, when per capita GDP stood at just over 80 % of that of the United States in its peak year; in Taiwan, this occurred in 2014 at a comparable level of convergence, while in South Korea it occurred in 2013, when the convergence level was 60 %.

(2) The advantage of this index is that it does not require detailed data or a subjective opinion on a product's complexity as regards its technological content or the specialist skills involved in the production process. An alternative index developed by Lall (2000) uses a typology (with values ranging from 1 to 5) to define the technological intensity of a product according to the necessary expenditure on research and development and other aspects relating to the production process. That index requires a great deal of data and a high dose of judgement, and becomes outdated as technology advances. Nevertheless, the two methods mentioned here lead to the same conclusion on the relative sophistication of Chinese exports.

(3) The revealed comparative advantage in sector k is calculated here as the ratio between the share of the sector in a given country c's total exports (x_{ck}/X_c) and that same sector's share in global exports $\sum_c (x_{ck}/X_c)$.

computers and other electronic equipment, and electrical machinery – that China had won substantial market shares by 2016, as shown by the size of the corresponding circles. Finally, we observe a shift in the specialisation of Chinese exports, from less sophisticated sectors such as textiles, footwear and toys, towards the more sophisticated sectors mentioned above (cf. vertical axis). This is a first indication that Chinese exports are moving towards the upper end of the product range.

CHART 4 CHINA HAS INCREASINGLY SPECIALISED IN MORE SOPHISTICATED EXPORT PRODUCTS, FROM TEXTILES TO ELECTRONICS



Sources: Own calculations based on UN Comtrade data (SITC rev. 3, 3-digit product classification) and data on per capita GDP (PPP) obtained from the IMF World Economic Outlook (WEO).

(1) The y-axis expresses the percentage point difference between the growth of the share of the product category considered in total Chinese exports between 2000 and 2016 and the corresponding growth of the share of the same product category in total world exports.

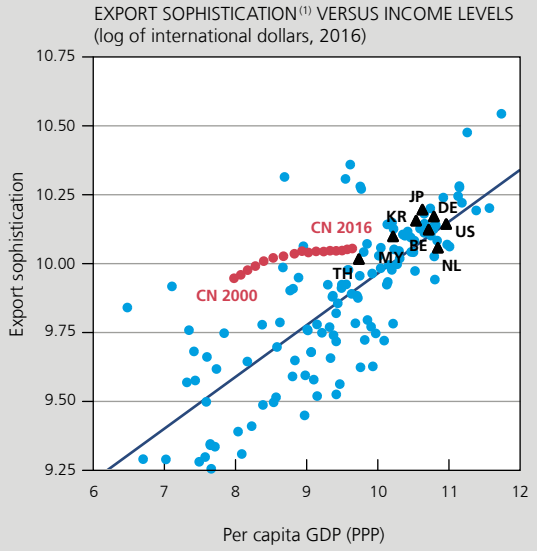
(2) Product sophistication, on the x-axis, is calculated as the average value of the PRODY index over the period 2000-2016, in other words, the weighted average of per capita GDP of all countries exporting a particular category of products during the period in question (see Hausmann *et al*. 2007). The size of the circles is proportional to the share of the product category in total Chinese exports in 2016. Only the ten largest product categories in Chinese exports are labelled.

A second index (EXPY), used to measure the degree of sophistication of Chinese exports as a whole, was obtained by calculating the weighted average, at country level, of the PRODY indices corresponding to the exported goods. In this case, the weighs are given by the corresponding export shares:

$$EXPY_c = \sum_k \left(\frac{x_{ck}}{X_c}\right) PRODY_k$$

A higher value for the EXPY index implies that a country has a more sophisticated export basket. Given the way the EXPY index is constructed, there is a strong positive correlation with a country's per capita GDP. From 2000 to 2016, China was always above the regression line, which means that its export basket resembles more that of rich countries than its per capita GDP would suggest. More particularly, the degree of sophistication of China's exports in 2016 was comparable to that of the Netherlands, even though the latter is three and a half times as rich, but was still slightly lower than that of some other advanced countries (Belgium, Japan, Germany and the United States).

CHART 5 THE UPGRADING OF CHINESE EXPORTS WAS PARTICULARLY RAPID DURING THE FIRST HALF OF THE PERIOD 2000-2016



Source: Own calculations based on UN Comtrade data (SITC rev. 3, 3-digit product classification) and data on per capita GDP (PPP) obtained from the IMF World Economic Outlook (WEO).

(1) The measure used for the sophistication of total exports is (a logarithm of) EXPY, i.e. the weighted average of per capita GDP corresponding to the countries' export baskets, the sophistication at product level being calculated as the PRODY index for the period 2000-2016 (see Hausmann *et al.* 2007 and the previous chart). The line indicates the best linear fit for the 2016 data.

In line with the rising prosperity, the sophistication of Chinese exports has increased considerably since 2000, starting from an already remarkably high level in 2000 (1). The progress towards an export structure closer to that of the advanced countries was most pronounced in the first half of the period considered, and seems to have decelerated after 2008. While it might be ever more difficult to continue increasing the sophistication of exports, it should be noted that the index does not take into account variations in quality or the location where value added is created.

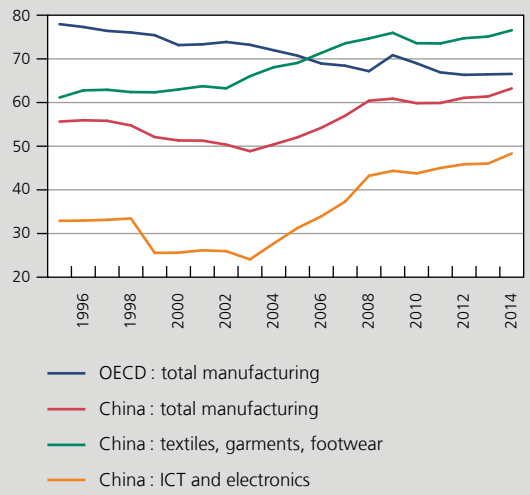
However, the fast rise of China as an exporter of sophisticated goods and a formidable competitor for the advanced countries is closely linked to the development of global value chains. During the 1990s, thanks to its vast domestic market, the abundance of cheap labour, its imminent accession to the World Trade Organisation (WTO) and the preferential regimes for foreign investors in the special economic zones, China became an attractive location for assembling imported parts. That happened in the context of a global trend towards ever-increasing international fragmentation of production chains. The manufacturing of ICT, electronic gadgets and cars lent itself particularly well to such a production method. Participation in global value chains enables low- or middle-income countries to penetrate higher technology sectors by specialising in low-skilled jobs such as assembly, and to benefit from economies of scale via trade. That also partly explains why China's export structure (like that of other Asian countries) is relatively sophisticated. Most of the value added is created during the initial stages of production (design and development) and in the final stages (branding and marketing), while the intermediate stages of production and assembly generate less value added. China's initial position as a global assembler was reflected in the country's small domestic share in the value added of its exports up to around 2003. We illustrate that by means of the "Trade in Value Added" (TiVA) database (2) of the OECD and the WTO.

(1) Xu (2010) and Rodrik (2006) conclude that China already had a "special" export structure at the beginning of the 2000s.

(2) The calculations are based on figures from the national accounts and input-output tables for the period 1995-2011 and use projections (nowcasting tables) for the years 2012 to 2014.

CHART 6 STARTING FROM A LOW LEVEL, THE SHARE OF DOMESTIC VALUE ADDED IN CHINA'S EXPORTS IS CONVERGING TOWARDS THE OECD (WEIGHTED) AVERAGE

(in %)



Source: Own calculations based on the OECD – WTO TiVA database.

The growing share of value added created in China in the total value added of its manufacturing exports from 2003 onwards is also a measure of the increasing sophistication of Chinese exports. That trend is evident in all sectors where fragmentation plays a major role. This indicates that China is taking on more tasks and replacing imported components with home-produced components ("on-shoring"). In addition, the Chinese government is deliberately adopting a strategy of creating more value added domestically. That substitution takes place at the expense of other countries: among OECD countries, the share of domestic value added in exports is declining. Nonetheless, it is more difficult to ascertain which advanced countries are suffering the most.

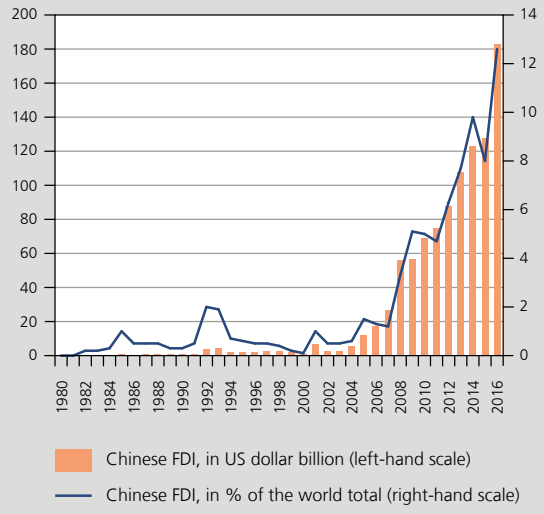
The success of the Chinese telecommunications company Huawei, which is now one of China's "national champions", is a striking illustration of these ambitions (Ahrens, 2013). Established in 1988 by a Chinese army engineer with the aid of a loan from a State bank loan, it began by selling telephone switches and fire alarm systems imported from Hong Kong. A few years later, the company started manufacturing the switches itself, together with a range of other more advanced products, copying foreign technologies. In 1996, Huawei was rewarded with a number of major contracts for the State and the army. Gradually, the company conquered foreign markets by selling telecommunications equipment and networks, first in emerging market countries and then in Europe and America, too. Today, Huawei does not only compete on cost, but also develops its own products and marketing strategy. In that regard, the company enjoys collaboration on research and development with leading producers such as Motorola, Siemens and Vodafone. Huawei is currently the third largest manufacturer of smartphones (with its own brand) after Samsung and Apple.

Inward foreign investment from advanced countries has long been one of the main ways of acquiring and disseminating technological know-how in China. In a number of strategic sectors, legal restrictions oblige foreign investors to form a joint venture with a Chinese company to facilitate the transfer of technology. Outward direct investment by Chinese companies has also gained ground since the global financial crisis. While there are various reasons pushing these companies to invest abroad, the purchase of foreign technologies and know-how is undoubtedly one of the main motives behind Chinese investments in advanced countries.

Outward foreign direct investment (FDI) by emerging market economies as a group, and by China in particular, is a relatively new phenomenon. Various recent studies have examined the channels through which this outward FDI

CHART 7 STEEP INCREASE IN CHINESE OUTWARD FOREIGN DIRECT INVESTMENT (FDI) SINCE THE CRISIS

(annual flows)



Source: Own calculations based on UNCTAD data.

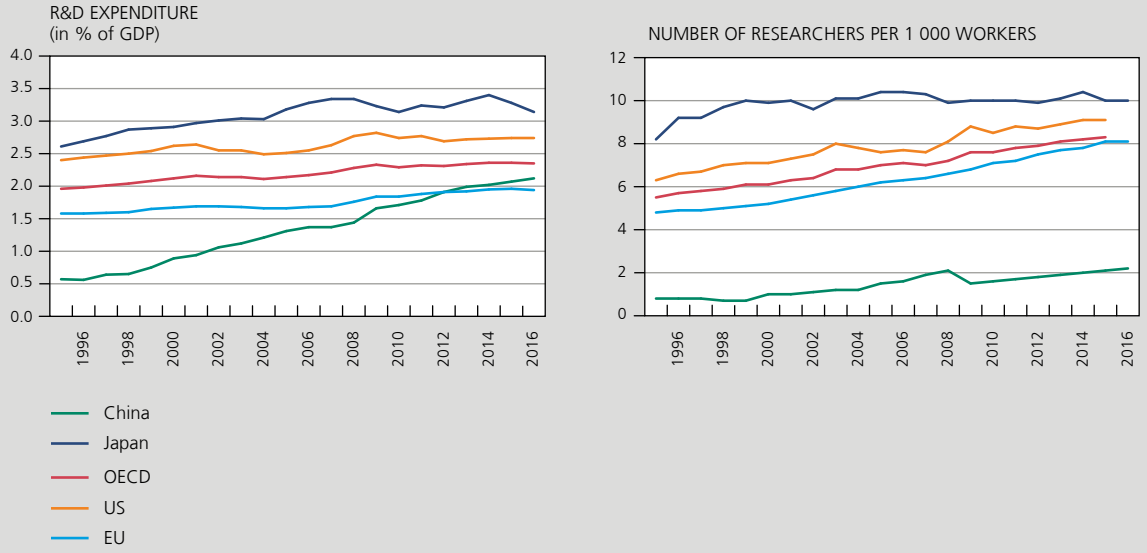
contributes to the development and industrial upgrading of emerging market economies (Chen *et al.*, 2012; Amann *et al.*, 2015; Cozza *et al.*, 2015; Li *et al.*, 2016; Li *et al.*, 2017; Knoerich, 2017). They find that financial returns are not the sole motivation of emerging market countries, as foreign subsidiaries also serve as vehicles for acquiring strategic assets (technology, production processes and organisation methods) and know-how, which are transferred back to the parent company (i.e. reverse technology transfers). These studies also stress that such reverse technology transfers only bear fruit if a number of preconditions are fulfilled in the investor country, including a minimum absorptive capacity, an appropriate legal and institutional framework, supportive policymaking, adequate training, and technological skills.

China seems well-placed to generate positive spillover effects for its own economy via its foreign investments. In recent years, the country has started to catch up in terms of investment in education and research and development (R&D). R&D expenditure expressed as a percentage of GDP is one key gauge of the importance a country attaches to innovation. In China, this ratio increased from 0.7 % in the early 1990s to 2.1 % in 2016. The country has thus caught up with the EU, though it is still lagging behind technological leaders such as Japan and the United States. Nonetheless, compared to other emerging market countries, Chinese performance in this area is strong.

Another criterion for assessing investment in R&D is the number of researchers among the workers. In that respect, China is still lagging behind, with 2.1 researchers per 1 000 workers in 2015, compared to between 8 and 10 in the main developed countries. That figure should be viewed in light of China's still ongoing process of catching up in education, starting from very low educational attainment levels following the cultural revolution (1966-1976). According to OECD data, the proportion of adults (25-64 years) with higher education qualifications was barely 10 % in 2010, whereas this figure was 18 % for the younger generation (25-34 years). However, the number of young people completing higher education each year is rising rapidly, and around 40 % of them specialise in the STEM disciplines (Science, Technology, Engineering and Mathematics) (Freeman and Huang, 2015). Furthermore, Chinese students in higher education are internationally mobile: representing around 612 000 in the OECD countries as a whole, they form the largest group of international students (20 % in 2015). In so far as these students remain in contact with their compatriots and/or return to their home country subsequently, these exchanges contribute to the transfer of scientific knowledge and applications to China.

Moreover, China does not lack supportive policies. In 2015, the government launched an industrial policy entitled "Made in China 2025", which aims to transform the country into an industrial superpower via the use of smart and

CHART 8 CHINA IS CATCHING UP IN TERMS OF R&D EXPENDITURE ... BUT IS LAGGING BEHIND THE DEVELOPED COUNTRIES WITH REGARD TO EMPLOYMENT IN R&D



Source: OECD.

innovative production technologies. The policy focuses on all the high-tech sectors which contribute greatly to growth in the advanced economies (energy-saving vehicles, other means of transport including aviation, renewable energy, mechanical engineering, robotics, ICT, medical instruments, etc.). According to Wübbeke *et al.* (2016), currently China does not have the technological knowledge needed to successfully complete this upgrading; in the short term, that implies opportunities for western businesses. In the medium term, however, the "Made in China 2025" strategy aims for a prominence of technologies developed in China and large market shares for Chinese companies. As usual, the strategy is supported by generous government subsidies for domestic businesses.

However, it is questionable whether the resources for R&D are allocated optimally. In China, R&D is mainly carried out by enterprises but is largely funded by government subsidies. Wei *et al.* (2016) study the link between subsidies and the degree to which enterprises convert their R&D expenditure into innovations in the form of patents and find no positive correlation. Chinese State-owned enterprises receive disproportionately more subsidies than domestic private enterprises or enterprises with foreign capital participation, and on average they file fewer patents. The problem is most significant for subsidies granted by local authorities to the smaller enterprises under their control.

As the richest countries are at the technological frontier and also have a democratic form of government, the prevailing view is that an undemocratic system is not compatible with technological leadership. The argument goes that innovative ideas and new technologies develop and spread most readily in economic and political systems characterised by free competition, protection of (intellectual) property rights, respect for the rule of law under the supervision of an independent judiciary, and free media. As a result of the decentralised government, the emphasis on local experiments and the particular system for promoting Party members, China does exhibit a high degree of competition (Xu, 2011). Conversely, on the other criteria just mentioned, China does not perform as well as the advanced countries. To achieve a breakthrough, the inventor of an innovative concept or new technology needs the support and protection of the local and/or central government. The practice whereby the government chooses the winners instead of leaving it to the free market could possibly hamper technological leadership.

China's specific institutions have nonetheless undergone a radical transformation in recent decades: since 1978, successive reforms have allowed a greater role for the market economy and private ownership. China has thus

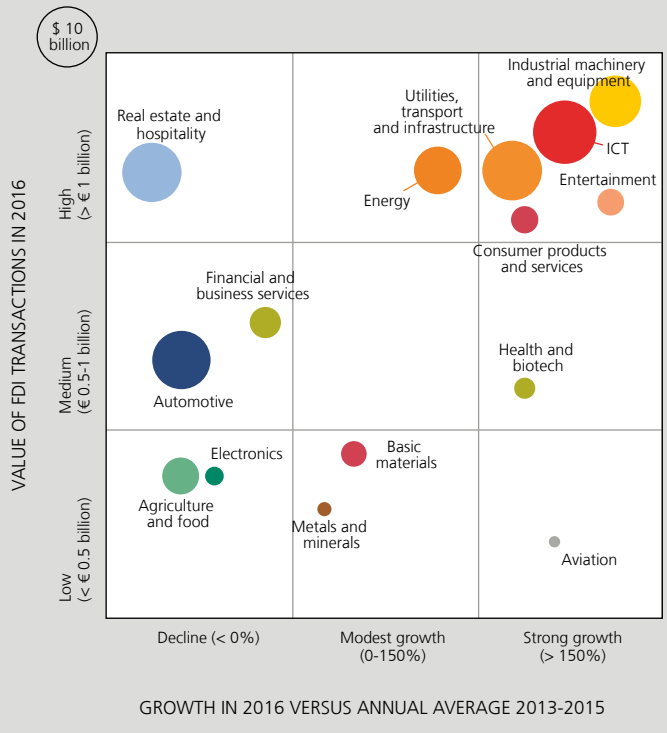
progressed from a State economy to a mixed economy. The growing presence of the free market is generally regarded as a major contributory factor in China's success (Wei *et al.*, 2016). At the Communist Party's Third Plenum held in November 2013, the new Chinese government announced that it would continue to strengthen the role of the markets in the allocation of resources, including a more market-driven pricing, and that it would ensure fairer competition for all participants. However, since president Xi Jinping took office in 2013, one can observe growing scepticism about the role of the free market among China's leaders, and a return to increased government interventionism.

4. Shift to a more hostile international environment

While smaller, fast-growing Asian economies have for a very long time maintained their export-centred growth strategy, that is not an option for China because of its sheer economic size. China's growing market share in total exports has already triggered protectionist responses by the United States and numerous anti-dumping litigations at the World Trade Organisation. More generally, there is a prevailing feeling that Chinese and western businesses are not competing on an equal footing owing to the distortion of prices in China, the generous State support (low energy prices, cheap loans) and the preferential treatment of Chinese enterprises with regard to the awarding of R&D subsidies and public contracts. Although the Chinese government asserts that it respects the rules of free trade, that is not the dominant view among western enterprises[(1)].

Chinese takeovers of companies in the United States or the EU are likewise encountering ever fiercer resistance. As already stated, China's outward FDI soared after the global financial crisis, but the situation is one-sided. Chinese firms have acquired holdings in the financial sector (Nagelmackers, Deutsche Bank), the car industry (Volvo, Daimler),

CHART 9 CHINESE FDI IN THE EU IS INCREASINGLY FOCUSED ON SPECIFIC SECTORS



Source: Rhodium Group and MERICS (2017).

(1) For more details, we refer the reader to the reports by the European Chamber of Commerce in China.

ports (Piraeus) and port container terminals (including in Antwerp), the nuclear sector (Hinkley Point) and sustainable energy projects. Yet there is no reciprocity on China's part : in the ranking of 62 countries where the OECD has examined openness to foreign investors, China is in 59th place. In response to threats by the United States, president Xi Jinping recently promised to partially open up a number of sectors (finance, aeronautics, navigation) to foreign investors and to grant free access to the car industry (which would eliminate the current obligation to form a joint venture with a Chinese company).

China's direct investment in the EU mainly targets the major western European countries, the southern countries affected by the crisis, Finland, and – more recently – the eastern European countries that are part of the "16+1" group(1) in the framework of the new Silk Road. According to the available data – which are, however, incomplete – the stock of Chinese investment in the EU countries generally still seems to remain relatively small : in 2016 it represented less than 1 % of the GDP of the recipient country in all Member States except for Hungary, Portugal and Finland. Concerns about Chinese FDI in the EU result from an increased focus on strategic and high-tech sectors such as industrial machinery, ICT, energy, transport and infrastructure, etc., i.e. the high priority sectors in the Chinese government's "Made in China 2025" policy.

For some time now, the United States and Japan have been systematically "screening" major Chinese FDI for national security reasons and in order to better protect their economic and scientific potential. As a result, the United States now automatically blocks any takeover bid for local semi-conductor producers, by Huawei or by any other Chinese telecommunications company. By analogy with that practice, in September 2017 the European Commission formulated a proposal for defining a common framework for the examination of FDI originating from third countries, with China in mind. At present, over half of the EU Member States, including Belgium, do not conduct any systematic screening. However, the EC's proposal divides Europe : most of the largest EU countries are in favour of tighter control over FDI, while the peripheral countries, which need investment in their infrastructure, oppose the proposal. These tensions are also thwarting the ambitions of the EU and China to conclude a bilateral investment treaty.

Conclusion

In view of the many uncertainties, it is hard to say for sure whether China will avoid the middle-income trap. On the basis of our analysis, we can be cautiously optimistic on that score.

Apart from the normal growth slowdown that accompanies economic development, the correction of the imbalances – including the financial excesses – will weigh on future growth. Measures are necessary to avoid a financial crisis and curb the accumulation of additional debt, without jeopardising the growth potential. The challenge is to strike the right balance in which rebalancing and industrial upgrading go hand in hand. Demographic trends are also working to China's disadvantage : never before has a country had to contend with population ageing at such an early stage of economic development.

Nonetheless, in various other respects China has a sound basis for achieving future growth driven by productivity gains, such as its specialisation in relatively sophisticated export products, a modern infrastructure and substantial investment in human capital and in R&D. The technological upgrading of the country's economy also opens up new opportunities. The strategy adopted aims at the continued growth of Chinese high-tech exports, on-shoring, the acquisition of technologies abroad via outward FDI, and the establishment of a domestic innovation policy. However, each of these strategies has its limitations : protectionist responses to a further growth of Chinese exports, legal restrictions (in the United States and a number of European countries) on the purchase of technology in strategic sectors by Chinese enterprises with State aid, and potential institutional obstacles concerning innovation.

(1) The 16 countries are Hungary, Bulgaria, Romania, Poland, Bosnia-Herzegovina, Serbia, Croatia, Slovenia, Slovakia, Albania, the former Yugoslav Republic of Macedonia, Montenegro, the Czech Republic, Lithuania, Latvia and Estonia. The suffix "+1" refers to China.

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Are inflation and real activity out of sync in the euro area ?

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J. Wauters (*)

Introduction

Over the past few years, many economies have experienced a combination of strong growth and subdued inflation. This "missing inflation" puzzle has led many to question if the Phillips curve relationship between inflation and economic slack had broken down.

This article analyses the situation in the euro area and poses the question whether it resembles more that in the US, where the expected achievement of the dual mandate has allowed monetary policy to normalise, or the situation in Japan, which suffers from chronic low inflation. To this end, we estimate a Phillips curve model for the euro area, Japan and the US that can take into account the fact that economic relationships have varied over time.

The first chapter of the article illustrates the low level of inflation and the perceived decoupling between inflation and economic growth in the recent period. The second chapter describes the Phillips curve framework that central bankers use to explain inflation. Finally, the third part examines the various explanatory factors for the recent weakness of inflation and draws conclusions in terms of monetary policy.

1. The missing inflation puzzle

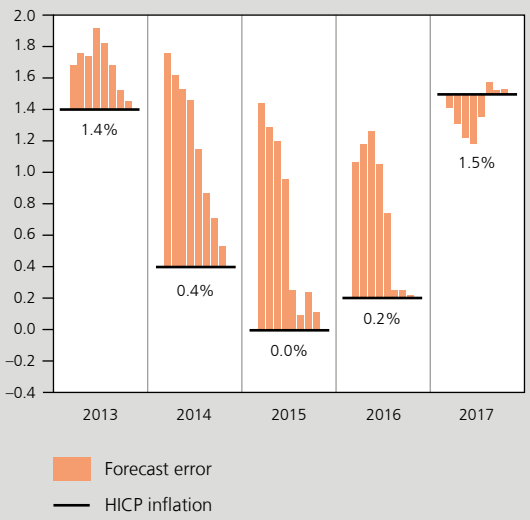
In the context of the economic recovery after the great recession, inflation forecasts for the euro area have turned out to be overly optimistic. In view of the dynamism of real economic variables such as GDP growth and the unemployment rate, nominal variables like wage growth and price increases were widely expected to be more vigorous from 2013 onwards.

In other words, traditional macroeconomic models and expert opinion, which are based on historical relations and various assumptions about the trend in raw material prices and exchange rates for instance, have been proved to be too high by observed inflation levels.

The weakness of inflation and the gap observed between real and nominal economic variables in the recent period is not specific to the euro area. In reality, it affects many advanced economies to varying degrees. Two cases stand out here, those of the United States and Japan.

(*) The authors thank Jef Boeckx and Paul Butzen for their remarks and suggestions.

CHART 1 FORECAST ERROR[1] AND INFLATION IN THE EURO AREA



Sources: ECB (Survey of Professional Forecasters), Eurostat.

(1) Difference between the forecast and average inflation observed respectively 24, 21, 18, 15, 12, 9, 6 and 3 months before the end of the target year. Total HICP inflation.

Protracted low inflation in the euro area

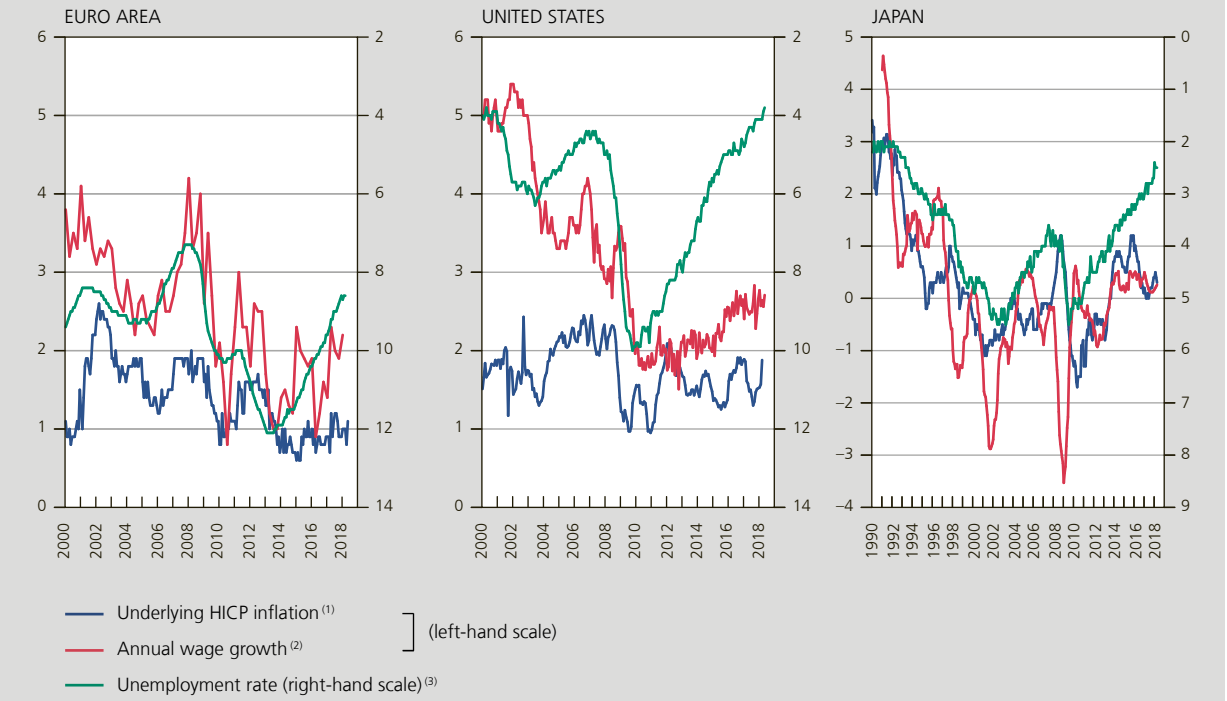
In the euro area, the economic recovery started in 2013, just after the sovereign debt crisis. Although unemployment has gradually ebbed away and economic growth has accelerated steadily since then, the nominal variables have still lagged behind.

Headline inflation has kept a good distance from the ECB Governing Council's target of below, but close to, 2 % in the medium term[1], reaching 0.7 % on average over the last five years. Underlying inflation, which measures the rise in prices excluding the most volatile components – energy and food product prices –, and thus reflects more closely the inflationary trend due to domestic supply and demand conditions, slowed down in the early stages of the recovery, before stabilising around 1 %. And lastly, wage growth has proven to be partially more dynamic, but well below its pre-crisis level.

According to the June 2018 macroeconomic projections compiled by the Eurosystem for the euro area, headline inflation is expected to reach 1.7 % in 2018, 2019 and 2020.

(1) For more information on the ECB's price stability mandate, see Deroose and Stevens (2017, Chapter 1).

CHART 2 DISCREPANCY BETWEEN REAL AND NOMINAL ECONOMIC VARIABLES



Sources: Thomson Reuters Datastream, ECB, Bureau of Labor Statistics (BLS).

(1) HICP for the euro area, CPI for Japan and PCE for the United States. Inflation excluding energy and food prices for the euro area and the United States. Inflation excluding energy and fresh food prices in Japan's case.

(2) Average hourly wages for the euro area and the United States, average monthly wages for Japan. Moving average over 12 months for Japan.

(3) Inverted scale.

Normalisation on the horizon in the United States

In the United States too, wage and price rises have remained out of step with the economic conditions seen over the last few years. Although rather slow, the recovery had already begun by mid-2009 across the Atlantic, and has held up ever since. However, headline inflation and underlying inflation have remained well below the Fed's target of 2 % since 2012 (1). Despite the constant decline in the unemployment rate, wage growth remained sluggish between 2010 and 2015, before gradually picking up.

Over the last few months, the prospect of seeing inflation return to its target has nevertheless firmed up. Various elements in fact suggest a gradual normalisation of price and wage rises:

(1) First of all, long-term inflation expectations have stayed well anchored at levels compatible with the inflation target. So, the US central bank's credibility as regards price stability has never been questioned.

(2) Secondly, over the last few years, inflation has been dragged down by specific price falls in some sectors like telecommunications or health care. Several of these price movements are perceived as temporary and therefore are not

(1) The Fed's target indicator is PCE (Personal Consumption Expenditure) inflation, which measures the change in prices of goods and services paid by or "on behalf of" households. CPI inflation only takes goods and services paid for directly by households into account. Apart from differences in the composition of the index's basket of goods and services, the weightings attributed to goods and services are also different. The general trend is fairly similar but, overall, CPI inflation is a little higher. The Fed's target is 2 % for headline inflation in the medium term, but underlying inflation logically gets a lot of attention.

likely to re-occur in the future. As far as health care[1] is concerned, inflation could fall further for some time to below the pre-crisis level (Mahedy and Shapiro, 2017), although some downward effects have already faded away since the end of 2017.

(3) Thirdly, in line with point (2) inflation and wages both accelerated at the beginning of 2018. Over the first four months of the year, for instance, hourly wage growth in the private sector reached an annual rate of 2.6 % and, last March, underlying PCE inflation fell back to 1.9 %.

(4) Lastly, the tax reform and fiscal easing adopted by the Trump Administration at the turn of the year are expected to encourage investment and private consumption over the coming quarters. In a context of full employment[2] where output is close to its potential and financial conditions are still favourable, this change should push up prices and wages.

For all these various reasons and although the degree of uncertainty remains high, it may be assumed that inflation will stabilise at around 2 % in the medium term. That, at least, is what the members of the Federal Open Markets Committee (FOMC) are expecting. According to the Committee's latest median projections, dating from June 2018, inflation and underlying inflation should reach 2.1 and 2 % in 2018, respectively, and then converge to 2.1 % in 2019 and 2020.

Structurally weak inflation in Japan

Japan stands out as a special case in that the current low inflation and weak wage growth displayed by its economy is nothing new. Its roots lay in the bursting of a major financial and real estate asset bubble at the beginning of the 1990s, following the archipelago's strong economic expansion in the 1980s.

The persistence of mild deflation or low inflation in the country for a quarter of a century bears witness to the structural rather than cyclical nature of the phenomenon. In reality, it could be argued that, between the beginning of the 1990s and early 2000, the Japanese economy shifted to a new low interest rate-low inflation equilibrium (Boeckx *et al.*, 2015).

However, this new equilibrium should not prevent the economy from growing to its full potential in the long term, as the record decline in its potential growth is largely due to demographic and productivity developments. The fall in the population, and especially the working-age population, has effectively dealt a heavy blow to the country's economic growth potential. Contrary to received opinion, its real economic dynamic is nevertheless far from listless when its demographics are taken into consideration. Since the beginning of the 2000s, for instance, GDP growth per working age person has been clearly higher in Japan than in the United States or the euro area.

Since the 1990s, the Japanese economy has not seen any net divergence between real and nominal trends. For example, it is surprising to note that the correlation between the unemployment rate and underlying inflation works out at –0.85 over the period 1990-2017.

However, over the last few quarters, despite a decidedly expansionary macroeconomic policy[3] and a highly favourable economic situation, inflation has remained adamantly anaemic. In 2017, GDP growth reached 1.6 %, against potential growth estimated at between 0.5 and 1 % by the Bank of Japan and, at the beginning of 2018, the unemployment rate had fallen back to 2.5 %, its lowest level for 25 years. Yet, inflation excluding energy and fresh food prices – the central bank's preferred consumer price yardstick – was no more than 0.5 %. Wage growth, on the other hand, was showing signs of gathering speed. One explanation of the persistent weakness of inflation in Japan in recent years seems to lie in the utmost caution that firms are taking in their price- and wage-setting decisions (Kataoka, 2018). According to the latest Tankan survey dating from March 2018, Japanese firms are expecting a headline inflation rate of around 0.8 % over the next year and they do not see inflation exceeding 1.1 % within the next three to five years. In April, the Bank of Japan was expecting to see underlying inflation go back up to between 1.5 and 1.8 % by the year 2020. The vast majority of

(1) Prices in the health care sector have been under pressure mainly as a result of adjustments made to the Medicare health insurance system (the federal health insurance intended for the over-65s and for disabled people), under President Obama's Affordable Care Act (Mahedy and Shapiro, 2017). As health care accounts for a large share of household consumption expenditure, the slow growth of prices in the sector has dampened headline inflation considerably.

(2) The unemployment rate had fallen to 3.8 % in May 2018, which is below the long-term unemployment rate, estimated at 4.5 % by the FOMC members.

(3) In 2013, Japan's Prime Minister Shinzo Abe launched a major stimulus plan widely referred to as 'Abenomics'. It is based on fiscal expansion, as well as implementation of structural reforms and running an accommodating monetary policy. Five years after its launch, the plan is still going. It has generated a recurrent government deficit and an unprecedented expansion of the Bank of Japan's balance sheet. With the aim to bring inflation up to its target of 2 %, the central bank currently applies a negative interest rate of –0.1 % on current account deposits with financial institutions. In addition, it is doing its utmost to keep the 10-year rate close to 0 % through a programme for purchasing Treasury bonds to the tune of 80 000 billion yen annually (more than € 600 billion). It also buys up other types of assets, such as exchange-traded funds and real estate investment funds.

its Monetary Policy Committee members nevertheless acknowledge that the risks are biased downwards. Again, the idea of an atypical macroeconomic equilibrium, characterised by a particularly moderate rise in prices and wages, is emerging.

What can the euro area expect in the future ?

One question that crops up is whether the euro area will shift more towards an American-style scenario, with the prospect of inflation returning to more normal levels, or whether it could slide towards a Japanese scenario, where low inflation becomes a structural feature of the economy. The remainder of this article tries to answer this question with a more in-depth analysis of the origin of the current weaknesses of inflation in these three economies.

2. How do central bankers think about inflation ?

2.1 The Phillips curve framework

What is the link between inflation and economic activity ? And should inflation be higher today given the decline in the unemployment rate ? To answer such questions, economists typically turn to the Phillips curve framework. Metaphorically speaking, the framework tells us that inflation is a kind of thermometer that indicates if the economy is running hot or cold. The thinking goes back to the seminal work of Phillips (1958), which shows an inverse (downward sloping) relationship between the unemployment rate and wage inflation for nearly 100 years of UK data. Put differently, wage inflation was found to be high when unemployment was low, and vice versa. Similar negative relationships between inflation and the unemployment rate have also been noted for other countries in the subsequent period. In the euro area, for instance, a negative relationship is also visible between the unemployment rate on the one hand, and wage or underlying inflation on the other hand (see chart 3).

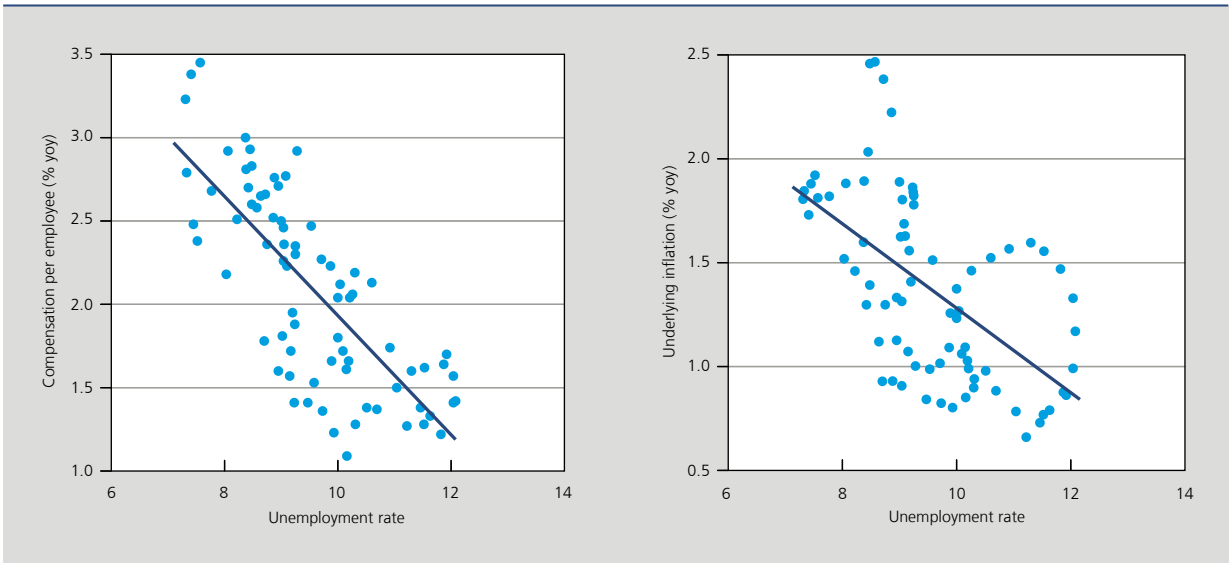
The Phillips curve can be intuitively explained by using the law of supply and demand. When the economy is buoyed up by strong demand, firms will try to produce more goods and services. To do so, they will outbid each other in order to attract available workers. Increased scarcity of labour lowers the unemployment rate and puts upward pressure on wage inflation. In turn, higher input costs and strong demand for final products induces firms to raise their output prices. The reverse is true, however, when weak demand leads to an economic downturn. In that case, firms will cut back their production and lay off workers. This will raise the unemployment rate and put downward pressure on wage and price inflation. These aggregate demand effects cause movements along the downward sloping Phillips curve.

Taken at face value, the Phillips curve seems to suggest that policymakers can select a specific inflation and unemployment outcome by stimulating or restraining aggregate demand. However, once inflation expectations and the supply side of the economy were included into the theory, it became clear that this view is misguided. It is now thought that the central bank can use monetary policy measures to influence inflation and economic activity in the short run, but, in the long run, these measures cannot permanently affect economic activity. Specifically, the reasoning goes that there is a certain "natural" rate of unemployment that ensures stable inflation. This is the unemployment rate where the economy is running neither hot nor cold. When the economy is overheating, the "unemployment gap", or difference between the unemployment rate and its natural rate, will be negative, and upward pressure will follow on inflation. When the economy is running cold, the opposite should hold. The natural rate of unemployment depends on supply-side factors in the economy, which the central bank does not control. Therefore, the central bank cannot permanently keep the unemployment rate below its natural rate, because the resulting pressure will continuously push up inflation expectations and actual inflation while the unemployment rate converges to its natural level again. The outcome would be higher inflation without lower unemployment. Graphically, the Phillips curve (intercept) shifts upwards [(1)].

Although the Phillips curve framework is widely used, it remains a source of controversy among macroeconomists. The negative relationship between inflation and the unemployment rate tends to disappear and reappear in the data, and Phillips curve models have a patchy track record in forecasting inflation. Nevertheless, it is still one of the main frameworks for explaining inflation, and modern empirical models typically contain an unemployment gap or output

(1) For an overview of the Phillips curve framework and its history, see Lacker and Weinberg (2007) and Gordon (2011).
(2) The output gap is the percentage deviation between actual real output and "potential" real output. The latter is the level of output that is consistent with stable inflation. Thus the output gap and unemployment gap both express whether the economy is running hot or cold, but they have opposite signs.

CHART 3 PHILLIPS CURVES IN THE EURO AREA (1999Q1-2017Q4)



Source: ECB Statistical Data Warehouse.

gap in an equation that explains inflation[2]. We now turn to an empirical application with a model that enables, among other things, the Phillips curve relationship to change over time. This model sheds light on our main question: why do inflation and real activity appear out of sync in the euro area?

2.2 Explaining low inflation within a Phillips curve framework

Three driving factors

In our empirical application, we consider three categories of factors to explain persistently low inflation in the euro area, namely real, nominal, and external factors. The real factors represent the Phillips curve relationship between economic activity and inflation. We classify effects that relate to the formation of inflation expectations as nominal factors. Finally, the external factors consist of effects which are beyond the direct influence of the central bank. This category contains such things as shocks to oil and other commodity prices. The way they propagate and ultimately affect inflation in the longer run is, however, influenced by the central bank's monetary policy.

Model specification

Our empirical model is based on Wauters (2018), who extends the time-varying parameter Phillips curve model proposed by Chan *et al.* (2016) and estimates it on euro area data. The model is described briefly below and the reader is referred to Appendix 1 for further technical details.

The empirical model decomposes headline price inflation in each period "t", π_t, into the three driving factors as follows:

$$(1) \qquad (\pi_t - \pi_t^*) = \rho_t (\pi_{t-1} + \pi_{t-1}^*) + \lambda_t \left(\frac{Y_t^* - Y_t^*}{Y_t^*}\right) + \gamma_t (\pi_t^m - \pi_t^{m*}) + \epsilon_t^\pi$$

The group of nominal factors contains two elements in the above equation, namely trend inflation π_t^* and inflation persistence ρ_t. Trend inflation π_t^* represents the expected rate of inflation in the long run and is commonly interpreted in the literature as the central bank's implicit inflation target. The deviation of inflation from this trend $(\pi_t - \pi_t^*)$ is defined as the "inflation gap". Equation (1) assumes that the inflation gap is a process that mean-reverts to zero. The current inflation gap is linked to the past inflation gap through a persistence parameter ρ_t. This parameter allows for differences

in either the central bank's tolerance for inflation deviations from target, or the central bank's ability to direct inflation towards its target (Chan *et al.*, 2016). All else being equal, a high degree of persistence implies a slower convergence of inflation towards its target once shocks have occurred.

The real factors represent the typical Phillips curve relationship. They arise from the multiplication of a time-varying Phillips curve slope λ_t with the output gap $(Y_t - Y_t^*) / Y_t^*$. The latter measures the percentage difference between actual and potential output, and is analogous to the unemployment gap in the sense that it measures the degree of over- or underutilisation of economic resources.

Finally, the external factors comprise the time-varying impact γ_t of the gap between inflation in the relative price of imports and its trend $(\pi_t^m - \pi_t^{m*})$. Import price inflation is included in order to incorporate the effect of supply shocks. The accompanying time-varying coefficient γ_t allows for measuring, for e.g., a larger effect from imported inflation due to globalisation (IMF, 2013). All remaining effects are captured by the model residual ε_t.

The model parameters $(\pi_t^*, \rho_t, \lambda_t, \pi_t^{m*})$ including the variance of the residual ε_t , evolve according to a random walk process, where the ρ_t and λ_t elements are bounded to lie between 0 and 1. Potential output Y_t^* follows a random walk with a stochastic drift term in order to capture changes in the economy's potential growth rate (see Appendix 1 for details).

The model is related to several recent papers that estimate a time-varying parameter Phillips curve relationship for the US or other countries. Our approach differs from these papers in several ways. First, relative to Stevens (2013) and Riggi and Venditti (2015), we estimate the Phillips curve parameters and the driving variables like economic slack and trend inflation jointly rather than taking official output or unemployment gap measures from institutions as given inputs. Second, relative to Blanchard *et al.* (2015) and Dany-Knedlik and Holtemöller (2017), we use the output gap as a measure of slack because it has been pointed out that the unemployment rate could understate the level of slack in the economy (see below).

We refer the reader to Appendix 2 for details on the data used in the empirical exercise.

3. Empirical Phillips curve estimates

This section discusses the empirical results for the euro area and makes a comparison with the estimates for the US and Japan. First of all, it looks at how the real, nominal and external factors dragged inflation down during the crisis period, then summarises the relative contributions of these factors for the euro area, and concludes with some implications for monetary policy.

3.1 Real factors have weighed down on inflation…

Output gap and Phillips curve slope estimates

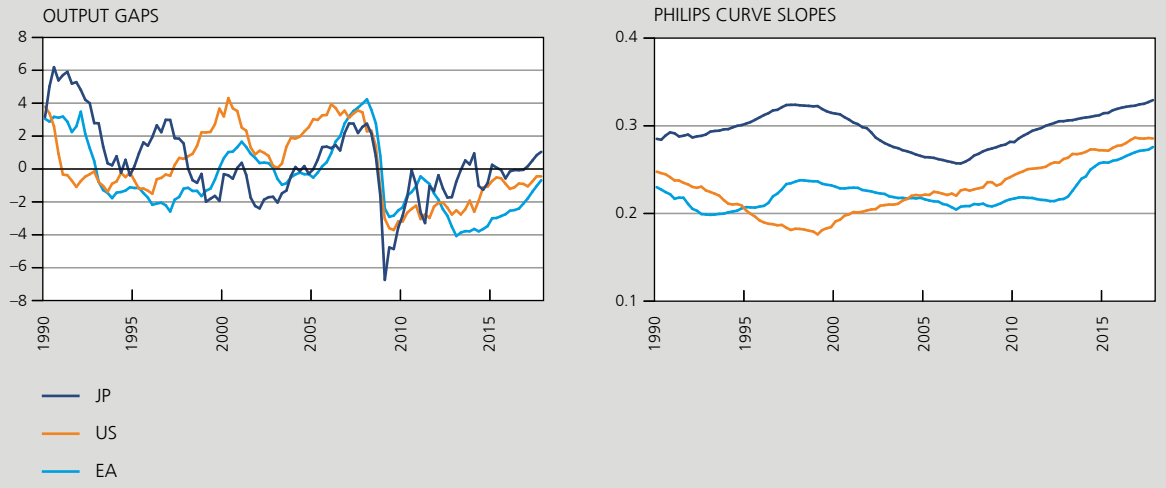
The left-hand plot of chart 4 shows the estimated output gaps $(Y_t - Y_t^*) / Y_t^*$ for the three areas. The euro area output gap is estimated to have been large and negative in recent years, and it is still returning to zero. Slack also appears larger in the euro area than in the US over the past five years due to the euro area sovereign debt crisis. The Japanese output gap is slightly positive at the end of the sample, which suggests that protracted low inflation is not driven by real factors there. The right-hand plot, which shows the trend of the Phillips curve slope λ_t, indicates that slack continues to have an economically relevant effect on inflation in the three regions. The slopes have turned upwards in recent years in the three regions. This could be related to recent structural reforms that reduced the degree of nominal rigidities (e.g. through lower collective bargaining coverage), and therefore made the economies more flexible [(1)].

The combination of a negative output gap and a steeper (or stronger) Phillips curve slope in the euro area might be surprising to some. Several observers have interpreted the absence of high inflation in the face of strong growth during

(1) In line with several studies (e.g. IMF, 2013), the Phillips curve slopes flatten (follow a long-run downward trend) for the US and euro area between the mid-1970s and 2000 (not shown).

the recovery as a sign that the Phillips curve has either flattened (weakened) or that it has broken down completely (Miles *et al.* 2017). Our estimates lead to the opposite conclusion. Although the economy has grown strongly in recent years, output has not yet caught up with its potential level. The gap between actual and potential output persists because the crisis has not had the same impact on potential output as on actual output. Moreover, inflation remains subdued because of a *more active* Phillips curve relationship from slack to inflation. So although slack is gradually disappearing, the remaining idle resources are weighing more on inflation since the slope has got steeper.

CHART 4 ESTIMATED OUTPUT GAPS AND PHILLIPS CURVE SLOPES



Source: Own estimates.

Despite strong growth, EA slack might be larger than presumed

Since the output gap is typically estimated with a large degree of uncertainty, it is hard to take a strong stand on its size and sign. Nevertheless, policymakers are discussing whether slack in the euro area economy is larger than generally presumed (Reuters, 2018), and there is evidence pointing in that direction.

First, the level of unemployment might understate the true degree of unemployment in the economy. The left-hand-side plot of chart 5 shows the headline unemployment rate (U) in the euro area and the so-called "U6" broad unemployment measure. The difference between them is that the latter also includes part-time employees who are looking for full-time work in the broad unemployment measure, as well as workers who have left the labour market because they have become too discouraged to seek employment[(1)]. During the financial crisis, the gap between U and U6 got wider as the broad unemployment group increased substantially. So although the unemployment rate declined in the euro area, its level might still understate the "true" degree of unemployment in the economy (as people work fewer hours than desired or are still too discouraged to enter the labour market).

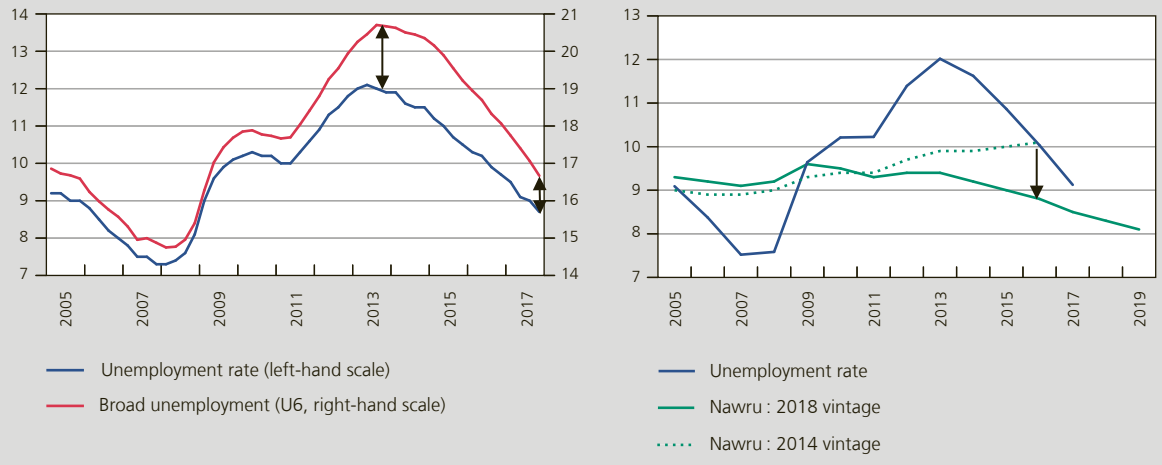
Second, the deterioration of the economy's supply potential may have been overestimated in the wake of the crisis. The right-hand-side plot shows the evolution of the unemployment rate in the euro area, together with the 2014 and 2018 vintages of the European Commission's estimated non-accelerating wage rate of unemployment (NAWRU). This is a measure of the level of the unemployment rate that is consistent with stable wage inflation, and indicates some form of "natural" unemployment rate. Since 2014, the EC's forecasts have systematically revised the NAWRU downwards – a change that is consistent with

(1) To be precise, the unemployment rate is the number of people unemployed as a percentage of the labour force. The U6 measure of broad unemployment also includes under-employed part-time workers (who want to work full time) in the numerator, and the group of "potential labour" in the numerator and denominator. The group of potential labour includes those who are seeking work but are not available (e.g. students finishing their studies), and those who are available but are not seeking work (the latter includes discouraged workers).

a stronger supply potential of the economy. The implication of these revisions is that, for a given unemployment rate, the unemployment gap was actually larger. Both assumptions in chart 5 – a higher "true" unemployment rate and a lower natural unemployment rate – are consistent with slack in the euro area being larger than initially presumed.

Third, the notion that slack might be larger resonates with the conclusions from recent studies. Lenza and Jarocinski (2016) compare several models in terms of their ability to predict euro area core inflation in real time, and find that the best-performing model delivers a much wider gap between actual and potential output than institutional measures. Coibion *et al.* (2017) argue that institutional estimates of US potential output are too procyclical, so it was revised downwards too much during the crisis. As a result, slack in the economy is now underestimated. Finally, Hong *et al.* (2018) estimate wage Phillips curves for several countries and conclude that there is greater slack in the labour market than suggested by headline unemployment rates.

CHART 5 EURO AREA UNEMPLOYMENT RATES AND NAWRU



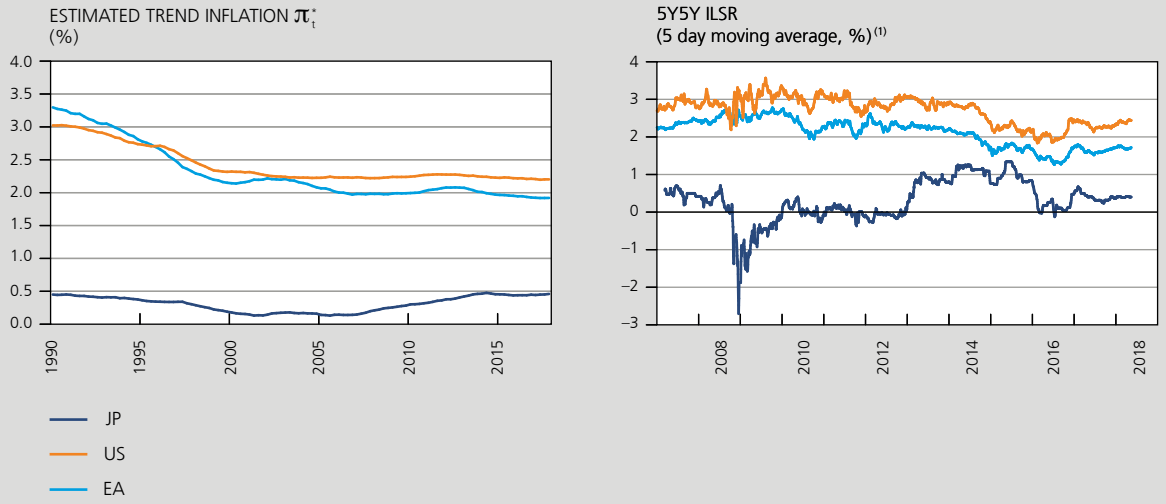
Sources: Ameco, Eurostat, SDW.

3.2 … nominal factors have acted as an additional drag…

Trend inflation levels are different

We now discuss the nominal factors, namely trend inflation π_t^* and intrinsic inflation persistence ρ_t, in turn. For the euro area, trend inflation was initially stable around 2 % from 1999, but drops slightly below 2 % at the end of the sample (chart 6, left-hand side). In contrast, trend inflation has been remarkably low in Japan for the past two decades, while in the US it has been slightly above 2 %. It is interesting to note that data on long-run inflation expectations, which are absent from the model, tell a similar story (chart 6, right-hand side plot). The series shown are financial market inflation compensation measures covering the five-year period starting five years from now (5-year 5- year-forward Inflation-linked swap rates [5y5y ILSR]). Roughly speaking, the three series co-move similarly in both plots: the Japanese readings are low and close to zero, and those for the US and euro area lie close to 2 %. It should be noted that differences between both plots in terms of the *levels* could also be due to, *inter alia*, inflation risk premia in the compensation measures (see box 1 in Deroose and Stevens, 2017). The takeaway is that low inflation seems to be a chronic issue in Japan, but not in the US and the euro area. For the latter two regions, the series are consistent with inflation returning to the central bank's target in the long term.

CHART 6 ESTIMATED TREND INFLATION RATES AND MARKET INFLATION EXPECTATIONS

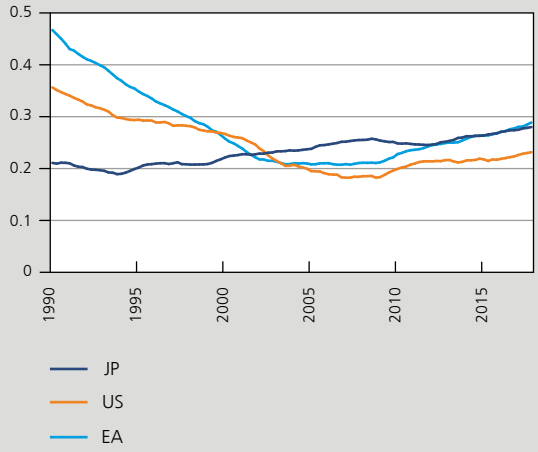


Sources: Own estimates, Bloomberg. The ILSR series start in 2007 and end on 16 May 2018.
(1) Implicit inflation rate derived from swap contracts hedging the inflation risk in the euro area during a five-year period starting five years after conclusion of the contract.

Intrinsic inflation persistence is on the rise again

Although trend inflation appears stable in the euro area, the degree of intrinsic inflation persistence ρ_t has risen in recent years, just like in the other areas (chart 7). Higher inflation persistence implies, all else being equal, a slower return of inflation to its trend. This rise could be due to more backward-lookingness in wage and price formation, for instance. For example, backward-looking indexation of wages has returned in Italy and covered around one-third of private sector employees in 2016 (Banca d'Italia, 2017). The more people use past inflation to form their expectations of future inflation, the harder it gets for monetary policy to bring inflation swiftly back to the target.

CHART 7 ESTIMATED INTRINSIC INFLATION PERSISTENCE

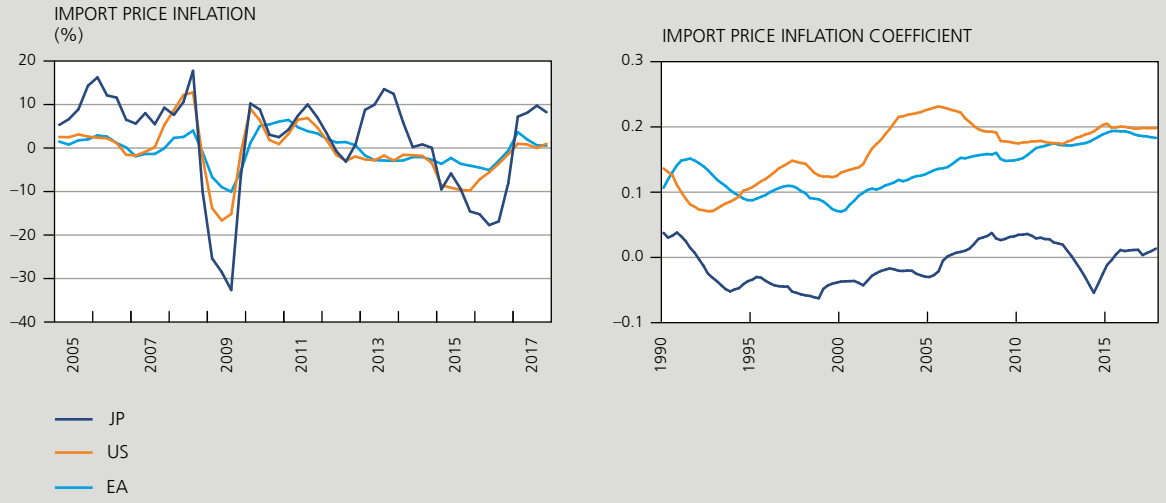


Source: Own estimates.

3.3 … and external factors were also negative contributors

Finally, we find that the external factors also had a negative impact on inflation. Relative import price inflation π_t^m trended downward during the post-2010 period in all three regions, but rebounded sharply at the end of the sample (chart 8, left-hand plot). Underlying inflation rates have actually been rather stable in the developed world in recent years, with the difference between headline and underlying inflation driven by commodity price movements (Miles *et al.*, 2017). The right-hand-side plot of chart 9 shows that the impact effect γ_t of the relative import price inflation gap $(\pi_t^m - \pi_t^{m*})$ has increased in the last three decades for the euro area and the U.S. Hence, the stronger impact of weak commodity price inflation has also kept inflation down after 2013. This is consistent with an impact from increased globalization, which means that economies are becoming more open and interdependent.

CHART 8 RELATIVE IMPORT PRICE INFLATION AND IMPACT COEFFICIENT WITH RESPECT TO THE RELATIVE IMPORT PRICE GAP



Source: See Appendix 2, own estimates.

3.4 Summing up the Phillips curve perspective

Chart 9 shows the estimated contributions of trend inflation, the output gap, the relative import price gap, and the residual on euro area inflation [1]. Trend inflation has not driven inflation away from 2 %: the trend has been close to 2 % since 2005, and declined only slightly after 2013. In contrast, the output gap and the relative import price inflation gap have played a crucial role since 2013 in explaining the period of protracted low inflation. The impact of relative import prices has recently become positive again, which explains the recent rebound in headline inflation. Overall, this means that low inflation in the euro area has been driven by cyclical factors (Phillips curve effect of the output gap) rather than structural forces (low trend inflation) [2]. In this respect, we can conclude that the euro area situation resembles more that of the US than that of Japan. Indeed Japan is characterised by low trend inflation, while the economy appears to be running above its potential level. In contrast, trend inflation is stable around 2 % in the US, but they are somewhat further in the economic recovery cycle compared to the euro area.

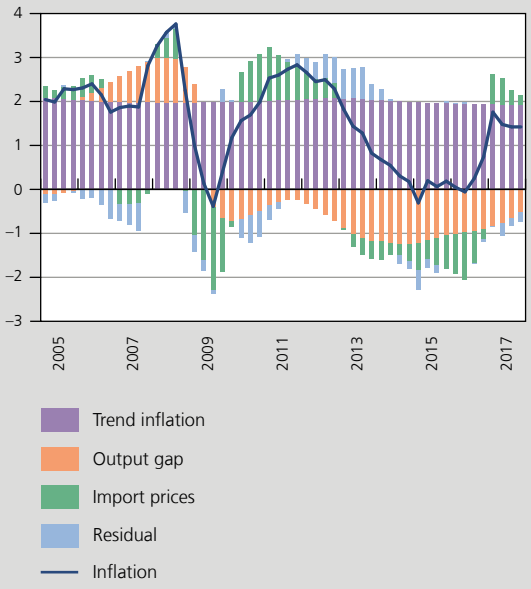
Note that the empirical results from this section provide an *ex-post* interpretation of the puzzle of protracted low inflation, while the forecast errors that were shown in section 1 showed a problem of understanding the inflation process

(1) These calculations take the time variation of the parameters into account. As the model is estimated in terms of annualised quarter-on-quarter inflation, the implied contributions to year-on-year inflation were calculated as the 4-quarter moving averages of the contributions to annualised quarter-on-quarter inflation.

(2) Using a similar model for the unemployment gap, Dany-Knedlik and Holtemöller (2017) also find that real, nominal and external factors have driven down euro area inflation. However, they find a more pronounced decline in trend inflation than we do.

in real time. But both are not necessarily inconsistent with each other. In fact, the time variation of the parameters could be one of the reasons why inflation has been difficult to forecast in real time (Riggi and Venditti, 2015). Other reasons relate to the usual problems of real-time estimation uncertainty surrounding the output gap, and (possibly multiple) *ex-post* revisions of real-time data.

CHART 9 ESTIMATED CONTRIBUTIONS TO EURO AREA INFLATION



Source : Own estimates.

3.5 Implications for monetary policy

From these results, we can draw several implications for euro area policymakers. First, the Phillips curve relationship still remains economically relevant for explaining inflation. We can expect that as the output gap closes, inflation will return to its trend level. However, the higher intrinsic persistence of the inflation gap implies that this process will likely take more time than before.

Second, the notion that economic slack is the main driver of subdued inflation implies that monetary policymakers are not faced with a trade-off scenario. Indeed, by supporting demand through accommodative policies, the central bank can both align aggregate demand with the economy's supply potential and – by doing so – bring inflation in line with the price stability mandate. By contrast, if low trend inflation were the main driver behind subdued inflation, monetary policymakers would have to consider overheating the economy above its potential level in order to raise inflation and inflation expectations. Even though this would be consistent with the ECB's primary objective, it is a less benign situation for the central bank.

Conclusion

Our analysis shows that low inflation in the euro area can be explained mainly by economic slack, slightly lower trend inflation, and downward drag from relative import price inflation. In this sense, the euro area situation resembles more that of the US, where low inflation is also mainly a cyclical phenomenon. In contrast, the fact that Japanese trend inflation is found to be very low indicates that low inflation is a chronic issue there. In all three regions, there has been a tendency in recent years towards a steeper Phillips curve and higher intrinsic inflation persistence.

The implications from these findings are the following. First, the Phillips curve relationship remains active and economically relevant in the euro area. As economic slack dissipates, we can expect euro area inflation to return towards its trend rate which stands close, but below, 2 %. Second, for this to happen, monetary policy should continue to support the economic recovery. This will help to absorb the remaining slack and, in its wake, bring inflation in line with the price stability mandate.

Appendix 1 – A time-varying parameter Phillips curve model

This appendix complements the description of the empirical model specification from section 2.2 with additional details.

The model belongs to the class of state-space models and consists of two measurement equations. The first one specifies that inflation depends on trend inflation, the past inflation gap, the output gap, and the relative import price inflation gap:

$$(\pi_t - \pi_t^*) = \rho_t (\pi_{t-1} - \pi_{t-1}^*) + \lambda_t (y_t - y_t^*) + \gamma_t (\pi_t^m - \pi_t^{m*}) + \varepsilon_t^\pi$$

Real output enters the equation as $y_t = 100LN(Y_t)$, where Y_t is the real GDP index. All variables with * superscripts represent the trends of their counterparts which do not bear the superscript. Thus, $(y_t - y_t^*)$ forms the output gap, which in equation (1) of the main text is written as $((Y_t - Y_t^*)/Y_t^*)$ for purposes of exposition. This model is based on Chan *et al.* (2016), but adds a relative import price inflation gap, and measures slack using an output gap instead of the unemployment gap $(U_t - U_t^*)$.

The second measurement equation is a second-order autoregressive process for the output gap:

$$(y_t - y_t^*) = \rho_1^y (y_{t-1} - y_{t-1}^*) + \rho_2^y (y_{t-2} - y_{t-2}^*) + \varepsilon_t^y$$

where the autoregressive parameters ρ_1^y and ρ_2^y are restricted in order to imply stationarity. In Chan *et al.* (2016), the above autoregressive process was used for the unemployment gap $(U_t - U_t^*)$.

The state equations define all model parameters $(\pi_t^*, \rho_t, \lambda_t, \gamma_t, \pi_t^{m*})$ and the variance ε_t^π of as random walks (e.g. $\pi_t^* = \pi_{t-1}^* + \varepsilon_t^{\pi*}$), with the exceptions that ρ_t and λ_t follow bounded random walk processes that lie between 0 and 1. Potential output (y_t^*) is assumed to follow a random walks with stochastic drift as:

$$y_t^* = y_{t-1}^* + g_t + \varepsilon_t^*$$
$$g_t = g_{t-1} + \varepsilon_t^g$$

Ergo, g_t captures the trend quarter-on-quarter growth of potential output. The model is estimated using Bayesian techniques. For more details on the implementation and the priors, see Wauters (2018).

The prior settings follow those from Chan *et al.* (2016) for the shared model components. For the new parameters, we use relatively uninformative priors.

We run the Gibbs sampler for sixty thousand draws, discard the first ten thousand as burn-in sample, and keep one in ten draws of the remaining fifty thousand draws for posterior inference.

Appendix 2 – Overview of the data used in the empirical analysis

All inflation rates in the empirical exercise are defined as annualised quarter-on-quarter growth rates of the price index. For instance, $\pi_t = 400LN(P_t/P_{t-1})$, where P_t is the price index and is the natural logarithm. Headline inflation is the Harmonised Index of Consumer Prices (HICP) in the euro area, and the Consumer Price Index (CPI) in the US and Japan. We follow Matheson & Stavrev (2013) and define the relative price of imports as the import-price deflator relative to the gross domestic product (GDP) deflator. The samples range from 1970Q4 for the euro area, 1948Q1 for the US, and 1986Q1 for Japan, and end in 2017Q4. Data for the euro area are taken from the ECB's Statistical Data Warehouse (SDW) and are backdated until the 1970s using the corresponding series from the Area Wide Model database. The table below provides more details on the exact series used.

Country	Variable	Source *(and code)*	Transformations
Euro area	Inflation	SDW *(ICP.M.U2.Y.000000.3.INX)* AWM *(HICP)*	AWM price index seasonally adjusted following the X13 procedure with JDEMETRA+ software SDW price index backdated with AWM price index using growth rates
	Real GDP	SDW *(MNA.Q.Y.I8.W2.S1. S1.B.B1GQ._Z._Z._Z.EUR.LR.N)* AWM *(YER)*	SDW output index backdated with AWM output index using growth rates
	GDP deflator	SDW *(MNA.Q.Y.I8.W2.S1. S1.B.B1GQ._Z._Z._Z.IX.D.N)* AWM *(YED)*	SDW price index backdated with AWM price index using growth rates
	Import price index	SDW *(MNA.Q.Y.I8.W1.S1. S1.C.P7._Z._Z._Z.IX.D.N)* AWM *(MTD)*	SDW price index backdated with AWM price index using growth rates
US	Inflation	FRED *(CPIAUCSL)*	
	Real GDP	FRED *(GDPC1)*	
	GDP deflator	FRED *(GDPDEF)*	
	Import price index	FRED *(A021RD3Q086SBEA)*	
Japan	Inflation	Datastream *(JPCONPRCE)*	
	Real GDP	Datastream *(JPGDP…D)*	
	GDP deflator	Datastream *(JPGDP…B: JPGDP…D)*	JPGDP…B/JPGDP…D
	Import price index	Datastream *(JPIMNGS.B: JPIMNGS.D)*	JPIMNGS.B/JPIMNGS.D

Notes: The acronyms and their weblinks are as follows. SDW: ECB's Statistical Data Warehouse (http://sdw.ecb.europa.eu), AWM: Area Wide Model database (https://eabcn.org/page/area-wide-model), FRED: Federal Reserve Bank of St. Louis Economic Data (https://fred.stlouisfed.org).

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Shedding new light on the mortgage debt of households in Belgium

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M. Emiris
Ch. Piette
M.-D. Zachary(*)

Introduction

Belgian household debt has risen almost continuously since the early 2000s. Although that trend is not specific to Belgium, it contrasts with developments in most euro area countries, where individuals in general have reduced their debt level since the 2008 financial and economic crisis. The increased debt in Belgium is due mainly to the growth of mortgage loans, while house prices have also been rising.

Past experience – be it in Europe, the United States, or other countries – has shown the risks that rising property prices combined with credit expansion could present for financial stability. In particular, those risks may materialise if the economy suffers a negative shock to employment and incomes, or following a sudden interest rate hike which reduces some households' ability to service their debts, ultimately leading to default. In such circumstances, the losses that credit institutions incur could be further exacerbated by the decline in the value of the property used as collateral.

These potential risks are the reason why household debt is an important point for the attention of the prudential authorities, which are responsible for ensuring that the banks have sufficiently substantial capital buffers to absorb any losses. In 2013, in view of the strong growth of mortgage lending, the National Bank of Belgium ("the Bank") therefore decided to impose on credit institutions a five percentage point increase in the risk weightings calculated on the basis of internal models used for the purpose of determining their capital requirements. In 2018 that measure was supplemented by a new component which takes account of the risk profile of the whole mortgage loan portfolio of each bank. Those provisions are a response to the continuing rise in house prices and lending in recent years, in a context which also features fierce competition within the banking sector.

Against that backdrop, this article aims to shed new light on the origins of these macroeconomic developments. In particular, it seeks to clarify the links between Belgian households' borrowings, their income, and property prices while also taking account of the influence of demographic factors. For that purpose it is based largely on data per municipality. At present, they are the most detailed data that can be used for a quantitative analysis of those links, in the absence of exhaustive individual data. Nonetheless, they permit account to be taken of a degree of heterogeneity within the Belgian population, particularly in terms of income, which is not apparent in the main macroeconomic aggregates. Furthermore, the data have a geographical dimension which is highly relevant for the analysis of the links between lending and

(*) The authors are very grateful to Lien Tam Co (Statbel) and Peter Neefs (NBB) for their help in constructing the database used for this study. They also thank Catherine Fuss, Pelin Ilbas, Geert Langenus and Christopher Warisse for their advice.

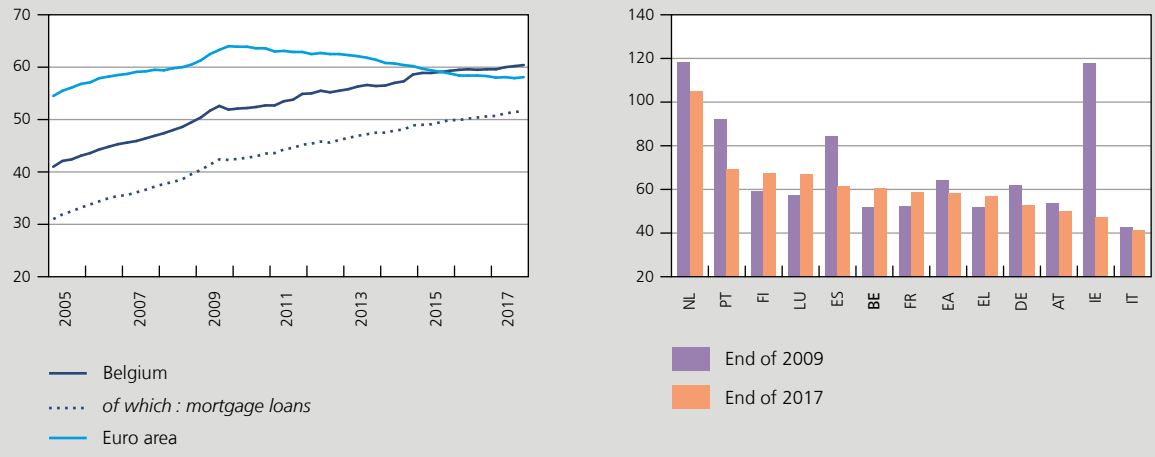
property market developments. They thus constitute a useful addition to the existing macroeconomic statistics and the non-exhaustive individual survey data.

The first section of this article presents the recent developments in household debt in Belgium and in the euro area. The second section analyses the macroeconomic determinants which may have influenced the growth of mortgage debt. The third section constitutes the main part of the article, with an econometric analysis which tries to identify, at municipality level, the fundamental factors behind the increased debt. It examines the influence of the age, income and wealth of individuals and the effect of property price movements. It also addresses some regional aspects. The fourth section brings together the main findings in order to examine them in the light of a selection of other euro area countries and identify points specific to Belgium. Finally, the conclusion highlights the main results of this study.

1. Recent trends in household debt in Belgium and in the euro area

In the past ten years, household debt in Belgium has risen almost continuously as a ratio of GDP, whereas in the euro area as a whole it has declined since the 2008 financial crisis. Since 2015 the debt of Belgian households has exceeded the figure for the euro area, mainly on account of mortgage loans. At the end of 2017 it stood at 60.4 % of GDP, compared to 58.1 % in the euro area.

CHART 1 OUTSTANDING AMOUNT OF HOUSEHOLD DEBT IN BELGIUM AND IN THE EURO AREA
(in % of GDP)



Sources : EC, NBB.

The situation seems somewhat mixed in the euro area, and Belgium is not the only country where household debt has risen. That was also the case in France, Finland and Luxembourg. However, most Member States began a process of debt reduction : at the end of 2017, the debt of individuals was lower than in 2009.

That adjustment was very substantial in Spain, Ireland and Portugal. In the first two countries it was accompanied by the bursting of property bubbles. In the years preceding the crisis, property price rises and household debt levels reinforced one another in those countries : first, because higher property prices generally drive households to borrow larger sums to finance the purchase of a home, and then because a rise in the market value of mortgaged property may also make the banks prepared to lend a higher amount. Finally, demand for new homes provided considerable support for activity in the construction industry and in associated sectors. That resulted in strong employment and income growth which in turn favoured the property bubble via escalating demand for housing and credit. However, in other countries where

the property market did not collapse, household debt ratios have also fallen since 2009. That applies to Germany and Austria, for instance.

Despite the reduction in debt levels there are still sometimes substantial differences between Member States, for a variety of reasons. For example, differences may be due to credit legislation which is more flexible in some countries than in others, or to supply factors such as competition within each country's banking sector. Differences may also be attributable to the availability of more flexible lending arrangements giving easier access to finance in some countries.

The situation in the Netherlands is worth mentioning in that regard. A large proportion of household credit there consists of bullet loans, a formula whereby the principal is repaid at maturity, in contrast to repayment loans in which part of the borrowed capital is paid back in each monthly instalment. In the case of bullet loans, the whole amount borrowed appears on the household's balance sheet throughout the term of the loan, which explains the high level of outstanding mortgage loans for Dutch households.

The tax applicable to real estate and mortgage loans may also account for variations in debt levels. For instance, some countries (including Belgium) have introduced a tax on imputed rents, while many countries allow a tax deduction for the interest paid on a mortgage loan (Wolswijk, 2005). There are other institutional or even cultural factors, too. In Italy, for example, the rate of home ownership is relatively high but that is not reflected in the outstanding debt of households, perhaps because greater use is made of alternative funding sources, such as loans between individuals, transfers between family members, or inheritance (Gomez-Salvador *et al.*, 2011). Finally, demographics, and particularly the structure of the age pyramid, may also explain part of the variations in debt levels between countries. All other things being equal, a larger percentage of young people in the population should be reflected in a higher debt burden, as young people are more likely to contract a bank loan in order to finance the purchase of a home.

2. The macroeconomic context

From a macroeconomic standpoint, mortgage lending is influenced by a range of determinants, including the credit institutions' lending policy which is itself dictated to some degree by the policy of the regulators, the Eurosystem's monetary policy and the tax measures of the federal and regional governments in Belgium. All these factors discussed in detail below play a part in determining the supply of credit.

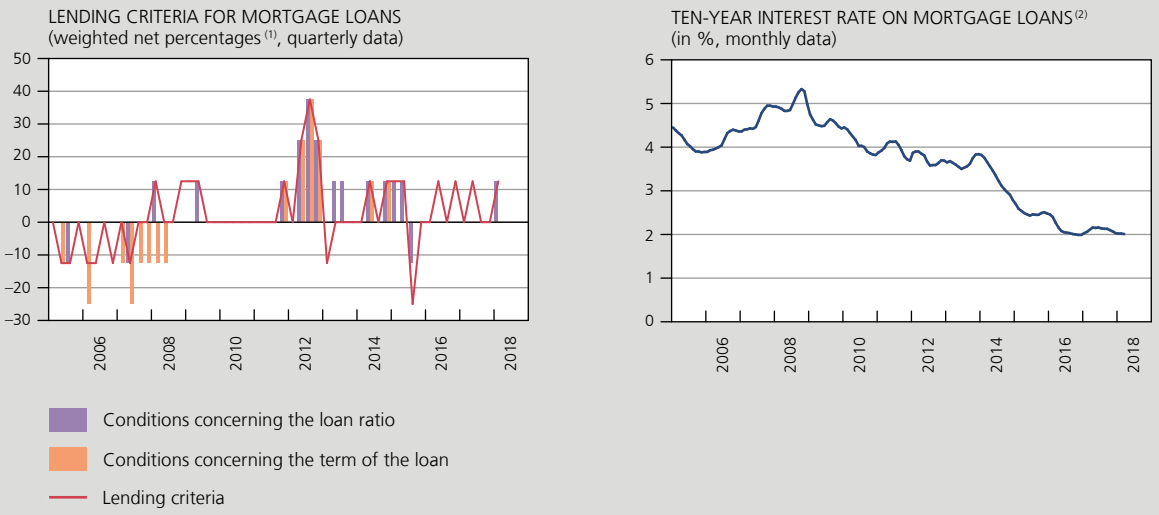
Bank lending criteria and prudential policy

Household demand is certainly a factor in the volume of mortgage loans in an economy, but the credit institutions' own policy on lending also plays a role. During the years covered by this study, credit institutions have made adjustments, notably in response to the Bank's prudential measures. In general, mortgage loans are an important market for Belgian banks, both because they enable the banks to secure their customers for long periods, and because this is a fairly low-risk market in view of the guarantee provided by the mortgage. That also accounts for the fierce competition in this segment.

In the years preceding the 2008 financial crisis, the banks repeatedly relaxed their home loan credit criteria, as is evident from the responses to the bank lending survey (BLS). Conditions relating to the term of the loan and those concerning the loan-to-value ratio were both weakened. That credit policy was revised during the quarters that followed the outbreak of the crisis, as the banks were obliged to clean up their balance sheet. The tightening occurred in 2009, but also in 2012 during the sovereign debt crisis, leading to a decline in the volume of lending in those two years in particular (see below).

In connection with its macroprudential mandate, the Bank has also taken steps to limit any future risks. Thus, at the end of 2013 the risk weightings applicable to mortgage loans were raised by 5 percentage points for banks adopting an internal ratings-based approach (IRB). In addition, in 2015, in response to the steep rise in the household debt level, the Bank called on credit institutions to exercise due caution in setting their mortgage loan conditions. Finally, in 2018 the 2013 measure was extended and supplemented with a new component the size of which depends on the risk of each bank's entire mortgage loan portfolio. Those announcements may have played a role in the successive moves to tighten lending criteria from 2013 onwards.

CHART 2 FINANCING CONDITIONS FOR MORTGAGE LOANS IN BELGIUM



Source: NBB.
(1) A positive (negative) percentage indicates a tightening (easing) of lending conditions.
(2) Interest rate on new contracts in which the rate is fixed for longer than 10 years.

Eurosystem monetary policy

Another dimension of the credit supply is reflected in the interest rate on loans. That rate is influenced by the monetary policy applied in the euro area, which has been accommodative in recent years. Thus, retail interest rates, including the rates charged on mortgage loans, have declined since 2008 in line with the reference rates set by the ECB: in Belgium, the (average) interest rate on mortgage loans with a term of ten years or longer had climbed to 5.3 % in 2008, but was down to just 2.0 % at the end of 2017.

This sharp fall in interest rates on mortgage loans led to many loans being renegotiated, especially in 2014 and 2015 when interest rates were slashed.

Tax measures

The introduction or abolition of tax measures by the various governments at federal or regional level may affect the production of mortgage loans in any particular year, as households can bring forward or postpone their borrowing in order to take advantage of a particular tax measure.

During the period considered, various measures were introduced and/or abolished. First, in 2010, two measures introduced at federal level may have played a more specific role in boosting the volume of mortgage lending. Those measures were the reduction in the VAT rate to 6 % for new builds, home renovation and the purchase of social housing (in force from 1 January 2009 to 31 December 2010) and the abolition on 1 January 2011 of registration fees applied to the value of the land included in the price of a new property, those fees being replaced by VAT. Among other things, the latter measure drove up the tax expense involved in the purchase of a new home, so that some contracts were concluded more speedily in the second half of 2010.

Furthermore, in 2011 the abolition of the tax advantage for "green loans" – another federal measure – for financing energy-saving projects (in force from 1 January 2009 to 31 December 2011) generated a rise in the amounts granted in the form of mortgage loans to fund renovation. There was a corresponding decline in new mortgage business in 2012 because that tax incentive had disappeared.

In 2013, the reticence on the property market, and consequently the reluctance in the conclusion of new home loans, was due partly to the uncertainty over continuation of the tax deductibility of interest on mortgage loans for a person's sole own home (also known as the "housing bonus") following the transfer of the powers in that respect to the Regions from mid-2014. Conversely, the announcement of changes to the rules under the reform of the tax treatment of mortgage loans from 2015 prompted some households in Flanders to bring their transactions forward to 2014, so as to retain the benefit of a more favourable tax advantage.

3. Beyond the macroeconomic determinants: the influence of income and property prices

The trend in mortgage loans granted to Belgian households can be explained by distinguishing between three factors. The first concerns the macrofinancial framework described in the previous section, which may influence both the supply of mortgage loans and the demand from borrowers. The second factor concerns individuals' income, which largely determine their borrowing capacity, in other words the amount that the banks are willing to lend them when they apply for a loan. Finally, the third factor concerns the effect of property price levels, which influence the funding needs of households wishing to purchase a home. If property prices rise, that implies a bigger loan if there is no change in income, assuming that the maximum sum authorised by the bank has not been reached.

3.1 Identification of the fundamentals via an econometric analysis

In order to identify how the macroeconomic framework, household incomes and property prices respectively influence borrowing, we used econometric estimates. Ideally, these models should be estimated using a data bank with individual data for all Belgian households, so that the amount of each mortgage loan granted can be linked to the borrower's income and wealth, and to the value of the property being purchased. However, such a data bank does not currently exist.

Nevertheless, in the absence of such a data bank, an analysis can be conducted on the basis of the statistics available at the NBB's Central Credit Register. Those statistics permit a dual breakdown, by municipality and by age group[(1)], of new mortgage loan contracts concluded in Belgium each year, and a breakdown by the amounts concerned, from 2006 onwards[(2)]. These data can be compared to the ones on net taxable income, which are likewise broken down by municipality and age group, and made available by Statbel. The period covered by the income data ends in 2015. With these two data sources combined, it is possible not only to assess the influence of households' income on the mortgage loans granted to them, but also to analyse the geographical distribution across Belgium's 589 municipalities. This geographical dimension enables us to examine the link between the amounts of the mortgage loans granted and the prices charged on the property market, since these data are also available at municipal level from the same institution.

To use the information contained in these statistics we apply an econometric method designed for analysing longitudinal data. The advantage of that approach is that we can distinguish between the influence of income and property prices on mortgage lending, and the impact of the factors discussed in the preceding paragraph concerning the macrofinancial framework. This method also enables us to take account of the effects specific to each municipality which cannot be observed via the variables included in the model. For instance, those effects may be due to differences in the age structure of the population[(3)].

The first estimated model can be represented by the following equation:

$$Credits_{i,t} = \alpha + \beta_r Income_{i,t} + \beta_p Price_{i,t} + \gamma_i + \delta_t + \varepsilon_{i,t}$$

(1) In the case of loans concluded by two or more persons, the breakdown by age and municipality is based on the data relating to the first person named in the contract.

(2) These data also include changes to existing contracts. Those changes do not appear in the transaction statistics obtained from the financial accounts. Those statistics relate to net credit flows, i.e. the amounts of new loans minus the amounts of expired loans. Consequently, the credit data used in this section of the article are not entirely comparable with the statistics published elsewhere.

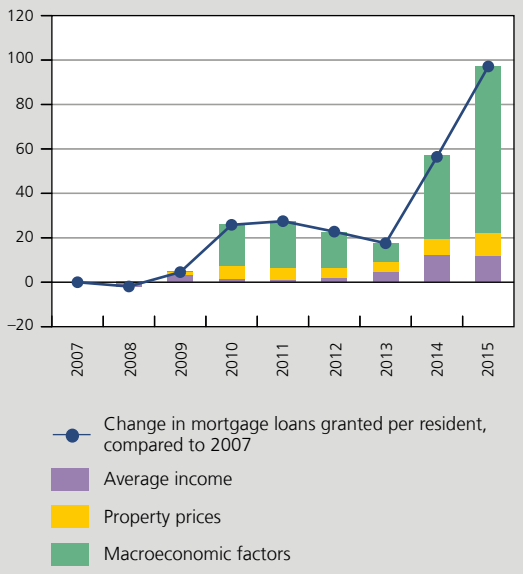
(3) Such effects may be due, for example, to the presence of a care home in a municipality which otherwise has few residents.

In this equation the dependent variable, $Credits_{i,t}$, is the amount of the loans granted in municipality i during year t, in relation to the number of residents. The model's main explanatory variables, namely $Income_{i,t}$ and $Price_{i,t}$, are defined respectively as the real average net taxable income per resident (aged 18 or over) and the real average price of housing purchased on the secondary market[1]. It should be noted that the prices themselves may also be influenced by the loans granted, since more favourable borrowing terms for households may lead to stronger demand for housing and thus exert upward pressure on house prices. From an econometric point of view, the endogenous nature of that variable may result in distortion, which was taken into account in our estimates. Those estimates are based on the two-stage least squares method, which helps to avoid any endogeneity problems[2]. The parameter γ_i represents the effects specific to each municipality, while the parameter δ_t aims to capture the effects specific to each year. It is the latter parameter that enables us to estimate the influence of changes in the macrofinancial environment on lending. However, it should be noted that this approach cannot distinguish the respective influences of each of the factors concerned. Nonetheless, it offers a way of assessing the impact of particular measures or macroeconomic shocks on lending, according to the timing of those events.

The regression results are summarised in chart 3, in the form of estimated contributions to the trend in mortgage lending. The impact of macroeconomic factors on total mortgage lending is clearly apparent from 2010, when the interest rates applied by the banks fell sharply and the abolition of certain tax concessions was announced, prompting individuals to take out more mortgage loans in 2010 and 2011 (see section 3.2). The disappearance of those same tax incentives and the tightening of credit conditions were reflected, as one would expect, in a smaller contribution of the macroeconomic environment to credit trends in the two ensuing years. In 2014, and to an even greater extent

CHART 3 CONTRIBUTIONS OF THE MAIN EXPLANATORY VARIABLES TO THE TREND IN MORTGAGE LENDING

(estimates based on an econometric model[1], percentage changes compared to 2007)



Source: NBB.

(1) Apart from the variables shown in the chart, the model includes fixed effects per municipality.

(1) That price is calculated for each municipality and for each year as the weighted average of the average prices of apartments, houses and villas. The weightings are determined on the basis of the number of transactions. As in the case of taxable income, the nominal property prices are divided by the consumer price index to obtain series expressed in real terms.

(2) This method requires the selection of a number of instrumental variables which may have no correlation with the error term of the equation to be estimated, but must provide an explanation of property prices. The instrumental variables selected for that purpose are presented in table 2 (see below).

in 2015, a dominant factor in that trend was the renegotiation of current loans at a time when the decline in interest rates was at its steepest.

The estimates in chart 3 show not only the significant role of macroeconomic factors but also the influence of household income and house prices on the lending figures during the period examined. As a result of the crisis years, the incomes of Belgian households did not make any substantial contribution to the growth of lending between 2007 and 2013. It was not until 2014 and 2015 that they resumed their upward influence on credit expansion, as a result of the recovery. House prices, which have risen slowly but steadily since 2010, also influenced the volume of loans granted in 2010 to 2015. The links between these two determinants and the pattern of lending are examined in more detail in the next two sections.

3.2 Links with household income and wealth

3.2.1 At household level

The link between the movement in income and mortgage lending can be related to the structural behaviour of households on the property and mortgage market. That behaviour is heavily dependent on household income and age, as explained by the life cycle theory originally formulated in the 1950s by Franco Modigliani[(1)] and subsequently refined further.

This theory is based on the assumption that households try to maintain a stable level of consumption throughout their life (consumption smoothing). In so doing, they tend not to adjust their expenditure according to their current income but rather according to an estimate of their longer-term income ("permanent income"). They borrow or save to offset fluctuations and trends in their income. Consequently, households' borrowing and saving behaviour is linked to their age and income. Young households with good income prospects can contract loans and acquire property. If their income is sufficient, in middle age and later, households can typically save more and build up wealth either in the form of financial assets or in additional property. After retirement age, that wealth can then be used to offset a decline in income and thus maintain their level of consumption. Information from the Household Finance and Consumption Survey (HFCS)[(2)] can be used to provide an empirical illustration of the life cycle theory.

Households can take out a mortgage loan to purchase a home of their own, as their primary residence, or to invest in another property (e.g. as a second home, a property to let out, or a property for business purposes). Using the HFCS data it is possible to distinguish between the various forms of property ownership and the associated mortgage loans.

According to data from the HFCS for 2014, 32 % of all Belgian households had an outstanding current mortgage loan for their own home in that year, i.e. 45 % of home-owning households. Altogether, 70 % of Belgian households are owner-occupiers. It is mainly young households (under the age of 35) and middle-aged households (in the 35-44 and 45-54 age groups) that have an outstanding mortgage loan on their own home. Thus, over half of households in which the reference person was under the age of 55 had a current mortgage loan. In the older age groups (55-64 and 65 or older), the figure was less than a third. That finding tallies with the life cycle theory.

However, the link between mortgage loan market participation and age varies according to the level of household income. That life cycle pattern is more pronounced for higher-income households. Thus, more than six in ten young or middle-aged households in the top two income quintiles have a current mortgage loan. Furthermore, almost nine out of ten such households own their primary residence. The life cycle theory therefore seems to be borne out more clearly in the case of households with higher incomes and more favourable income prospects. Compared to lower-income households, they have a better chance of securing a loan at a younger age and being able to pay it off. The link between home ownership and age is therefore relatively flat for the top two income quintiles.

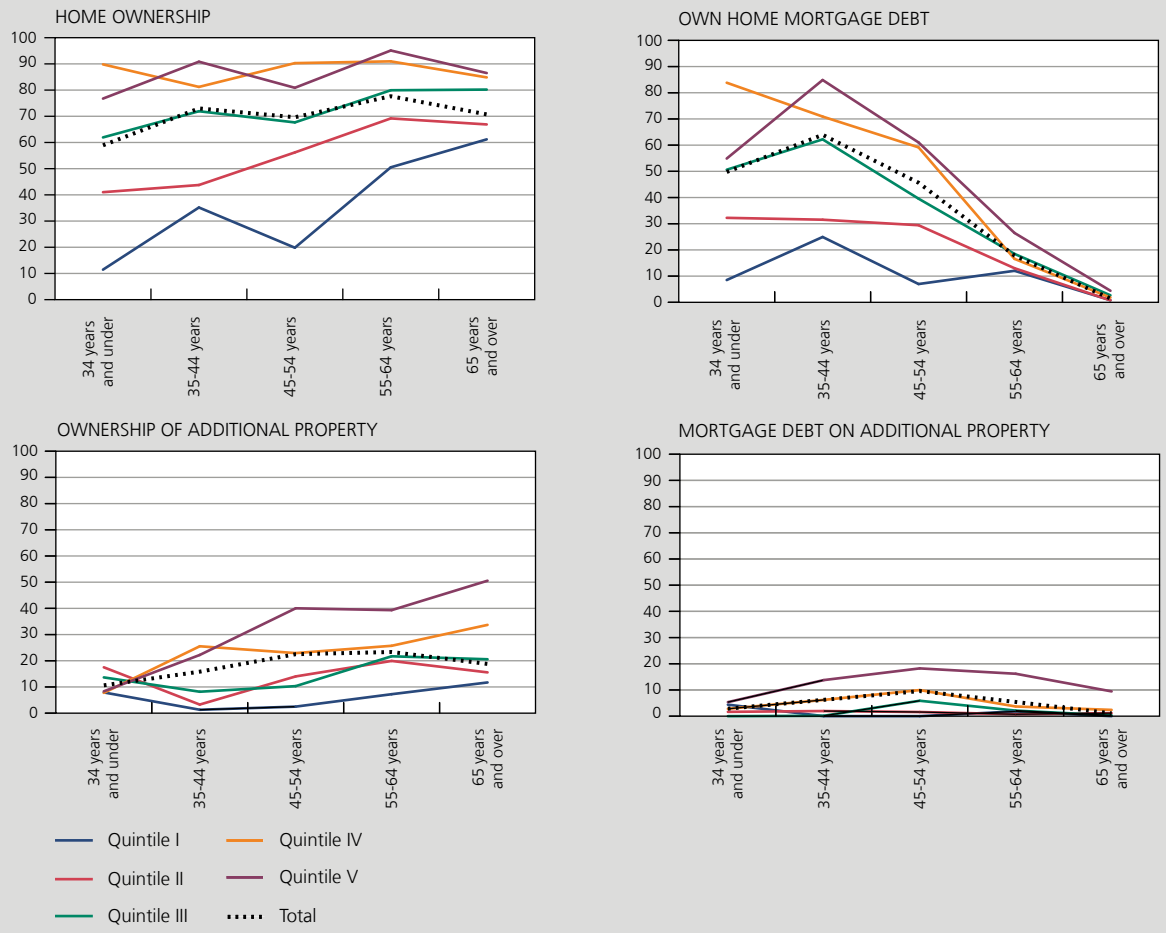
(1) Franco Modigliani together with his student Richard Brumberg laid the foundations of the life cycle theory (see Modigliani and Brumberg, 1954). After Brumberg's untimely death, Modigliani developed his theory in more detail with Alberto Ando (see Ando and Modigliani, 1963).

(2) We do not have longitudinal data at household level which would enable us to test the life cycle theory for Belgium. The Household Finance and Consumption Survey (HFCS) provides transverse data on incomes and wealth permitting a range of relevant findings. The latest results of that household survey relate to 2014. In that regard, it is always necessary to bear in mind that variations between age groups observed at a given moment could always be due to cohort effects (certain generations having different financial capacity and/or habits) and may therefore not be due solely to life cycle effects. For a more detailed account of the content of the HFCS and its organisation in Belgium, see Du Caju (2013).

Lower-income households are less inclined to take out a loan to buy a house. They are subject to credit constraints and it is therefore relatively unusual for them to become home owners at a young age. Their chances of acquiring a home increase with age, but are still significantly less than for higher income households. For households in the bottom two income quintiles, the link between credit market participation and age is therefore relatively flatter and the link between home ownership and age is more pronounced.

CHART 4 PROPERTY OWNERSHIP AND MORTGAGE DEBT BY AGE GROUP AND INCOME QUINTILE

(participation rates in % of households)



Source: HFCS 2014.

Still according to the 2014 HFCS data, 18 % of Belgian households owned a property in addition to their own home. That figure was higher than in 2010, when it stood at 16 % [1]. The level of investment by Belgian households in property other than their own home therefore seems to have increased. This type of property ownership also becomes more common with age, and in this case the age profile is more marked for higher-income households. It is mainly households in the top income quintile (three in ten) and to a lesser degree in the next quintile (two in ten) that can afford to buy such property, particularly in middle age or in their later years. Households in the other income quintiles have less chance of owning additional property, and that likelihood barely increases with age.

(1) See Du Caju (2016) for a more detailed analysis of the 2014 results in Belgium, and for a comparison with the 2010 figures.

The purchase of a property other than their own home therefore seems to be an investment which broad sections of the population cannot readily afford, which explains why only 25 % of Belgian households owning such property have concluded a mortgage loan to finance it, compared to 45 % of households in the case of their own home.

The 2014 HFCS reveals that around 5 % of households have an outstanding mortgage loan for the purchase of another property in addition to their own home. In most of those households, the reference person is between 45 and 64 years old. Those households have usually been able to build up financial wealth enabling them to finance all or part of the additional property. For such households, there may be a tax advantage in contracting a home loan to purchase an investment property, because the borrowing costs can be deducted from the income from the property.

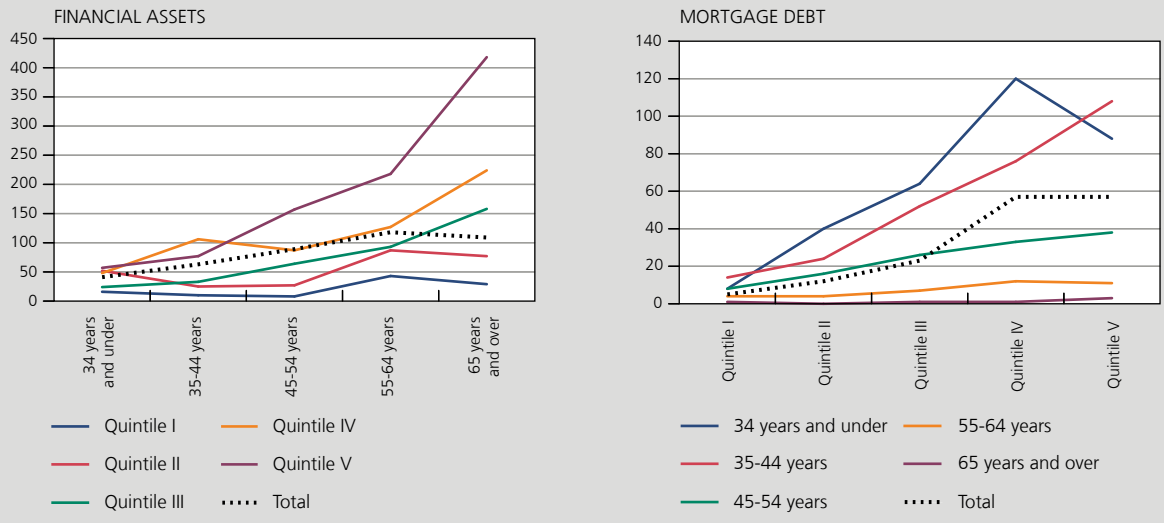
The HFCS results for Belgium in 2014 do indeed show that the average financial wealth of households increases with age, broadly speaking up to retirement age, and subsequently diminishes somewhat, in line with the life cycle theory. However, there are wide variations according to income level : it is households in the bottom two income quintiles that have to tap into their savings as they grow older, so that their wealth declines, while households in the higher quintiles see their wealth increase for longer. They often continue working for longer, they have more additional income derived from their assets, and that income is generally more substantial (rental income, returns on investments). Moreover, they reinvest that additional income, and that gives them better protection against unexpected expenditure or enables them to build up an inheritance. The age profile of financial wealth therefore rises much more steeply (and for longer) in the case of higher income households.

In general, the results of the survey conducted in Belgium in 2014 therefore do not appear to refute the life cycle theory. The rates of participation in the mortgage loan market and the property market display age profiles in line with those postulated by the theory. What is more, relevant differences are apparent as regards household income levels and property types.

Finally, if we examine the total outstanding mortgage debt of households broken down by age and income we find that, on average, households in the higher income quintiles have larger outstanding mortgage debts.

CHART 5 OUTSTANDING MORTGAGE DEBT[1] AND FINANCIAL ASSETS BY AGE GROUP AND INCOME QUINTILE

(average amounts for all households, in € thousand)



Source : HFCS 2014.

(1) Contracted for own home purchase.

Of course, that is because more of them own their home (and their houses are more expensive), but it is also due to their greater borrowing capacity and to the banks' policy on assessing loan applications. This last factor indicates a generally sound approach to lending by the banks, though it must be said that loans with a higher risk of default are also granted. Consequently, there are pockets of risk in certain segments of the Belgian mortgage market, where it is particularly single-parent households and young households on lower incomes that incur higher risks [1]. Research has also shown that the Belgian mortgage market could be susceptible to unemployment shocks and the potentially associated loss of income for households [2].

The link between debt and income appears to be much stronger for younger households (44 years or under). Younger households can only purchase a property and take out a loan for that purpose if their income and income prospects are sufficiently favourable. Moreover, they can borrow larger sums and buy more expensive properties the higher their income. The link is much weaker or even non-existent for older households. They are less likely to have a current loan to repay, and furthermore, they have often built up financial wealth (especially in the case of the highest income quintiles).

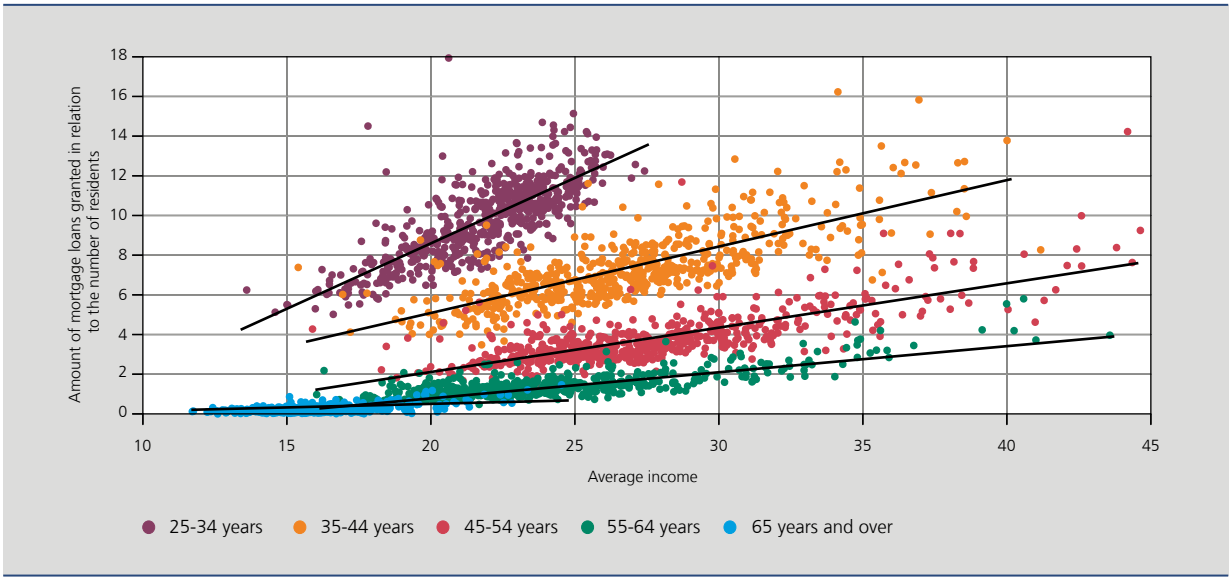
3.2.2 At municipality level

The income profile of Belgian households and their saving and investment behaviour, which change with age in line with the life cycle theory, are also reflected in the geographical distribution of their debts. According to the Central Credit Register data, around two-thirds of the mortgage loans contracted each year are granted to persons in the 25-44 age group. That is evident in chart 6, where each point represents, for a particular municipality and age group, the link between loans granted (in relation to the population) and average per capita income. It is very clear that, in relation to other age groups at the same income level, the amounts borrowed are substantially higher for the population aged between 25 and 34 years, and to a lesser extent for the 35-44 age group.

The link between loans obtained and household income highlighted above on the basis of the HFCS data is also evident in the data per municipality. In fact, whichever age group is considered, municipalities with a high per capita income

CHART 6 LINK BETWEEN THE AMOUNTS OF MORTGAGE LOANS GRANTED IN EACH MUNICIPALITY AND AVERAGE INCOMES, BY AGE GROUP

(averages over the period 2006-2015, data in € thousand)



Sources: Statbel, NBB.

(1) See Du Caju (2017) for a more detailed analysis of these pockets of risk on the Belgian mortgage market.
(2) See Du Caju *et al.* (2016).

TABLE 1 DETERMINANTS OF THE AMOUNT OF MORTGAGE LOANS PER RESIDENT IN THE BELGIAN MUNICIPALITIES

(coefficients estimated via a linear regression per age group[1] on the basis of data per municipality for the period 2006-2015)

	Age group				
	25-34 years	35-44 years	45-54 years	55-64 years	65 years and over
Average income	1,729***	1,319***	0,906***	0,048	0,348
Property prices	3,296***	3,154***	2,872***	1,650***	0,028
R^2	0,766	0,828	0,746	0,553	0,361
Number of observations	5 048	5 048	5 048	5 029	4 457

Source: NBB.

(1) Apart from the variables shown in the table, the model includes fixed effects per year and per municipality. The coefficients marked with three asterisks (***) are significant at the 1 % level.

have a higher concentration of loans than those where the average income is lower: that also shows that borrowers' incomes are a significant factor in credit institutions' lending policy. However, the link is much more marked for persons in the 25-34 age group than for those in the older age groups.

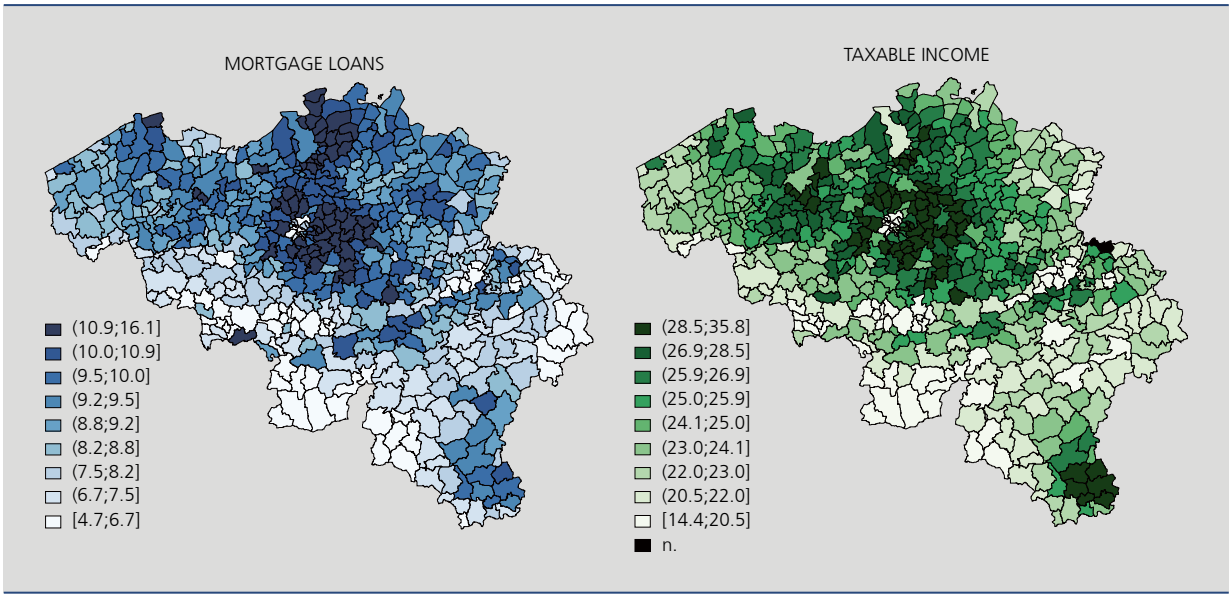
This declining link between the income elasticity of loans according to age can be confirmed by estimating econometric models similar to the model described in section 3.1, this time for each age group. Those models can be formulated as follows:

$$Credits_{i,\,t,\,a} = \alpha_a + \beta_{a,\,r}\,Income_{i,\,t,\,a} + \beta_{a,\,p}\,Price_{i,\,t} + \gamma_i + \delta_t + \varepsilon_{i,\,t,\,a}$$

where α symbolises the age group in question. The estimates of these models also include fixed effects per municipality and per year. They are shown in simplified form in table 1.

CHART 7 MORTGAGE LOANS GRANTED TO PERSONS IN THE 25-44 AGE GROUP AND AVERAGE INCOME, BY MUNICIPALITY

(in € thousand per resident aged between 25 and 44 years, averages over the period 2006-2015)



Sources: Statbel, NBB.

According to these estimates, all other things being equal, the income elasticity of loans is 1.73 for the 25-34 age group, 1.32 for the 35-44 age group and 0.91 for the 45-54 age group, and is not significant for the older age groups. Furthermore, an additional statistical test shows that the estimated elasticity for the 45-54 age group is significantly lower than for the 25-34 age group. Loan elasticity in relation to property prices also tends to diminish with age.

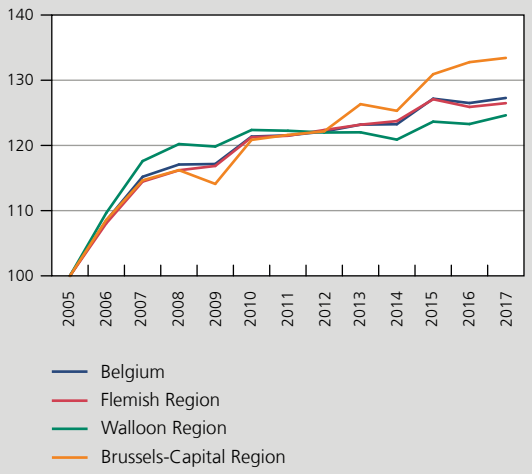
In general, the income level of a municipality's residents thus largely determines the amount of the loans granted to them. That can also be illustrated on the basis of geographical maps, by comparing the distribution of the amounts borrowed per resident aged between 25 and 44 years and the average income distribution between the Belgian municipalities. In chart 7 the similarity between the distributions of these two variables is unmistakable. Thus, the residents of the wealthiest municipalities in the country, most of which are located in the provinces of Flemish Brabant, Walloon Brabant and Antwerp, are also the ones borrowing the largest amounts.

The dichotomy evident in the Brussels-Capital Region is interesting : in the wealthiest municipalities, located in the south and south-east of the city, the amounts loaned are also the highest, in stark contrast with the municipalities in the north-east, where average incomes are generally lower than in neighbouring districts.

3.3 Links with property market developments

According to the estimates presented above, the movement in property prices also had a major influence on the growth of lending during the period considered. That contribution is linked to the rise in those prices in the past ten years, shown in chart 8 in relation to their 2005 level for Belgium as a whole and for the three regions.

CHART 8 REAL HOUSE PRICES[1] BY REGION
(indices, 2005 = 100)



Source : NBB.
(1) Nominal prices deflated by the consumer price index.

However, this link between property prices and lending to households is not always clear-cut, particularly in Brussels. The rise in the prices of houses traded on the secondary market there was steeper than in the other two regions, particularly from 2010 onwards. In real terms, after adjustment to take account of the general rise in consumer prices, house prices in Brussels increased by 10.4 % between 2010 and 2017, compared to 4.9 % for Belgium as a whole. As shown in chart 7, if we exclude the five municipalities in the south and south-east, where incomes are high, the amounts of home loans granted in the Brussels-Capital Region were relatively small compared to the other two regions of the country.

To understand the reasons for this apparent paradox, it is first necessary to identify the factors which may determine property prices in a given geographical area. That is a rather difficult exercise, given the volatility of the data relating to house prices[1]; our approach was based on a brief econometric analysis, the results of which are set out in table 2. The estimate of the market value of housing in a given municipality is closely correlated with the incomes and financial wealth of its residents. In the regressions, this last factor is addressed by the proportion of persons aged 65 years and over in the total population, in the knowledge that a large part of the financial wealth and property of Belgian households is owned by that age group (see subsection 3.2.1). In particular, the relatively rapid rise in household incomes between 2005 and 2009 certainly bolstered demand for housing during that period, and hence also the general rise in prices, while the decline in real incomes during the ensuing years can account for part of the slower pace of price rises after 2009 (Warisse, 2017). The price increase in 2015 can also be linked to the rise in incomes.

Some characteristics specific to the municipalities, such as the standard of living, may also influence the prices charged on the property market. That applies, for example, to municipalities where a fairly large part of the area is devoted to recreational facilities or other types of open space such as parks or woodlands.

TABEL 2 FACTORS INFLUENCING THE PRICES OF PROPERTIES TRADED ON THE SECONDARY MARKET

(coefficients estimated by means of linear regressions[1])

	Dependent variable: Average price per municipality[2]
Average income[2]	0.286
Share of persons aged 65 years and over in the total population	1.056
Population density (in relation to the land area in residential use)[2]	0.096
Proportion of land used for recreational purposes and other open spaces in the total area[2]	0.040
R^2	0.135
Number of observations	5 035

Source: NBB.

(1) The estimates were made for the period from 2005 to 2015. Apart from the variables shown in this table, they include a binary variable for each year and random effects. All the reported coefficients are significant at the 1 % level.

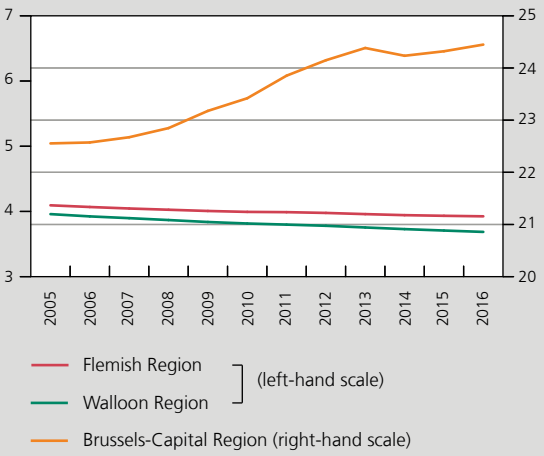
(2) Variable expressed as a logarithm.

Apart from individuals' financing and borrowing capacity, other factors which may also influence property prices relate to the supply, such as the availability of housing or building plots. This supply rigidity is the main reason why house prices are generally higher in densely populated urban areas, and the Brussels-Capital Region is no exception. As there has been no significant increase in the area of land for residential use in Brussels, the population growth there over the past ten years is probably behind the above-average rise in house prices. As chart 9 shows, the population density in Brussels increased from 22 600 persons per km² of residential area in 2005 to 24 400 in 2016, which is equivalent to a rise of almost 8 % over eleven years. In contrast, during that same period the population density declined slightly in the other two regions, owing to the increase in the residential area available for house building, which was greater in Wallonia than in Flanders.

(1) In this connection it should be borne in mind that these data only concern properties traded on the secondary market and take no account of new builds. They therefore concern only a limited proportion of the housing stock in a given municipality.

CHART 9 NUMBER OF RESIDENTS IN RELATION TO THE AREA OF RESIDENTIAL LAND

(thousands of persons per km²)



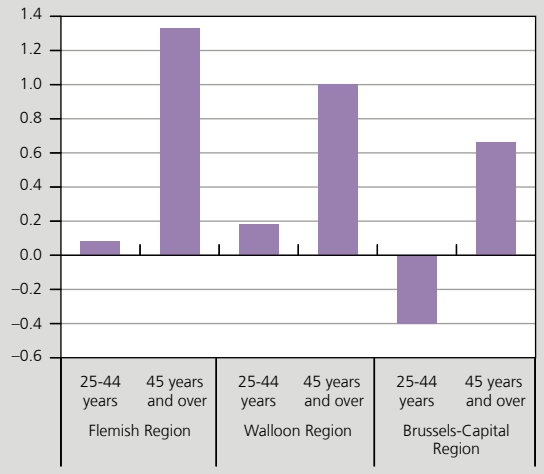
Source: Statbel.

The fact that the steeper rise in house prices in Brussels was not reflected in the volume of mortgage loans granted is due largely to demographics and to the predominance of rental properties on the capital's housing market.

A considerable proportion of the population taking up residence in Brussels over the past ten years in fact comprises young, single adults, particularly students, or persons in the 18-30 age group[1] whose incomes are relatively low

CHART 10 REAL GROWTH OF AVERAGE INCOMES

(annual averages over the period 2006-2015, data deflated by the consumer price index)



Source: Statbel.

(1) This particularly concerns immigrants.

compared to the Belgian average (Deboosere *et al.*, 2009; de Maesschalck *et al.*, 2015; Van Hamme *et al.*, 2016). At the same time, the population that left Brussels and moved to Flanders or Wallonia included many young households (mainly persons in the 30-45 age group). This change in the population of Brussels was thus accompanied by a decline in the average income of persons aged between 25 and 44 years, the age group that generally accounts for a large share of mortgage loan applications, while the incomes of persons resident in Flanders and Wallonia increased overall (see chart 10).

It is therefore likely that among persons moving to Brussels over the past ten years and looking for somewhere to live, a larger proportion turned to the rental market, which is substantial in the capital. We do not have chronological data on the proportion of individuals resident in a rental property, but according to the data from the latest census conducted by Statbel in 2011, only 39 % of Brussels residents were owner-occupiers, compared to 71 % in Flanders and 66 % in Wallonia. That also means that a large proportion of the residential properties in the Brussels-Capital Region can actually be regarded as investment properties. Also, as is evident from the results of the HFCS (see subsection 3.2.1.), that type of investment is becoming increasingly popular with Belgian households. Assuming that this trend is likewise reflected in property transactions in Brussels, it is highly plausible that the strong demand on the rental market was reflected in increased demand for investment properties which therefore supported the rise in house prices. As was also demonstrated in section 3.2.1., it is usually older people with high incomes who purchase a residential property not intended to be their main home. Such purchases are therefore largely funded out of their own resources, which is probably why the amounts of loans granted in Brussels do not reflect the rise in property prices.

4. International comparison of the fundamentals of loans to households

The statistics presented so far point to the existence of a very close link between mortgage loans granted to individuals and their incomes. They also suggest that there is a link between loans and house prices, but it is not clear-cut, since the link may be weaker in some areas, such as Brussels, where the proportion of renters is higher. In such cases, property prices may be influenced to a greater extent by demand for properties to let out – demand that generally comes from fairly wealthy individuals seeking investment properties – than by main home purchases financed largely by mortgage loans.

TABLE 3 HOUSEHOLD LOANS AND SOME OF THEIR DETERMINANTS IN THE EURO AREA COUNTRIES

(averages for the period 2010-2016; percentage annual change, unless otherwise stated)

	LU	FI	**BE**	FR	DE	NL	AT	**EA**	IT	PT	EL	ES	IE
Net loans to households, 2010 to 2016 (in % of GDP)	4.0	2.6	**2.5**	1.8	0.8	0.6	0.6	**0.5**	0.3	–1.9	–2.0	–2.1	–2.8
Real average income growth of persons aged from 25 to 49 years	–0.9	–0.1	**–0.1**	–0.2	0.4	0.5	–0.6	**–0.6**	–1.6	–1.3	–7.1	–2.7	–0.6
Real house price growth	3.6	0.2	**0.6**	0.0	2.3	–2.3	4.3	**–0.7**	–3.6	–1.1	–6.8	–4.8	–2.4
Percentage of owner[1]	68	68	**70**	59	44	58	48	**61**	68	75	72	83	71
Growth of the population aged from 25-49 years	2.1	–0.2	**0.0**	–0.3	–1.1	–0.8	–0.3	**–0.8**	–0.7	–1.4	–1.4	–1.3	–0.1

Sources: EC, HFCS 2014, OECD.
(1) Owner-occupier households, in % of total households in 2014.

Mortgage lending, property prices and residents' incomes may explain, at least in part, the sometimes divergent movements in lending to households in the euro area since the 2008 crisis. First, as regards the link between loans and incomes, the decline in the real incomes of persons under the age of 50 certainly depressed lending in the great majority of countries (such as Italy, Portugal, Greece and Spain). It had less impact in Belgium where lending was down by an annual average of 0.1 % between 2010 and 2016, compared to a decline of 0.6 % in the euro area as a whole (see table 3).

Next, the relatively strong rise in house prices in Belgium probably favoured the increase in Belgian household debt, whereas those debts sometimes dropped sharply in other euro area countries. That effect was all the more marked in that Belgium has a high rate of home ownership, with the notable exception of the Brussels-Capital Region. The way in which use of the rental market affects the link between lending and house prices may also explain why the relatively strong price growth in Germany and Austria, averaging 2.3 % and 4.3 % respectively from 2010 to 2016, was not accompanied by a comparable rise in lending to households. In fact, these two countries also have quite a low proportion of owners in their population.

Finally, the demographic factor, and particularly the structure of the age pyramid, must not be overlooked, because the volume of lending in an economy is naturally linked to the proportion of the resident population of an age to take on debts. In Germany, in particular, population ageing has significantly depressed the level of mortgage lending since the late 1990s (Geiger *et al.*, 2016). In that regard, it is worth noting that the population in the 25-49 age group has been generally stable in Belgium since 2009, whereas it has tended to decline in many other euro area countries.

Conclusion

In contrast to what happened in most other euro area countries, household mortgage debt continued to increase in Belgium after the 2008 financial crisis, reaching over 60 % of GDP at the end of 2017. Owing to the risks to financial stability presented by excessive household debt, this situation requires the attention of the macroprudential authorities. In that connection it is particularly relevant to look at the reasons for household debt in Belgium.

The volume of mortgage lending in recent years in Belgium, which depends partly on the macroeconomic environment, may have been influenced by various other factors, such as the bank's supply strategies, government tax measures, or monetary and macroprudential policies. These are not the only aspects. A number of determinants relating to demographics and the characteristics (age and income) of Belgian households were also identified as factors explaining the increased debt.

In general, variations in mortgage debt – both over time and between individual households, municipalities or even countries – are consistent with the life cycle theory. This implies that young households with favourable income prospects are able to contract loans and purchase a property, and that in middle age or in their later years, they can save more and build up assets. Empirically, this life cycle is observed mainly in the case of households with relatively high incomes and more favourable income prospects.

Indeed, the data used for this study clearly indicate a close, positive link between the growth of mortgage debt and the trend in residents' incomes, but the link varies from one age group to another. In particular, the link between debt and income is strongest for persons in the 25-44 age group, but tends to diminish for the older age groups. The main factor explaining this is that older persons have greater real and financial assets which they may use for investment purposes or for limiting their need for bank finance.

House prices also determine the amount of mortgage loans. However, in some regions, such as Brussels, where a relatively high proportion of residents are renters, this link between house prices and lending is weaker.

Despite the finding that variations in mortgage debt depend largely on household income – reflecting a sound lending policy on the part of banks – there are also pockets of risk on the Belgian mortgage market, concentrated on groups of households which devote a large part of their income to debt repayment, and which have only meagre financial reserves to cover any loss of income. The prudential supervision authority needs to keep a close eye on these pockets of risk. These findings prompted the Bank to take steps to ensure that credit institutions are resilient enough to cope with any shock affecting the mortgage market.

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Energy transition : impact and economic stakes for firms

Carine Swartenbroekx (*)

Introduction

Tackling global warming is one of the main challenges facing both advanced and emerging economies. This necessarily implies transforming modes of energy production and consumption, or *energy transition*, a transition that aims to meet the primary objective of reducing greenhouse gas (GHG) emissions by limiting or reducing consumption of fossil fuels. In this general context, supplemented in Belgium by the decision to ultimately close down all nuclear power stations in accordance with the Law of 28 June 2015 (1), the Belgian energy mix is therefore bound to change considerably over the next few years.

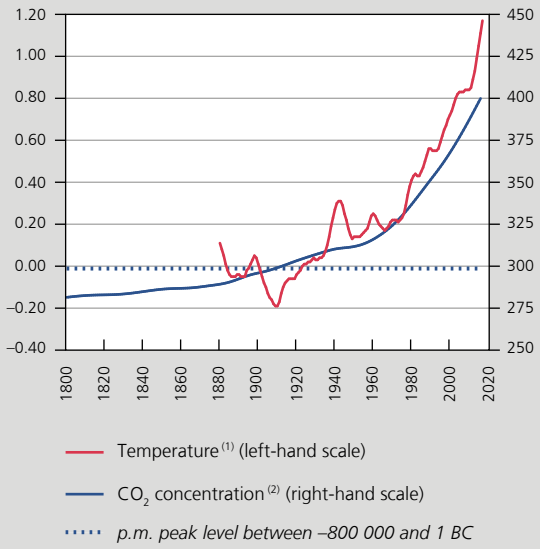
This transition nevertheless has to be accomplished with due regard for certain economic constraints, such as safeguarding business competitiveness and ensuring security of the energy supply, so that it is not ultimately rejected by a section of the population that could become a collateral victim (through job losses in some economic sectors or an across-the-board increase in energy costs). Such considerations were taken into account in the inter-federal Energy Pact approved by the Regions and the Federal Government last March. In addition, the federal authorities have made various commitments as part of their energy strategy with a view to guaranteeing security of supply and keeping energy affordable (while respecting the Paris Agreement). They include in particular (a) defining an energy standard aimed at curbing the cost of energy (and its various components) compared with costs in the neighbouring countries, (b) establishing various monitoring systems (concerning climate change, energy prices, security of supply and nuclear safety) and a Federal Energy Committee bringing together the government, the Regions and business representatives, and (c) adopting the principle of a mechanism for remunerating electricity generation capacities so as to guarantee a robust and reliable power system. For many businesses, energy is in fact still crucial to their production process, but – like any other input – it needs to be used more efficiently.

The objective of this article is therefore to document the efforts made by companies over the last few years to reduce their ecological footprint, while highlighting some of the competitiveness issues, at both domestic and international level, associated with these developments. The first part recaps the commitments made in this area and the various policies implemented to encourage firms to adapt their business activities in line with the energy transition. The second part presents the findings of the main simulation exercises carried out at European level to assess the economic impact of the transition. However, the impact of these energy and environmental policies is not the same for all sectors and firms, and varies greatly depending on the processes they use or their level of energy efficiency. The third part begins by presenting the scale of energy costs per branch of activity before focusing on the potential consequences of the energy transition from the point of view of international competitiveness ; in so doing, it compares the energy efficiency of Belgian firms

(*) The author would like to thank E. Dhyne for his valuable comments.

(1) *Moniteur belge/Belgisch Staatsblad* (2015), Law amending the Law of 31 January 2003 on the phasing out of nuclear energy for industrial production of electricity in order to guarantee security of energy supply, 6 July 2015.

CHART 1 CONCENTRATION OF GREENHOUSE GASES HAS SOARED AND AFFECTED THE CLIMATE



Sources: NASA, University of Bern, University of California.

(1) Deviation from the average over the 1880-1900 period, in degrees Celsius. Data for the period before 1880 are not available.

(2) Concentration in volume, parts per million (ppmv).

to that of their main competitors (neighbouring countries) and highlights any distortions of competition that may be caused by divergent regulations. The third part addresses the energy transition from the point of view of the constraints that it may impose on Belgian manufacturing industry, and in particular on its competitiveness, but that transition could ultimately be a source of growth since it requires the introduction of innovative technological solutions, which open up opportunities for developing new markets. The fourth part examines these aspects and the measures needed to enable Belgium to gain the maximum benefit from the transition. The fifth and final part presents our main conclusions.

1. The environmental constraints as a driving force behind the transformation of the European economy

1.1 Energy transition in a European context…

In ratifying the United Nations Framework Convention on Climate Change back in 1996[1], Belgium opted to convert to a low GHG emission economy. That decision fits in with a wider European context of GHG emission reduction, improvement of energy efficiency and development of renewable energy sources (RES). For these three dimensions, the targets set by both the European and the Belgian authorities were in turn set out in the 2020 Climate and Energy Package launched in 2007 and in the 2030 Climate and Energy Framework adopted in October 2014.

These initiatives are in line with the EU's long-term objectives set out in the roadmap *"for moving to a competitive low-carbon economy in 2050"*, which aims to reduce GHG emissions by at least 80 % from their 1990 level. Moreover, energy policy is identified as one of the Commission's ten priorities for action over the period 2015-2019 (Energy and Climate Union). The legislative proposals concerning "Clean energy for all Europeans – unlocking Europe's growth

(1) "The ultimate objective of this Convention (…) is to achieve (…) stabilization of GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system."

TABLE 1 TARGETS SET IN THE EUROPEAN FRAMEWORK FOR 2020 AND 2030
(in %)

	2020 Strategy		2030 Strategy
	EU	Belgium	EU
Reduction of GHG emissions from their 1990 level	–20	–15 (1)	–40 (2)
Increase in the share of RES in gross final energy consumption	20	13	30
Reduction of gross domestic energy consumption from the reference figure calculated in 2007	–20	–18	–27 to –30

Source : EC.
(1) A 15 % reduction in GHG emissions compared to their 2005 level by sectors not subject to the European emissions trading system.
(2) The effort is shared between sectors that are subject to the European emissions trading system and those that are not, with reductions of, respectively, 43 % and 30 % from their 2005 level. For the latter sectors, that meant a binding national target of a 35 % reduction for Belgium.

potential "(Clean Energy Package), put forward in November 2016, seek to "*cut CO2 emissions by at least 40 % by 2030 while modernising the EU's economy and delivering on jobs and growth for all European citizens*". They cover energy efficiency, renewable energy, organisation of the electricity market, security of power supply and governance rules. A strategy on connected and automated mobility is also proposed here, as well as several facilitation measures designed to speed up innovation supporting clean energy, to renovate buildings in Europe, to encourage public and private investment, to promote the competitiveness of EU firms and to ease the societal impact of the energy transition.

Last but not least, these various commitments dovetail precisely with the 2030 Agenda for Sustainable Development adopted in 2016 under the aegis of the United Nations, which explicitly sets out to "ensure access to affordable, reliable, sustainable and modern energy for all".

1.2 … transposed at national, regional and local levels

In the same way as for other issues, regionalisation in Belgium resulted in responsibilities relating to the energy transition being shared out among the different levels of power. While the federal State is in charge of matters "which need to be treated at national level, owing to their technological and economic indivisibility" (forecasting and security of supply, major infrastructures for energy production, storage and transport (including their pricing), and nuclear power), the Regions are responsible for local issues (local transmission and distribution of electricity and gas, heat and power networks, development of RES, and solutions for rational use of energy). There are arrangements for a dialogue between the different levels of government in order to ensure consistency between the various energy policy measures.

In practice, the energy transition centres on three focal points :

– improvement of energy efficiency, which is the best way of limiting the carbon footprint of human activities on the exploitation of the planet's resources and the associated GHG emissions ;
– expansion of production of low-carbon sources of energy under affordable technical and economic conditions ;
– electrification of final uses and substitution of fossil fuels by carbon-free sources of energy in intermediate and final consumption of energy (1).

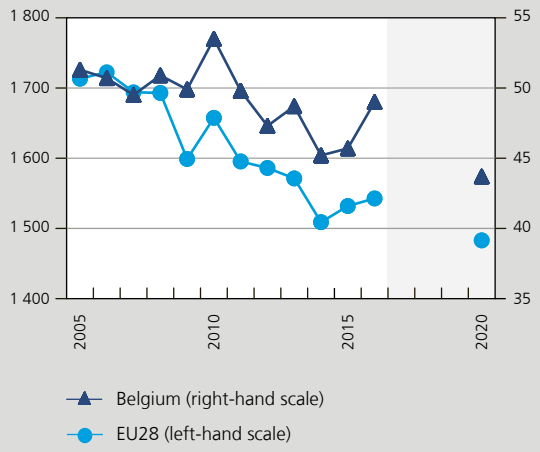
The last two points are of course crucial for achieving the targets. However, in this article we confine ourselves to analysing the first aspect. For Belgium, this means a target of reducing primary energy consumption by 18 % by the year 2020 from the reference level calculated in 2007, which implies cutting gross domestic energy consumption to 43.7 million tonnes of oil equivalent (Mtoe), converted to an indicative target of 32.5 Mtoe in terms of final consumption.

(1) The difference between primary consumption and final consumption is due to the processing of primary energy sources (nuclear, gas, solid fuels and oil), necessary to make them "usable" for consumers (mainly in the form of electricity and refined petroleum products).

Since 2005, primary energy consumption has been falling steadily in Belgium, although there was a sharp rise in 2016. In the coming years, efforts to cut energy consumption in Belgium therefore need to be maintained or even intensified, not just to honour the commitments made for the year 2020, but also to help achieve the target set by the European Parliament in January 2018 of a 35 % reduction in the EU's primary energy consumption by 2030.

CHART 2 CHANGE IN PRIMARY ENERGY CONSUMPTION OF THE EU28 AND BELGIUM AND INDICATIVE ENERGY EFFICIENCY TARGETS

(in million tonnes of oil equivalent)



Source: Eurostat.

The policies pursued by the various levels of government which rely essentially on action by companies themselves, concern measures to improve efficiency of energy use (energy audits and energy management systems) and energy supply (reinforcing rules that promote cogeneration), transversal actions in the area of approval and certification, training and information, and energy services[(1)]. Other actions apply more specifically to products: this concerns providing information about energy consumption of products through labelling, so as to help consumers to choose the products that use the least energy, and eco design requirements for these products, in order to limit their energy consumption throughout their life cycle.

In the Belgian institutional context, the federal government is in charge of policies regarding labelling of energy-related products, and the performance and eco design of appliances that consume energy. In regard to taxation, 13.5 % of the cost of environment-friendly R&D investment and energy-saving investment is tax deductible.

The Regions are responsible for the other policy measures. They have introduced various measures to encourage companies to adapt and improve their production processes through regulations, financial incentives and information; the implementing conditions vary according to the Region. The main instruments are:

(1) These policies come under the national energy efficiency programme and the related Directive 2012/27/EU.

– The regulatory energy audits that large enterprises[1] have to carry out every four years (in accordance with the EU Directive). In Wallonia, subsidies are available to help SMEs finance such audits. In Brussels, the obligation also applies to environmental permit applicants considered as large consumers. Companies that have set up an energy management system certified by the ISO 50001 standard guaranteeing adoption and application of a structured approach to energy management in their business activities (for processes, equipment and building infrastructures) are exempt from the audit in all three Regions. In 2016, 70 certificates covering 55 sites were granted in Belgium, the highest number since 2011 (178 certificates covering 103 sites were issued over the period from 2011 to 2016).
– The sectoral agreements on energy or voluntary branch agreements concluded between the regional authorities and business federations representing the most energy-intensive firms. Under these agreements, firms commit themselves to boosting their energy efficiency and reducing their energy consumption by drawing up – on the basis of a prior audit – an action plan identifying feasible and viable measures (in terms of estimated savings in energy consumption and investment costs), and then implementing it (obligation to deliver on commitments). In Wallonia, firms are also obliged to conduct surveys on RES potential, CO_2 mapping, and to establish a sector-specific roadmap for 2050. In Flanders, they pledge to examine the feasibility of combined heat and power, heating and cooling, and to adopt an energy management system. These agreements cover around 80 % of industrial energy consumption in both Wallonia and Flanders. In 2015, 187 Walloon entities and 334 Flemish ones were involved in such agreements and accounted for respectively 14 % and 53 % of the energy savings recorded in 2015 under the Energy Efficiency Directive (as reported to the European Commission during its follow-up to the measures). The rest of the savings are made on the basis of measures designed to improve the energy efficiency of both public and private buildings (subsidies for insulation, installation of energy-efficient boilers, etc.).
– Introducing financial counterparts to these commitments by reducing the burden on the energy bill (partial exemption from the surcharge for green power certificates), a reduction in green certificate quotas, or grants to fund audit studies. Aid for specific types of investment (biomass, cogeneration, "green heat") is also aimed at SMEs.
– Developing the market in energy-efficient solutions and the companies that provide them (known as energy service companies or ESCOs) and third-party investment formulas. These companies take charge of energy efficiency projects (design, installation, funding) over a long period of time. They bear the risk associated with the project's obligation to deliver in terms of energy savings (the result is contractually guaranteed in an energy performance contract) and are reimbursed by the beneficiary of the investment on the basis of the financial value of the energy savings made. Project stakeholders in the various types of energy service-related activities come from the banking sector, engineering companies, consultancies, and project facilitators.
– Education and training programmes, including energy counselling programmes aimed at promoting and developing energy efficiency measures.

2. Macroeconomic assessment of the impact of the energy transition

The measures guiding the economy's transition towards more energy-efficient operation with lower carbon emissions are based on various types of instruments and mechanisms: taxes, subsidies for investment or R&D, and regulatory constraints. The aim is to achieve a more energy-efficient allocation of resources which is more respectful of the environment but still preserves growth potential.

Although the ambitious targets entail costs in the adaptation of equipment and processes, the expense incurred in the short and medium term may be justified in the light of the long-term cost of failure to act in response to climate change. By becoming pioneers in less energy-intensive or more environment-friendly technological sectors, firms also gain opportunities for growth and for developing new activities and products.

The introduction of a carbon tax or any other mechanism that incorporates the environmental cost in product prices thus results in a change in the relative prices of "carbon-containing" inputs and therefore influences agents' choices: the rise in the energy bill has a negative effect on household incomes; households respond by switching to lower carbon goods and services, though the net effect on growth depends on the scope for substitution. For firms, the unilateral adoption of such a tax has an *a priori* detrimental impact on their competitiveness; since the tax influences the price of carbon-containing products, most of which are imported, the resulting substitution effect encourages the use of more

(1) Enterprises employing more than 250 full-time equivalents or whose turnover exceeds € 50 million and annual balance sheet exceeds € 43 million.

carbon-free (domestic) products, which in turn mitigates the negative impact on economic activity. This may even have a favourable influence on the trade balance. In the absence of any additional measures, the carbon tax nevertheless inhibits growth and has a short-term inflationary effect. However, the redistribution of the proceeds from the tax (for example, in the form of measures to reduce labour costs) helps to offset these negative effects, with a possible reduction in production costs, net job creation and an improvement in competitiveness and growth. Consequently, the economy reaps a double dividend : lower CO_2 emissions and higher GDP and employment.

More direct encouragement for the adoption of low-carbon goods and technologies can be given by schemes supporting investment (subsidies or feed-in tariffs) which benefit activity according to the multiplier effect associated with such investment. In that respect, the method of funding those measures may also influence the impact. As a rule, the impact will be smaller if the funding is provided by cuts in other government expenditure, rather than by borrowing.

A third approach entails imposing regulatory standards (emission standards, and technical standards for products or buildings) and thereby reducing the impact of pollution-creating goods and installations. These standards apply in the same way to all goods and installations, regardless of the marginal costs incurred in complying with them. However, they introduce distortion compared to a price-based approach. The end result depends on the available alternatives to polluting installations and the cost of compliance (Ouvrard *et al.*, 2014).

The macroeconomic impact studies that preceded the adoption of the various EU strategies on the subject investigated how intensified measures would affect GDP growth (and its components) and employment, including at sectoral level. The analyses and simulations were based on the use of a post-Keynesian macroeconometric model and a general equilibrium model. That made it possible to broaden the assessment of the possible implications, determine the necessary conditions, and define the conditions favourable to growth. The results of various energy policy scenarios were obtained exogenously (on the basis of the PRIMES model[(1)]) and incorporated in the assumptions adopted for the simulations, which also took explicit account of the investment funding issue.

In the macroeconometric model, higher prices for energy and CO_2 increase the cost of carbon-containing products, thus reducing household purchasing power and influencing business competitiveness, and hence GDP. Conversely, the increased investment needed to meet the targets contributes to the expansion of sectors such as construction or engineering services, and that supports growth, as does the replacement of some of the expenditure on fossil fuels with expenditure on "low-carbon" domestic products. As regards employment, those mechanisms lead to a reallocation of labour in favour of highly labour-intensive activities.

In the general equilibrium model, the impact on growth depends on the combination of the positive effects on domestic activity resulting from the reduction in imports of fossil fuels, the increase in (domestic) demand for "low-carbon" goods and services, and the lower costs facilitating progress along the learning curves of certain technologies. However, the substantial initial investment entailed (though subsequently offset by lower energy costs) puts a strain on household and business finances and may have the effect of displacing other investment or consumption expenditure if savings are used. In a tight labour market, the pressure on wages may likewise affect costs.

In the end, the impact assessments indicate a predominantly beneficial macroeconomic effect on growth and employment, in which the initial adverse effect on growth (change in relative prices) is later offset by the expansion resulting from the switch to low-carbon domestic products and technologies, made possible by technological progress. However, this does not mean that the growth is evenly distributed across the branches of activity, as demand is diverted away from energy-related branches. As far as the competitiveness of energy-intensive sectors is concerned, there is little change in the energy-related costs (capital costs generated by new investment, energy purchases, emission rights) expressed in terms of value added, as the capital costs are offset by savings on energy purchases (EC, 2016).

(1) PRIMES is a detailed partial equilibrium model for the energy market, developed at EU and Member State level. It models the energy system for all sectors and for all types of fuels.

The main findings of these impact studies are set out in the table below for the Reference 2016 scenario, based on the measures and provisions that have already been adopted, and for the EUCO27 and EUCO30 scenarios, which assume that additional measures are taken to reduce gross domestic consumption by respectively 27 and 30 % from the reference level calculated in 2007 (and by 24 % in the case of the Reference 2016 scenario). The negative results in terms of growth and employment projected in the general equilibrium model are related to the assumption of financing from own funds (savings, cutting consumption).

TABLE 2 IMPACT OF STEPPING UP THE ENERGY EFFICIENCY TARGET AT EUROPEAN UNION LEVEL BY 2030

(in %, unless otherwise stated)

	Reference 2016	EUCO27	EUCO30
Reduction of GHG emissions from their 1990 level	–35	–41	–41
Share of RES in gross final energy consumption	24	27	27
Energy expenditure in % of value added for energy-intensive industries	40.3	40.8	40.1
GDP (in € billion in 2013 and in % against the reference year 2016)			
Macroeconometric model	17 928	0.65	1.05
General equilibrium model	16 955	–0.28 to 0.04	–0.50 to 0.30
Employment (in million units and in % against the reference year 2016)			
Macroeconometric model	233.1	0.17	0.34
General equilibrium model	216.4	–0.18 to 0.09	–0.36 to 0.29

Source : EC (2016).

Impact assessments have also been carried out using microeconomic data. On the basis of individual data for French firms covering the period from 1997 to 2010 (a period marked by a sharp drop in the volume discounts granted to big industrial consumers of gas and electricity), Marin *et al* (2017) demonstrated that while a 10 % rise in energy costs for an individual establishment yields a 6.4 % reduction in energy consumption and an 11.5 % reduction in CO_2 emissions, it also reduces employment and wages by 2.6 % and 0.4 % respectively. The impact on employment is amplified if the sector concerned is energy-intensive (a significant reduction in employment of 3.2 %, compared with 1.3 % (nevertheless not significant) in other branches) or if the sector is exposed to international competition (a significant reduction in employment of 3.1 %, compared with 1.6 % in companies that are less exposed). According to the authors, the trade-off between employment and environmental protection measures via a change in relative energy prices involves three mechanisms : the rise in energy prices has an adverse effect on production and employment ; more expensive energy is replaced by other inputs (capital and labour) ; and the innovation induced by relatively higher prices for lower-carbon products curbs the slowdown in output and opens up more scope for substitution. Theoretically, the final outcome is open-ended and depends on the scope for substitution, technological developments, and compositional adjustments between and within branches of activity (with, for instance, stronger growth and a competitive advantage for firms using fewer polluting inputs).

3. The energy transition and competitiveness

While societal choices also apply to the corporate world, the energy transition must not take place at the expense of the competitiveness of firms, and consequently that of the country's entire economic fabric. The targets for cutting energy consumption aim primarily to keep production costs under better control and reduce the energy intensity of production and consumption processes. Companies operating in fiercely competitive markets are bound to benefit from such moves to enhance their productive efficiency. However, they sometimes need incentives to change their behaviour. The best

incentive for reducing energy consumption is to change relative price signals, by putting up the prices of fossil fuels and products derived from processing these energy sources.

But if some countries, sectors of activity or businesses enjoy preferential access to fossil energy sources, that approach may lead to distortions of competition that could put Belgian industrial firms at a disadvantage with their competitors, whether they are based outside the European Union or within the EU's Single Market. This part of the article documents the scale of energy inputs for Belgian industrial production and identifies the branches of activity most exposed to possible distortions of competition.

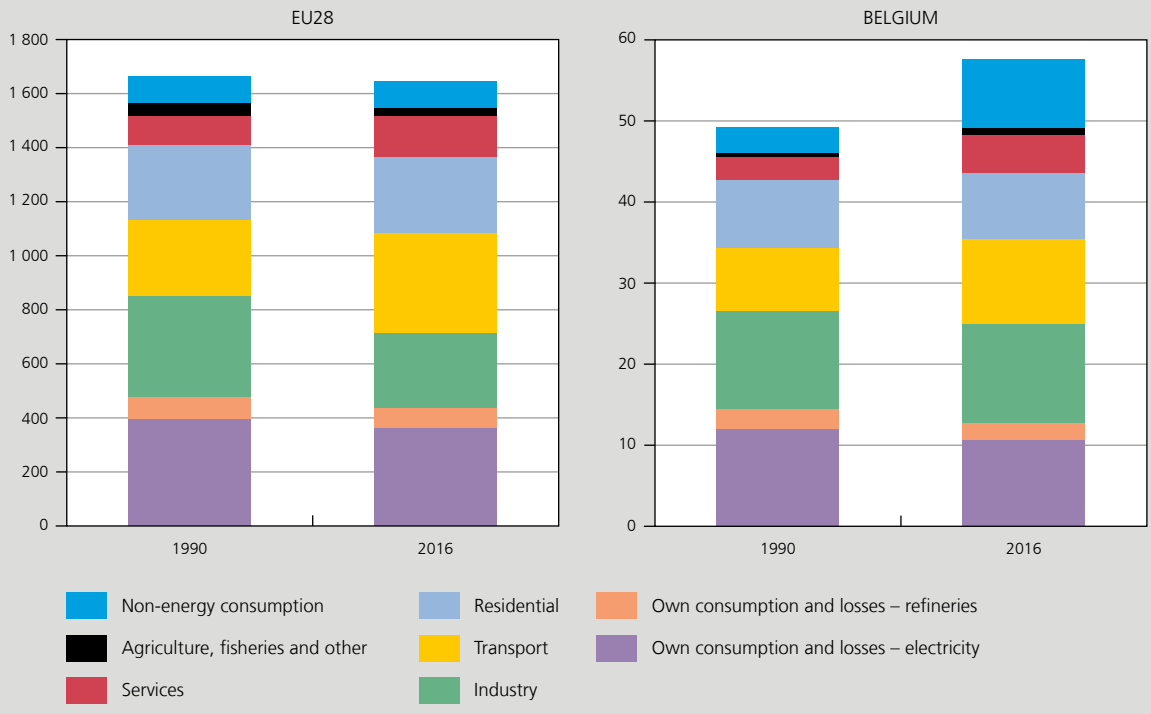
3.1 Energy consumption and energy intensity in Belgium

At global level, the improvement in energy intensity (primary energy consumption per unit of GDP) is gaining ground: since 2010, it has fallen by 2.1 % a year, compared with 1.3 % over the period from 1973 to 2010. These efforts must continue, and energy efficiency is an important lever here. In fact, since 2014, improvements in energy intensity have offset three-quarters of the impact of GDP growth on GHG emissions, while greater recourse to RES and use of alternative, lower-carbon-emission fuels have helped cover the rest (IEA, 2017).

While gross domestic energy consumption [1] declined slowly at European level between 1990 and 2016, in Belgium it rose by 18 % following the sharp acceleration of non-energy final consumption of petroleum products (which tripled) and natural gas (which doubled), used as raw materials by the petrochemicals industry. Energy consumption in the

CHART 3 BREAKDOWN OF GROSS DOMESTIC ENERGY CONSUMPTION BY BRANCH IN THE EU28 AND IN BELGIUM, IN 1990 AND IN 2016

(in million tonnes of oil equivalent)



Source: Eurostat.

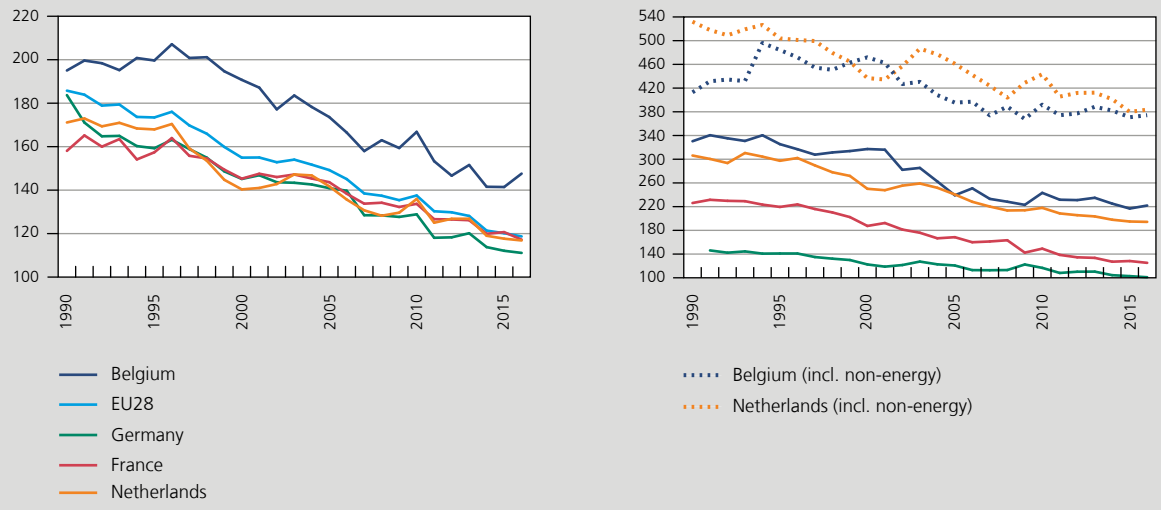
(1) Gross domestic energy consumption represents the quantity of energy required to meet the domestic energy consumption of a given country. Final energy consumption is obtained after the primary energy sources (nuclear, gas, solid fuels and oil) have been processed into forms that are "usable" for consumers, essentially electricity and refined petroleum products. The difference between the two concepts relates to processing and transport activities, which also use energy (own consumption) but which above all generate transformation losses (mainly related to power station efficiency) and transmission losses (on the gas and electricity networks). The energy available for final consumption by businesses and households is divided between final consumption for energy use and for non-energy use (energy products used as raw materials).

transport sector, for both private and business use, also recorded an increase of around 35 % as a result of expanding international transport by road and by air, while consumption attributable to inland waterways is falling. Consumption by industrial sectors (excluding non-energy use) declined by 1 %, but the trend varies from one sector to another : the sharp rise in consumption by the iron and steel industry is offset by a similar reduction in energy consumption by the chemicals/petrochemicals sector. Consumption by the – relatively energy-intensive – food, paper and timber sectors is also coming down. Structural effects caused by the shift in the domestic production network towards more service activities [1] cannot be excluded. Lastly, production for own consumption and transformation and transmission losses in the production and distribution of gas, heat and power have declined, but still accounted for 19 % of Belgian domestic primary energy consumption in 2016, a similar proportion to transport.

As already noted, the trend in Belgium's consumption of energy deviates from that of the EU as a whole, as its final energy consumption is still relatively concentrated on energy-intensive industrial activities, even for non-energy uses (oil and gas used as raw materials, especially in petrochemicals) : in 2016, that concerned 19 % of final energy consumption in Belgium, compared with 9 % in Germany and 8 % in France. Only the Netherlands – which is also home to a major petrochemicals cluster – posted a higher share of final consumption for non-energy purposes, of almost 21 %. Trends in energy intensity in fact vary more between countries if industry is considered on its own, and mainly reflect the specific nature of the Belgian and Dutch industrial fabric.

CHART 4 ENERGY INTENSITY IN BELGIUM, GERMANY, FRANCE, THE NETHERLANDS AND AT EU28 LEVEL, FOR THE ECONOMY AS A WHOLE [1] AND FOR MANUFACTURING INDUSTRY [2], 1990-2016

(in tonnes of oil equivalent per € million of GDP and value added)



Source : Eurostat.

(1) Gross domestic energy consumption per unit of GDP in chained euros, with 2010 as reference year.

(2) Final consumption of manufacturing industry per unit of value added in chained euros, with 2010 as reference year.

The reduction in energy intensity of manufacturing industry as a whole nevertheless conceals differences in levels and trends between industrial branches, taking account of the production processes implemented and their potential for improving energy efficiency. Contrary to what is observed in the neighbouring countries, energy intensity in the food, textiles and leather, and wood and paper product industries is rising in Belgium, and remains at a higher level there. The non-metallic mineral products branch, which includes cement production, is the most energy-intensive (after chemicals, if non-energy uses are taken into consideration), including in comparison with other countries. The Belgian chemicals industry's energy intensity is fairly stable and well below that of its Dutch counterpart. Nevertheless, Belgium

(1) Where energy consumption is, moreover, on the increase.

has to contend with a specific structural effect since it is more specialised in energy-intensive branches of activity than the neighbouring countries: in terms of value added, the share of the chemicals and petrochemicals, metallurgy and non-metallic mineral product branches accounts for 27 % in Belgium, compared with 18 % in the Netherlands and 14 % in France and Germany.

However, it should be noted that, overall, Belgium's manufacturing industry seems to be more energy-intensive than that of its three main neighbours. This may indicate that Belgium is lagging behind in adopting technologies that use less energy, or that Belgian industry is positioned in the most energy-intensive segments of the European value chains. While it is difficult to distinguish the contribution of these two factors, it is worth noting that, as demonstrated by Dhyne and Duprez (2015), compared with its three main neighbours, Belgium is in fact more specialised in branches of activity that tend to be further upstream in the global value chains. Those initial stages of production generally tend to have the highest fossil fuel content.

TABLE 3 ENERGY INTENSITY OF THE MANUFACTURING BRANCHES (NACE REV. 2) IN BELGIUM, GERMANY, FRANCE AND THE NETHERLANDS, IN 2000 AND IN 2015

(in tonnes of oil equivalent per € thousand of value added)

	Belgium		Germany		France		Netherlands	
	2000	2015	2000	2015	2000	2015	2000	2015
Manufacturing industry	0.32	0.22	0.12	0.10	0.19	0.13	0.25	0.19
Manufacturing industry (including non-energy uses)	*0.47*	*0.37*	*0.18*	*0.14*	*0.27*	*0.19*	*0.44*	*0.38*
of which:								
Food, drink and tobacco industries	0.15	0.17	0.10	0.10	0.14	0.12	0.18	0.15
Textiles, clothing, leather	0.12	0.15	0.10	0.08	0.23	0.06	0.15	0.08
Wood, paper and printing articles	0.24	0.34	0.20	0.30	0.43	0.24	0.22	0.16
Chemicals, petrochemicals and pharmaceuticals industry	0.29	0.31	0.21	0.23	0.28	0.14	0.92	0.65
Chemicals (including non-energy uses)	*0.89*	*0.88*	*0.61*	*0.49*	*0.82*	*0.48*	*2.34*	*1.89*
Other non-metallic mineral products	0.57	0.57	0.43	0.43	0.45	0.44	0.38	0.35
Metallurgy	1.57	0.36	0.79	0.78	1.35	1.10	2.17	1.51
Transport equipment	0.05	0.08	0.04	0.02	0.07	0.05	0.04	0.02
p.m. Share of the most energy-intensive branches[1] in manufacturing industry's value added	*0.28*	*0.27*	*0.16*	*0.14*	*0.14*	*0.14*	*0.17*	*0.18*

Sources: Eurostat, EU-KLEMS.
(1) Chemicals and petrochemicals, metallurgy and other non-metallic mineral products.

3.2 Reducing the burden of energy costs

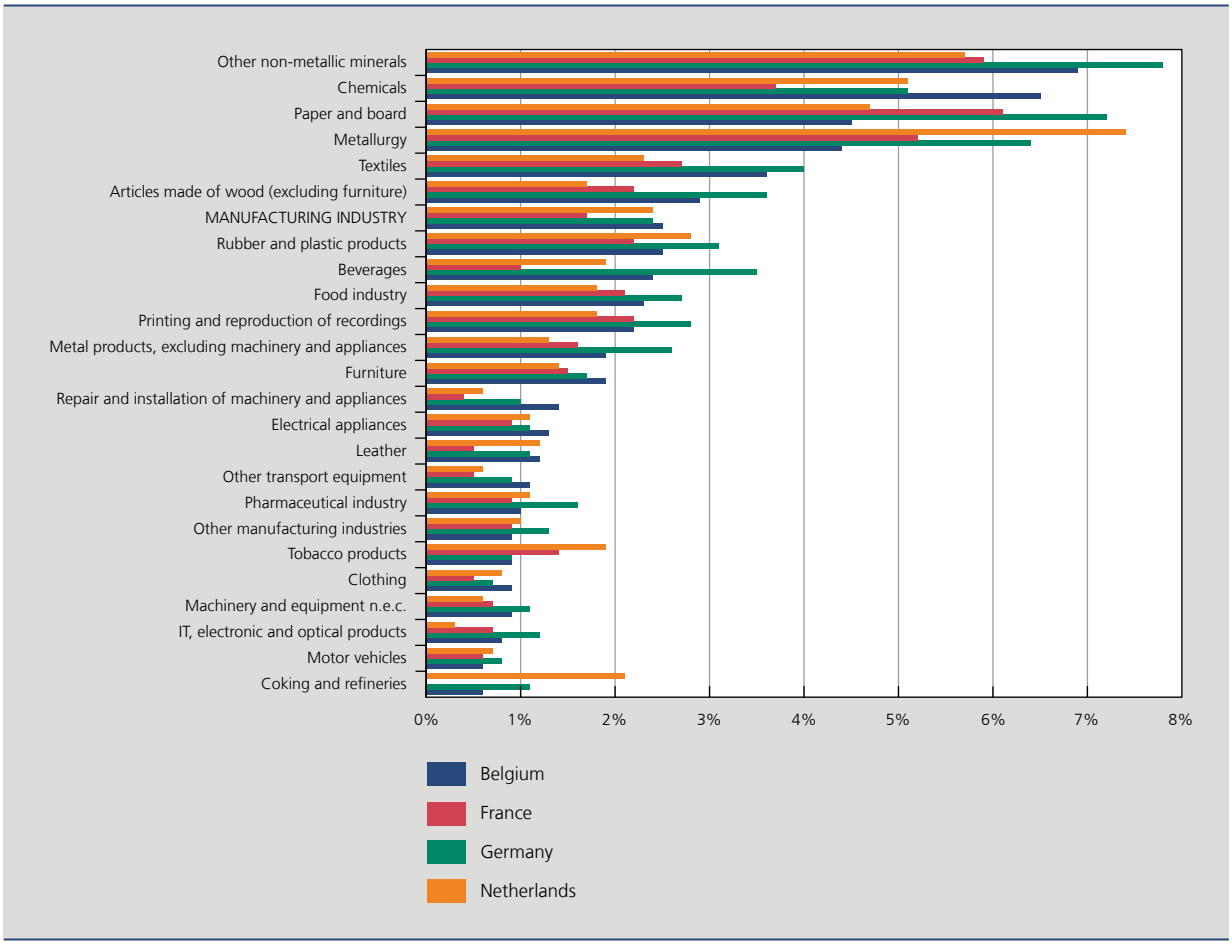
Like other costs, energy expenses are a factor in the competitiveness of some branches and firms, depending on the relative level of that expenditure. Detailed statistics for enterprises published by Eurostat provide data that may shed a different light on the relative level of these expenses for the various industrial branches (at NACE Rev.2, 2- and 3-digit level).

It appears that, on average over the period from 2008 to 2015, energy costs accounted for 2.5 % of Belgian industrial firms' expenditure on goods and services and wage bills, a similar level to that seen in Germany and the Netherlands (2.4 %), but slightly above the figure of 1.7 % for France. In manufacturing industry, these expenses are in fact relatively minor, compared for example with spending on wages (which corresponds to around 10 % of costs in Belgium).

Among the branches incurring energy costs proportionally higher than this average, the chemicals industry – which accounts for 14 % of value added and 9 % of employment in manufacturing industry – bears a much heavier energy cost burden in Belgium compared to the neighbouring countries. A similar situation, which also applies to the same branches in Germany, is true for non-metallic mineral products, textiles and wood products.

CHART 5 SCALE OF ENERGY EXPENDITURE IN MANUFACTURING INDUSTRY

(in % of costs of goods and services and wage costs, average over 2008-2015, ranked in descending order for Belgium)



Source : Eurostat.

In order to refine the analysis, we consider three branch profiles based on the (average) relative level of their expenditure on energy : branches in which companies' energy costs exceed 10 %, on average, and where energy management is critical for their competitiveness ; branches where energy costs range between 5 and 10 %, where greater energy efficiency enhances competitiveness ; and branches where energy costs account for less than 5 % of their expenses and are not a priority. According to the microeconomic data, energy costs account for over 5 % of total expenses for around 15 % of all firms on average in Belgium, and actually represent over 10 % of their costs for one-third of these firms. The proportion of companies concerned nevertheless declined between 2008 and 2015.

The (NACE 3-digit) branches in which energy costs represent, on average, more than 5 % of firms' expenses correspond to about 17 % of value added and 13 % of employment in Belgium (for branch details, see table in the annex). These are the highest proportions in comparison to the neighbouring countries. Branches where companies' spending on energy exceeds 10 % of their costs, on average, account for only around 1 % of Belgian manufacturing industry's employment and value added. The figure is three times as high in Germany.

TABLE 4 SHARE OF VALUE ADDED AND EMPLOYMENT IN BRANCHES[1] WHERE ENERGY COSTS ACCOUNT FOR MORE THAN 5 % OF EXPENDITURE ON GOODS AND SERVICES AND WAGE COSTS

(in % of value added and employment in manufacturing industry, average 2008-2015)

	Belgium		Germany		France		Netherlands[2]	
	Value added	Employment FTE	Value added	Employment FTE	Value added	Employment FTE	Value added	Employment FTE
10 % > Share of energy costs ≥ 5 %	15.9	12.4	6.7	4.8	7.5	6.5	11.7	7.0
Share of energy costs ≥ 10 %	1.1	0.9	3.4	3.2	1.4	1.1	2.3	2.7

Source : Eurostat.

(1) As the criterion used is the relative level of energy costs, the branches considered (at NACE Rev. 2, 3-digit level) may vary from one country to another.

(2) The figures for the Netherlands are minimum amounts as the data are not available for several branches at this level of detail.

3.3 Energy prices as a determinant of competitiveness

While energy cost management can be improved with the help of energy efficiency measures, the scale of energy expenses is also influenced by the prices charged to industrial consumers. Among the latter, producers in the chemicals sector – where no distinction can be made according to specific basic products – are particularly affected by movements in energy prices in other regions of the world in relation to prices in Belgium and in Europe. The respective situation of American, Japanese, European and Belgian industrial consumers in the face of these trends is illustrated on the basis of the index for unit values of sales to industry deflated by the producer price index for gas and electricity. There are actually very substantial variations in network energy prices between the regions, even before tax.

While gas prices displayed a predominantly upward trend for Japanese and European consumers until 2013-2014, there was a particularly marked fall in the prices charged to American consumers in 2008-2009, when increasing supplies of shale gas came onto the US market. That fall was initially also reinforced by the US authorities maintaining their gas export authorisation procedures. Moreover, the taxes levied, which vary from one State to another, are generally modest (2 to 6 %).

By contrast, from 2008 onwards, prices on the Japanese market virtually doubled in the space of five years. That reflected both tightening of the liquefied natural gas market in the Pacific Basin (where Japanese buyers get their supplies) and the steep rise in domestic demand which resulted from recourse to gas-fired power stations to replace the coal-fired plants destroyed in the 2007 earthquake, and from the Japanese government's willingness to use gas rather than coal to generate electricity. The nuclear accident at Fukushima in 2011 and the concomitant decision to suspend nuclear power generation further accentuated demand for gas and increased the pressure on prices. What is more, prices charged to industrial consumers are also driven up by a wholesale market structure that is still highly concentrated, and by cross-subsidisation in favour of Japanese residential consumers.

On the European gas market, too, there has been a slight reversal of the trend since 2010-2012, due to generally plentiful supplies (arrival on the markets of US liquid natural gas (LNG) as a result of new liquefaction investment projects), in a context of rather weak demand from both industry and electricity generating plants on the European markets. Gas-fired power stations are used less frequently than coal-fired power plants, which enjoy advantageous fuel prices.

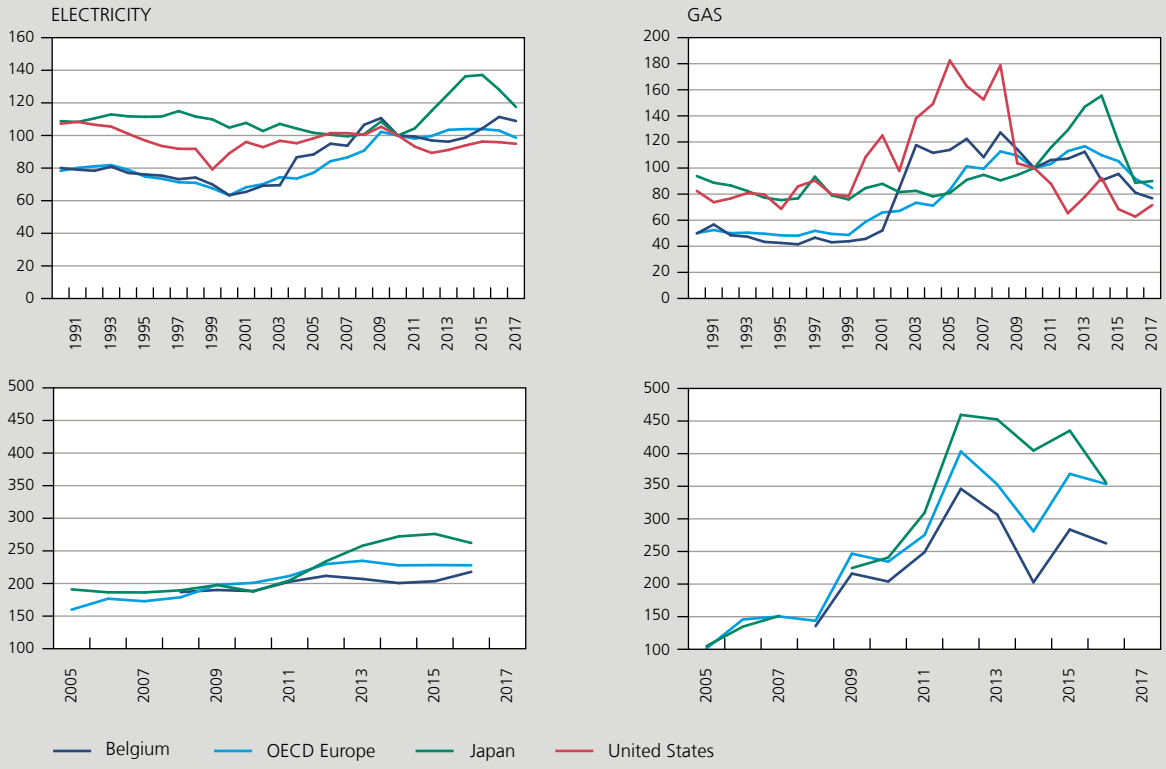
The differentials compared with prices paid by US industrial consumers narrowed a little in 2016, but European prices are still between 2 and 2 ½ times as high. The extraction of non-conventional gas (and oil) in the United States has also led to parallel production of natural gas liquids (NGLs) and condensates. These hydrocarbons comprise different molecules that are traded on diverse markets, either as fuel or as raw materials. The availability of gas and cheap NGL supplies

CHART 6 INDEX OF UNIT VALUES OF SALES OF ELECTRICITY AND GAS TO INDUSTRY IN BELGIUM, EUROPE, JAPAN AND THE UNITED STATES SINCE 1990

(index 2010 = 100)

COMPARISON BETWEEN UNIT VALUES OF SALES OF ELECTRICITY AND GAS TO INDUSTRY IN BELGIUM, EUROPE AND JAPAN AND THOSE IN THE UNITED STATES[1]

(in %)



Source: IEA (2018).

(1) Ratio calculated on the basis of unit values expressed in purchasing power parity.

therefore gives American industrialists another advantage over foreign competitors, namely for non-energy uses[1] in petrochemicals for ethylene production (used for many polymers and polyethylene, PVC and PET), or for production of ammonia-based fertilisers.

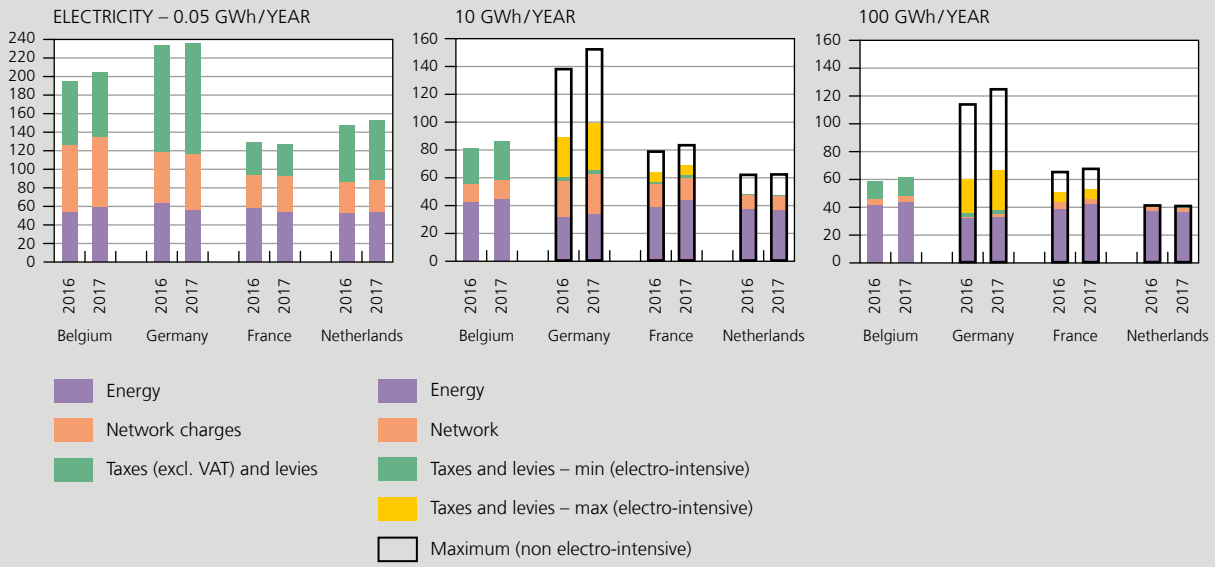
As for electricity prices, they are influenced by the structure of the production facilities (and the related production costs) and by divergent economic policy objectives (be they environmental or social), such as funding in the form of levies that may affect prices charged to the final consumer, including industrial users. The difference compared to electricity prices in Japan is due to adaptation of the production facilities, involving increasing use of gas. Electricity price differentials in relation to US industrial prices have gradually widened as a result of the increasing price advantage enjoyed by Americans thanks to the expanding production of cheap shale gas, which has replaced coal in electricity generation.

Electricity prices in Belgium differ considerably from those in neighbouring countries. Apart from energy prices as such, network charges and taxes or levies sometimes exert a substantial influence on price levels. The analysis covered the prices for three levels of consumption: annual consumption of 50 000 kWh as billed to small business users, annual consumption of 10 GWh, and annual consumption of 100 GWh.

(1) Owing to its composition, gas (methane CH_4) is often used as a source of carbon and hydrogen in chemical and petrochemical industrial processes, such as the production of ammonia or methanol. If methane is used as a chemical reagent for cracking and reforming processes in the production of ethylene, propylene, butylene, aromatics and other plastic raw materials, then it is classified as non-energy use.

CHART 7 ELECTRICITY PRICES FOR SMALL BUSINESS CONSUMERS AND INDUSTRIAL CONSUMERS, BY LEVEL OF CONSUMPTION, IN 2016 AND 2017

(in €/MWh)



Sources: CREG and PwC (2017)[1].

(1) The CREG data on small business consumers (annual consumption of 0.05 GWh for electricity and 0.1 GWh for gas) are based on a representative selection of products invoiced to the end user. This concerns a weighted average of energy prices based on the default supplier's standard offer in a particular Region, the best offer in the same Region as that supplier, and a competing offer by the second market supplier. For an objective comparison between countries, each sub-component of the electricity and natural gas prices is adjusted, if necessary, to exclude – for example – the effect of renewable energy costs included in the supplier's price, or the costs of the public service obligations imposed on the network operators, and to impute them to the surcharges.

The prices charged to large industrial consumers were recorded in January each year. The commodity prices were derived from the same combination of various prices recorded (on varying maturities) on the markets of the various countries. In the case of France, the regulated price was also taken into account.

The small business customers considered here are charged a tariff comparable (5 % lower) to that for residential customers (excluding VAT). The variations between countries are greatest in the tax and levies component: small business users in Germany have to make a large contribution (in the same way as residential consumers) towards funding the country's policy of supporting RES. Belgium has the largest network component, including in relation to neighbouring countries. The smallest differences are seen in the energy component.

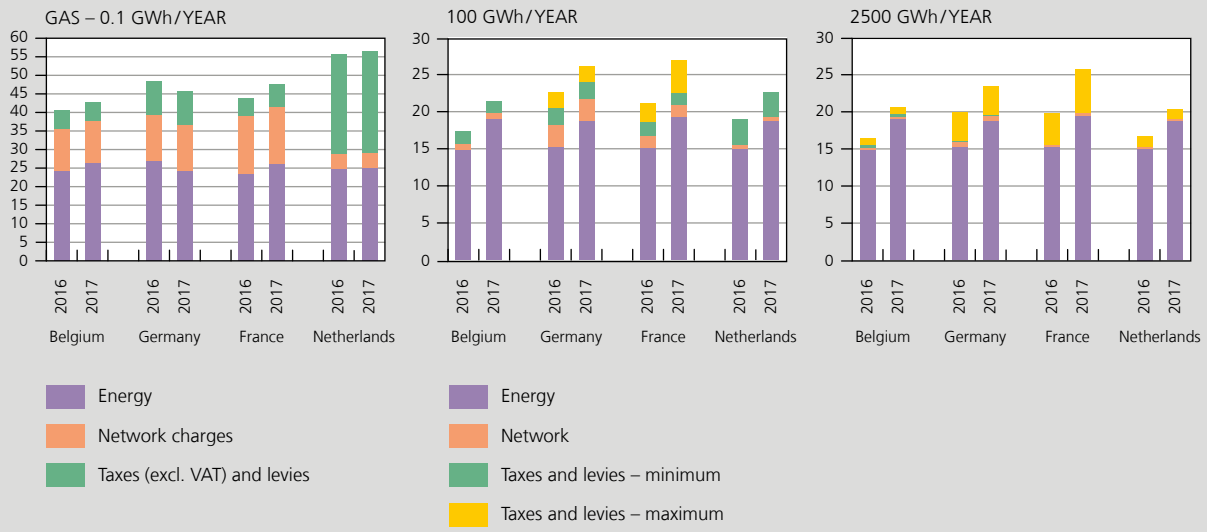
For the largest industrial consumers, the cost of the energy component is virtually identical for the various annual consumption levels[1], yet it is accounting for the existence of a competitive advantage between the various countries, consumers in the Netherlands and Germany enjoying lower market prices. There are wide variations in transport costs between countries, with particularly high charges in Germany. However, those charges decline rapidly as consumption increases: exemptions or tariff reductions enable large electro-intensive consumers in Germany, in particular, to improve their competitive position. The tax burden also declines as consumption increases, owing to the degressive nature of the taxes. In Germany, large industrial consumers which are not electro-intensive pay a hefty sum in taxes and levies. However, if the consumers are classed as electro-intensive, then the corresponding prices invoiced are much lower than in Belgium, and that applies to all countries. The neighbouring countries use a criterion for the consumers' electro-intensity for the purpose of graduating the tax levies (with exemptions that increase for more electro-intensive consumers). That is not so in Belgium, where the levies only depend on the consumption profile (and the type of grid connection).

As regards gas prices, three annual consumption levels were considered: the small business consumer using 0.1 GWh/year for whom the tariffs are similar to those for residential consumers, and the levels corresponding to large

(1) On the basis of the hourly rates for electricity outside weekends for the lower consumption level, and all hourly rates for the higher consumption level.

CHART 8 GAS PRICES PAID BY SMALL BUSINESS CONSUMERS AND INDUSTRIAL CONSUMERS, BY LEVEL OF CONSUMPTION, IN 2016 AND 2017

(in €/MWh)



Sources: CREG and PwC (2017).

industrial consumers, at 100 and 2 500 GWh/year respectively. In this last case, it is assumed that gas may be used as a raw material.

The gas price is largely determined by the commodity cost, to a greater degree than the electricity price. For small business consumers, the price is highest in the Netherlands, despite the low network charges, because the Dutch government imposes high surcharges via the *Regulerende Energiebelasting* in order to encourage energy saving and a reduction in CO_2 emissions.

For industrial consumers, the differences in commodity costs between countries are smaller than in the case of electricity, owing to a degree of market price convergence. Although the network costs plus taxes and surcharges represent a relatively small share, they are decisive for price competition between the various countries. For example, in the case of annual consumption of 100 GWh/year, Belgian industrial consumers enjoy the most competitive prices, which also benefit from low transport charges, even though – in France and Germany – exemptions may also be granted on the basis of economic criteria (such as participation in a carbon market). In all countries, very large industrial consumers (annual consumption of 2 500 GWh) qualify for volume-related tax exemptions. The taxes and levies are highest in France and Germany, and lowest in Belgium. If industrial consumers use gas as a raw material, they enjoy additional exemptions which result in a substantial reduction in the general level of taxes and levies in all countries. Nevertheless, Belgian industrial customers pay the highest taxes in that case.

4. Energy transition and growth opportunities

According to the impact analyses, it will require annual investment of around € 380 billion[(1)] in the EU during the period 2020-2030 to meet the set targets. That investment primarily concerns energy efficiency, RES, infrastructure and installations. By taking an active part in that process, firms therefore gain new opportunities for growth.

(1) Excluding investment in transport, namely € 736 billion in annual expenditure in 2013 (EC, 2016).

4.1 The energy transition creates new types of demand, ...

Firms need to make an effort regarding the operation and maintenance of installations and processes, especially if they are energy intensive. In that connection, the minimum energy efficiency requirements under the Ecodesign Directive 2009/125/EC apply to energy-related products in 25 categories of products and installations, such as electric motors, ventilation units, circulation pumps or hydraulic pumps. Innovation and standardisation efforts are also needed to ensure that products and equipment supplied to business customers comply with the Directive's requirements.

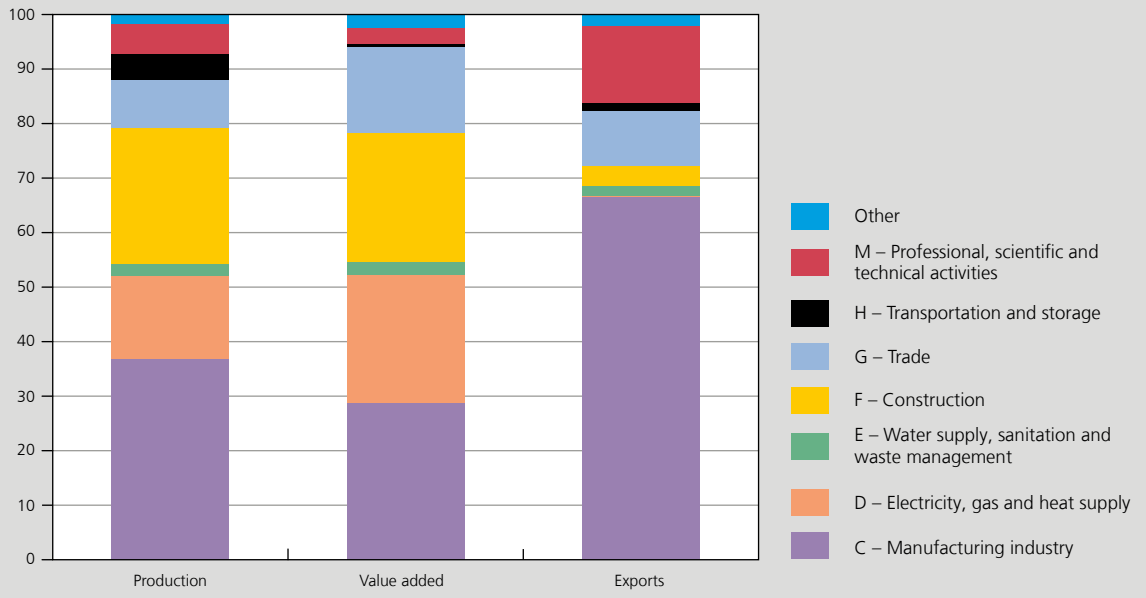
A major part of the energy efficiency policy is also devoted to improving the energy performance of the stock of buildings via Directive 2010/31/EU on the energy performance of buildings and the role to be performed by the construction industry and – upstream – the suppliers of building materials and other energy-related equipment (boilers, air conditioning, lighting).

The economic importance of activities concerning the transition to a low-carbon energy system is addressed indirectly in the environmental economic accounts drawn up by the Federal Planning Bureau. These satellite accounts of the national accounts measure the impact of human activities on the environment (namely activities aimed primarily at reducing or eliminating stress on the environment and making more efficient use of natural resources). This concerns both activities relating to environmental protection and those relating to the management of natural resources, including the management of energy sources. This last aspect covers the production of renewable energy, energy and heat saving (insulation work), and activities aimed at reducing the use of fossil energy sources as raw materials.

On that basis, firms involved in the management of energy sources have generated around 0.4 % of the gross value added generated by market activities. Their market output corresponds to roughly 0.6 % of Belgian production. Their exports also brought in almost € 1.6 billion, representing 0.5 % of Belgian exports. Firms in manufacturing industry account for most of these exports, both in the production of renewable energy and in energy saving or activities aimed at reducing the use of fossil energy sources as a raw material. The construction industry represents roughly 25 % of the value added and production resulting mainly from activities relating to energy saving and the development of RES.

CHART 9 BRANCH BREAKDOWN OF ENVIRONMENTAL GOODS AND SERVICES RELATING TO THE MANAGEMENT OF ENERGY SOURCES IN TERMS OF PRODUCTION, VALUE ADDED AND EXPORTS

(average 2014-2015, in %)



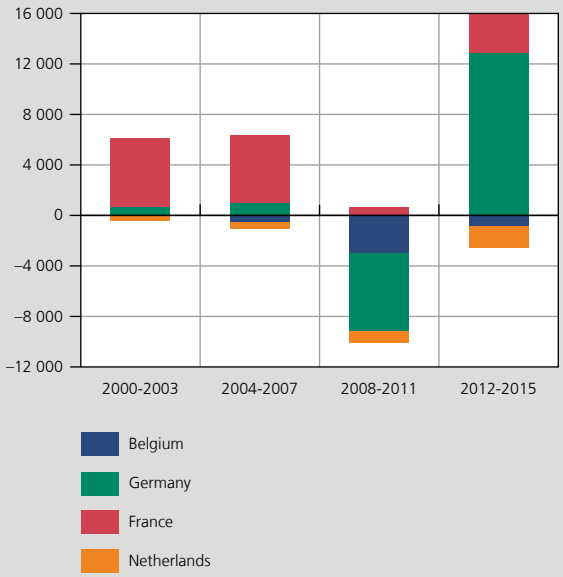
Source: FPB (2017).

The sale on international markets of products developed on the basis of low carbon energy technologies is likewise a driver of sustainable economic growth[1]. An analysis conducted for the Commission (Pasimeni, 2017) indicates that, in the EU28, exports relating to low carbon energy technologies doubled in value, from a total of € 34 billion over the period 2000-2003 to € 71 billion in 2012-2015, primarily in the wind power, heat production and energy storage sectors. EU imports more than tripled between 2000-2003 and 2008-2011 (up from € 26 billion to € 93 billion) and came to € 60 billion in 2012-2015. That is the direct result of the exponential growth of imports of photovoltaic equipment, reflected in a net deficit of almost € 62 billion for the EU28 during the period 2008-2011. It is notable that the total value (sum of exports plus imports) of trade within the EU28 relating to low carbon energy goods exceeds the figure for trade outside the EU28.

During the period examined, the net external balance of that trade was always negative for Belgium, and deteriorated sharply in 2008-2011. Among the three main neighbouring countries, France always recorded a positive balance, largely thanks to trade in equipment used for heat production, gas-fired power stations and clean coal power stations. While trade with countries outside the EU28 seems to have picked up, France's trade within the EU28 is still well below its pre-crisis level. The opposite is true of Germany, where the net external balance escalated during the recent period owing to the very favourable expansion of trade in wind power equipment (net balance of € 6.8 billion in such equipment) and equipment for storage, heat production and power stations using gas and clean coal. The deficit of € 6.1 billion in 2008-2011 reflects the net imports of photovoltaic equipment totalling around € 20.5 billion from non-European countries (China). The Netherlands did not record any surplus in low carbon energy goods overall. Nonetheless, that country is a net exporter of goods from the thermal solar energy and insulation branches and, since 2012-2015, biofuels. It is Belgium's biggest competitor in these last two branches.

CHART 10 NET EXTERNAL BALANCE FOR GOODS RELATING TO LOW-CARBON ENERGY TECHNOLOGIES FOR BELGIUM, GERMANY, FRANCE AND THE NETHERLANDS

(2000-2015, in € million)



Source: Pasimeni (2017).

(1) The technologies considered cover a much wider field than that concerning environmental goods and services alone: they also include technologies relating to nuclear power and those concerning gas and clean coal.

The European photovoltaic energy sector exposed to competition from China

The rise in imports, especially from China, has had a major influence on the EU 's foreign trade in photovoltaic equipment, whereas there has been little change in the EU28's exports. Against the backdrop of strong world demand, and partly as a result of measures to support the development of RES in Europe, China endeavoured to boost exports by its photovoltaic energy sector during the period from 2004 to 2008. The sector benefited from financial support for R&D and export credits at advantageous rates, whereas sales on the domestic market were disappointing because the Chinese authorities had given priority to developing the wind power sector.

The 2008 financial crisis had a serious impact on the sector. It prompted the Chinese government to promote its development on the domestic market, but without much success, so that the result was excess capacity. That reinforced the downward trend in prices associated with technological progress and economies of scale achieved by the installation of large production units.

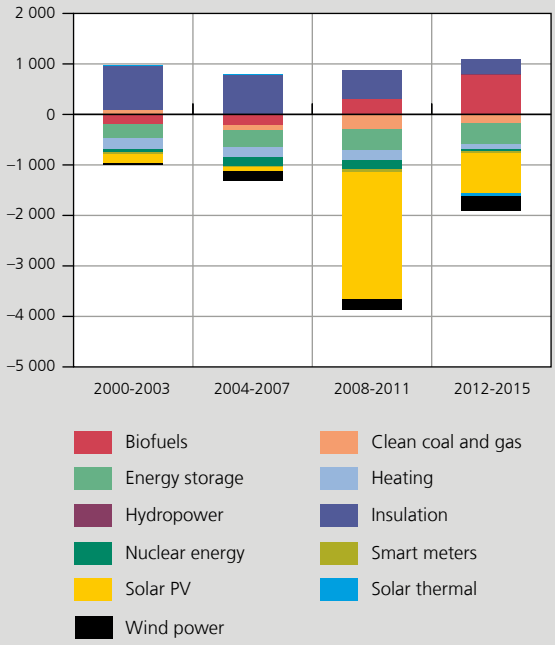
In 2012, the situation gave rise to a trade dispute with the EU (and the United States). As a result, the EU adopted anti-dumping and anti-subsidy duties (averaging 47.7 %) in June 2013 for a two-year period ; Chinese exporters were exempt from these duties if they charged more than a set minimum price. At the end of this two-year period, these anti-dumping duties were nevertheless regularly renewed for varying lengths of time and were revised to take account of movements in market prices.

The latest extension of these measures dates from 1 March 2017 and covers a period of 18 months. So as not to penalise the European installation sector, while protecting European equipment producers, the EU authorities decided on that occasion to bring the minimum prices into line with current world market prices.

While Belgium's external trade balance for these goods is in deficit overall, intra-EU28 trade still posted a net surplus of about € 400 to € 500 million (net exports increased in the case of biofuels and photovoltaic energy, but declined for insulation products). Net imports of photovoltaic equipment from outside the EU28 also rocketed over the 2008-2011 period, to reach a cumulative sum of € 3.25 billion, partially offset by net intra-EU28 exports amounting to € 730 million. Hence, just as in the neighbouring countries, Belgium's net imports of photovoltaic sector goods from outside the EU28 have always exceeded its net exports within the EU28 (excluding the Netherlands in 2000-2003).

CHART 11 BELGIAN NET EXPORTS OF LOW-CARBON ENERGY TECHNOLOGY GOODS

(2000-2015, in € million)



Source: Pasimeni (2017).

4.2 … new R&D opportunities…

It is generally acknowledged that innovations, and even real technological breakthroughs, will be essential to ensure and speed up the transition. As a general rule, innovation entails the protection of intellectual property, support for R&D, creation of a favourable environment for innovation, and the training of properly skilled workers. Apart from support for actual R&D funding (including for demonstration projects), development of the infrastructures required for the more widespread adoption of innovative solutions can also do much to speed up the spread of new technologies: for instance, innovations in telecommunication networks complement those in the smart electric networks needed in response to the decentralisation of electricity production and consumption, and to the increasing use of electric vehicles.

In 2013, around € 20 billion was spent on R&D in fields connected with the Energy Union[(1)] in the EU28 as a whole, or 0.15 % of GDP. The private sector accounted for 80 % of that expenditure, which has risen by 45 % since 2007. Germany and France recorded the highest private sector expenditure, at 36 % and 13 % respectively of total expenditure in 2013, equivalent to 0.29 % and 0.17 % respectively of their GDP. Since 2010, the private sector in both countries has focused mainly on research into batteries and electric vehicles, while in the Netherlands ever-increasing amounts are being spent on research into efficiency solutions for industry.

In Belgium – in contrast to the neighbouring countries and the EU28 – private sector expenditure is lower than that of the public sector, 52 % of which is spent on nuclear safety (or 28 % of total expenditure). Private sector spending is concentrated on industrial energy efficiency and renewable energy, accounting for 22 % and 15 % respectively of R&D expenditure relating to energy in Belgium, and represents 0.09 % of GDP.

(1) This concerns R&D expenditure relating to RES, energy efficiency, flexible energy systems, smart networks and equipment, biofuels, CO_2 capture and storage, and nuclear safety.

TABLE 5 PRIVATE AND PUBLIC SECTOR EXPENDITURE ON R&D RELATING TO ENERGY IN 2007, 2010 AND 2013 (1)

(in € billion)

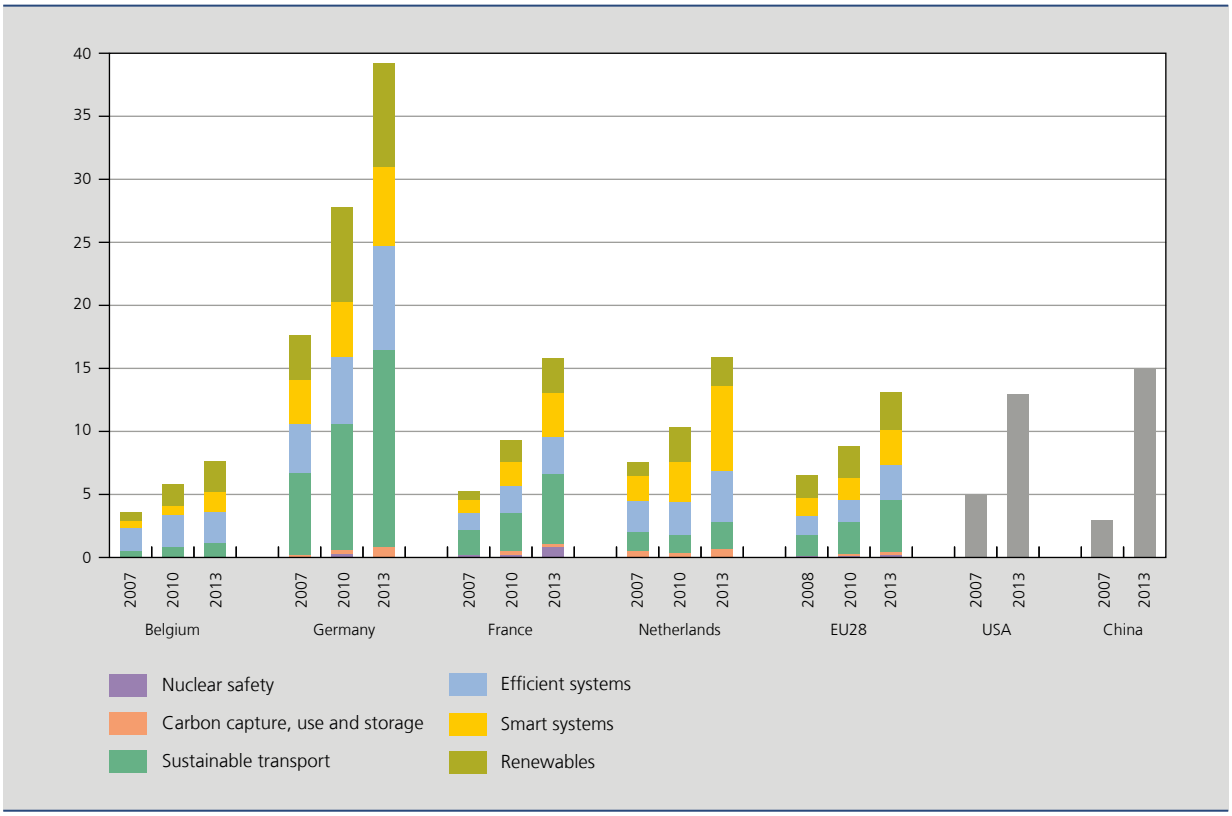
	Private sector	Public sector	Total
EU28 – 2007	11.000	2.600	13.600
EU28 – 2010	16.779	4.169	20.948
EU28 – 2013	15.962	4.240	20.202
of which:			
Belgium	0.159	0.190	0.349
Germany	7.351	0.808	8.159
France	2.582	1.084	3.666
Netherlands	0.846	0.185	1.031

Sources: Fiorini *et al.* (2017), EC (2017).

(1) This concerns renewables, smart systems, efficiency-enhancing systems, sustainable transport, carbon capture, use and storage, and nuclear safety.

CHART 12 PATENTS FILED IN SPHERES RELATING TO THE ENERGY UNION

(per million inhabitants)



Sources: Fiorini *et al.* (2017), EC (2017).

Government policy on R&D is expected to promote innovation, the number of patents filed being one of the outputs. Although these statistics are a crude way of measuring technological progress (inventions are not necessarily always patented, and the content of a patent varies greatly according to the likelihood of finding an industrial application for it), they do give some idea of innovation performance. Furthermore, innovations in the field of chemicals and materials, for example, also have an influence on technologies relating to the energy transition.

In 2013, in the sphere of the Energy Union, the number of patent categories[1] filed per million inhabitants in the EU28 was equivalent to the figure for the United States and – at the moment – for China. However, it must be said that the number of Chinese patent applications increased five-fold between 2007 and 2013. For Japan and South Korea respectively, patent applications totalled 96 and 111 per million inhabitants in 2013. Germany owned 47 % of the 6 600 patents filed in the EU28, and among the individual patent categories considered it actually owned 67 % of those relating to electric vehicles. In Belgium, the number of patents filed per million inhabitants has risen slightly, but is still rather low compared with the neighbouring countries. A growing share of these patents concerns renewable energy and intelligent systems.

There remains the question of gearing these innovations to affordable transition solutions, but without creating new risks of increased environmental stress on other sectors activated by these new technologies and new products. In fact, equipment used in technologies relating to the energy transition, e.g. in the production of renewable energy (such as batteries, catalysts, magnets, optic fibres, thermal interfaces, special glass, ceramics and super alloys), entails the use of rare metals. The recycling option, often suggested as the answer to their scarcity, nevertheless has its limits: recycling is all the more difficult for applications in which these metals form complex alloys, and even impossible where they are used as dispersants (as additives) or in quantities which are too small to be recoverable. The aim of reduced dependence on imports of fossil fuels risks turning into (a new) dependence on suppliers of ores and other rare minerals.

4.3 … and jobs

Estimating the impact of the energy transition on employment, whether in the new "low-carbon" production sectors or in the implementation of energy saving measures, is a tricky exercise. Since employment statistics by branch of activity

TABLE 6 GROSS DIRECT AND INDIRECT EMPLOYMENT AND TURNOVER BY RES SECTOR IN BELGIUM, IN 2016

(in number of jobs and in € million)

	Gross direct and indirect jobs[1]	Turnover[1]
Photovoltaic energy	2 400	440
Wind power	2 300	450
Heat pumps	1 500	280
Solid biomass[2]	1 000	260
Biofuels[2]	900	240
Biogas[2]	400	100
Small-scale hydropower	400	80
Renewable urban waste	300	60
Thermal solar energy	200	30
Geothermal energy	< 100	< 1
Total	9 500	1 950

Source: EurObserv'ER (2018).

(1) The employment and turnover data refer to the main investment activity in the value chain (manufacture, distribution and installation of equipment, operation and maintenance of installations).

(2) The bioenergy sectors (biofuels, biomass and biogas) include upstream activities, i.e. the supply of fuels within the agriculture and forestry industries.

(1) The data on the patents in question concern categories of "related" patents protecting the same or similar technical content.

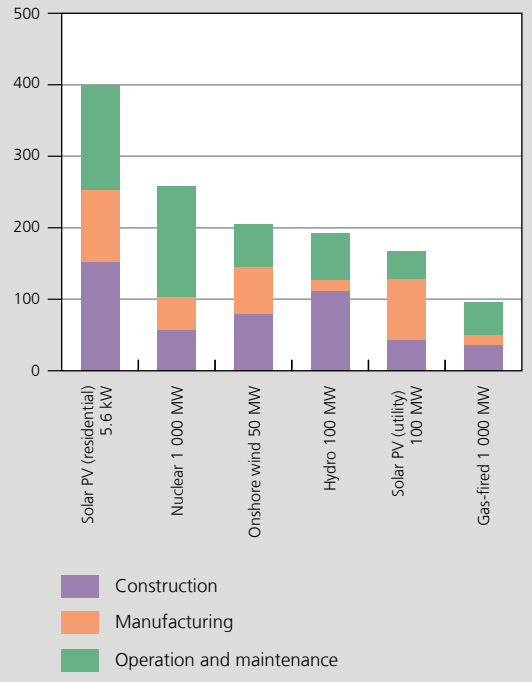
are compiled on the basis of the industrial classification of firms, it is hard to measure the impact of these activities in terms of direct jobs. However, by using the environmental economic accounts compiled by the Federal Planning Bureau, it is possible to estimate the number of direct jobs created in 2014-2015 in energy resource management at around 12 400 (full-time equivalents), which is 0.4 % of market sector employment[1] (FPB, 2017). 52 % of these jobs concerned energy management and energy saving, 32 % concerned the production of energy from renewable sources, and the remainder were created in activities aimed at reducing the use of fossil fuels as raw materials. One-third of these jobs are found in the construction sector, 26 % in manufacturing industry and 19 % in trade.

However, it must be acknowledged that the value chains associated with these new sectors extend beyond their operational activities, and may include the production of equipment and its installation on site. On this basis, in 2016, some 9 500 people were employed in RES sectors in Belgium alone, generating a total turnover of € 1.95 billion. The photovoltaic and wind power sectors employ the most workers, producing a combined turnover of € 890 million. At European level, Germany and France head the rankings, although Italy (followed by Spain) predominate in the heat pumps branch.

In its analysis of investment in the energy sectors (IEA, 2017), the International Energy Agency estimates the potential for creating new jobs (first-rank direct and indirect jobs) in the various electricity-generating sectors. It distinguishes between jobs related to plant construction, production of equipment, and operation and maintenance.

CHART 13 EMPLOYMENT RELATED TO THE PRODUCTION OF 1 TWH FROM NEW CAPACITY

(2016, in number of jobs/TWh/year[1], per sector)



Source: IEA (2017b), "World Energy Investment 2017" – adapted from figure 3.8 compiled by the IEA © OECD/IEA [2017].

(1) For the comparison by sector, cumulative jobs over the number of years of operation were standardised over 25 years for the calculation of employment per TWh of annual electricity production, taking account of the respective load factors. Example: for a wind farm with 228 MW of capacity, 500 jobs are recorded in the installation phase over five years and 40 jobs in the operational phase for 20 years. That works out at a cumulative figure of 2500 + 800 jobs over 25 years or, respectively, 100 jobs a year in installation work and 32 jobs a year in the operational phase for a 228 MW wind farm.

(1) The market sector covers non-financial corporations (S11), financial corporations (S12) and households (S14), plus a (small) part of general government (S13) and non-profit institutions serving households (S15).

The job content is highest in the residential photovoltaic energy sector, with an estimated 400 jobs created in the installation of sufficient capacity to generate an annual output of 1 TWh. The impact on employment of the equipment manufacturing phase depends more on the relative competitive edge of domestic industries over their foreign rivals, and those jobs may in some cases be outsourced. The jobs entailed in running hydro-electric power stations are concentrated on the construction phase, although that depends very much on the site. Conversely, gas-fired power stations require less manpower for that stage, as they are relatively quick to install and put into streamlined operation.

Conclusions

The fight against climate change is a major challenge for the European economies, as the European and national strategies put in place require changes and improvements in the management of energy inputs. They imply a radical transformation of modes of energy production and consumption, and that affects business activities.

To persuade the economic agents to make the required reductions in GHG emissions, to use renewable energy sources and to cut energy consumption, it is necessary to use a combination of various means, relating to energy prices, regulation, innovation and R&D, training, investment finance, etc. The impact assessments that motivated the adoption of ambitious targets conclude that the macroeconomic effects are generally favourable in terms of growth, jobs or reducing the energy bill.

However, it is important that the targets imposed on firms do not put them at a disadvantage compared to their competitors owing to the initial increase in energy costs, if the adoption of measures to protect the environment is based on a change in relative prices of energy. That impact is not the same for all sectors of activity and businesses. In Belgian manufacturing industry, which is relatively more energy-intensive than that of the three main neighbouring countries since it is positioned more upstream in the European value chains, spending on energy accounts for 2.5 % of variable costs, on average, whereas that item represents more than 10 % of expenditure on variable inputs for rather more than 4 % of firms. Energy-intensive industries and those exposed to the international environment are more specifically affected if the relative prices of their energy inputs take an adverse turn compared to those of their rivals. At international level, the differential between gas and electricity prices paid by European manufacturers compared to their American competitors increased considerably with the development of US shale gas production. Thus, the prices that Belgian industry pays for gas and electricity are on average 2 and 2 ½ times higher respectively than those paid by their American rivals. These price differentials between Europe and the United States are also accompanied by significant price differences within the EU. In comparison with the main neighbouring countries, electricity price differentials do not favour Belgian industrial consumers, even though the tax levies decline as consumption increases : exemptions or lower tariffs are granted to French, Dutch and German manufacturers, especially if they are recognised as electro-intensive. In the case of gas, price competitiveness between countries is determined by network costs plus taxes and additional levies that, in this instance, do not generally place Belgian manufacturers at a disadvantage, unless they use natural gas as a raw material. In that case, they pay the highest taxes despite the exemptions granted.

Although the ambitious targets involve costs in adapting equipment and processes, that expense is still justified in view of the long-term costs of failing to act against climate change. Establishing a position in more eco-friendly technological sectors or ones which consume less energy also offers firms opportunities for growth and scope for developing new activities and products, including on foreign markets.

A successful transition with ample growth potential is based on the implementation of significant technological improvements. That implies an innovation policy in favour of "low-carbon" goods and services, accompanied by support measures where appropriate. However, those measures must not distort competition and need to be temporary, which means they must cease as soon as the technologies are operational, or if they clearly fall short of expectations. In 2013, the EU28 devoted roughly € 20 billion to R&D in the energy field ; Belgium spent € 350 million of that, or 0.09 % of its GDP, compared to 0.15 % for the EU28.

These adjustments to the economic fabric will undeniably also affect workers in the sectors concerned, leading to substantial shifts on the labour market. The success of the transition therefore also depends on worker mobility, together with the adjustment of workers' skills by means of targeted support and guidance.

To sum up, the success of the energy transition concerns much broader and more diverse spheres than just the energy sector. It requires coordination with government policy measures other than those relating to energy, such as policies on industry, mobility, urban development, industry and innovation. That is particularly true in Belgium, where the powers in question are allocated among the various federated entities. Nonetheless, these policy measures should not be defined without taking account of their European dimension. Although the commitments under the inter-federal Energy Pact may be welcomed, the implementation of a common European policy on the environment, energy and security of supply culminating in a genuine single energy market is essential to ensure that decisions taken by one party or another do not lead to distortion of competition and inefficiency.

Both the government and the private sector have their role to play in ensuring the best match between public policies and investment strategies, with the aim of providing businesses with appropriate information and incentives that encourage them to invest in the technologies with the greatest economic and technical relevance.

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Annex

ENERGY COSTS OF MANUFACTURING BRANCHES (NACE REV. 2, 3-DIGIT) IN BELGIUM, EMPLOYMENT AND NUMBER OF FIRMS CONCERNED, AVERAGE 2008-2015

(in % of the wage bill and expenditure on goods and services, in % of value added and in number of firms)

		Energy cost share	Energy costs / value added	Employment FTE	Number of firms in 2015
C233	Building materials, clay	15.3	20.8	1 314	62
C235	Cement, lime and plaster	15.2	41.3	2 498	19
C171	Paper pulp, paper and paperboard	9.8	34.8	3 088	40
C202	Pesticides and other agrochemicals	9.3	16.4	1 159	18
C231	Manufacture of glass and glass products	8.5	32.1	7 226	165
C201	Basic chemicals, fertilisers and nitrogen compounds, plastics and synthetic rubber in primary forms	8.1	38.5	24 565	219
C234	Other ceramic and porcelain products	7.4	11.1	363	51
C133	Finishing of textiles	7.4	22.8	866	209
C241	Iron and steel	6.4	43.8	12 896	59
C232	Manufacture of refractory products	6.2	20.5	468	20
C245	Smelting	5.4	16.9	2 096	73
C239	Manufacture of abrasive products and non-metallic mineral products n.e.c.	5.1	22.6	1125	35
C103	Processing and preservation of fruit and vegetables	4.8	22.7	7 289	152
C131	Preparation and spinning of textile fibres	4.5	22.1	844	166
C132	Weaving	3.8	12.6	3 083	114
C206	Artificial and synthetic fibres	3.8	29.6	901	25
C107	Bread and pastry products and pasta	3.7	9.9	17 507	4 049
C256	Treatment and coating of metals; machining	3.2	7.4	12 504	2 793
C139	Other textiles	3.2	11.3	11 280	670
C211	Basic pharmaceutical products	3.1	6.1	614	17
C255	Forging, pressing, stamping; powder metallurgy	3.0	12.1	1 610	–
C236	Articles of concrete, cement and plaster	3.0	9.0	10 170	430
C142	Articles of fur	3.0	9.1	25	14
C162	Articles of wood, cork, straw and plaiting	3.0	10.1	7 754	1 495
C322	Musical instruments	2.7	6.2	54	98
C161	Sawmilling and planing of wood	2.7	11.9	1 392	251
C222	Plastic products	2.6	8.8	18 610	667
C	Manufacturing industry	2.5	12.0	433 316	33 788

Source: Eurostat.

Abstracts from the Working Papers series

331. Nowcasting real economic activity in the euro area: Assessing the impact of qualitative surveys, by R. Basselier, D. de Antonio Liedo, G. Langenus, December 2017

The paper analyses the contribution of survey data, in particular various sentiment indicators, to nowcasts of quarterly euro area GDP. It uses a genuine real-time dataset that is constructed from original press releases in order to transform the actual dataflow into an interpretable flow of news.

The latter is defined as the difference between the released values and the prediction of a mixed-frequency dynamic factor model.

The purpose is twofold. First, the authors aim to quantify the specific value added for nowcasting GDP from a set of heterogeneous data releases including not only sentiment indicators constructed by Eurostat, Markit, the National Bank of Belgium, IFO, ZEW, GfK or Sentix, but also hard data on industrial production or retail sales in the aggregate euro area and individually in some of the largest euro area countries. Second, their quantitative analysis is used to draw up an overall ranking of the indicators, on the basis of their average contribution to updates of the nowcast.

Among the survey indicators, the authors find the strongest impact for the Markit Manufacturing PMI and the Business Climate Indicator in the euro area, and the IFO Business Climate and IFO Expectations in Germany. The widely monitored consumer confidence indicators, on the other hand, typically do not lead to significant revisions of the nowcast. In addition, even if euro area industrial production is a relevant predictor, hard data generally contribute less to the nowcasts: they may be more closely correlated with GDP but their relatively late availability implies that they can to a large extent be anticipated by nowcasting on the basis of survey data and, hence, their 'news' component is smaller. Finally, in line with earlier literature, the authors also show how useful the NBB's own business confidence indicator can be for predicting euro area GDP. The prevalence of survey data also remains under a counterfactual scenario in which hard data are released without any delay. This finding confirms that, in addition to being available sooner, survey data also contain relevant information that does not seem to be captured by hard data.

332. The interconnections between services and goods trade at the firm level, by A. Ariu, H. Breinlichz, G. Corcosx, G. Mion, October 2017

In the paper, the authors study how international trade in goods and services interact at the firm level. Using a rich dataset on Belgian firms during the period 1995-2005, they show that: i) firms are much more likely to source services and goods inputs from the same origin country rather than from different ones; ii) increases in barriers to imports of goods reduce firm-level imports of services from the same market, and conversely. They build upon a discrete-choice model of goods and services input sourcing that can reproduce these facts to design their econometric strategy. The results suggest that a liberalization of service trade has direct and sizable effects on goods trade and vice versa. Moreover, sourcing goods and services from the same origin brings substantial complementarities to both.

333. The employment consequences of SMEs' credit constraints in the wake of the great recession, by C. Cornille, F. Rycx, I. Tojerow, December 2017

The article takes advantage of access to confidential matched bank-firm data relative to the Belgian economy to investigate whether and how employment decisions of small and medium-sized enterprises (SMEs) have been affected by credit constraints in the wake of the great recession. Variability in banks' financial health following the great recession is used as an exogenous determinant of firms' access to credit. Two-stage least squares and bivariate probit estimates suggest that SMEs borrowing money from pre-crisis less healthy banks were significantly more likely to be affected by credit constraint and, in turn, to adjust their labour input downwards than pre-crisis clients of more healthy banks. More precisely, estimates show that credit-constrained SMEs were ceteris paribus between 40 and 65 % more likely to reduce their workforce than their counterparts not facing such constraints. Yet, findings also indicate that employment consequences of credit shortages depend heavily on the environment in which SMEs operate. Results do actually indicate that credit constraints have been essentially detrimental for employment among SMEs experiencing a negative demand shock or facing severe product market competition. Finally, in terms of adjustment channels, results show that credit-constrained SMEs adjusted their workforce significantly more at the extensive margin (through individual layoffs, reduction of temporary employment and early retirement) than their non-constrained counterparts, but also that they relied more intensively on temporary layoff schemes (for economic reasons).

334. Exchange rate movements, firm-level exports and heterogeneity, by A. Berthou, E. Dhyne, January 2018

The paper provides an estimation of the reaction of firm-level exports consecutive to real exchange rate movements – the exchange rate elasticity of exports. Following recent theoretical works emphasising the role played by firm heterogeneity, the authors test in particular how the exchange rate elasticity may be affected by firm-level productivity, and how the heterogeneous reaction of different firms may contribute to shape the aggregate reaction of countries' exports. The analysis relies on a unique cross-country micro-based dataset of exporters available for 11 European countries (2001-2011), which details in particular information about firms' productivity and export performance. The results show that while the average exchange rate elasticity across firms is quite weak, it is also highly heterogeneous. The least productive firms within each country and sector tend to react more to real exchange rate movements than the most productive firms. This weak reaction of highly productive and large exporters tends to reduce the macroeconomic exchange rate elasticity in all countries. Cross-country differences in the shape of the productivity distribution among exporters have a strong influence on the macroeconomic exchange rate elasticity: countries populated with a higher density of low productive firms tend to respond more to exchange rate movements in terms of aggregate exports than countries populated with highly productive exporters.

335. Nonparametric identification of unobserved technological heterogeneity in production, by L. Cherchye, T. Demuynck, B. De Rock, M. Verschelde, February 2018

The authors propose a novel nonparametric method for the structural identification of unobserved technological heterogeneity in production. They assume cost minimisation as the firms' behavioural objective, and they model unobserved heterogeneity as an unobserved productivity factor on which firms condition the input demand of the observed inputs. Their model of unobserved technological differences can equivalently be represented in terms of "unobserved\latent capital" that guarantees data consistency with their behavioural assumption, and the authors argue that this avoids a simultaneity bias naturally. Their empirical application to Belgian manufacturing data shows that their method allows strong and robust conclusions to be drawn, despite its nonparametric orientation. For example, their results pinpoint a clear link between international exposure and technological heterogeneity and show that primary inputs are substituted for materials rather than for technology in the sectors under consideration.

336. Compositional changes in aggregate productivity in an era of globalisation and financial crisis, by C. Fuss, A. Theodorakopoulos, February 2018

The authors demonstrate that common modelling assumptions underlying micro-unit productivity indices induce biases in the evolution and decomposition of standard aggregate productivity measures. After controlling for such biases, they decompose aggregate productivity based on groups of economically significant firm types. They show that large incumbent firms that both export and import determine the evolution of aggregate productivity for the Belgian manufacturing sector. Over time, the increase in average productivity outweighs the decline in the covariance between market shares and productivity of this group. The former result stems from stronger learning-by-doing effects for granular firms. The latter suggests an increase in resource misallocation due to market distortions. This pattern intensifies after the 2008 financial crisis. All other firm types, if anything, contribute negatively to aggregate productivity and productivity growth.

337. Decomposing firm-product appeal : How important is consumer taste ?, by B. Yan Aw, Y. Lee, H. Vandenbussche, March 2018

The authors develop and structurally estimate a trade model in order to identify the importance of consumer taste. The model separates taste from quality and productivity (TFPQ) at the firm-product level. Export data by destination countries allow us to identify the level of taste from consumer heterogeneity across destinations. The authors decompose export revenue into the contribution of taste, quality and costs. They find that taste is very important and explains about 50 % of the variation in export revenue. Productivity (TFPQ) differences between firm-products become more prominent than taste in explaining export success only when the cost elasticity of improving quality is high.

338. Sensitivity of credit risk stress test results : Modelling issues with an application to Belgium, by P. Van Roy, S. Ferrari, C. Vespro, March 2018

The paper assesses the sensitivity of solvency stress testing results to the choice of credit risk variable and level of data aggregation at which the stress test is conducted. In practice, both choices are often determined by technical considerations, such as data availability. Using data for the Belgian banking system, the authors find that the impact of a stress test on banks' Tier 1 capital ratios can differ substantially depending on the credit risk variable and the level of data aggregation considered. If solvency stress tests are going to be used as a supervisory tool or to set regulatory

capital requirements, there is a need to further harmonise their execution across institutions and supervisors in order to enhance comparability. This is certainly relevant in the context of the EU-wide stress tests, where institutions often use different credit risk variables and levels of data aggregation to estimate the impact of the common methodology and macroeconomic scenario on their capital level while supervisors rely on different models to quality assure and validate banks' results. More generally, there is also a need to improve the availability and quality of the data to be used for stress testing purposes.

339. Paul van Zeeland and the first decade of the US Federal Reserve System : The analysis from a European central banker who was a student of Kemmerer, by I. Maes, R. Gomez Betancourt, March 2018

The authors demonstrate that common modelling assumptions underlying micro-unit productivity indices induce biases in the evolution and decomposition of standard aggregate productivity measures. After controlling for such biases, they decompose aggregate productivity based on groups of economically significant firm types. They show that large incumbent firms that both export and import determine the evolution of aggregate productivity for the Belgian manufacturing sector. Over time, the increase in average productivity outweighs the decline in the covariance between market shares and productivity of this group. The former result stems from stronger learning-by-doing effects for granular firms. The latter suggests an increase in resource misallocation due to market distortions. This pattern intensifies after the 2008 financial crisis. All other firm types, if anything, contribute negatively to aggregate productivity and productivity growth.

340. One way to the top : How services boost the demand for goods, by A. Ariu, F. Mayneris, M. Parenti, March 2018

In the paper, the authors take advantage of a uniquely detailed dataset on firm-level exports of both goods and services to show that demand complementarities between services and goods enable firms to boost their manufacturing exports by also providing services. The positive causal effect of services accounts for up to 25 % of the manufacturing exports of bi-exporters (i.e. the firms that export both goods and services), and 12 % of overall goods exports from Belgium. The authors find that by associating services with their goods, bi-exporters increase both the quantities and the prices of their goods. To rationalise these findings, they develop a new model of oligopolistic competition featuring one-way complementarity between goods and services, product differentiation, and love for variety. By supplying services with their goods, firms increase their market share, and hence their market power and markup. The model then shows that exporting services acts as a demand shifter for firms, increasing the perceived quality of their products. Going back to the data, the authors find strong confirmation for this mechanism.

341. Alexandre Lamfalussy and the monetary policy debates among central bankers during the Great Inflation, by I. Maes, April 2018

The 1970s were a turbulent period in postwar monetary history. The paper focuses on how central bankers at the Bank for International Settlements (BIS), and especially Alexandre Lamfalussy, the BIS's Economic Adviser, responded to the Great Inflation. The breakdown of Bretton Woods forced central bankers to look for new monetary policy strategies as the exchange rate lost its central role. Lamfalussy, in his early years a Keynesian in favour of discretionary policies, shifted to a "conservative Keynesian" position, acknowledging that a medium-term orientation and the credibility of monetary policy were important to break inflationary expectations. However, Lamfalussy never moved over to "monetarist" positions. He certainly acknowledged that monetary targets could reinforce the credibility and independence of monetary policy. But he rejected mechanical rules. In essence, he

aimed for a middle-of-the-road position : rules applied with a pragmatic sense of discretion. In the early 1980s, with the rise of financial innovations, Lamfalussy would put even more emphasis on the limitations of monetary targeting. His focus turned increasingly to systemic financial stability risks, preparing the ground for the macroprudential approach of the BIS. In Lamfalussy's view, central banking remained an art, not a science.

342. The economic importance of the Belgian ports : Flemish maritime ports, Liège port complex and the port of Brussels – Report 2016, by F. Coppens, C. Mathys, J.P. Merckx, P. Ringoot, M. Van Kerckhoven, April 2018

The paper analyses the economic importance of the Belgian ports based largely on the annual accounts data for the year 2016. On the back of strong growth, direct value added in the Belgian ports remained more or less stable in 2016 at around € 18 billion (current prices) or roughly 4.3 % of Belgium's GDP. Direct value added declined in the Flemish seaports, mainly in Antwerp. Ghent and Zeebrugge could only partly compensate for the fall in Antwerp's value added, while Ostend showed a small decline itself. The inland ports as a whole grew over the period 2015-2016 ; the port of Brussels registered a decline and the Liège port complex an increase. Indirect value added is around 82 % of the direct figure.

After declining from 2012, direct employment in the Belgian ports was more or less stable in 2016 at around 115 000 FTE or approximately 2.8 % of Belgium's total domestic employment. Direct employment in the Flemish seaports increased, mainly in the ports of Zeebrugge, Ghent and Antwerp. Ostend showed a decline in employment. The inland ports recorded lower employment ; the port of Brussels registered a decline, as did the Liège port complex. Indirect employment is around 1.2 times the direct figure.

Delving deeper into the data and trying to explain the above trends in terms of the structural composition of the Belgian ports shows that all ports are concentrated on a few sectors, and within those sectors often on just a handful of companies.

Based on traffic figures, the Flemish ports can be considered as real bridgeheads for trade with the UK. Developments regarding the arrangements and consequences of Brexit should therefore be followed with the greatest attention. Given the existing import and export volumes in terms of tonnage, it seems Brexit will mostly be a challenge for Zeebrugge and to some extent for Antwerp too.

343. The unemployment impact of product and labour market regulation : Evidence from European countries, by C. Piton, June 2018

The paper provides a robust estimation of the impact of both product and labour market regulations on unemployment using data for 24 European countries over the period 1998-2013. Controlling for country-fixed effects, endogeneity and various covariates, results show that product market deregulation generally tends to reduce the unemployment rate. This finding is robust to all specifications and in line with theoretical predictions. However, not all types of reform have the same effect : deregulation of State controls and in particular involvement in business operations tends to push up the unemployment rate. Labour market deregulation, proxied by the employment protection legislation index, is detrimental to unemployment in the short run while a positive impact (i.e. a reduction of the unemployment rate) occurs only in the long run. Analysis by sub-indicators shows that reducing protection against collective redundancies helps in reducing the unemployment rate. The unemployment rate equation is also estimated for different categories of workers. While men and women are equally affected by product and labour market deregulations, workers distinguished by age and by educational attainment are affected differently. In terms of employment protection, young workers are almost twice as strongly affected as older workers. Regarding product market deregulation, highly-educated individuals are less impacted than low- and middle-educated workers.

Conventional signs

%	per cent
e	estimate
e.g.	*exempli gratia* (for example)
etc.	*et cetera*
i.e.	*id est* (that is)
p.m.	*pro memoria*
RMB	renminbi

List of abbreviations

Countries or regions

BE	Belgium
DE	Germany
IE	Ireland
EL	Greece
ES	Spain
FR	France
IT	Italy
LU	Luxembourg
MT	Malta
NL	Netherlands
AT	Austria
PT	Portugal
FI	Finland
EA	Euro area
UK	United Kingdom
EU	European Union
CN	China
JP	Japan
KR	Korea
MY	Malaysia
TH	Thailand
US	United States

Other abbreviations

ABC	Agricultural Bank of China
AWM	Area-Wide Model
BBC	Beleids- en beheerscyclus (policy and management cycle)
BLS	Bank lending survey

BOC	Bank of China
BOCOM	Bank of Communications
CCB	China Construction Bank
CH_4	Methane
CO_2	Carbon dioxide
CPAS/OCMW	Centre public d'action sociale / Openbaar centrum voor maatschappelijk welzijn (public social welfare centre)
CPB	Central Planning Bureau (the Netherlands)
CPI	Consumer price index
CRAC	Regional Municipal Aid Centre
CREG	Commission for Electricity and Gas Regulation
DGS	Directorate General Statistics
EC	European Commission
ECB	European Central Bank
ESA	European System of Accounts
ESCO	Energy service company
EU-KLEMS	EU level analysis of capital, labour, energy, materials and services input
EXPY	Export Sophistication Index
FDI	Foreign direct investment
FOMC	Federal Open Markets Committee
FPB	Federal Planning Bureau
FPS	Federal Public Service
FRED	Federal Reserve Bank of St. Louis Economic Data
FTE	Full-time equivalent
GDP	Gross domestic product
GHG	Greenhouse gas
GWh	Gigawatt hour
HFCS	Household Finance and Consumption Survey
HICP	Harmonised index of consumer prices
HSBC	Hong Kong & Shanghai Banking Corporation
ICBC	Industrial and Commercial Bank of China
ICT	Information and communication technology
IEA	International Energy Agency
ILSR	Inflation-linked swap rates
IMF	International Monetary Fund
IRB	Internal ratings-based (approach)
ISO	International Organization for Standardization
KWh	Kilowatt hour
LNG	Liquid natural gas
MERICS	Mercator Institute for China Studies
Mtoe	Million tonnes of oil equivalent
MWh	Megawatt hour

NACE	Nomenclature of economic activities in the European Community
NAI	National Accounts Institute
NASA	National Aeronautics and Space Administration
NAWRU	Non-accelerating wage rate of unemployment
NBB	National Bank of Belgium
NCPI	National consumer price index
NEO	National Employment Office
NGL	Natural gas liquids
NPI	Non-profit institution
OECD	Organisation for Economic Cooperation and Development
OPEC	Organisation of the Petroleum Exporting Countries
PCE	Personal Consumption Expenditure
PET	Polyethylene terephthalate
ppmv	Part per million in volume
PPP	Purchasing power parity
PRODY	Product Technological Sophistication Index
PVC	Polyvinyl chloride
PwC	PricewaterhouseCoopers
R&D	Research and development
RES	Renewable energy sources
SDW	Statistical Data Warehouse
SITC	Standard International Trade Classification
SME	Small and medium-sized enterprise
S&P	Standard and Poor's
STEM	Science, Technology, Engineering and Mathematics
TiVA	Trade in value added
TWh	Terawatt hour
UNCTAD	United Nations Conference on Trade and Development
UVCW	Union des Villes et Communes de Wallonie
VAT	Value added tax
VVSG	Vereniging van Vlaamse Steden en Gemeenten
WEO	World Economic Outlook
WTO	World Trade Organisation

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