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Separating the trend from the cycle : The debate on euro area potential output and implications for monetary policy

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Introduction

A decade since the onset of the financial and economic crisis, estimates by international organisations suggest that economic activity in the euro area is now at or close to its potential level. Rather than being a cause for celebration, the closing of the output gap has sparked debate.

This is not surprising. Given that potential output is unobservable, any estimates of it are always surrounded by uncertainty. Consequently, whether the economy is operating above, at, or below its potential is often subject to discussion. What has been noteworthy this time though, is that despite the output gap closing, inflationary pressures have remained weak. And when digging a little deeper, it turns out that the closing of the output gap is in large part due to potential output being revised downwards rather than the economy fully recovering from the damage caused by the crisis. It is these large downward revisions in potential output in particular that have been questioned. Are they mainly statistical artefacts resulting from modelling approaches that have problems with correctly separating the trend from the cycle ? That may suggest that slack in the economy may be larger than what published output gap estimates suggest. Or do these downward revisions of potential output reflect reality ? And if they do, are they permanent or transitory ? Or, in the words of Coeuré (2017), has the crisis and the related persistent shortfall in demand scarred or merely scratched the euro area economy's potential ?

This article addresses these questions. It discusses recent research in this area and backs it up with NBB analyses focusing on the euro area. More specifically, it provides evidence that many methods of estimating potential output face challenges in distinguishing between cyclical and structural forces that are driving the economy. This makes these estimates procyclical, meaning that potential output tends to weaken when the economy is weak and pick up when the economy is strong. Clearly, procyclicality induced by statistical methods is undesirable and should be corrected for.

However, from an economic perspective, it is not clear-cut whether procyclicality should be ruled out altogether. According to the standard view, potential output is a supply-side concept and should thus be purely driven by structural, slow-moving forces that are unrelated to the business cycle. In other words, demand-side developments (shocks or policies) cannot influence it. But since the crisis, the idea has resurfaced

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that demand-side developments, if persistent, may also influence the economy's supply side and, in turn, potential output too (i.e. hysteresis view).

The discussion about the procyclicality of potential output is not only important from an econometric and theoretic point of view, but is also relevant for policy. Over- or underestimations of potential output may guide policy-makers to run the economy respectively too hot or too cold. Furthermore, the standard versus hysteresis view on potential output differ on how policy should boost potential output: the former advocates structural policies, whereas the latter also sees scope for demand-side policies (e.g. monetary policy stimulus).

While this article stresses the many uncertainties that surround estimates of potential output and, thus, the output gap, it does not dismiss these concepts altogether, like some have done [1]. On the contrary, it explores how the estimation of potential output can be improved. For monetary policy-makers, the large uncertainty implies that they should not give too much weight to one specific output gap measure and should keep an open mind about various estimates that might tell a different story and raise important questions.

The remainder of the article is structured as follows. Section 1 sketches the different paths that potential output in the euro area may have followed since the crisis. Section 2 gives a concise overview of different methods for estimating the economy's potential. Section 3 addresses the issue of procyclicality in the estimates of potential output and how to deal with it. Finally, section 4 presents some take-aways for monetary policy-makers. [2]

1. Potential output after the crisis

Ten years after the start of the financial crisis, economic activity remains more than 10 percentage points below its pre-crisis trend path in the euro area, the US and the UK (Barnichon *et al.,* 2018). From a historical perspective, such a persistent gap is not unusual. In fact, a cross-country analysis shows that about two-thirds of recessions are followed by lower output relative to the pre-recession trend even as the economy has recovered (Blanchard *et al.*, 2015). This is also more common for recessions caused by a financial crisis (83 %) than in the absence of a financial crisis (66 %).

From a conceptual point of view, an important determinant of this gap is the level of potential GDP – defined as the highest level of economic activity that can be sustained without generating inflationary pressure (ECB, 2018).

So, where does potential GDP in the euro area currently stand? Let's consider some stylised examples. A first possibility is that potential GDP has stayed high (i.e. in line with the pre-crisis trend, see blue line in chart 1). In this case, the "output gap" – the percentage difference between real GDP and its potential level – would remain considerably negative [3]. A second option entails a slowdown in potential GDP growth, in which case the output gap may already have closed or even be positive. In this respect, three sub-options can be distinguished:

- Potential output growth was already slowing well before the onset of the crisis (see green line in chart 1 and Fernald, 2014). In this case, there is nothing peculiar about the low post-2008 potential growth rate. It is simply the continuation of a long-term downward trend in productivity which can only be offset by structural (i.e. supply-side) changes or policies.
- Potential growth may only have started slowing during or after the crisis (see red line).
- The level of potential GDP declined due to a series of negative shocks around the financial crisis, but potential growth then caught up with its pre-crisis trend (see orange line).

1 See, for instance, Brooks and Basile (2019) and Efstathiou (2019).

2 Fiscal policy implications, while important, are beyond the scope of this paper.

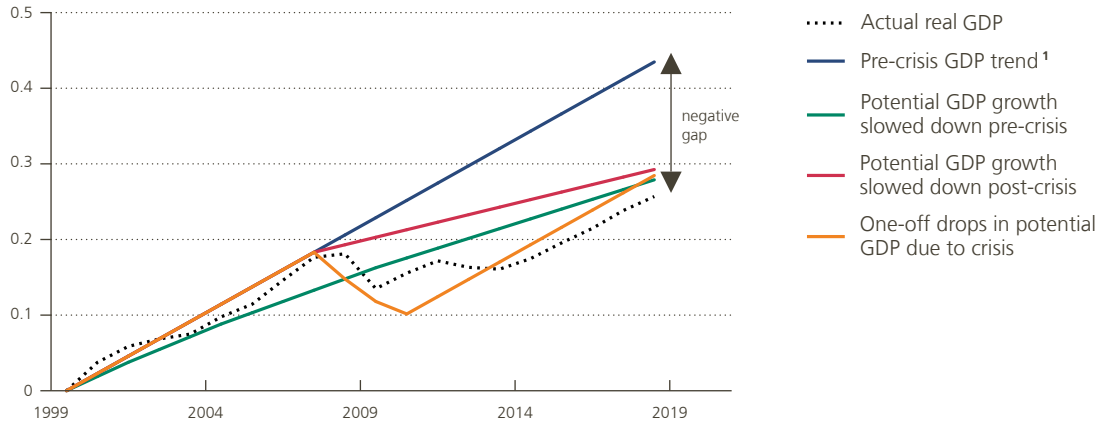
3 The output gap is defined as (Real GDP – Potential GDP)/Potential GDP. Figure 1 visualises this expression in (natural) logarithmic terms as output gap = log(Real GDP) – log(Potential GDP). A similar concept is the unemployment gap – defined as the difference between the unemployment rate and its "natural rate".

Why would potential output undergo persistent level shifts or grow slower post crisis (as depicted by the orange and red lines)? On the one hand, an explanation could be given by the supply side of the economy. Just as slow-moving supply-side developments may be gradually lowering potential output, a recession that starts with a negative supply shock, e.g. permanently higher oil prices due to turmoil in the Middle East, may cause a sudden fall in potential output. On the other hand, the demand side of the economy may also be involved, as a recession that starts because of negative demand shocks can also have permanent or long-lasting effects on the economy's supply side or potential output. This is called hysteresis and could happen when, for instance, people become unemployed for a long time and lose their skills or leave the labour market; firms invest less during the recession and the capital stock becomes permanently lower than in the absence of the recession; the recession and restricted credit hampers the creation of new and innovative start-up firms. It is worth noting, though, that hysteresis can work both ways, with positive demand shocks, for example in the context of a tight labour market, lifting potential output. This also implies that the loss of potential output since the crisis could be recovered by demand-side policies.

Chart 1

Potential trajectories of potential GDP in the euro area

(in natural log index 1999 = 0)



Sources: EC, NBB.
Note: Depicted trajectories of potential GDP are only illustrative.
1 The pre-crisis (1999-2007) average annual growth rate was 2.3 %.

The level of potential output relative to actual output determines the output gap – an important concept for monetary policy-makers because it is often linked to inflation dynamics. According to the Phillips curve framework, a positive (negative) output gap indicates an economy that is running hot (cold), and this will induce upward (downward) pressure on inflation (see e.g. Cordemans and Wauters, 2018). Knowing the sign and size of the output gap is thus expected to help in forecasting the future path of inflation and setting the course of monetary policy. Specifically, a negative output gap generally calls for demand stimulus, while a positive output gap prompts monetary tightening.

However, the level of potential output – and thus also the output gap – is unobservable and must be estimated using observed data. In practice, a plethora of different types of models (and specifications) are used to gauge the degree of slack in the economy, and the results can differ substantially. As a result, there is an ongoing debate on the degree of slack in the euro area economy and what it implies for inflation dynamics.

2. How to measure potential output?

There are three basic approaches to estimating potential output: (1) statistical approaches: (2) production function, or growth-accounting, approaches: and (3) the newest addition, dynamic stochastic general equilibrium (DSGE) approaches. The DSGE approach is more micro-founded whereas the other two are mainly based on empirical relations between macroeconomic variables with fewer theoretical restrictions. This section takes a closer look at each of the three approaches, briefly mentioning their advantages and drawbacks. The aim is not to determine which approach is best – there is no consensus about this – but rather to show which shocks to potential output the different methods consider and how this influences potential output and thus the output gap. So, the focus is not on quantitative results.

2.1 Statistical approaches: trend-cycle decompositions

Statistical methods are often used to obtain estimates of potential output. In their simplest form, a univariate time series, being actual GDP, is split (e.g. by the Hodrick-Prescott (HP) filter) into a trend component – which is identified as potential output – and a cyclical component. More sophisticated multivariate approaches also use information from other economic indicators to disentangle the trend from the cycle. For instance, output, unemployment and inflation can be combined and potential output obtained by using a Phillips curve relationship. Statistical approaches define potential output as the long-run stochastic trend of output.

The advantage of statistical methods is that they are relatively simple. One disadvantage is that potential output estimates at the beginning and end of the sample may be inaccurate. In addition, univariate methods disregard the economic relationships underpinning potential output. Statistical approaches may also struggle with correctly separating the cycle from the trend. Especially during a slow recovery following a deep recession, this approach may find it difficult to distinguish persistent from permanent shocks. In other words, the potential output estimate comoves with the economic cycle (we return to this issue of procyclicality in section 3).

2.2 Production function approach: the semi-structural practical choice

Most central banks (including the NBB) and international organisations (including the EC and OECD) use the production function approach to estimate potential output. This method models potential output in terms of its underlying building blocks: labour, capital and total factor productivity[1]. The method requires choosing an appropriate specification of the production function, which (in the NBB and EC's case for instance) is typically a Cobb-Douglas aggregate of labour and physical capital with constant returns to scale. Next, the potential level of the input factors must be determined. This corresponds to the maximum or normal amount of each variable that could be used for production without leading to an acceleration of inflation. For labour, this is generally structural employment, for capital, it is the actual capital stock, while (trend) total factor productivity is typically a residual category.

The production function approach defines potential output as the level of output consistent with current technologies and normal utilisation of capital and labour input.

The production function approach has several advantages, the main one being that it is grounded in bottom-up or growth-accounting principles as it enables GDP growth to be broken down into the contributions of labour, capital and total factor productivity. However, some assumptions on the structure of the economy need to be made and they may not fully correspond to reality (e.g. the assumption of constant returns to scale). Another drawback is that the production function approach focuses solely on the supply side. Nor is the potential level of

1 Havik *et al.* (2014) describe the production function methodology of the EC, and Turner *et al.* (2016) that of the OECD. See Basselier *et al.* (2017) for an example for Belgium.

the input factors straightforward to obtain. Production function measures of potential output are also inherently cyclical because each of its components may exhibit some degree of cyclicality. This is especially true for capital: this input factor usually enters the production function unfiltered so that cyclicality in the capital stock induces cyclicality in potential output. Like with the statistical approach, the filtering techniques used to obtain the sub-components of the production function can also introduce cyclicality. For instance, an HP filter is often used to estimate the trend in labour force participation. Depending on the smoothing parameter used, this may produce estimates of the trend component that are affected by the business cycle.

Note that there is no clear-cut separation between production function methods and statistical approaches. The methods can be combined, for instance with a production function being used in a trend-cycle decomposition.

2.3 DSGE models: in line with economic theory, but relatively complex

DSGE models represent a micro-based approach to macroeconomic modelling. They have a New-Keynesian (NK) structure and are thus consistent with current monetary policy thinking. This means that, because of distortions related to the delay in wage and price adjustment and associated time-varying profit mark-up fluctuations, the consequences of real (demand) disturbances can be inefficient and their degree of inefficiency can be mitigated by the monetary policy response. Regarding the estimation process, in a first step, the parameters of the model are calibrated or estimated on the relevant economy so that the different shocks hitting the economy can be identified. In a second step, potential output is obtained from the solution of the model when certain shocks and frictions are turned off.

Within a NK-DSGE framework, the concept of potential output is more complex than in traditional approaches. Typically, it is defined as the level of output that could be attained if prices and wages are fully flexible and price and wage mark-ups are constant (so-called flex-price potential output; see Appendix 1 for an overview of the various potential output concepts in DSGE models). The resultant (flex-price) output gap is a relevant guide for central banks focusing on price stability over the medium term, as long as wage and price mark-up shocks are not too persistent.[1] However, note that there is no direct positive Phillips curve-type relationship between inflation and the output gap in DSGE models with both price and wage stickiness. Instead, price inflation depends positively on the current and future expected inverse profit margin of firms, while wage inflation depends on the ratio between the marginal disutility of working (expressed in consumption goods) and the real wage. A simple Phillips curve-type relationship between inflation and output exists only in stylized models with flexible wages (e.g. Woodford, 2003).

The advantage of a DSGE model is that it enables a structural interpretation: potential output and structural shocks are jointly estimated within a general equilibrium framework which thus makes it possible to conduct a quantitative and internally consistent assessment of inflationary pressures and a normative evaluation of alternative policy measures. But potential output estimates obtained from DSGE models also have their disadvantages. They are quite hard to communicate, as they are rather abstract (see above). They are highly dependent upon the underlying model and the frictions assumed therein. They may not capture structural changes appropriately: many DSGE models assume that all shocks are transitory and, thus, that the economy ultimately returns to a fixed steady state. Consequently, these models should be handled with care when analysing long-term shifts (like in demographics and productivity). For instance, a trend slowdown in the rate of productivity growth would, through the lens of these models, appear as a long sequence of negative shocks to productivity. Once these shocks disappear, everything will return to normal, with the new normal being the same as the old normal. DSGE models designed to estimate potential output should ideally thus include longer-term shocks, trends and dynamics.

1 This condition is met for the DSGE based output gap estimates discussed in Chart 5.

Summing up, all the available methods have their pros and cons, and none is unequivocally declared better than the alternatives. In practice, given their relative simplicity and transparent methodology, policy institutions tend to use production function and statistical approaches rather than DSGE models. On the other hand, every economic cycle is different. Hence, keeping analyses simple and purely data-driven may be problematic in a complex world. In this respect, the microfoundations of DSGE models could be a useful economic cross-check to understand what is driving potential output and how to better estimate it.

3. The issue of procyclicality in potential output estimates

One of the most controversial features of potential output estimates is that they tend to be procyclical : potential growth tends to be weak when the economy is weak and strong when the economy is strong. This feature is also apparent during the financial crisis. At first sight, procyclicality seems to contradict the standard view of potential output, namely, that it is driven by structural, slow-moving forces that are unrelated to the business cycle. It is a supply-side concept that demand-side developments (shocks or policies) cannot influence (exemplified by the statement that "monetary policy is neutral in the long run"). Nevertheless, some procyclicality in potential output estimates can be explained or justified.

On the one hand, there are statistical reasons for cyclicality. Some potential output concepts are based on the actual capital stock (e.g. production function approach). Cyclicality in actual capital thus automatically causes cyclicality in potential output. Cyclicality in estimates of potential output can also stem from incorrect trend-cycle decompositions. This may be due to end-of-sample problems or methods that do not provide for long enough cycles after deep recessions and identify slow recoveries as lower trend output. For instance, estimates of structural employment may also be procyclical. Gechert *et al.* (2016) find that EC's methodology implies that the estimated structural unemployment rate is largely determined by actual unemployement as opposed to other data used in the estimation.

On the other hand, there may also be economic reasons for cyclicality. These are related to hysteresis. *Inter alia*, Ball (2014), Blanchard (2018a) and Reifschneider *et al.* (2015) have suggested that an extended weakness in cyclical demand can damage the supply potential of the economy through hysteresis effects. So, if one finds the hysteresis view relevant, one also expects to see some cyclicality in estimates of potential output.

Note that the three estimation methods described above can deliver procyclical potential output estimates. If so desired, their degree of procyclicality can be attenuated, though. The following sections take a closer look at recent research in this respect. More specifically, section 3.1 shows that potential output estimates made by international institutions tend to be too sensitive to demand shocks but not sensitive enough to supply shocks. Subsequently, section 3.2 looks at how estimation methods could be amended so that they can better identify the shocks that ought to drive potential output. Yet there remains a caveat, which is discussed in section 3.3, namely, that economic theory is inconclusive about the appropriate degree of cyclicality in estimates of potential output or, put differently, whether only supply shocks drive the economy's potential.

3.1 Traditional approaches to estimating potential output may overreact to demand shocks and underreact to supply shocks

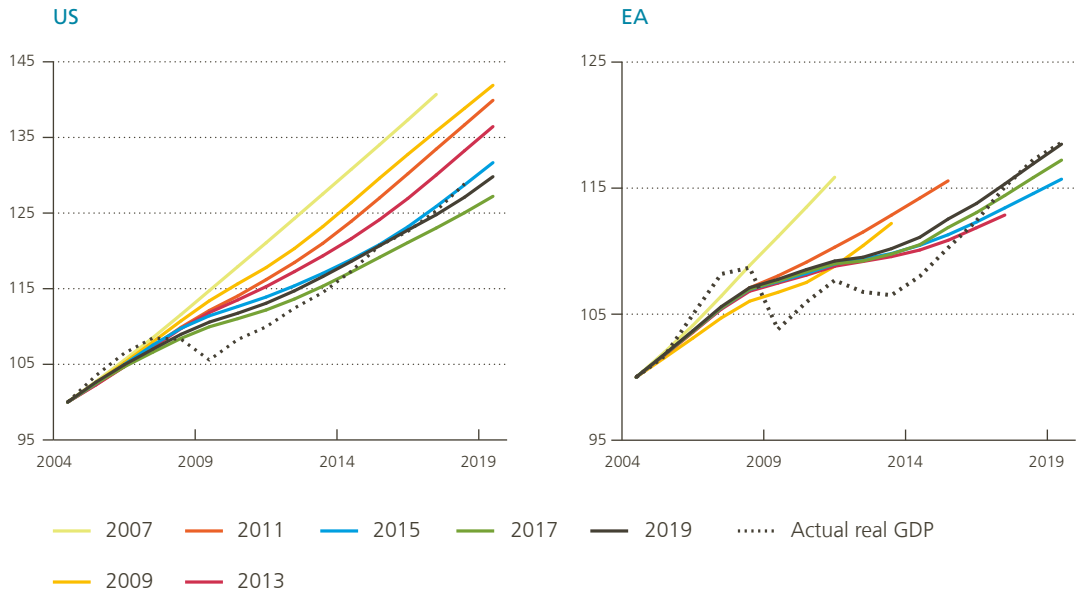
It is natural that revisions to actual GDP data cause revisions to potential output estimates. But, merely looking at different vintages of potential output estimates suggests that these estimates may be too procyclical. For instance, chart 2 shows that since the onset of the financial crisis in 2008, initial estimates of the EC's potential output have been subject to downward revisions over subsequent vintages, thus following the decline in actual GDP. By contrast, once the recovery started in 2013, potential output estimates for the euro area were revised upwards, thus following the increase in actual GDP. The procyclical nature of these revisions suggests

that the methods used by international institutions to estimate potential output have difficulty in identifying the shocks that ought to drive potential output.

Chart 2

Potential output vintages (full line) and actual output (dotted line)

(index 2004 = 100)



Sources: CBO, EC, FRED.

Coibion *et al*. (2018) make this point in a more elaborate way. They empirically find that institutional estimates of potential output obtained from production function and statistical approaches are too cyclical. More specifically, across countries, they find an over-response of real-time estimates of potential output to demand shocks and an under-response to supply shocks.

This finding has two implications. First, estimation methods used by international institutions may not seem to differ that much from simple statistical filters. To the extent that these methods fail to identify the different shocks behind the changes in economic activity, they will naturally lead to slow-moving dynamic responses of potential output to all shocks that move actual output. Second, the downwardly revised path of potential output since the crisis (see chart 2) may thus not be a good reference for the future path of actual GDP. In fact, the strong performance of the US economy has recently led to upward revisions in US potential output.

3.2 Solutions for dampening statistical procyclicality

In order to obtain less cyclical potential output estimates – and consequently get estimates that are more in line with the standard theory according to which longer-term developments in potential output should respond to supply shocks but be largely independent from demand shocks – Coibion *et al.* suggest combining statistical approaches with economic restrictions.

Methods proposed by Coibion et al.

One proposed method entails applying a Blanchard-Quah (BQ, 1989) structural decomposition to a 2-variable vector autoregression (VAR) model consisting of output and unemployment. This approach relies on long-run restrictions to distinguish shocks that have permanent effects on output (labelled supply shocks) from those with only temporary effects on output (labelled demand shocks) and, by construction, rules out hysteresis. Potential output is in fact recovered from the contribution of shocks that have a permanent impact on output. Coibion *et al*. find this estimate of potential output to be less cyclical and less subject to revision. In addition, the BQ potential output estimate has also fallen by less than that of the Congressional Budget Office (CBO) and thus implies a more negative US output gap.

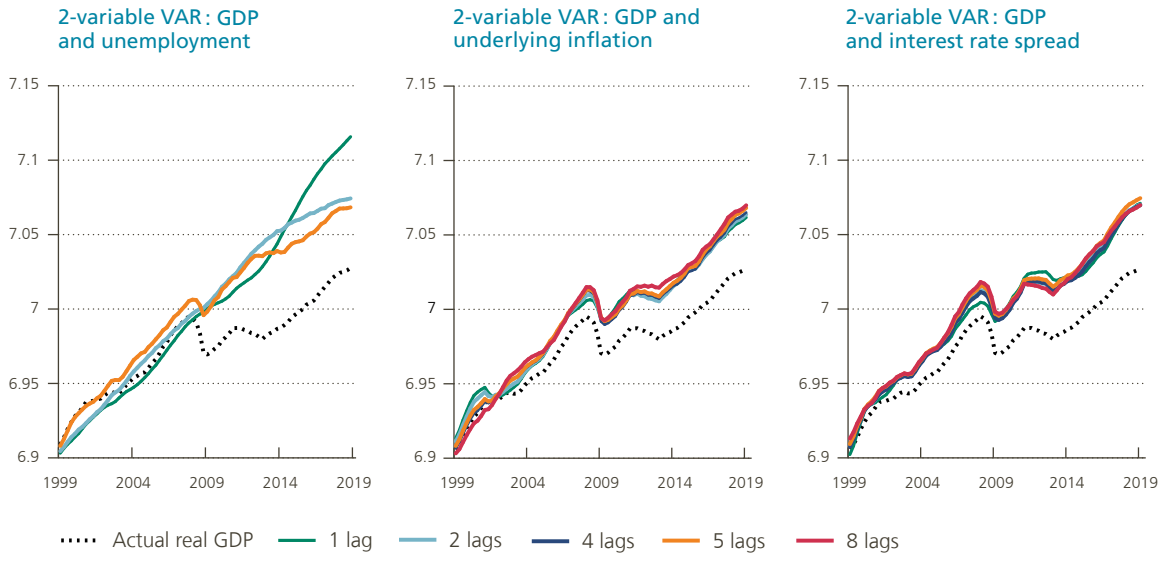
While attractive given its simplicity, the method comes with some caveats. Blanchard (2018b), the co-founder of the BQ method, has, in a reaction to Coibion *et al.*'s research, mentioned the method's limits, one being that it does not necessarily identify supply and demand shocks but rather separates permanent from temporary shocks. A supply shock that has a temporary and thus non-permanent effect on potential output will be incorrectly labelled as a demand shock and will thus not show up in the reconstructed series for potential output. Similarly, a demand shock that affects potential output (hysteresis) will not show up in the reconstructed potential output series.

In addition, applying the simple BQ decomposition to a similar 2-variable VAR but with euro area data looks less promising to obtain better potential output estimates. A first problem is related to the fact that euro area unemployment has a unit root while the BQ approach requires the series to be stationary. The unemployment rate can be replaced by another stationary variable that captures the state of the business cycle, but results are in general quite dependent on the lag length and on the variables included in the system (see results in chart 3). So, instead of a 2-variable VAR, a bigger model on which to apply a modified BQ approach would be needed to obtain a more reliable estimate of potential output for the euro area.

Chart 3

Estimates for euro area potential output following the BQ approach

(potential output in log levels)



Source : NBB.

Note : To extract the level of potential output from the BQ VAR, the output gap is assumed zero in 1997Q1 and the long-run growth rate of output is assumed to be stable at 2 %.

Moreover, the dynamics of potential output do not only depend upon the choice of variables and lags, but also on the assumptions about the long-run growth rate of the economy. Depending upon whether one includes a high or a low long-run growth rate of GDP, the output gap will be bigger or smaller today. Coibion *et al.* (2018) recognise this problem of sensitivity of the assumed long-run growth rate and thus consider several values for the pre-crisis long-run growth rate. Their benchmark is 3.1 % (being the average GDP growth rate over the period 1977-2007) but considering other sources of long-term growth projections, they find that the output gap can work out at anywhere between –15 % (Macro Advisers) and –2 % (CBO) since the great recession.

Another approach to estimating potential output follows Gali (1999), who defines potential output as being solely driven by technology shocks. Given this narrower interpretation of what can drive potential output, it is probably not surprising that Coibion *et al.* (2018) find that US potential output estimated according to this approach has declined by even less than when using the BQ approach.

The different estimates of potential output depending on the alternative approaches used by Coibion et al. (2018) again highlight that it is extremely important to know what concept of potential output is being estimated : different concepts imply different reactions of potential output to shocks and they have different (monetary) policy implications. In addition, the precise implementation needs to be fine-tuned.

An alternative way of trying to better identify trend and cycle effects (and avoid excess cyclicality as well) entails adding extra sources of information to the statistical model through variables related to inflation or financial factors (just as DSGE models do). The following section discusses some of these more sophisticated multivariate approaches.

Phillips curve models

A broad range of models include the Phillips curve relationship as a source of information for measuring the economy's output gap more accurately. According to this relationship, demand shocks can be identified through the fact that they lead output and inflation to co-move in the same direction. Therefore, these models contain an inflation equation which links the "inflation gap" – the difference between inflation and its trend – to the output (or unemployment) gap, so that positive (negative) output gaps translate into upward (downward) pressure on future inflation. This feature is particularly relevant for the recent "lowflation" years in the euro area where upbeat economic growth coincided with weak inflation. Not taking account of the latter fact could bias the estimates of potential output downwards, in that univariate methods would risk interpreting a long period of relatively strong growth as fast convergence to (and even above) potential while the inflation trajectory would suggest another view (still room to grow towards potential).

We highlight two recent studies in this domain. First, Jarociński and Lenza (2018) build a dynamic factor model of the euro area, where deviations of output from its trend – the output gap – are consistent with the behaviour of inflation. The authors compare different model specifications based on how well they forecast core inflation in real time. According to the best models, the output gap is very wide after the crisis. In the best model, it even reaches –6 % of euro area GDP in 2014, a figure twice as negative as the official estimates by international institutions.

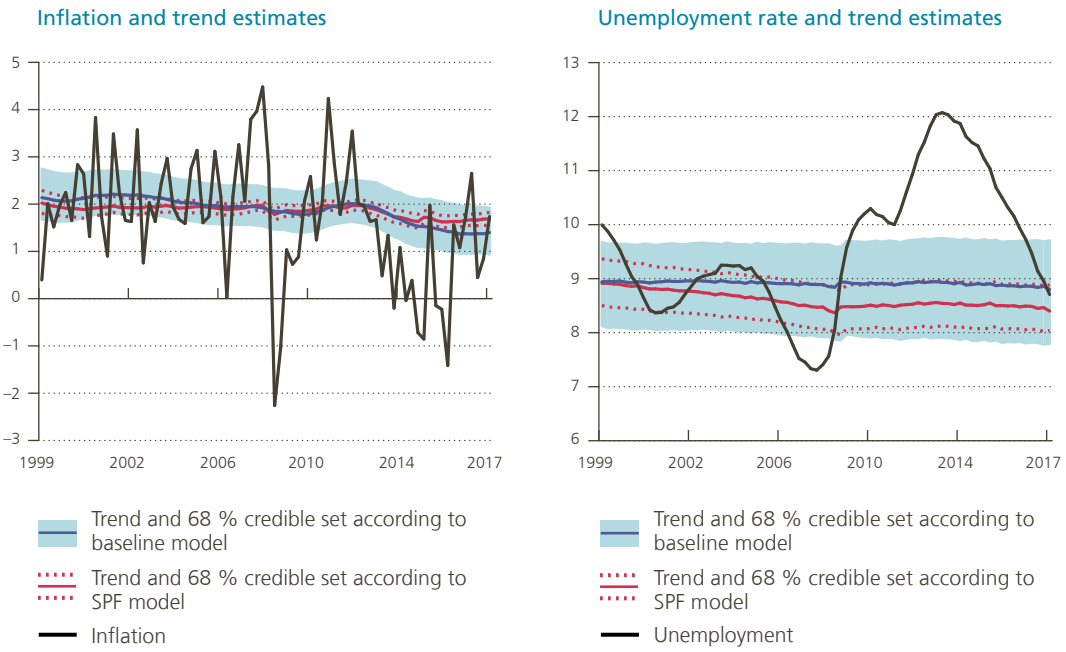
A second example is the work by Stevens and Wauters (2018), who estimate a Phillips curve model where the trends and parameters can vary over time. In addition, they estimate specifications where the model's forecasts are made consistent with the average inflation expectations from the ECB's Survey of Professional Forecasters (SPF) at short- and long-term horizons. Several papers in this field of literature also use long-term inflation expectations to inform the estimates of trend inflation : not doing so can lead to low inflation being interpreted as a lower trend while a long and slow recovery could explain the below-target inflation. Their approach differs from the literature in that it uses a term structure of expectations and not only long-term inflation expectations. In fact, the inclusion of short-term expectations should also make it possible to measure how quickly the economy reverts (or is expected to revert) towards its trend rates, thereby helping to distinguish between changes in trends and persistent deviations from those trends. That could be particularly relevant in the wake of the double-dip recession in the euro area.

The results[1] show that euro area lowflation up to 2017 was mainly driven by cyclical (and thus temporary) forces, i.e. by an economy operating persistently below potential. Chart 4 shows euro area inflation and trend inflation – the expected rate of inflation in the long term – for the "baseline" Phillips curve model which neglects expectations data, and the expanded "SPF model" which makes the model forecasts consistent with SPF data. The inclusion of survey data (whose long-term inflation expectations remain fairly stable) leads to a more muted decline in trend inflation at the end of the sample. Trend inflation is about 1.7 % at the end of 2017 in the SPF model, and 1.4 % in the baseline model. To explain persistent low inflation, the SPF model attributes a larger role to economic slack. Chart 4 shows the euro area unemployment rate and the estimated natural (or trend) rates from both models. At the end of the sample, the natural rate is close to the unemployment rate for the baseline model, indicating an economy operating at its potential. By contrast, the natural rate is lower in the SPF model, and the unemployment gap remains positive at the end of 2017.

Chart 4

Adding extra data can help models to better distinguish the trend from the cycle

(in %)



Source: Stevens and Wauters (2018). The figure on the left shows quarter-on-quarter annualised headline HICP inflation for the euro area, and two types of trend estimates. The figure on the right shows the euro area unemployment rate, and two types of estimates of the natural rate. The baseline results correspond to a model estimation which does not take SPF expectations into account, whereas the SPF model has model-based forecasts which are in line with the SPF expectations.

The key take-away from these examples is that weak inflation developments in the last few years in the euro area could be the symptom of more slack than had been generally presumed.

Models with financial variables

Another view is that financial factors, and the financial cycle more generally, help to identify potential output. Barnichon *et al.* (2018) estimate a non-linear vector moving-average (VMA) model which allows for asymmetric

1 The sample ends in 2017Q4, updated estimates are in production.

effects from adverse and favourable financial shocks. They find that temporary adverse financial shocks have persistent effects on output and prices. Using a counterfactual simulation which shuts down the financial shocks of 2007-2008, they show that these shocks had very large effects, and persistently lowered GDP by roughly 7 percentage points in the US, and by 8 percentage points in the UK. In a next step, the authors investigate how the financial shocks affect the components of GDP. Interestingly, adverse financial market disruptions deliver strong and persistent negative effects on R&D spending, thereby providing a potential channel for how these shocks influence the economy's long-term economic performance.

Borio e*t al.* (2017) propose an unobserved components model that includes information from the financial cycle in measures of potential output. They report that this approach of creating "finance-neutral" output gaps makes the output gap estimates more precise, less procyclical and more robust in real time[1]. By contrast, they argue that inflation (see the above section on the Phillips curve) carries very little information to infer potential output. In similar vein, Basselier *et al.* (2017) report finance-neutral output gap estimates for Belgium. The inclusion of financial measures in the estimation leads to a more positive output gap that exceeds traditional estimates by around 1 percentage point between 2001 and 2011, whereas the opposite is true in the most recent period (2014-2016). However, the larger output gap prior to the great financial crisis is not due to financial variables, because the financial gaps are found to be negative in that period. And there is no proof of the output gaps being more stable in real time.

3.3 However, economic theory is not clear about how cyclical potential output should be

While advances in modelling may help to better identify the economic shocks that influence potential output in a given economic framework, theory is not at all clear as to which shocks potential output should ultimately react or not.

It is straightforward that permanent supply shocks should be a driver of potential output as they determine the productive capacity of the economy. But what about demand shocks? At first sight, and in line with standard thinking, potential output should not react to demand shocks. However, if these demand shocks have persistent effects and, consequently, also impact the supply side of the economy, potential output may also react to these demand shocks (i.e., the hysteresis view introduces an economic rationale for cyclicality in estimates of potential output).

The degree of cyclicality in estimates of potential output also has significant monetary policy implications. First, it may substantially affect monetary policy's stabilisation decisions. Following a (persistent) decline in aggregate demand, a highly cyclical potential output estimate, by implying a less negative output gap, would signal less need for monetary easing than a more stable potential output estimate. Second, it determines the extent to which monetary policy may influence potential output. To understand this, it should be recalled that the standard view implies no impact from monetary policy on potential output (i.e. it is neutral in the long run), whereas, according to the hysteresis view, monetary policy can have permanent or at least persistent effects on potential output.

We illustrate the first issue by showing how the cyclicality in a sub-component of potential output, namely the capital stock, impacts potential output and consequently the output gap and monetary policy's reaction to it. More specifically, building on the DSGE model of de Walque *et al.* (2017), we compare the impact on flex-price potential GDP of a cyclical measure of the capital stock, namely actual capital, to a less cyclical measure of the capital stock, referred to here as hypothetical capital (i.e. which would prevail in the absence of any nominal

1 This works as follows: by removing the unsustainable part of GDP that is driven by financial imbalances, the sustainable output measure evolves more steadily during financial crisis periods compared to traditional potential output measures. Therefore, the corresponding sustainable output gaps tend to suggest more severe overheating (i.e., a larger positive output gap) before the crisis and more excess capacity afterwards (i.e. a more negative gap) compared to traditional output gap measures (Basselier *et al.*, 2017).

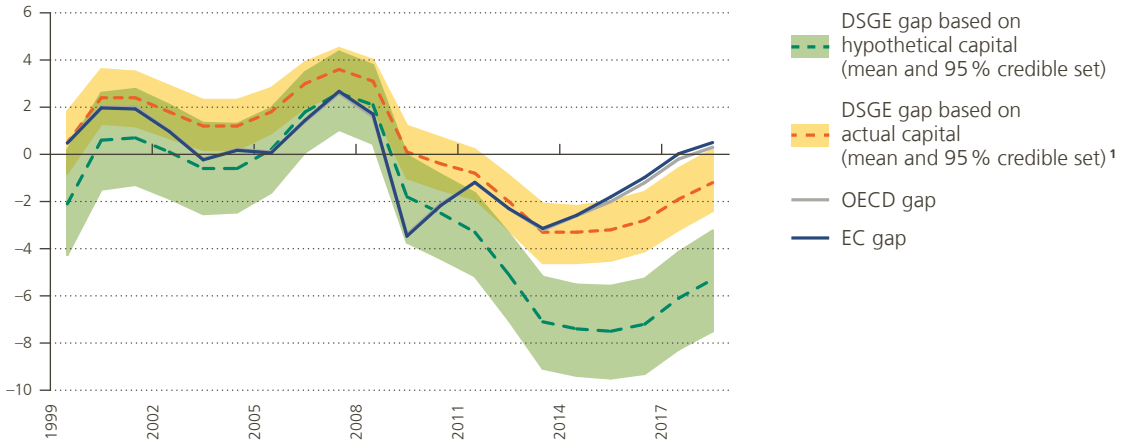
rigidities)[1]. In 2018, the output gap for the euro area that takes the hypothetical capital stock into account was more negative than that based on the actual capital stock (see chart 5). This reflects the large wedge between the hypothetical and the actual capital stock, with the latter suffering from low investment during the financial crisis. In addition, the output gap for the euro area based on actual capital tracks the EC's and OECD's output gap estimates closely, which would be expected as international institutions' potential output estimates are typically also based on the actual capital stock (see above).

At first sight, the different sizes of the output gap based on actual versus the hypothetical flexible price capital stock have different policy implications, with the former suggesting less need for monetary stimulus than the latter. However, potential output has fallen more strongly in the concept based on actual capital compared to that based on hypothetical capital, reflecting spillovers of reduced aggregate demand (a risk premium shock in this model) onto the physical capital stock and thus potential output (hysteresis view). As the economy recovers, capital accumulation may again lift potential output in the concept based on actual capital. Economic slack may thus be bigger than suggested by the output gap based on actual capital. So, even if the output gap based on actual capital were closed, additional demand stimulus need not threaten price stability (if the supply side of the economy were to expand to a similar degree). We do find that the euro area economy has scope to grow at rates above its long-run trend for several years until the hypothetical output gap is closed, without price stability being threatened. This would justify basing monetary policy decisions on the outlook for price stability, rather than on the (uncertain) magnitude of the output gap.

Chart 5

Euro area output gap measures based on different capital stock concepts

(in % of potential GDP)



Source: NBB.

1 The series has been demeaned – implying that, on average over the sample, the output gap is zero – to better align it with EC and OECD output gap estimates.

This brings us to the second issue, being the extent to which monetary policy may influence potential output. The analysis above suggests that the standard view's assumption of monetary policy having no impact on potential output may be a bit too strong. In fact, Blanchard (2018a) highlights that in any standard DSGE model,

1 Note that potential output based on hypothetical capital would correspond to unconditional flex-price potential output and that based on actual capital broadly to conditional flex-price potential output (see again Appendix 1).

monetary policy is likely to affect actual output for some time because of nominal rigidities.[1] If there is monetary tightening that triggers a recession, output will decline. This decline in output is likely to come with a decline in investment (or in other factors of production). As output declines, the capital stock is lower for some time and, by implication, so is (conditional) flex-price potential output.

Using a workhorse DSGE model (derived from Christiano, Eichenbaum and Trabandt, 2016), which allows for capital accumulation and matching frictions in the labour market, Blanchard (2018a) illustrates that (conditional) flex-price potential output follows a path similar in shape to that of actual output (without such deep a drop) after an adverse monetary policy shock. When actual output reaches its trough, potential output also reaches its trough. After 15 quarters, potential output is still lower than before the shock[2].

Based upon this finding, Blanchard (2018a) concludes that the issue is not about models (standard versus hysteresis – as in a standard DSGE model potential output is also procyclical) and consequently not about the existence nor permanence of monetary policy effects on potential output, but rather about their size and persistence. Blanchard urges macroeconomic research to assess the degree of persistence of monetary policy effects on potential output and microeconomic research to identify and examine specific channels of persistence. He himself sees macro- and microeconomic evidence as suggestive, but not conclusive, evidence against the "long-run neutrality of money" hypothesis. Therefore, he suggests that monetary policy-makers retain the standard view (no permanent effects of monetary policy on potential output) as their baseline, but also keep an open mind and put some weight on alternatives.

Overall, the existence of different concepts of potential output (standard versus hysteresis view) suggests that a deeper understanding of potential output is required. Is it purely a supply-side concept or can demand shocks also have an impact? This has important implications for monetary policy as it implies that continued stimulus may either overheat the economy above potential or lift its potential.

4. Take-aways for monetary policy-makers

The concept of the output (or unemployment) gap is important for monetary policy-makers: it is used for understanding and forecasting future inflation developments, and minimising the output gap is welfare-improving (both inflation and the output gap typically enter a monetary policy-maker's loss function). However, the considerable uncertainty surrounding estimates of potential output and the output gap question the prominent place that they have in policy-making in general. This uncertainty stems from multiple sources and is unlikely to disappear in the foreseeable future because:

- potential output is unobservable;
- economic data used to estimate potential output are often subject to revision (although unemployment and inflation are revised less frequently);
- data revisions can in turn alter the perspective on the underlying supply-side factors shaping potential output;
- there are multiple statistical approaches to estimate potential output and there is no consensus as to which one performs best;
- there is no consensus about the shocks influencing potential: do only slow-moving supply-side factors drive it or do demand shocks also play a role (standard versus hysteresis view) and, if so, what is their persistence?

1 More precisely, this is the case when potential output is defined as the level of output that can be attained when prices are flexible in the present and the future (i.e. conditional flex-price output). In contrast, in our above analysis, potential output that is based on the hypothetical capital stock corresponds to the level of output that can be attained when prices are flexible in the past, present and future (i.e. unconditional flex-price output). See Appendix 1 for nuances on conditional and unconditional potential output concepts

2 Similar cyclicality can be detected in the natural unemployment rate.

Monetary policy-makers should take this uncertainty into account in their work. Uncertainty about where the economy stands relative to its potential increases the risk of policy missteps, which at the current juncture entail either being too tight and not tapping the economy's full potential or being too lenient and thus overheating the economy with higher inflation. Yet, given that inflation currently stands below 2 %, such overheating of the economy need not imply that inflation will rise above the ECB's inflation aim.

To minimise policy mistakes, it is best to look at a wide range of potential output estimates and have a good understanding about how different assumptions and methodologies shape these estimates. In that way, information about the economy stemming from a preferred output gap – which is consistent with the general view on what drives potential – can be cross-checked against information stemming from alternative output gaps, thus leaving room to quantify alternative views and mechanisms.

Nevertheless, given the uncertainty about the magnitude of output gaps and the role they play in driving inflation, monetary policy-makers should (and indeed do) look at a broad number of variables when assessing the temperature of the economy and inflationary pressures. An important variable to watch in this respect is (wage) inflation and its projections.

Appendix: Four different concepts of potential output in a DSGE model

Within a NK DSGE framework, there are four distinctive notions of potential output. Three, namely efficient, natural and potential output, are flex-price and more short-run concepts, whereas the other, namely steady-state output, focuses on the long run (see also Vetlov *et al.,* 2011):

- Efficient output is the flex-price level of output that would prevail under perfect competition (implying that both steadystate mark-ups and mark-up shocks are zero). The related output gap measures the relevance of imperfect competition and nominal rigidities. From a welfare point of view, theory suggests that this is the relevant output gap to focus on;
- Natural output is the flex-price level of output that would prevail under imperfect competition (implying that steady-state mark-ups and mark-up shocks can be different from zero). The related output gap measures the relevance of nominal rigidities (the inefficient allocation due to infrequent adjustments of prices and wages to their optimal level). From an inflation point of view, this is the relevant output gap to focus on. Monetary policy-makers thus aim for the natural level of output. Note that, due to imperfect competition, the natural level of output is in general below the socially-efficient level. In most cases, i.e. in the presence of cost-push shocks or other real frictions (e.g. real wage rigidities), central banks face a trade-off between stabilising the natural output gap, and thus inflation, and stabilising the welfare-relevant output gap. Only in the absence of these frictions (i.e. under "divine coincidence") is the central bank able to stabilise both, or more correctly, it stabilises the natural output gap at the zero level and the efficient output gap to a constant (as in this scenario the difference between natural and efficient output is constant, invariant to shocks and proportional to the level of the steady-state mark-up). However, as natural output tends to be very volatile, potential output is a more practical benchmark for optimal monetary policy;
- Potential output is the flex-price level of output that would prevail under imperfect competition and constant mark-ups. These potential output estimates often correspond more closely to more traditional potential output estimates;
- Steady-state output is the level of output resulting from the sequence of permanent (unit root) technology shocks.

Steady-state output takes a longer-term view on potential, just like more traditional approaches do: in both cases, shocks affecting the economy at business cycle frequencies have no major effects on potential output, but they are captured in the corresponding output gap. In contrast, efficient, natural and potential output estimates from DSGE models are affected by structural shocks that push the economy temporarily away from the steady state. They thus tend to be more volatile – but not necessarily all to the same extent – and to imply smaller and less persistent output gaps than those using steady-state output or more traditional approaches.

With respect to the above flex-price potential output concepts, one can make yet another distinction based on the treatment of "state" variables – these variables are typically pre-determined at the beginning of the considered time period, like e.g. physical capital.

- Conditional flex-price potential output is obtained if prices and wages are flexible in the present and in the future but taking the actual capital stock as given. Note that under this definition, bygones are bygones. For example: a monetary policy mistake in the last period (t–1) that reduces or increases the capital stock – and thus potential output – today (t) does not open the conditional output gap (the capital stock at time t is the same for both actual and conditional potential output). Consequently, there is no need for monetary policy today to correct its past mistake when it uses this potential output concept.
- Unconditional flex-price potential output is obtained if prices and wages are flexible in the past, present and future. Under this computation of potential output, the considered capital stock would be the one that would exist if prices had always been flexible, implying that potential output is defined as what it could be today in a hypothetical world. In particular, if monetary policy fails to stabilise the economy in

response to, say, an adverse demand shock and thus the actual capital stock is lower than its flexible price counterpart, monetary policy should take into account the potential for the actual capital stock to recover towards its flexible price counterpart if sufficient stimulus is provided.

Under the unconditional concept, potential output is always independent of monetary policy whereas this is not the case under the conditional concept.

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Exchange rates, prices, monetary policy and competitiveness

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A. Stevens

Introduction

The relationship between prices and the exchange rate is particularly crucial for monetary authorities whose mandate is to ensure price stability. On the one hand, exchange rate fluctuations affect the pricing chain and are perceived as a source of disruption to which central banks should react, but on the other hand changes in the monetary stance also cause exchange rate variations. To understand these interactions that depend on the reasons behind the initial exchange rate movement, it is necessary to analyse both structural and cyclical elements.

The strength of the transmission of changes in the relative value of currencies to the various prices is usually covered by the generic term "exchange rate pass-through". Most of the time, this refers to a *ceteris paribus* elasticity that can be measured at several horizons through econometric regressions. Empirical facts regarding the exchange rate-prices relationship are set out in Section 1. In particular, exchange rate sensitivity declines sharply along the pricing chain, with consumer prices being about ten times less responsive than import prices. Also, in very open economies like Belgium, consumer prices are not much more sensitive to the exchange rate than prices in larger and less open euro area members.

Such a *ceteris paribus* concept for import prices can be related to structural elements characterising a country's international environment, such as its degree of trade openness, the fact of belonging to a currency union and/or of having a reference currency. When it comes to the structural pass-through to consumer prices, the distinction between imports for direct final consumption and imports for intermediate input in domestic production becomes crucial, especially with nominal rigidities lower at the border than in the domestic production sector. As the degree of trade openness measured by the import-to-GDP ratio displays a strong positive correlation with the import content of exports, this point is a key reason why the huge cross-country variation in trade openness does not result in a similar diversity in the measured exchange rate pass-through to consumer prices. These points are discussed in detail in Section 2.

In addition to the structural determinants, it is essential to take cyclical factors into account when analysing the exchange rate-prices relationship. Even though currency depreciations are always associated with imported inflationary pressures, the conditional correlation between consumer prices and the value of the currency may vary in intensity or may even switch sign, depending on the type of shock hitting the economy. For example, an unexpected increase in domestic productivity simultaneously depresses domestic producers' prices and the

domestic currency. As domestic prices account for a bigger share of the consumer price index than import prices, the imported inflation due to such a shock is not enough to trigger a rise in consumer price inflation. Conversely, a looser than expected monetary policy stance pushes domestic producers' prices upwards, reinforcing the imported inflation resulting from the associated currency depreciation. The strength and sign of the exchange rate-consumer price relationship is therefore both shock-dependent and state-dependent, preventing the use of a "one-size-fits-all" rule of thumb as further described in Section 3.

The expected (or endogenous) reaction of the monetary authorities with respect to nominal and real developments in the economy, as summarised by the so-called Taylor rule, exerts significant influence over the mechanisms outlined in the previous paragraph. According to the benchmark general equilibrium open economy New Keynesian model, the more aggressive the endogenous monetary policy reaction to inflation and growth deviating from their steady path, the less inflationary the impact of a depreciation. This first indicates that the exchange rate also constitutes a channel for the transmission of monetary policy, and second, that the relatively weak relationship between the exchange rate and consumer price inflation may also be attributable to the central bank's credibility in stabilising inflation, in addition to the structural elements mentioned above. This is developed in Section 4.

Finally, Section 5 tackles the link between the exchange rate and growth. Currency devaluations are often perceived as a quick and efficient way to improve the competitiveness of an economy in difficulty. However, this is only true where the increase in external demand outweighs the decrease in domestic demand resulting from the negative wealth effect. In other words, it depends on the strength of the expenditure switching effect, which is itself directly related to the structural features of the economy described earlier. These features include the purposes for which an economy imports: direct consumption or intermediate inputs. If it is harder for firms than for households to replace more expensive inputs with cheaper ones, that reduces the case for depreciation as a way of enhancing growth.

1. Empirical facts about the relationships between exchange rates and prices

Exchange rate sensitivity declines across the pricing chain...

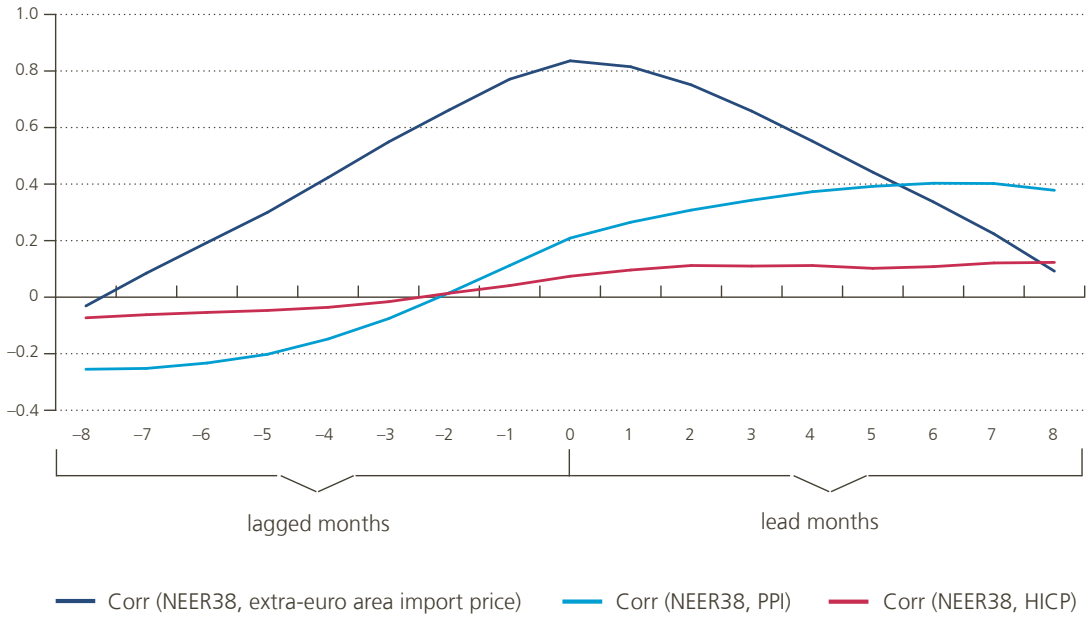
The transmission of exchange rate changes from import prices at the border to final consumer prices can first be assessed by looking at the time series co-movements. Chart 1 shows lead and lag correlations between the nominal effective exchange rate of the euro and, respectively, at-the-border extra-euro area import prices, producer prices and consumer prices for the period between 2010 and 2019. There is evidently a significant, though imperfect, contemporaneous co-movement between changes in the exchange rate and import prices, suggesting substantial transmission at the euro area border. However, the pass-through is weaker and delayed when it comes to domestic producer prices. Finally, the co-movement between currency fluctuations and consumer prices is hardly significant, suggesting that transmission to final prices is even weaker and further deferred.

More rigorous empirical approaches confirm the intuitive impression derived from observed co-movements. Econometricians have tried using various tools to formally assess the exchange rate sensitivity of prices. The most common one consists of a regression of price inflation (e.g. the import price or the consumer price) on exchange rate fluctuations and a series of control variables, as popularised by Campa and Goldberg (2005, 2010) and briefly described in Box 1. The outcome of such an exercise is an average elasticity, which is often interpreted as a *ceteris paribus* "exchange rate pass-through" in the literature. While point estimates may vary from one study to another, and may be surrounded by considerable uncertainty, an undisputed finding is that the exchange rate pass-through declines across the pricing chain. The ESCB Exchange Rate Pass-Through Expert Group recently reproduced this type of price regressions for

Chart 1

Lead and lag correlations of the euro Nominal Effective Exchange Rate (38 trade partners) with the Import Price, the Producer Price Index and the Consumer Price (HICP) in the euro area

(correlations computed on the year-on-year percentage changes, data observed on a monthly frequency)



Sources: ECB, Eurostat.

the countries of the European Union. Their report is summarised in an ECB occasional paper by Ortega *et al*. (2019). In line with the literature, it is found that a 1 % depreciation of the euro would on average increase euro area import prices within one year by about 0.35 %, and headline consumer price inflation (HICP) by about 0.03 % (ranging from 0.01 to 0.04 %, see right-hand panel of Chart 2 below)[1].

… with consumer prices displaying very low short-run sensitivity

According to these estimates, after one year the exchange rate pass-through to consumer prices is about one tenth of the transmission to import prices. Chart 2 also indicates that the low sensitivity of consumer prices to a change in the value of the euro does not only hold for the euro area as a whole but is also a robust finding across its members. What is particularly striking is that this order of magnitude does not seem to be directly related to the degree of trade openness of an economy (see left-hand panel of Chart 2). While countries such as Belgium or the Netherlands have an import-to-GDP ratio nearly twice as high as that of the largest euro area members (Germany, France, Spain and Italy), the measured exchange rate pass-through to consumer prices is not statistically different.

1 The "ranges" mentioned here and in chart 2 below refer to the extreme values of point estimates of a series of variants of the regression displayed in Box 1. Various specifications of this equation are tried with different control variables. More detail on this can be found in Rubene (2018). Due to the linear character of these regressions, the numbers also hold, mutatis mutandis, for a 1 % appreciation of the euro.

BOX 1

Econometricians have tried using various tools to formally assess the elasticity of prices to exchange rate movements. The most common method consists of a distributed lag regression of price inflation (Δp_t^z, with z indicating the price in question, e.g. the import price or the consumer price index) on the exchange rate fluctuations (Δs_t) and a series of control variables ($x_{r,t}$), as popularised by Campa and Goldberg (2005, 2010):

$$\Delta p_t^z = \alpha + \sum_{k=0}^{K} \beta_k \Delta s_{t-k} + \sum_{k=0}^{K_r} \sum_{r=1}^{R} \gamma x_{r,t-k} + \varepsilon_t$$

The outcome of such an exercise is an average elasticity, which is often interpreted as the structural (or ceteris paribus) exchange rate pass-through in the literature. It is computed at any horizon h as the (cumulative sum of) the coefficients of the change in the exchange rate: $ERPT_h^z = \sum_{k=0}^{h} \beta_k$. The ESCB Exchange rate Pass-Through Expert Group recently reproduced this type of price regressions for the countries of the European Union and compared their results with other published estimates (see Ortega *et al.*, 2019). The point estimates obtained are usually rather imprecise, with large standard deviations. Furthermore, they are sensitive to the specification of the equation and in particular to the choice of the control variables, as can be seen in Chart 2.

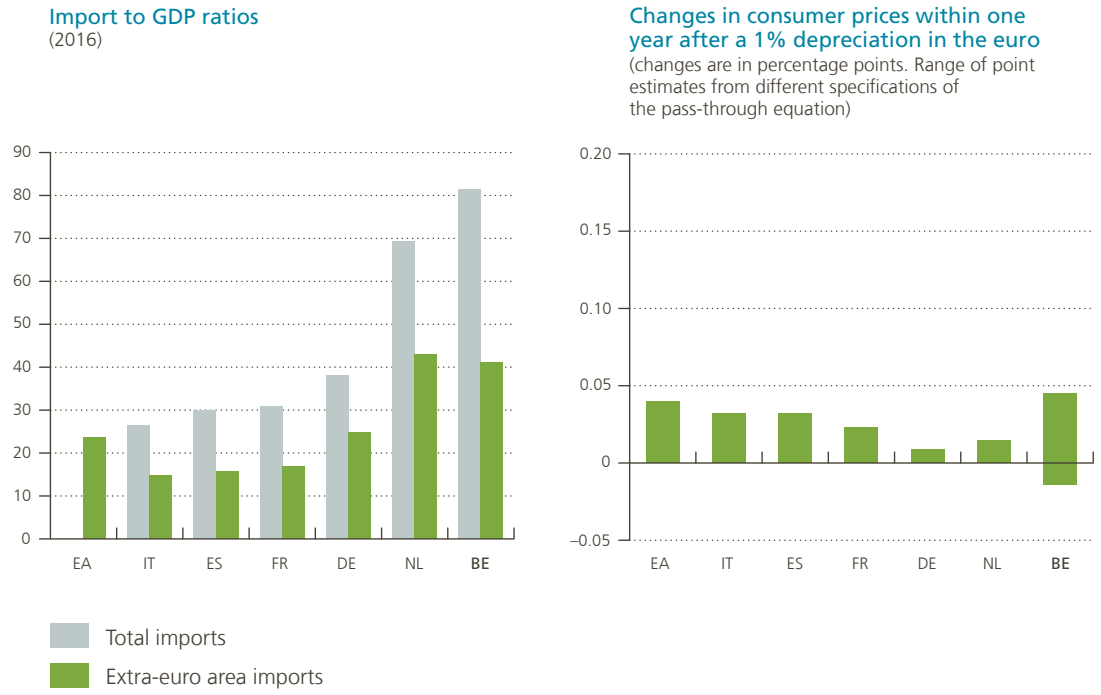
Greater trade openness does not necessarily mean increased consumer price sensitivity

This observation is interesting as it contradicts the natural intuition that a higher import-to-GDP ratio means more foreign content in final goods, and thus a higher consumer price elasticity to the relative value of the currency. Furthermore, Ortega *et al*. (2019) do not report any significant degree of increase in this elasticity across time. This again contradicts the above intuition, as trade openness has maintained an upward trend in most countries in recent decades, in accordance with the globalisation of economies. The next two sections aim to shed light on this apparent enigma by underlining the main factors behind the limited co-movement between exchange rates and consumer prices. These factors can be divided in two broad classes: structural and cyclical. Structural factors are directly related to the *ceteris paribus* view of the exchange rate pass-through as developed so far, and refer to various characteristics of an economy's international trade. However, macroeconomic series diverge from their steady growth path due to a variety of shocks that drive their respective dynamics during the business cycle. The link between the exchange rate and prices may differ greatly depending on the nature of the shock[1].

1 In the econometric approach described in Box 1, this dimension is taken into account through the control variables in order to isolate the structural component of the price-exchange rate relationship. In the general equilibrium approach that will be followed from here on, the structural factors consist of the constant parameters of the price equations, while the cyclical factors can be assessed through a shock-specific price-exchange rate co-movement.

Chart 2

Consumer price sensitivity and degree of trade openness



Sources: OECD, Ortega *et al.* (2019), right-hand chart is reproduced from Ortega *et al.* (2019).

2. Structural factors behind the exchange rate/prices relationship

What are the factors that potentially mitigate the direct link between trade openness and transmission of the exchange rate to the consumer price index? Let us start with the upper part of the pricing chain, i.e. the import price at the border, and then consider the channels through which this border price affects the consumer price index. Factors are first reviewed in a general perspective, while the case of Belgium is summarised in the last subsection.

2.1 Factors affecting the sensitivity of border prices

Price rigidity (at the exporting firm level)

Price stickiness means that exporting firms setting their optimum price in local currency do not necessarily adjust it immediately to reflect a change in the exchange rate but instead absorb the change in their profit margins. This behaviour can be justified by the cost of re-adjusting or re-negotiating the price contract, or it may be due to the degree of competition as explained in more detail below. Such nominal rigidities delay the transmission of exchange rate changes to import prices, and make it incomplete in the short run. Microeconomic empirical studies for the US and the euro area (see e.g. Dhyne *et al.*, 2006 and Nakamura and Steinsson, 2008) have revealed that firms re-optimise their prices with a median frequency of between 8 and 11 months. There is considerable heterogeneity across sectors and types of products, with goods sensitive to the business cycle, such as energy and unprocessed food, being associated with the lowest degree of rigidity, and services with the highest. These numbers have been compiled at the level of all firms and do not focus on exporting firms. Given the relatively high volatility of bilateral exchange rates, it might be the case that such firms reset their optimum price more often.

Extra-euro area trade

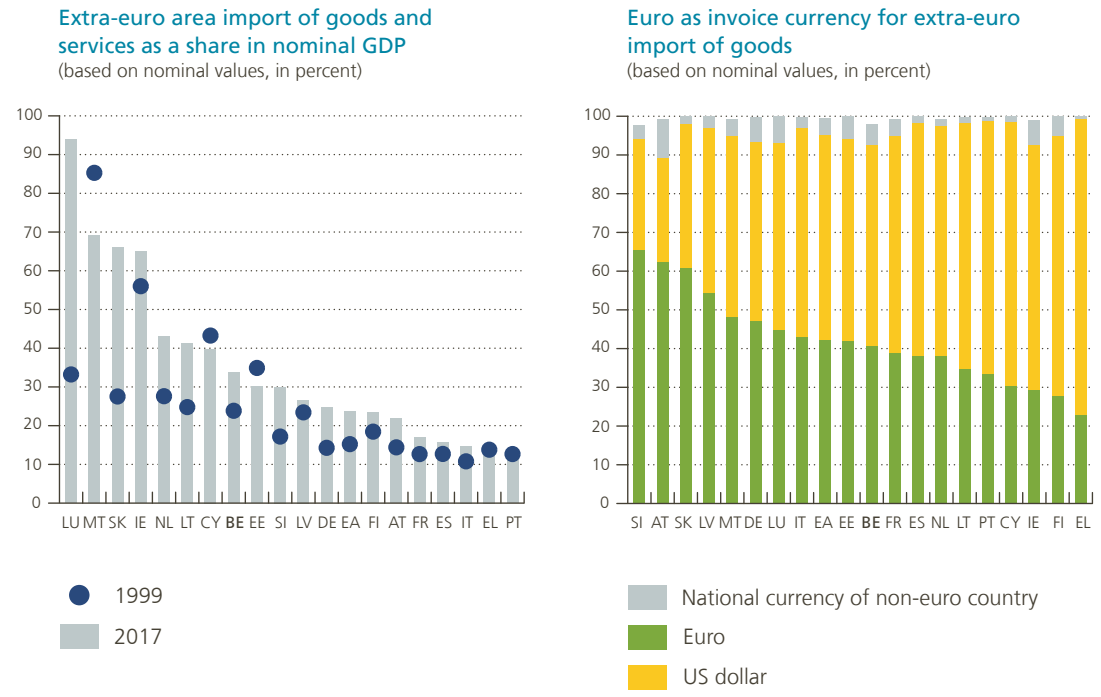
Trade among euro area partners, or intra-EA trade, is usually invoiced in euro. For the euro area countries, it is thus essential to distinguish between overall trade openness and the share of imports directly exposed to the exchange rate risk, i.e. imports coming from outside the euro area[1]. As indicated in Chart 3, trade with non-euro area partners has increased overall since 1999 for most members, most probably due to the internationalisation of the production system, the so-called global value chains[2]. However, it is still relatively limited compared to the overall import-to-GDP ratio for some countries (e.g. Austria, Belgium, the Netherlands, Portugal), and that significantly reduces the share of imports with a potentially high exchange rate pass-through.

Currency of invoicing

Furthermore, the euro has gained reference currency status, and increasing numbers of exporters from outside the euro area invoice their sales in euro. It is likely to further reduce the share of imports directly exposed to exchange rate fluctuations. When the value of their currency changes relative to the euro, these exporters do not necessarily pass on all the variation in their export prices in euro, which limits the exchange rate transmission to the prices of euro area imports from outside the zone[3,4].

Chart 3

Local and dominant currencies in international trade



Sources: Eurosystem projections database, Eurostat.
Note: Data for Malta and Croatia refer to 2000 instead of 1999. Note: Data refer to 2018, except for EE and EA to 2016.

1 Note, however, that even imports from a partner within the euro area are not totally immune to exchange rate variations, as the goods may only be transiting via that euro area partner or may include components from outside the currency union.

2 It has declined for a few countries, namely Malta, Cyprus and Estonia, reflecting increased trade with euro area members after joining.

3 This can be linked to the theoretical choice between local or producer currency pricing for an exporting firm. In the second case, the exporter is supposed to be indifferent t to exchange rate variations when setting its price on external markets, and the exchange rate pass-through is then complete and immediate for the importers. Conversely, if the exporter optimises its price in the currency of the destination market, nominal rigidities also apply to exchange rate variations, delaying their transmission to the import price.

4 For a microstudy on the role of a dominant currency, see the recent work by Amiti, Itskhoki and Konings (2018).

The internationalisation of the dollar makes it a dominant currency for invoicing trade between euro area members and extra-EA partners. The share of the greenback in a country's international transactions generally far exceeds its share of bilateral trade with the United States[1]. Such dominance influences the measured exchange rate pass-through. If trade between euro area countries and economies with volatile currencies is invoiced in US dollar, it makes their import prices less exposed to these unstable currencies and weakens the co-movement between the effective euro exchange rate and euro area import prices.

The combined effect of dominant currency and price stickiness

For instance, let us consider that euro area countries import sugar cane from Brazilian producers and that this transaction is denominated in US dollar. Table 1 gives two examples for which dominant currency pricing limits the transmission of a Brazilian real depreciation to euro area import prices. Example 1 considers a depreciation of the real vis-à-vis the dollar and the euro, while the parity of the last two currencies remains stable. If prices are fully sticky in US dollar, it means that Brazilian exporters absorb the exchange rate fluctuation into their margin. As the euro remains stable relative to the dollar, the sugar cane price converted to euro does not change. In this first example, a potential decline in the euro price would only follow if sugar cane producers decided to pass on part of the depreciation in their dollar price, e.g. 50 % in the partly-sticky case or 100 % in the fully-flexible case, and would not be due to the depreciation of the real compared to the euro. In Example 2, it is assumed that the euro depreciates relative to the dollar. If exporters do not adjust their price sufficiently, Brazilian sugar cane exports may become more expensive for euro area importers, even if the real depreciates versus the euro. In this case, the co-movement between the exchange rate and prices actually changes sign as compared to Example 1. These examples show that when prices are sticky in the dominant currency, what matters for the exchange rate transmission is the movement in a country's currency with respect to the dominant currency. Gopinath (2015) points out that international prices set in US dollar tend to be sticky, and the combination of the duration of this stickiness and the currency of invoicing therefore has a substantial impact on the exchange rate pass-through.

Table 1

Dominant currency pricing. Examples based on euro area imports of Brazilian sugarcane products priced in US dollar

	Exchange rates			Sugarcane price in USD			Sugarcane price in EUR		
	USD / BRL	EUR / USD	EUR / BRL	Fully sticky	Partly sticky	Fully-flexible	Fully sticky	Partly sticky	Fully-flexible
Initial conditions	0.27	0.89	0.24	100	100	100	89	89	89
Example 1	0.23	0.89	0.20	100	93	85	89	82	76
Example 2	0.23	0.98	0.23	100	93	85	98	91	83

Market power and local distribution services

Foreign exporters often face competition in the destination market from other producers, both domestic and foreign, who set prices in a local or a dominant currency. This competition may give them an incentive to adapt their margins so as to keep their price stable relative to competitors and avoid losing market share. The degree to which firms can adjust margins in response to the relative currency price depends on their market power and market conditions. Berman *et al*. (2012) and Amiti *et al*. (2014) find a negative relationship between import price pass-through and exporters' market share : firms with greater market power prefer to adjust mark-ups rather than prices in order to stabilise their market share. Auer and Schoenle (2016) offer complementary evidence :

1 This observation holds even when accounting for the share of oil in a country's imports, as oil is usually invoiced in US dollar.

at the extremities of the market power spectrum, very small and very large exporters tend to pass on the exchange rate fluctuations in full in their selling prices.

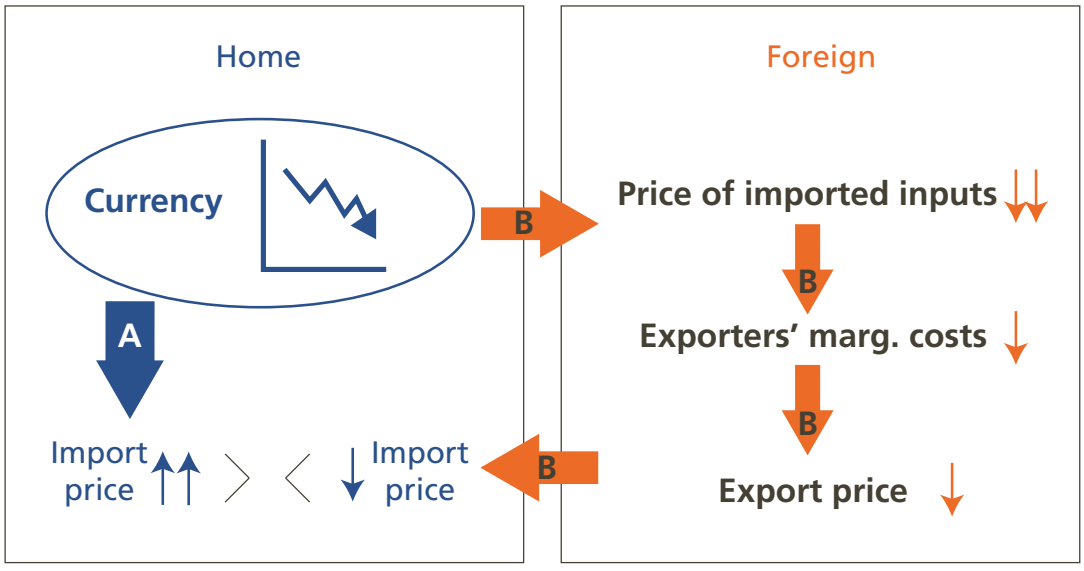
Moreover, exporters' goods are generally distributed to the destination consumers via domestic services (e.g. logistic, retail), further diluting the exchange rate sensitivity of the price of the distributed good at the retail level. If exporting firms take these local distribution costs into account when setting their prices, the distribution channel modifies the perceived mark-up of the foreign exporters on the home market, replacing the influence of their own marginal cost and exchange rate with the price of the local distribution services (see Burstein, Neves and Rebelo, 2003, Corsetti and Dedola, 2005, or Jeanfils, 2008). Consequently, higher distribution costs in the destination market decrease the exchange rate pass-through at the border.

Integration of home-country products into Global Value Chains

Finally, the expansion of international trade in intermediate goods corresponding to a decomposition of the production process into more intermediate stages also has an impact on the exchange rate sensitivity of import prices. Imagine a euro area country producing tyres and selling them to a car producer outside the euro area. All other things being equal, a depreciation in the euro leads to an increase in the price of euro area car imports. However, it also generates a decline in the marginal cost of the extra-EA car producer, as the prices of euro area tyres used in its production have decreased. When a euro area country imports cars from this external producer, the exchange rate effect is neutralised approximately in proportion to the share of the tyres in the total value of the imported car. In this sense, the more a country produces goods that are used as intermediate inputs in the production chain of its trading partners, the less its import price should react to relative currency prices. This effect weakens the influence of foreign costs on a country's inflation, and is particularly significant for the largest euro area economies like Germany, whose foreign imports include a substantial amount of their own value added. The invoicing currency also interacts with global value chains: If an exporter uses imported inputs priced in a local or a dominant currency, it has an incentive to sell its output in the same currency so as to make its mark-up less sensitive to exchange rate movements.

Chart 4

Global Value Chains: A high domestic content in foreign production weakens the exchange rate pass through



2.2 From border prices to consumer prices

While the exchange rate sensitivity of a country's import price is limited by the structural factors mentioned above, empirical evidence presented in Section 1 indicates that the exchange rate pass-through declines further down the pricing chain. We review here the structural factors that affect the transmission of exchange rate fluctuations from import prices at the border to final consumer prices.

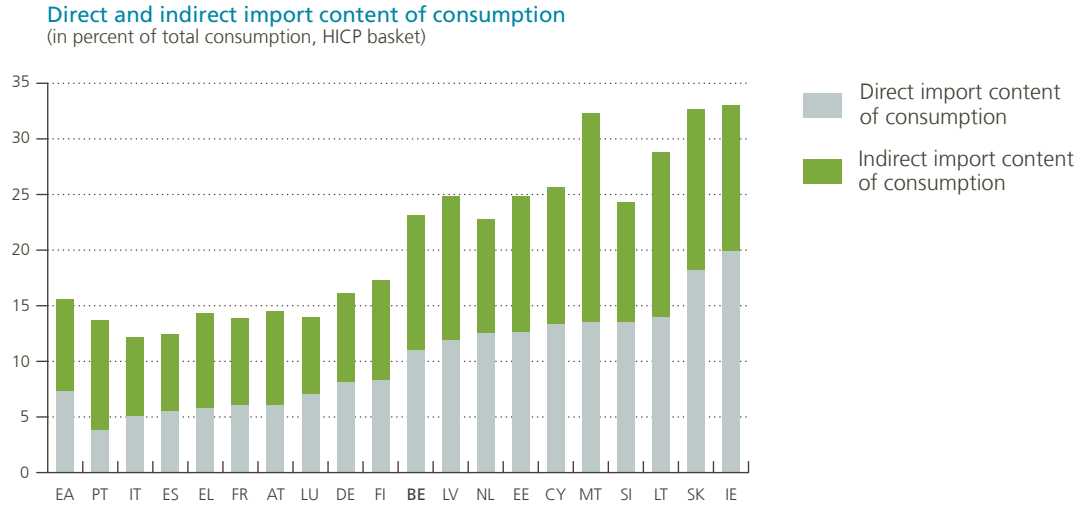
Higher input trade reduces the direct import content of consumption

Imported goods do not all end up directly in the consumer basket. Only a relatively small proportion of imports takes the form of finished products directly distributed to final users, for which the retail price is directly exposed to the exchange rate pass-through to border prices. According to the World Bank, the direct import content of goods consumed by euro area countries and originating from outside the currency union is rather small (WIOD database, 2016 release, see Chart 5). It has tended to increase somewhat over the last two decades at the aggregate euro area level, and it varies from country to country, ranging between 4 % (Portugal) and 20 % (Ireland).

Chart 5

Direct and indirect import content of consumption

(Extra-EA import content for EA members, in % of total consumption, HICP basket)



Sources: WIOD (2016 release), material drawn from Schaefer (2019).

The remaining imported goods may either be directly re-exported (transit goods) or may enter the domestic production process as intermediate inputs[1]. The domestically produced goods are then either exported or consumed locally. In the latter case, foreign intermediate inputs form the indirect import content of domestic consumption, and their (border) price affects final prices only indirectly, via the domestic producers' marginal cost.

In a world of perfect price flexibility, the distinction between the direct and indirect import content of consumption would be unimportant. However, in the presence of nominal rigidities, the difference becomes crucial as nominal

1 Examples are numerous: raw materials (metals, coke, petroleum products, rubber, plastics, chemicals), machinery and equipment, electrical equipment, intermediate components in the production of durable goods such as cars, houses, ingredients in the production of processed food (such as cacao beans), etc.

rigidities are reported to be lower at the import price level compared to the aggregate domestic producers' price level. Let us be more specific and consider, for example, that all firms, domestic and foreign, whatever the market they sell to, reset their price every *x* months. Most of the time, firms do not sell directly to end users (households or government). Instead, their customers are other participants in the production process, so that the nominal rigidities accumulate from one intermediary to the next until the final product is sold to the consumer. This explains why price rigidities measured at the end-users' level far exceed those observed at the firms' level. When a product – be it intermediate or final – crosses the border, that clearly identifies one production stage, with an associated stickiness of *x* months. Therefore, in the case of imports that reach the consumer basket indirectly, price changes are moderated twice before affecting the consumer price: first briefly, when crossing the border, and second more durably, when passing through the domestic production process. The indirect import component of final goods plus price rigidities at the domestic producer level together explain a fair share of the progressive flattening of the exchange rate transmission along the pricing chain as observed in Chart 1:

- low nominal rigidities at the border explain why import prices track exchange rate movements fairly closely;
- the producer price index (PPI) may be viewed as the average of the prices of all firms at the various stages of production, and therefore reflects the exchange rate transmission to the mean representative firm with average nominal rigidity (assessed at between 8 and 11 months by Dhyne *et al.*, 2006);
- the low exchange rate sensitivity of the consumer price index is explained by the small share of direct imports in consumption (7.3 % for the euro area, see Chart 5), and the accumulation of all the nominal rigidities across the production process for the indirect import content of consumption (8.2 % for the euro area, see Chart 5).

All other things being equal, trade openness increases in line with the import content of exports

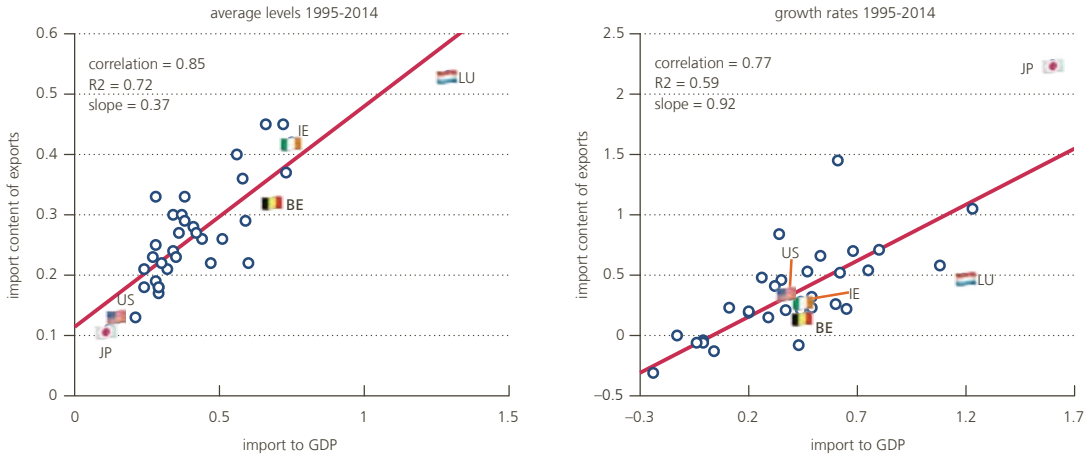
The import content of exports computed by the OECD helps to assess the importance of the indirect import content of consumption. Goods that are re-exported without any substantial domestic value added, defined as transit goods[1], are removed from OECD concept of the import content of exports. Therefore, assuming the domestic production process of goods for both domestic and foreign markets implies the same share of foreign intermediate inputs, the import content of exports can be a reasonable proxy for the import content of production, that is the share of foreign intermediate inputs in the domestic production process. Chart 6 (left-hand panel) highlights the positive and statistically significant cross-country relationship between trade openness and the import content of exports. Hence, the more open an economy, the larger the share of imports destined for the production sector rather than the consumption basket. Given the discussion of the previous point, this is key to explaining why larger import-to-GDP ratios do not necessarily mean that consumer prices are more sensitive to foreign factors.

The right-hand panel of Chart 6 displays the same cross-country scatter plot, but now shows the growth rates of each variable. The (close to) 45° regression line reveals a one-to-one relationship, meaning that, on average, all other things being equal, trade openness increases in line with the import content of exports. This might explain why the exchange rate pass-through to consumer prices has not been affected proportionally (if at all) by the general upward trend in trade openness.

1 These imports only "transit" through an economy and can be particularly substantial in countries with international sea ports, such as Belgium with Antwerp or the Netherlands with Rotterdam. Note that transit goods are meant to be excluded from the national account trade statistics. However, in economies with intensive transport activity and narrow borders, one can imagine that a share of imports is re-exported without any substantial domestic value added beyond the logistic services.

Chart 6

Import content of exports and trade openness



Sources: OECD, material drawn from de Walque *et al*. (2019).

2.3 The case of Belgium

Despite a high degree of trade openness as measured by an import-to-GDP ratio of around 80 %, empirical evidence in Section 1 suggests that the short-run exchange rate pass-through to consumer prices in Belgium is no greater than for larger and less open euro area countries. Let us review here the various structural factors affecting the pass-through from the Belgian perspective in order to explain this apparently counterintuitive observation.

First of all, the share of imports that are re-exported is significant for Belgium. According to Duprez (2014), the import content of Belgian exports is around 60 %, half of it being directly re-exported, mostly through major Belgian sea hubs (and especially the port of Antwerp). As a result, a large proportion of the imports comprised in the import-to-GDP ratio is diverted from domestic absorption (consumption and investment).

Second, Belgium mostly trades with euro area partners, with about 60 % of Belgian goods imports coming from other members of the euro area, and almost 80 % originating from the three largest neighbours: the Netherlands, Germany and France. As intra-EA transactions are essentially invoiced in euro, this significantly limits the share of imports exposed to exchange rate fluctuations, even allowing for the possibility that some of this intra-euro area trade may comprise components from outside the euro area. The principal countries of origin for Belgian imports from outside the monetary union are the United States (about 14 % of Belgian extra-EA imports), the United Kingdom (11 %), China (6 %), Russia (6 %), Japan (6 %) and Sweden (5 %)[1]. However, a large share of these trade flows is invoiced in reference currencies, as 41 % of imports from outside the European Union are denominated in euro, while 52 % are in US dollar, as indicated by Chart 3. As discussed above, this large proportion of euro-denominated trade and the dominance of the dollar in Belgian import pricing limits the exchange rate transmission at the border.

Moreover, the share of imported consumer products in Belgian consumer prices is rather low, at around 11 % of the Harmonised Index of Consumer Prices (see Chart 5). The NBB DSGE macro model estimates an aggregate Belgian domestic price rigidity about 4 times greater than the stickiness of Belgian border prices. Taking account of this high nominal rigidity and low direct exposure, the Belgian price structure is characterised by an important indirect channel which significantly delays the transmission of exchange rate effects to final consumer prices.

1 Source: NBB stat, 2018, national concept.

3. Cyclical factors behind the exchange rate/prices relationship

The exchange rate – price co-movement depends on the source of economic fluctuations…

While the above elements are necessary to determine the complex nexus between the exchange rate and prices, they are certainly not the whole story. As already pointed out, they form the structure of this interconnection, common to any kind of shocks that might hit the economy. However, the origin of the disturbances that push the economy away from its steady path implies potentially very different cross-correlations between the relative value of a currency and the various prices in the economy. First of all, nominal and real variables react in their own way to any shocks, be they domestic or foreign. It is the expected reactions of relative monetary policies and consumer price inflation – i.e. the combined domestic and foreign reactions – that, according to economic theory, cause movements in the exchange rate – the so-called uncovered interest rate parity. This contrasts strongly with the traditional view expressed earlier that there is a generic, rule-of-thumb, "exchange rate pass-through", and that a strict proportional computation suffices to assess the nominal consequences of exchange rate fluctuations. As emphasised earlier, this traditional single equation econometric measure should instead be linked to the structural nominal transmission channel of the exchange rate.

… which prevents the use of any "one-size-fits-all" rule of thumb

When the shock- and state-dependent exchange rate/prices relationship is considered, general equilibrium effects become extremely important, i.e. the way the nominal and real sides of the economy interact, under the rule of the monetary policy endogenised by the economic agents. Let us illustrate this case by means of the estimated two-country New-Keynesian model described in de Walque *et al*. (2017), simulating various shocks hitting the euro area such as to generate a 1 % devaluation of the euro with respect to all the other currencies in the first quarter. Table 2 shows the responses of the euro area consumer price and of the nominal euro exchange rate.

Co-movement between domestic prices and the exchange rate tends to be negative in the case of demand shocks…

In the first panel, an adverse demand shock affecting the whole euro area is considered. This shock drives consumers' and investors' preferences and may correspond, in practice, to a change in agents' confidence in the economy. For instance, in periods of uncertainty, a negative shock generally leads to a decline in consumption, a rise in saving, and the postponement of investment until economic conditions are more favourable. The decline in private demand generates deflationary pressures and a slowdown in output, which in turn triggers the easing of monetary conditions. The resulting decline in the real interest rate discourages savings in euro, leading to a depreciation of the currency. In our simulation, this depreciation produces an increase in the price of the import content of consumer prices such that it counteracts the initial deflationary pressures, and euro area consumer prices go up slightly. Consequently, consumer prices and the value of the euro display a negative co-movement after the demand shock.

… but positive when it comes to supply shocks

In contrast, this co-movement has the opposite sign when it comes to the simulation of a supply shock affecting the whole euro area. An example of such a supply disturbance is a total factor productivity shock. A technological innovation increases the productivity of the production factors and enables firms to produce identical or bigger quantities at lower cost. The productivity shock therefore leads to increased output and lower prices. Monetary policy reacts to these deflationary pressures by cutting its main interest rate so that real rates go down in the economy. This expansionary monetary policy generates a depreciation of the euro, and an increase in import prices. However, these effects are not enough to offset the initial deflationary pressures in the first year after the impact of the shock. As a result, consumer prices go down and display a positive co-movement with the exchange rate.

Relative response of consumer prices to exchange rates is strongest following a monetary policy shock…

The third panel reports the case of a monetary policy shock, which reflects the non-systematic part of monetary policy. In the model, economic agents assume that monetary policy sets the nominal interest rate according to the Taylor rule. Every deviation from that rule is a "surprise" in relation to the agents' expectations and is reflected by the monetary policy shock[1]. If policymakers reduce the interest rate below the level implied by the Taylor rule, they create an accommodative shock. As a consequence, real interest rates decline, generating a depreciation of the euro, while prices go up due to the expansionary effect of the shock. Moreover, foreign exporters react by increasing their prices invoiced in euro, exerting additional upward pressure on domestic prices. The increase in prices is gradual due to the presence of nominal rigidities. Compared to the effect of other shocks, the monetary policy shock is found to be associated with the largest exchange rate/price co-movement. This result is consistent with the literature (Comunale and Kunovac, 2017, and Ortega *et al.*, 2019). Indeed, in the case of monetary surprises, initial inflationary pressures are supplemented by the imported inflation resulting from depreciation. In the case of demand and productivity shocks, the direct effect is deflationary, so that prices move in the opposite direction compared to the movement triggered by inflationary pressures generated by the lower value of the currency.

… while endogenous monetary policy plays a key role in co-movements

Finally, the last panel presents the reaction of the exchange rate and consumer prices after an exogenous depreciation of the euro, that is one that cannot be related to any other fundamental sources of fluctuations. In the model, this simulation is obtained by increasing the international risk premium on the euro relative to other currencies. The higher risk premium may reflect weaker investor sentiment towards the euro, unconnected with either the euro area outlook or monetary policy. The subsequent depreciation of the euro leads to a sharp increase in the nominal value of the share of imports priced in foreign currencies. The mark-up of foreign exporters who invoice their goods in euro is compressed, and they also adjust their prices upwards, though only gradually due to nominal stickiness. The increase in aggregate foreign prices percolates down the pricing chain, affecting consumer prices in a more direct way for imported finished products than for foreign inputs. The central bank reacts to these inflationary pressures by raising the policy rate, which mitigates inflation and partly counteracts the initial depreciation of the euro. Monetary policy therefore dampens the co-movement between the exchange rate and prices, and itself plays a key role in this relationship. This role and the further implications for monetary policy are explained in more detail in the next section.

1 In practice, that surprise may be added deliberately by the monetary policymakers, e.g. because they have more information on economic developments and/or because their expectations differ from those of the markets, or because they want to change agents' expectations (see the disinflation policy in the early 1980s).

Table 2

Responses of the euro-dollar exchange rate and euro area import and consumer prices to different shocks hitting the euro area economy

(Responses are in basis point change with respect to a baseline economy not affected by any shock. Import prices are extra-euro area foreign prices. Shocks are calibrated such as to produce a 1 % depreciation of the euro in the first quarter.)

Shocks	Horizon	EUR / USD	Import price	Consumer price
Adverse demand shock				
	Q1	100.0	14.2	1.2
	Q4	143.0	25.1	2.2
	Q8	158.6	30.2	2.4
	Q12	161.2	31.7	2.6
Positive supply shock				
	Q1	100.0	13.2	–0.2
	Q4	142.4	23.0	–0.7
	Q8	158.0	27.2	–1.9
	Q12	161.5	28.1	–2.9
Expansionary monetary policy shock				
	Q1	100.0	14.6	2.6
	Q4	133.3	25.2	5.0
	Q8	136.0	29.5	6.5
	Q12	127.3	30.2	8.0
Exogenous depreciation (international risk premium shock)				
	Q1	100.0	12.7	1.6
	Q4	117.0	19.8	2.7
	Q8	104.1	20.3	2.8
	Q12	83.6	17.6	2.9

Sources: Simulations from the estimated NBB EA-US DSGE model described in de Walque *et al.* (2017).

4. Implications for monetary policy

Exchange rate movements have two-sided implications for the conduct of monetary policy. On the one hand, they are a source of price fluctuations to which monetary policy should react. On the other hand, changes in the monetary stance cause exchange rate variations, which may matter for the transmission of both conventional and unconventional monetary policies.

On the one hand, exchange rate movements are a source of fluctuations to which monetary policy should react…

To the extent that they create additional price fluctuations, exogenous exchange rate movements require the intervention of monetary policy to preserve its goal of price stability. The lower the sensitivity of end user prices to the exchange rate, the smaller the effort required from the monetary authorities. The latter is thus influenced by the various structural factors reviewed in Section 1. The dominance of a few currencies in international transactions is a telling example, as emphasised by Gopinath (2015). For the US, she reports that 93 % of their imports are priced in dollar, which greatly reduces the effect of a foreign currency appreciation vis-à-vis the greenback, and its transmission to US domestic prices. Consequently, US domestic inflation is better insulated

against external shocks than economies whose imports are priced in a foreign currency. Conversely, the exposure of economies to imports priced in dollar (see Chart 3 for an approximation for euro area countries) makes their inflation more sensitive to bilateral changes in relation to the American currency.

… on the other hand, monetary policy itself influences the exchange rate/price co-movements

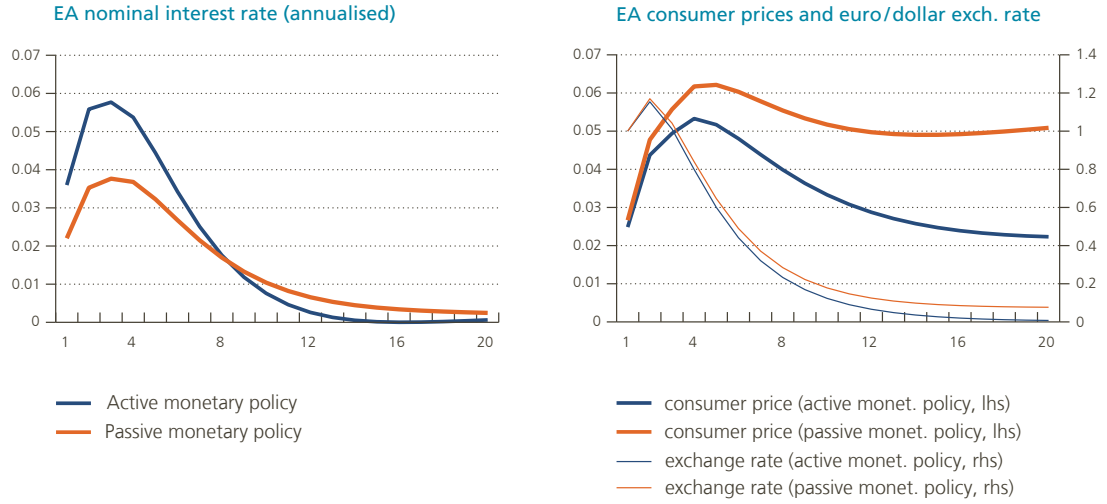
The monetary policy stance itself also influences the co-movement between exchange rates and prices. In particular, monetary policy may also be a factor in the amplitude of the co-movement : The more credible and aggressive the response of monetary policy in counteracting inflationary pressures, the lower the sensitivity of prices to exchange rate fluctuations. This is illustrated in Chart 7 which shows the changes in the EA consumer price and the EA short-term nominal interest rate after an exogenous 1 % depreciation of the euro. An active monetary policy (blue lines) reacts aggressively to the inflationary pressures generated by the depreciation. The interest rate is raised to higher levels than under a passive policy (red lines), and the response of consumer prices to the monetary tightening is more muted.

This example conveys an important policy message. It would not be wise to conclude that if consumer prices display low exchange rate sensitivity, monetary policy can simply disregard currency movements in monitoring inflation dynamics. In contrast, there is evidence that this low sensitivity can be a consequence of a monetary policy which internalises the exchange rate effects.

Chart 7

Changes in EA short-term nominal interest rate and consumer price after an exogenous 1 % depreciation of the euro

(percentage points deviation from steady state, absolute for the interest rate, relative for the other variables ; quarters on the horizontal axis)



Source : simulations from the estimated NBB EA-US DSGE model described in de Walque *et al.* (2017).

The exchange rate is a channel for monetary policy to stabilize inflation…

According to the expected uncovered interest rate parity, the exchange rate can also serve as a valuable ally in the conduct of monetary policy. An increase (decrease) in real interest rates after a restrictive (accommodative) policy leads to an appreciation (depreciation) of the domestic currency, which generates deflationary (inflationary) effects on import prices. Foreign components of consumer prices thus become cheaper (more expensive),

thereby helping monetary policy in steering domestic inflation downwards (upwards). This exchange rate channel is less powerful if the pass-through to end user prices is weak. In this regard, and referring again to the US dollar example, having a dominant currency in international transactions makes monetary policy less effective in stabilising prices, *ceteris paribus*.

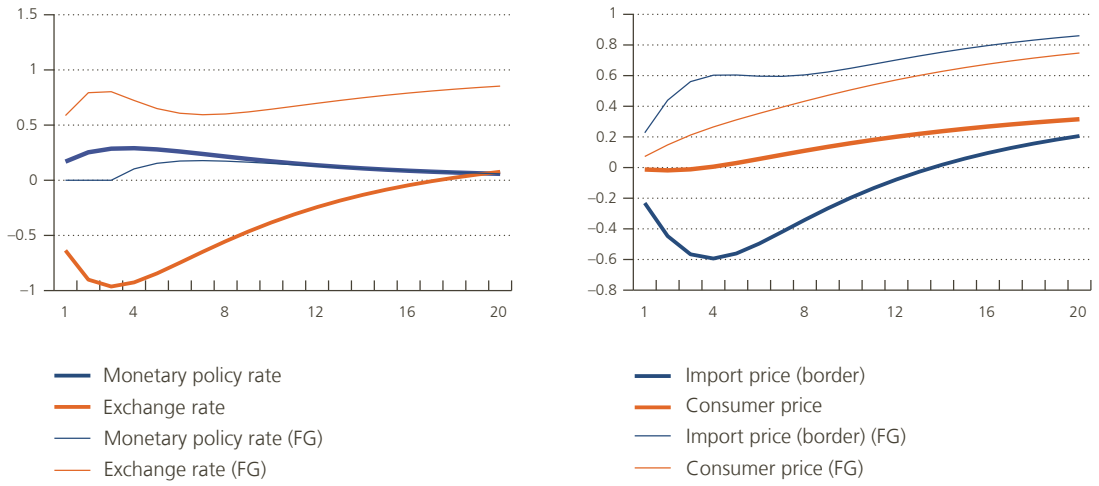
… which can be strongly influenced by forward guidance

Forward guidance aims to influence interest rate expectations via a strategy of communication on the future path of the central bank rate. If it is successful, agents' anticipations of the future monetary stance have implications for the exchange rate channel via the uncovered interest rate parity. Chart 8 illustrates these implications for an expansionary demand shock hitting the euro area. The shock stimulates aggregate consumption, exerting upward pressure on consumer prices. Following a conventional policy (solid lines), monetary authorities react to the inflationary pressure by raising the interest rate. More specifically, the monetary policy rate is raised by more than the expected change in inflation (according to the so-called Taylor principle), which means that the real interest rate increases. This causes the euro to appreciate. The appreciation in turn generates deflationary effects according to the channel described above, attenuating to some extent the initial influence of the shock on prices.

Chart 8

Changes in EA nominal variables after an expansionary aggregate demand shock

(percentage points deviation from steady state, absolute for the interest rate, relative for the other variables; quarters on the horizontal axis)



Source: simulations from the estimated NBB EA-US DSGE model described in de Walque *et al*. (2017).

In a counterfactual scenario (dashed lines), monetary policymakers commit to keeping the nominal interest rate unchanged for three quarters under a forward guidance strategy. Now the real interest rate drops, triggering a depreciation of the currency. As a result, the exchange rate channel adds extra inflationary pressures, as the foreign content of consumer goods gets more expensive. The co-movement between the exchange rate and consumer prices is now reversed compared to what happens under conventional monetary policy. The more credible the central bank's commitment, the stronger the forward guidance effects on the exchange rate channel. These results suggest that careful consideration should be given to the exchange rate channel in the design of a forward guidance strategy.

5. Exchange rates and competitiveness

Apart from the relationship between the exchange rate and prices detailed so far, exchange rate movements are also often perceived as favouring (hindering) an economy's growth prospects in the event of a depreciation (appreciation). In this sense, the manipulation of the relative value of currencies becomes part of the arsenal of available policy instruments and it is one of the elements often advocated by some EU countries reluctant to enter the currency union. Similarly, many observers commented that the Greek situation would have been much less critical during the sovereign debt crisis if Greece had retained the option of improving its competitiveness by engineering a devaluation of the drachma. However, improvements in the trade balance do not systematically outweigh the decrease in domestic demand caused by the impoverishment of the population.

Let us now extend the previous discussion about the structural determinants of the transmission of exchange rate movements from the nominal side to the real side of the economy and examine under what circumstances the common intuition that devaluations are growth-enhancing is indeed verified. General equilibrium models are de facto the most appropriate tool to generate and analyse the interactions between the real and nominal sides of an economy. For the purpose of the discussion, we build this exercise on a calibrated symmetric version of the two-country New Keynesian macroeconomic model described in de Walque *et al*. (2017)[1]. In Section 3 we state that the origin of the shock hitting the economy is an essential factor in understanding how prices interact with the value of the currency. As a result, the source of the exchange rate variation is also crucial in assessing how real variables evolve after an observed depreciation. However, for illustrative purposes, we now focus on the interactions triggered by an international risk premium shock (i.e. an exogenous depreciation). Throughout the exercise we consider a shock such that the domestic currency loses 1 percent of its value on impact. This is a more neutral way of studying the potentially growth-enhancing effect of a depreciation, as any other shock would activate the exchange rate channel in addition to other mechanisms, depending on the actual nature of the disturbance in question. Such exogenous change could moreover represent a devaluation policy. The shock is simulated so as to slowly decay through time, which means that the depreciation is long lasting.

5.1 Importance of the structural characteristics of the economy

As outlined earlier, an exogenous and unexpected devaluation is inflationary via its impact on import prices. This rise in prices and the ensuing monetary policy tightening lead to a negative wealth effect that decreases private demand and hence domestic private absorption. This is translated into lower demand for foreign goods while domestic goods become cheaper for the trading partners. From this we can deduce that the devaluation may boost growth if the reactions of import/export prices provoke a sufficiently strong expenditure switching effect, away from foreign goods and towards domestically produced ones, that dominates the negative wealth effect.

Elements limiting import price sensitivity to the exchange rate and Armington trade elasticity

This condition is directly related to all the elements reviewed in Section 2.1, i.e. the role of dominant currencies, nominal rigidities, distribution services and global value chains, that all reduce the sensitivity of international prices to the exchange rate. The strength of the expenditure switching effect traditionally depends on the Armington trade elasticity of substitution between domestic or foreign produced goods: the greater the substitutability, the larger the trade balance benefits of a devaluation. The simulations displayed in Chart 9 clearly show that the overall degree of substitutability does indeed matter for developments in the real economy. Regarding the nominal dynamics, Chart 9 also confirms the key importance of the stage of the production process at which home-produced and foreign goods/inputs are combined. Let us examine those results in more detail.

1 A much more detailed version of this debate can be found in de Walque *et al.* (2019).

A model where only final goods are internationally traded

The thin red lines representing the variables' reactions after a 1 percent devaluation for the home economy (calibrated on the euro area's characteristics) are obtained from a traditional open economy macro model where only final goods are traded. In other words, and in relation with Section 2.2, we first consider the case where only the direct channelling of imports to final consumption is activated (no indirect channel). Given the chosen high trade elasticity (set at 3), the increase in the domestic import price causes a strong switch in global demand away from foreign goods towards home-produced goods. The increase in the home economy's net exports more than offsets the decrease in its domestic demand (not plotted) and real GDP improves. Decreasing the trade elasticity would have the direct effect of mitigating this conclusion. Despite the evidence regarding the importance of trade in intermediate inputs and the expanding role of global value chains, it is noteworthy that this type of simplistic model is still the one most commonly used in open macroeconomics.

A model with international trade in intermediate inputs (the pure complementarity case)

If the model is modified to take into account that not only final goods are traded, but that production requires imported intermediate inputs, the calibration of the trade elasticity between home-produced and foreign goods becomes critical at these two different levels. Let us consider first that this substitution elasticity is still high for the final goods but that there is no substitution at the intermediate good level (i.e. perfect complementarity prevails between domestic and foreign inputs of production)[1]. The responses of macro variables for this model are the dark blue lines in Chart 9. As discussed earlier in Section 2.2, owing to trade in intermediate inputs, the total import content of consumption differs from the direct import content of consumption. The latter is valued at the import price in the consumer price index, while for imports that arrive indirectly in the consumption basket via the domestic production process, the transmission of the currency devaluation is much more attenuated by the stronger nominal rigidity prevailing all the way through the domestic production process.

The impact of the devaluation on the consumer price is thus lowered, and that has several consequences. First, the central bank has less need to react via its policy rate to fight inflationary pressures. Second, the combination of lower price reaction and less restrictive monetary conditions tends to attenuate the decline in domestic demand, and therefore the demand for foreign goods. The latter effect is supplemented by the perfect complementarity assumption whereby domestic firms now require a fixed proportion of foreign inputs in order to produce. As the model is fully symmetric and since the shock to the relative value of the two currencies is common to both economies, though in reverse directions, the responses of the foreign economy variables to the shock exactly mirror those of the home economy. Foreign households' demand for home-produced goods is therefore lower compared to the first (red) simulation. Perfect complementarity in production implies that the expenditure switching effect applies only to a proportion of the traded goods so that net exports improve much less in this simulation. Expenditure switching effects are now not enough to compensate for the depressed domestic demand (negative wealth effect) and real economic activity slows down.

A model with international trade in intermediate inputs with some substitutability

Let us now be less drastic regarding the trade elasticity for intermediate goods and consider that some substitutability is also allowed at this level, though less than for final goods (say 0.5 instead of 3). The outcome of this simulation is given by the green lines shown in Chart 9. As the substitutability is also allowed to play at the level of the firms' demand for inputs, the expenditure switching effect is somewhat stronger, with not only households but also firms on both sides of the border substituting cheaper home-produced goods for relatively expensive foreign goods. This improves the home economy's trade balance, and that improvement again outweighs the decline in domestic demand so that real GDP increases in the first two years[2]. More substitutability in inputs at the firms' level implies

1 Foreign inputs are assumed to make up 12 % of the total production inputs, while the total import content of exports for the euro area is estimated by van der Helm and Hoekstra (2009) at about 20 %.

2 This result is perfectly in line with previous work on the topic by Burstein, Kurz and Tesar (2008) in a real business cycle open economy model.

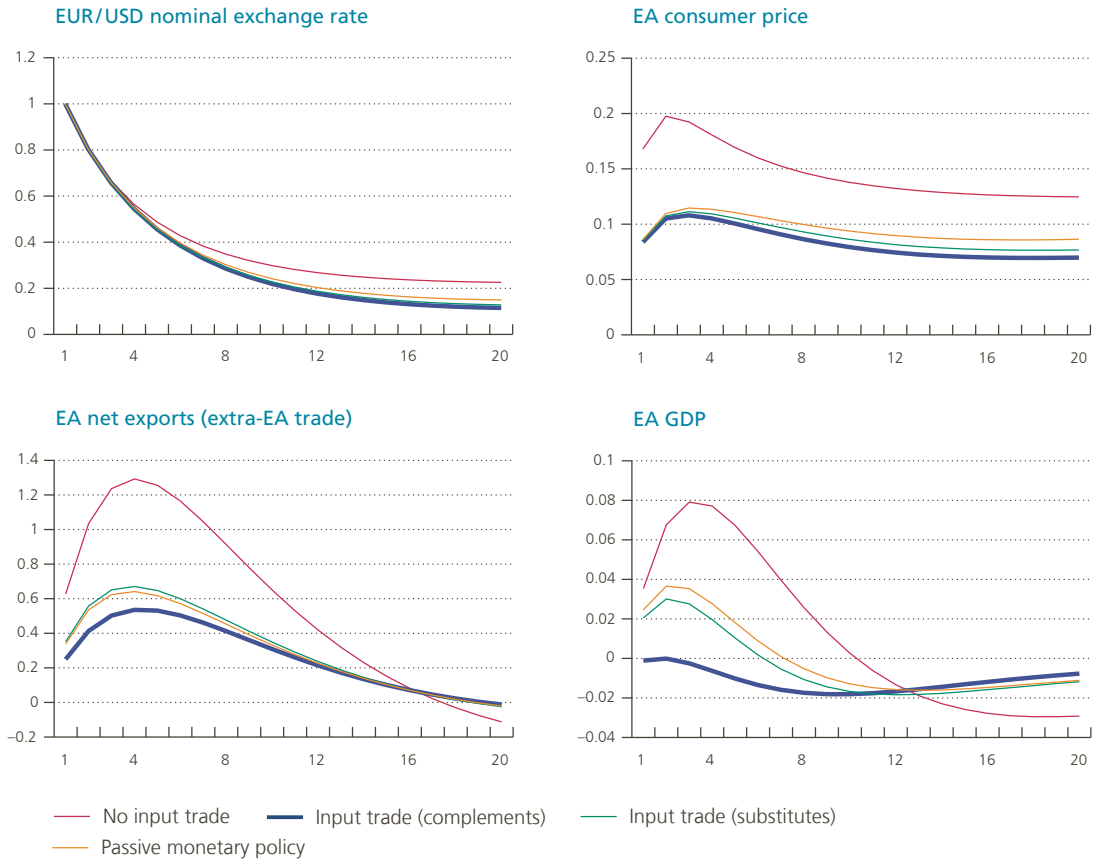
a greater expenditure switching effect and results in more real economic activity. The reason is that a higher global demand for home-produced goods exerts upward pressure on the price of domestic inputs (labour and capital), which more than offsets the substitution of cheaper foreign inputs in the marginal cost of domestic firms.

If we used the same value for the Armington trade elasticity for both inputs and final goods, the reaction of real GDP would be very similar to that obtained in the model with international trade in final goods only. Hence, the relative levels of the two substitution elasticities are key and influence the overall elasticity of substitution, which is determinant to obtain growth after a depreciation. The parameter driving the size of the input trade is important in determining the transmission of exchange rates to the price chain; that transmission is strong at the border and weak for the end-users. This suggests that the two substitution elasticities can be individually identified. In preliminary model estimates for the euro area, we obtain values that are close to those used in the green lines' simulation, i.e. trade elasticities around 3 for final goods and around 0.5 for intermediate inputs. These estimates suggest a dampened growth-enhancing effect of a devaluation at the overall euro area level[1]. This finding is consistent with a recent econometric study by Lane and Stracca (2018) who document that expenditure switching effects of a change in the euro exchange rate are limited for most euro area countries.

Chart 9

Reactions to an unexpected 1 % depreciation in a two-country symmetric model: on the role of input trade and trade elasticities

(percentage point deviation from steady state, absolute for the interest rate, relative for the other variables; quarters on the horizontal axis)



Sources: simulations from the estimated NBB EA-US DSGE model described in de Walque *et al.* (2017).

1 Not that these results are illustrative for the euro area as a whole and may not necessarily hold in the same proportion for all individual members or for other advanced countries or emerging countries.

5.2 Monetary policy

Apart from the elements discussed in the previous section, it is useful to remember the point made in Section 4 and illustrated in Chart 7 : the more active the systematic monetary policy as perceived by the economic agents, i.e. the stronger its reaction to deviations from long-run equilibrium inflation and GDP, the less volatile these two macroeconomic indicators. In an economy with a relatively passive monetary policy, the central bank reaction to the inflationary pressures resulting from depreciation is weaker ; for a given shock, that produces a stronger devaluation through the uncovered interest rate parity. The combination of these two elements leads to a larger deterioration in the terms of trade, and concurrently to stronger foreign demand for home-produced goods. At the same time, the weaker reaction of the real interest rate means that domestic private demand is less depressed. This results in a more positive reaction by real economic activity, domestic producers' prices, and consumer price inflation. Therefore, a trade-off appears between price stability and growth perspectives after an unexpected (and long-lasting) depreciation.

Conclusion

In this article we brought together elements that have recently been debated in the literature concerning the generic question of the transmission of exchange rate fluctuations to the pricing chain of an economy. For euro area members, for example, the exchange rate sensitivity of border prices is attenuated through the combination of a series of structural factors, such as (weak) nominal rigidities, the share of trade with countries in the currency union, the share of the remaining trade that is invoiced in euro, and the role of the dollar as a dominant currency. The multiple cross-border movements of intermediate products due to the internationalization of the production process may also help in understanding mitigated border prices co-movement with exchange rate.

It is worth noting that international trade in intermediate inputs tends to increase with the degree of trade openness, an observation which is valid both over time and across countries. We stress that, combined with nominal rigidities that are observed to be stronger in the domestic production process than at the border, trade in intermediate products is a very good candidate for explaining why the exchange rate sensitivity of consumer prices does not vary across OECD countries in proportion to differences in trade openness.

Apart from these structural factors, the unconditional (or average) correlation between exchange rates and prices is also very dependent on the types of shocks behind the business cycle dynamics of an economy. This important point has been widely discussed in recent years and should prevent policy makers from using any sort of one-size-fits-all rule of thumb to assess the way prices reflect exchange rate fluctuations. The systematic reaction of the monetary authorities to departures from the steady path of inflation and GDP is also identified as an important factor shaping the exchange rate-prices nexus.

All the above-mentioned items potentially play a role in the relationship between the exchange rate and real economic activity through competitiveness. However, before drawing any definitive conclusion on this, a careful estimation of the Armington trade elasticities pertaining to the final goods and the intermediate inputs respectively is still needed. Preliminary exercises tend to indicate that substitutability is lower for intermediate products than for finished goods, reducing to some extent the overall trade elasticity and the expenditure switching effect resulting from exchange rate fluctuations.

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Cheating tiger, tech-savvy dragon: Are Western concerns about "unfair trade" and "Made in China 2025" justified?

K. Buysse
D. Essers *

We are open traders, but we cannot afford to be naïve. Not all of our trade partners want to play by the same rules that we do – we must not be taken advantage of and must protect the EU, its competitiveness and its workers against unfair trading practices.

Jean-Claude Juncker,
speech at the launch of report on EU trade defence, 28 March 2019

Introduction

China's accession to the World Trade Organisation (WTO) in 2001 was hailed as a milestone at the time, bringing benefits to all. The EU and US expected this would not just induce China to import more of their goods and services, but encourage it to further open up its immense domestic market to foreign investors, and eventually to converge towards a market economy and democracy. After all, this had been the earlier experience with Japan, South Korea and Eastern Europe. But now, almost two decades later, many Western observers regard the outcome of this process as disappointing. It is felt that China has not fully lived up to its commitments under WTO membership, while the hoped-for political liberalisation has not materialised. Instead, China is now actively promoting an alternative model of governance, built on the supremacy of state power over individual rights and economic freedoms.

In response, tensions between China and its main trading and investment partners have risen. The US administration has been most vocal, accusing China of, among other things, unfair trade practices, distortionary subsidies, theft of intellectual property, and forced technology transfer[1]. EU policymakers appear to largely share US concerns, even though the language they use to describe the problems with Chinese trade and investment practices is somewhat more diplomatic. In the European Commission's latest EU-China Strategic Outlook, China is designated as a "strategic competitor" that "fails to reciprocate market access and maintain a level playing field" (EC, 2019a).

* The authors are grateful to Paul Butzen for his guidance, to members of the ECB's International Relations Committee (IRC) for helpful comments, and to staff of the IMF's Asia and Pacific Department (APD) for sharing their data.

1 For example, in a notable speech delivered at the Hudson Institute on 4 October 2018, US Vice President Pence declared: "The Chinese Communist Party has… used an arsenal of policies inconsistent with free and fair trade, including tariffs, quotas, currency manipulation, forced technology transfer, intellectual property theft, and industrial subsidies that are handed out like candy to foreign investment. These policies have built Beijing's manufacturing base, at the expense of its competitors – especially the United States of America."

This article draws on several sources of data and recent studies to shed some light on the validity of such oft-cited complaints. In order to better understand the potential threats from China, we start with a description of its approach towards industrial policy and economic modernisation, best captured by the Made in China 2025 initiative. We then look, successively, at China's "unfair" trading practices (Section 2), barriers to foreign direct investment (FDI) in China (Section 3), the role of state-owned enterprises (Section 4), forced technology transfer (Section 5), Chinese outward FDI into the EU (Section 6), and industrial espionage and cybertheft (Section 7). Finally, we analyse how the listed concerns are addressed in the EU's current strategy towards China (Section 8).

1. Made in China 2025

In May 2015, the Chinese government launched Made in China 2025 (hereafter abbreviated as MIC 2025), a comprehensive, forward-looking masterplan for economic and industrial modernisation. MIC 2025 is the first phase of President Xi Jinping's long-term ambition to re-establish China as one of the world's top manufacturing powerhouses and a technological leader by 2049, the 100th anniversary of the founding of the People's Republic of China. Its intermediate objective is to enhance the innovative capabilities of the country's manufacturing industry and to move China up the value chain by 2025.

MIC 2025 takes its inspiration from Germany's "Industry 4.0" and the Asian economic development model. In contrast with China's previous industrial policy plans, which were more focused, MIC 2025 is a comprehensive strategy targeting entire manufacturing processes in ten strategic high-tech industries: new generation information technology (IT), high-end numerical control machinery and robots, aerospace and aviation equipment, maritime engineering equipment and high-tech shipping, advanced rail equipment, new-energy and energy-saving vehicles, electric power equipment, agricultural machinery and equipment, new materials, and bio-pharmaceuticals and high-tech medical devices. China wants to raise the domestic value-added content in each of these industries by moving into the more sophisticated parts of the value chain, including research and development (R&D), product design, and branding. This should help secure China's future position as a global industrial power. Four years into the strategy's implementation, it is estimated that over 530 industrial parks have emerged in China (Zenglein and Holzmann, 2019). Many of these parks are active in technologically advanced areas such as big data (21 %), new materials (17 %) and cloud computing (13 %).

MIC 2025 is backed by strong political leadership, generous funding and a focus on innovation policies. The policy plan benefits from high-level involvement of the State Council in its coordination, while the Ministry of Industry and Information Technology (MIIT) takes the lead in implementation. However, the mobilisation of regional governments and private companies is also key to a successful execution of MIC 2025. Local governments roll out pilot projects related to the development of specific MIC 2025-related industries, establish provincial manufacturing innovation centres (in addition to the 40 national ones) and provide fiscal support mechanisms. Private companies have driven many of the current technological advances in areas such as new-energy vehicles, big data, facial recognition and digital payments. These private tech companies know that they need to align their business with national goals. In return, they benefit from a light regulatory framework and a competitive internal market, shielded from external competition in their infant stage (see Box 1 on Huawei). Finally, Chinese state-owned enterprises (SOEs) too play a critical role in the development of strategic industries.

The most important policy instrument is financial support in various forms. Most common are (low-interest) loans from state-owned financial institutions, funding from government-guided investment funds or from ministries' special financial vehicles, and subsidies from (mainly) local governments. The exact amounts provided are unknown but deemed to be important. For example, Huang (2019) estimates that there were over 1,600 government-guided investment funds with total capital of about RMB 4 trillion (4.5 % of GDP) at the end of 2018. The largest central government-owned financial vehicle, China Reform Holding (which invests in innovative SOEs), has capital of around 0.1 % of GDP (EU Chamber of Commerce in China, 2017).

An overriding objective of MIC 2025 is to strengthen the innovation system, borrowing from best practices abroad and investing heavily in domestic R&D, with the ultimate aim of replacing China's dependence on foreign technology imports with indigenous innovations, and creating Chinese companies that can compete domestically as well as globally (ISDP, 2018; Wübbeke *et al.*, 2016). The current dependence on foreign core components in many innovative products is considered a bottleneck as well as a source of vulnerability, especially in view of the tense relationship with the US. This dependence is most evident in the fields of new materials, semiconductors, and advanced machinery and machine tools. At the same time, China has become an important location for the R&D activities of foreign companies in some emerging industries. For example, several carmakers (BMW, Volkswagen, PSA) have set up R&D facilities for electric vehicles in China.

China has already demonstrated its ability to quickly move up the global value chain, most strikingly so in the electronics sector (Buysse *et al.*, 2018). In a recent sectoral analysis, the European Commission's Joint Research Centre finds that China is rapidly gaining competitiveness in the fields of nuclear energy, new-energy vehicles, wind power and photovoltaic technologies, artificial intelligence, and in some areas of advanced manufacturing technologies and robotics (EC JRC, 2019). In most other areas, however, China's industrial production base is still lagging that of major advanced economies.

Wary of the international backlash against its ambitious masterplan, Chinese officials no longer refer to MIC 2025 in public speeches. However, this seems to be mere window-dressing, as many provincial government plans and sectoral plans, such as Internet Plus or the New Generation Artificial Intelligence Development Plan, continue to refer to it. Moreover, MIC 2025 itself was largely an elaboration of previous plans guiding Chinese industrial policy[1].

2. China's "unfair" trading practices

A comparison of average most-favoured nation (MFN)[2] tariff levels shows that, across all sectors, China still applies significantly higher tariff rates on European imports than does the EU on Chinese imports. This difference persists despite a gradual decrease in Chinese tariffs over time. To be sure, the application of higher tariff rates does not violate China's WTO commitments *per se*, given that the rates remain below the bounds to which China subscribed at WTO accession, and is indeed to be expected in view of China's still much lower level of economic development compared to the EU28. Yet, a simple cross-sectional regression of average MFN tariff rates (applied in the manufacturing sector) on (log) GDP per capita indicates that although China is no clear outlier, its import tariffs continue to be higher than one would predict based on overall development levels.

More so than tariff levels, non-tariff barriers and other behind-border policy measures have taken centre stage in recent deliberations about China's "unfair" trade. Of the 341 disputes initiated at the WTO between 2002 and May 2019, 43 were aimed at China (Chart 2), making it the third most targeted country[3]. The majority of these were filed by the US (23); the EU comes in second place, with nine cases. Looking further into the 43 WTO disputes opened against China, we find that about half of them concerned the challenging of Chinese import restrictions (including anti-dumping measures that China imposed on its Western imports) and export restrictions (mostly of rare earths and other raw materials mined in China). More recently, claims of distortionary government subsidies and taxes, market access restrictions, insufficient protection of intellectual property rights, and forced technology transfer have also featured among the cases brought against China (Chart 3)[4].

1 Chen (2019) shows that the term "MIC 2025" also virtually disappeared from Chinese official media (People's Daily and Xinhua) from May 2018 onward. However, references to "indigenous innovation" and "core technology", phrases often associated with MIC 2025, continued and later increased significantly in Chinese media.

2 MFN tariffs are the tariffs that countries impose on the imports from other WTO members with whom they have not concluded preferential trade agreements.

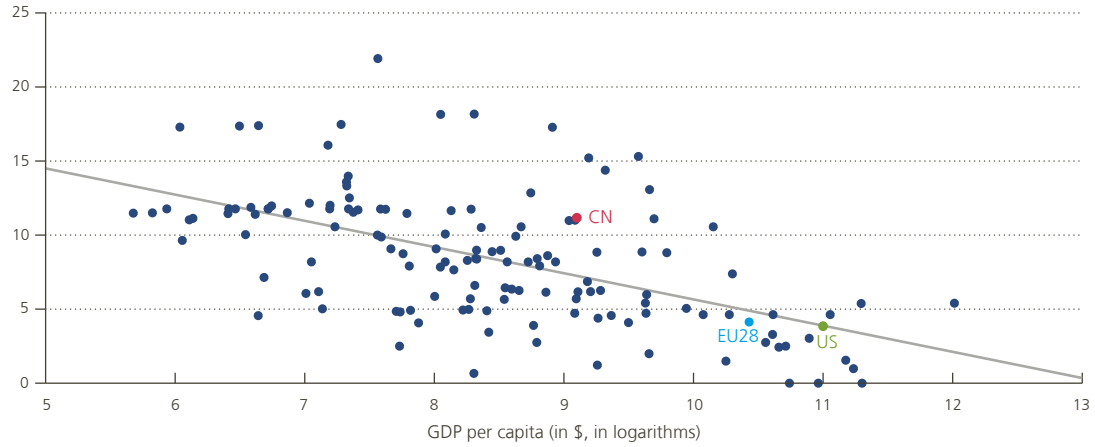
3 Over this period, the EU and especially the US have more often been targeted in WTO trade disputes than China (in 51 and 98 cases, respectively). Indeed, the 2018 peak in initiated trade disputes (Chart 2) can be ascribed to the challenging of the Trump administration's trade measures by the US's main trading partners (19 out of 39 cases in that year).

4 The Table in the appendix provides more details on the subject of the complaint, the current status and the outcome of each of the nine WTO disputes initiated by the EU against China.

Chart 1

Average tariff rates (on manufactured goods) vs income[1,2]

(2016 or latest available year, %)



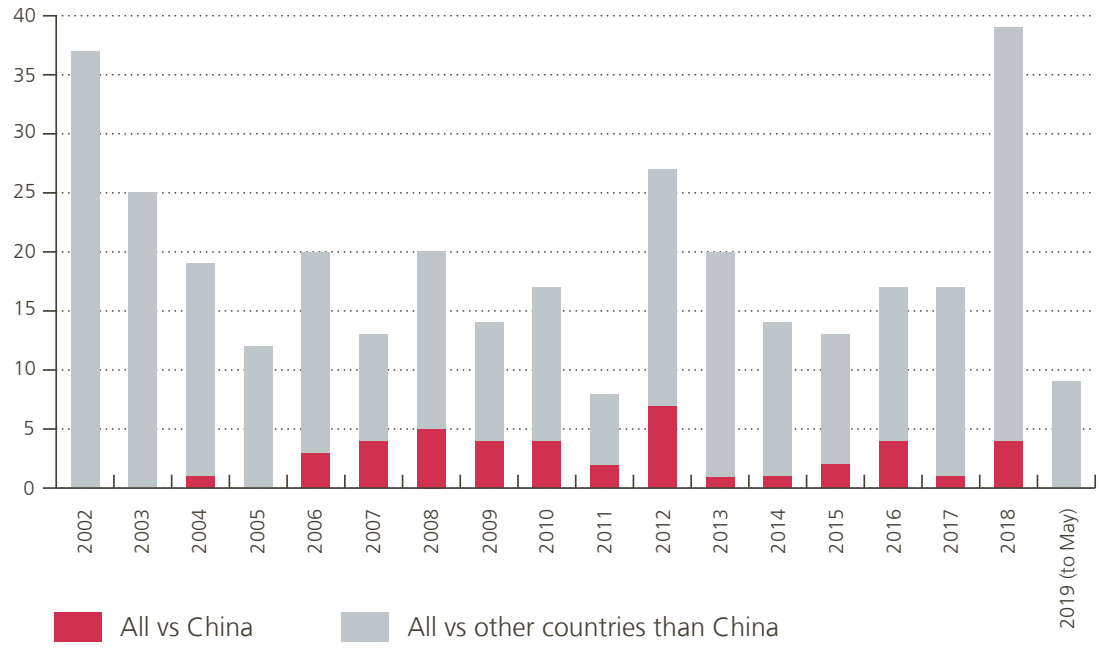
Source: World Bank WDI.

1 Sample consists of 140 countries plus the EU28.

2 Unweighted average of MFN rates on manufactured goods, i.e. commodities classified in SITC revision 3, sections 5-8 excluding division 68.

Chart 2

Number of WTO disputes initiated[1]



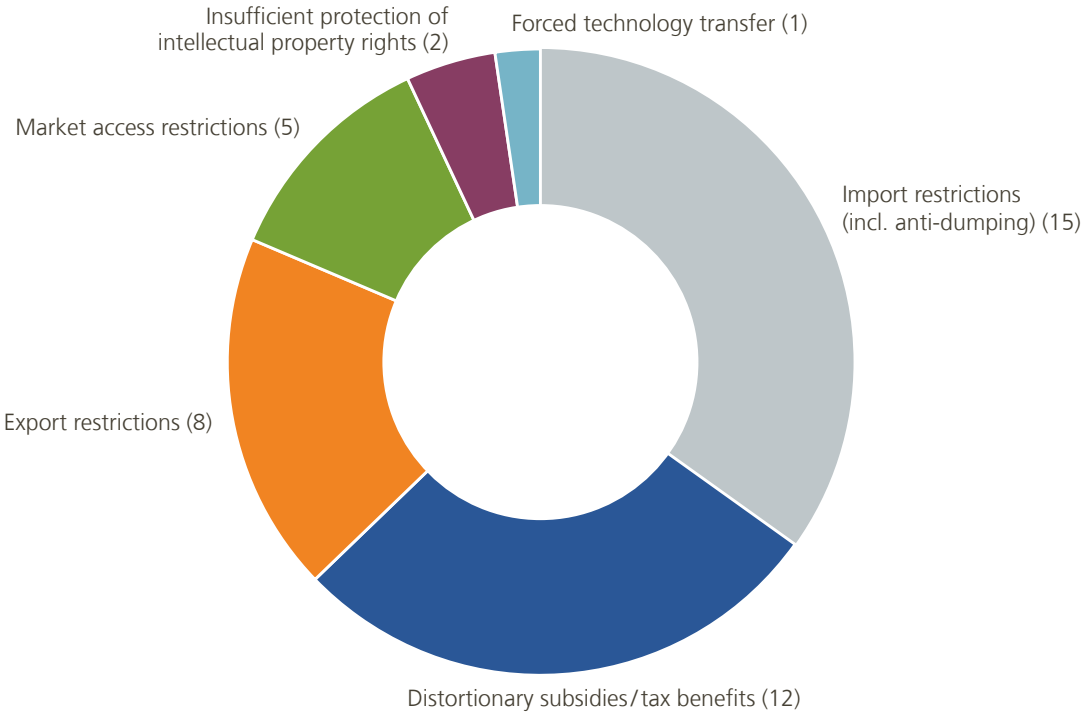
Source: WTO.

1 Number of requests for consultations. Where several WTO members made a joint request in a single document (with one identification number), this is counted as one dispute.

Chart 3

Number of WTO disputes initiated against China[1], by type of complaint[2]

(cumulative over 2002-19)



Sources: WTO, EC.

1 Number of requests for consultations in parentheses. Where several WTO members made a joint request in a single document (with one identification number), this is counted as one dispute.

2 For EU examples of these types of complaints, see appendix.

The large majority of WTO disputes have ultimately resulted in rulings favouring the EU and the US, and in the roll-back of the discriminatory measures in question by the Chinese government (see appendix; Schott and Jung, 2019). Arguably, China has been a better trading partner inside the WTO than it would have been outside (Blustein, 2019). This is not to say that the workings of the WTO and its system for dispute settlement cannot be improved. Dispute procedures against China have often been frustratingly slow, in part due to China's frequent use of the possibility to appeal against preliminary panel rulings. Moreover, several WTO agreements are ill-suited to dealing with major distortions in China's self-proclaimed "socialist market economy" system, which may explain why China has not been challenged more often by means of WTO disputes. We will return to this when we discuss WTO reform – actively pursued by the EU – as a possible way forward (Section 8.1).

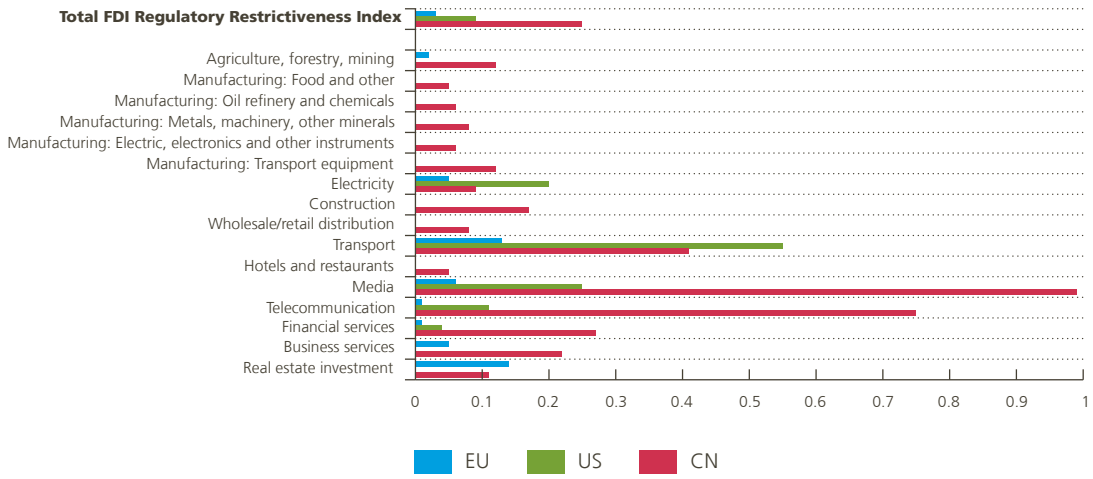
3. Barriers to FDI in China

On the investment front too, Chinese firms enjoy easier FDI access to the EU and US than vice versa. According to the OECD's composite index, Chinese FDI regulations are much more restrictive than those of the EU or the US in almost all sectors, and particularly in media and telecommunications (Chart 4). This is largely because of statutory limits to foreign equity, typically obliging foreign investors to enter into a joint venture with a Chinese partner. Despite a gradual improvement over time in China's overall score, the country is still ranked as the third most FDI-restrictive (behind Indonesia and Russia) in the sample of 50-plus countries for which the OECD index is available.

Chart 4

FDI Regulatory Restrictiveness Index[1], 2018

(0 = no restrictions, 1 = no access)



Source: OECD.

1 The index measures the restrictiveness of a country's FDI rules by scoring four main types of restrictions on FDI: (1) foreign equity limitations, (2) screening or approval mechanisms, (3) restrictions on the employment of foreigners as key personnel, and (4) operational restrictions.

Some further opening of the Chinese economy to foreign firms can be expected in the near future. China's new Foreign Investment Law, adopted in March 2019 and planned to come into effect in 2020, will replace the current approval system (based on three lists of prohibited, restricted and encouraged sectors) with a registration system for all foreign investors, except those in restricted industries defined through a "negative" list (Hanemann and Huotari, 2018). The negative list includes sectors of high strategic importance, such as cloud computing (related to MIC 2025), rare earths and mining. Since 2018, the number of sectors on the list has been reduced twice, to 40 currently. Most strikingly, the automotive sector and the financial sector are set to be removed from the list (by 2021). However, it can be argued that the recent abolition of the joint venture requirement in some sectors has merely been used as a bargaining chip in negotiations focused on improving reciprocity (Zenglein and Holzmann, 2019). For example, the automotive sector is no longer considered strategically important by China, as it believes that domestic car manufacturers can withstand foreign competition.

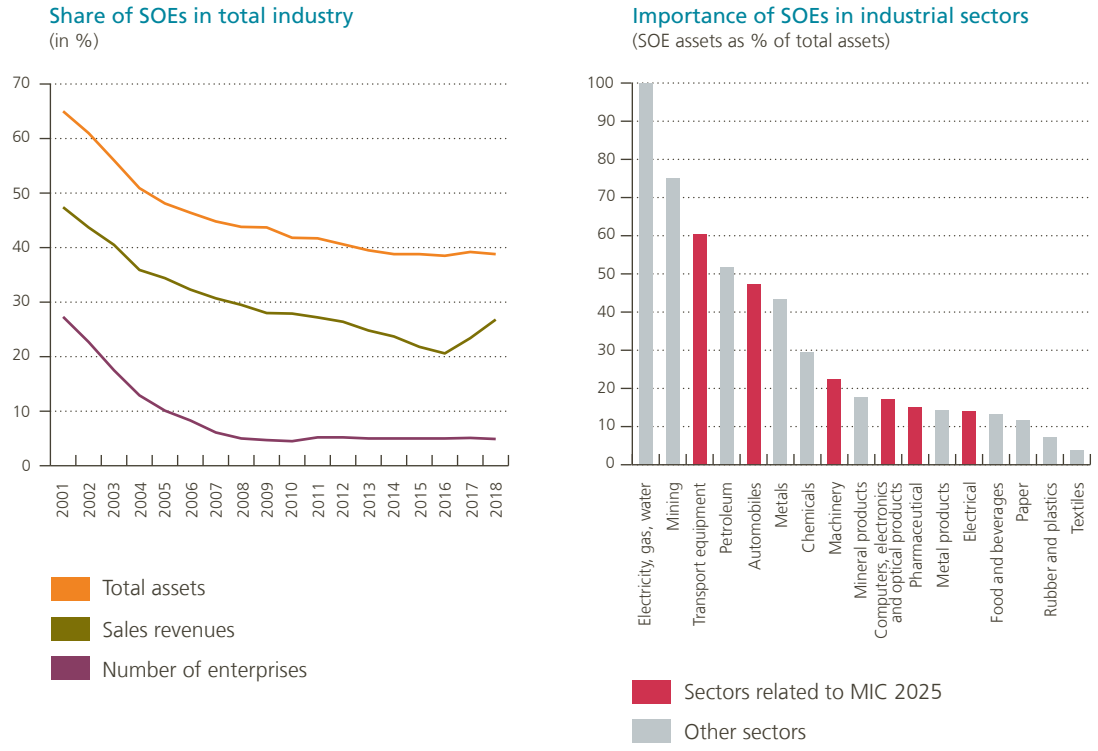
Surveys conducted by the European and US Chambers of Commerce in China add further insights into the obstacles that Western firms face when doing business in China, conditional on gaining a foothold in the market in the first place. A large proportion of surveyed firms confirm that local Chinese companies, and especially Chinese SOEs, hold advantages in areas such as market access, government support, licensing, public procurement, and compliance with domestic regulations (EU Chamber of Commerce in China, 2018, 2019; AmCham China, 2019). The new Foreign Investment Law includes provisions for the equal treatment of foreign and domestic firms when applying for licences and participating in government procurement. If implemented properly, this law could effectively contribute toward a more level playing field between domestic and foreign firms operating in China. That said, it remains a second-best option to the privatisation of commercially viable Chinese SOEs, which is currently not on the cards.

4. Role of state-owned enterprises

The footprint of the state in China remains large and pervasive, even after three decades of reform. Stellar private sector growth and privatisation have caused the weight of SOEs[1] in the Chinese economy to diminish. Yet even if they are now modest in number, SOEs still control nearly 40 % of total industrial assets, implying that they are capital-intensive (Chart 5). Large Chinese SOEs, such as Sinopec, China National Petroleum, State Grid, SAIC Motor and China Mobile, are found high on the Fortune Global 500 list of the world's biggest companies by revenue. The recent uptick in the SOEs' share in industrial sales revenue reflects the weak performance of private enterprises, which have been disproportionally hit by the Chinese government's clampdown on shadow banking and other efforts to de-risk the financial sector.

Chart 5

Importance of SOEs in Chinese industry



Source: CEIC.

SOEs play a key role in several sectors deemed "strategic" by the Chinese government, for a variety of reasons. Some sectors are clearly politically significant: power generation and distribution of electricity, gas and water, petroleum, and mining. Similarly, the telecom sector and the media are also fully controlled by the government. Other sectors are considered pillars of China's economic and technological development: transport equipment (aviation, shipbuilding and high-speed railways), automotive, machinery, IT and electronics – and are closely

1 In this article we use a broad definition of SOEs, which includes both state-owned and state-holding enterprises, according to the classification used in Chinese statistics. These statistics define state-owned enterprises as economic entities where all assets are owned by the state. Following successive reforms, many of them are limited liability or joint stock companies and fall under the supervision of the State-Owned Assets Supervision and Administration Commission (SASAC), whereas some remain under the auspices of their founding ministry. This structure exists at the level of both central and local government. State-holding enterprises are defined as a sub-classification of enterprises with mixed ownership, referring to enterprises where the percentage of state assets (or state shares) is larger than any other single shareholder of the same enterprise.

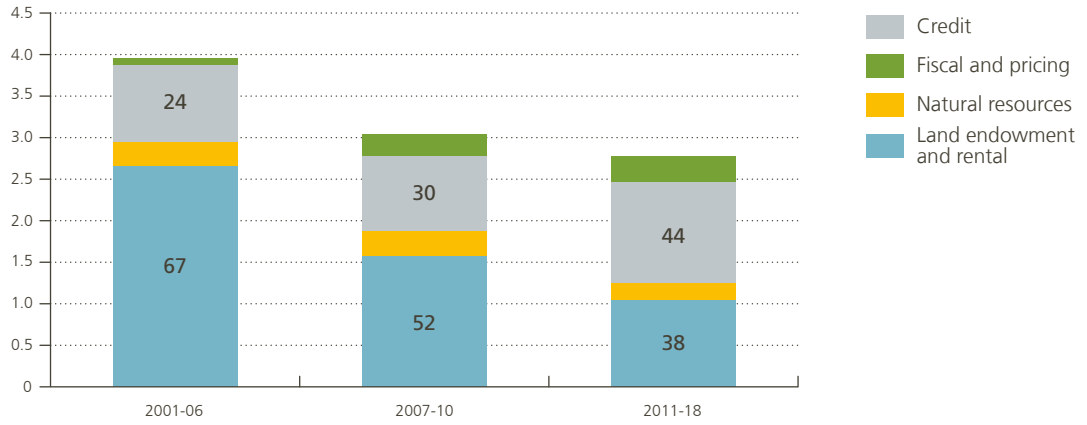
linked to MIC 2025. The Chinese government can steer the economy through its ownership of the "Big 5" commercial banks and the China Development Bank, its sovereign wealth fund, and stakes in many government-guided investment funds.

In theory, the presence of SOEs in a market economy is not necessarily a barrier to "competitive neutrality", whereby all enterprises are treated on equal footing regardless of their form of ownership. In practice, however, it is felt that Chinese SOEs' connections to the political hierarchy constitute a source of preferential treatment in several areas (loans, subsidies and tax exemptions, government contracts, licenses, access to land, etc.), rigging competition in their favour. In addition, generous and cheap government funding can facilitate the overseas investment of these firms (see Section 6). Difficulties in data collection and measurement mean that the evidence is scarce, but the few available studies corroborate the view that SOEs benefit from significant support. Lardy (2019) finds that the majority of bank loans continue to flow to SOEs, despite their lower profitability and weaker balance sheets compared to private enterprises. Banks are more inclined to lend to SOEs as they are perceived as less risky and shielded from defaults. Harrison *et al.* (2019) find that between 1998 and 2013 SOEs were systematically favoured by low-interest loans, larger loan volumes, a higher probability of receiving subsidies as well as larger amounts of subsidies. According to IMF (2019) estimates, which should be considered a lower bound, implicit support to SOEs between 2011 and 2018 amounted to almost 3 % of GDP annually, a decline from previous periods which can be attributed to reduced benefits from land endowment and rental (Chart 6). Subsidised credits are now the most important form of implicit support to SOEs, amounting to about 1.3 % of GDP.

Chart 6

Total implicit support to Chinese SOEs

(% of GDP, numbers in the bars refer to % share in total implicit support)



Sources: IMF (2019), Lam and Schipke (2017).

In China, however, market distortions are not only due to pervasive state ownership. Some characteristics of privately owned firms produce similar effects. Many of the latter were partially privatised during the reforms of the late 1990s and early 2000s but still retain close connections to the Chinese government. Tracking down the history of the firms covered in their sample, Harrison *et al.* (2019) show that "privatised" SOEs occupy an intermediate position in their access to subsidised credit and outright subsidies, between SOEs and private firms that were never state-owned. Another common mechanism through which state capture of privately-owned firms occurs is the presence of politically connected CEOs or staff members (Milhaupt and Zheng, 2015), with CEOs being members of the Chinese Communist Party (CCP) or even of the national/provincial People's Congress. This is the case in well-known companies such as Huawei, Lenovo Holdings, Alibaba, and Zhejiang

Geely Holdings. In the same vein, surveys conducted by Chinese agencies[1] show that private firms directly owned by Party members and those related to the political elite obtained significantly more bank loans than others (García-Herrero and Xu, 2017). In sum, the grip of the state on corporate decision-making in China is not limited to SOEs.

5. Forced technology transfer

Technology transfer by multinational enterprises is widely regarded as a key source of knowledge creation and economic growth, not least in China. Joint ventures of local Chinese companies with foreign (often Western) firms have been shown to lead to increased sales, productivity and patenting, with positive externalities for the Chinese partner and firms operating in the same industry (Jiang *et al.*, 2018). Van Reenen and Yueh (2012) estimate that international joint ventures, through the embedded technology transfer and other learning effects, may have added as much as one percentage point per annum to Chinese growth over the last three decades.

As pointed out by Andrenelli *et al.* (2019), there is a wide spectrum of government policies supporting international technology transfer, ranging from the legitimate facilitation and promotion of incoming (and outgoing) FDI, up to coercive, non-market-conforming practices, such as mandatory transfers of sensitive proprietary information or source codes from (prospective) foreign investors, and obligations to store company data locally. Between those extremes lies a grey zone of interventions that could be – but are not necessarily – problematic, including, for example, requirements for foreign companies to employ local inputs and/or personnel, or to form joint ventures with local firms. In practice, the line between what constitutes a voluntary, mutually agreed upon or at least "reasonable" technology transfer (enabling cross-border diffusion of knowledge that benefits wider innovation) and what classifies as "forced" technology transfer (mostly distorting competition) may be blurred.

Yet Western companies and policymakers *have* indeed voiced serious concerns about China's international technology transfer policies. Based on in-depth interviews with foreign firms operating in China, Prud'Homme *et al.* (2018) identify three categories of policies that are considered most worrying: policies that precondition market access on meeting technology transfer requirements; biases against foreign firms in the enforcement of intellectual property rights; and other strict requirements, such as provisions regulating the licensing of technology imports and exports. Survey results from the EU Chamber of Commerce in China (2018) indicate that almost 20% of European companies feel pressured into technology transfer in exchange for market access. In technology-intensive sectors such as aerospace and aviation, civil engineering, and the automotive sector the share of European firms reporting such involuntary technology transfer is even higher (Chart 7). AmCham Shanghai (2018) has found similar survey evidence for US firms.

More details on the exact Chinese international technology transfer policies and legal instruments that are criticised can be found in the June 2018 and (revised) December 2018 requests for consultations that the EU filed with the WTO (see Section 2 and appendix)[2]. First of all, EU authorities highlight that the Chinese Joint Venture Law requires that the technology and equipment brought into a joint venture by the foreign partner are sufficiently advanced and adapted to China's needs. Moreover, the accompanying Joint Venture Regulation demands that details about the transferred technology are submitted to the Chinese authorities for examination in order to obtain the necessary approval of the joint venture. These legal requirements are deemed to violate the commitments China made upon its WTO accession. The EU also takes issue with regulations that exist in some specific sectors. For example, under the New Energy Vehicle Regulation foreign carmakers wanting to access the Chinese market for electric vehicles need to master certain technologies that Chinese authorities are interested

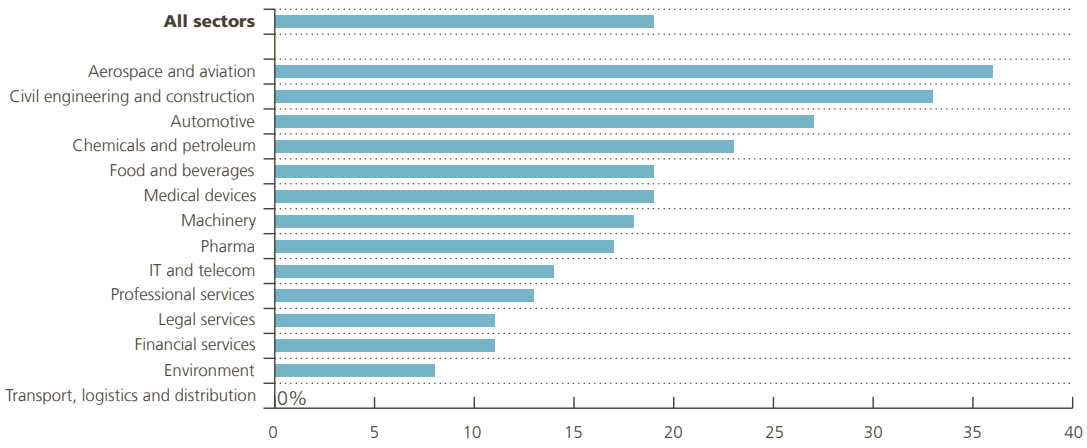
1 The surveys were conducted through face-to-face interviews in 1995, 2000, 2005 and 2010 by a CCP Central Committee department, the United Front Work Department, and two ministry-level central government agencies.

2 Dissatisfaction with forced technology transfer also lies at the heart of the Section 301 investigation that the US launched in August 2017 (see USTR, 2018).

Chart 7

EU firms that feel compelled to transfer technology in exchange for market access

(% of surveyed firms, N = 532)



Source: EU Chamber of Commerce in China (2018).

in, and are obliged to locate relevant parts of their production process and R&D activities in China. Another important set of rules are the Regulations on the Administration of the Import and Export of Technologies (TIER). TIER stipulates that contracts concluded between foreign and local companies cannot contain clauses that restrict the local party from improving the technology transferred by the foreign partner, or from using the improved technology. Furthermore, if the use of an imported technology gives rise to intellectual property infringements, the associated liabilities are to be borne by the (foreign) supplier of the technology. Such stipulations do not apply to Chinese firms involved in domestic technology transactions.

The new Foreign Investment Law that China adopted in March 2019 (see Section 3) includes provisions protecting the intellectual property rights of foreign investors and banning forced technology transfer, most likely as a response to continued criticism and the trade measures imposed by the Trump administration[1]. However, as some of these provisions are deemed to leave room for interpretation (Hornby, 2019), it remains to be seen how the Foreign Investment Law will be implemented in practice when it takes effect in 2020.

6. Chinese outward FDI into the EU

Chinese outbound FDI into the EU is a relatively new phenomenon, starting in earnest around the time of the global financial crisis and peaking in 2016. Chinese ownership has grown rapidly from a very low base, but still represents only a minor share of foreign-owned assets in the EU. According to European Commission estimates, investors from China (including Hong Kong and Macao) held only 3 % of total assets acquired by non-EU investors in EU companies at the end of 2016, compared with 61.5 % owned by US residents (EC, 2019b).

Chinese companies have several motivations for investing in the EU: asset diversification, hiding profits from the Chinese authorities, longer-term market access, industrial upgrading and technology acquisition. The latter motivation has raised concerns because of the perceived link with the government-driven MIC 2025,

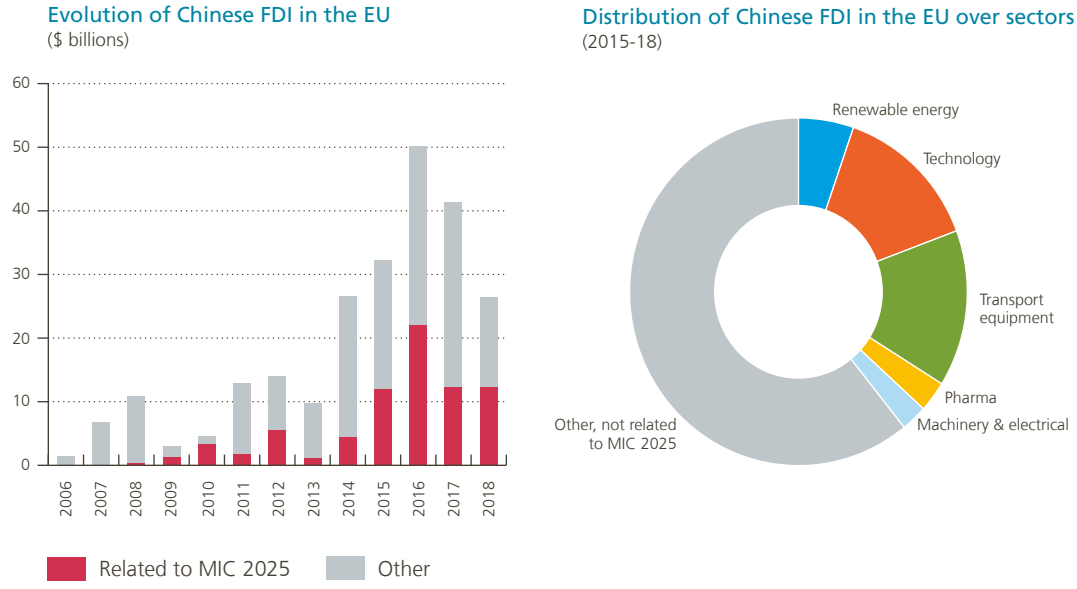
1 In addition, some of the most contentious articles in these laws and regulations have recently been weakened or abolished, in the wake of the US-China trade conflict (Prud'homme, 2019).

which "encourages" Chinese firms to acquire foreign high-tech assets. A growing backlash against Chinese FDI in the US has also pushed China to divert its efforts towards the EU in recent years. The Chinese counterparty in many merger and acquisition (M&A) deals is often an SOE, the sovereign wealth fund (China Investment Cooperation) or the State Administration of Foreign Exchange (SAFE). Moreover, as noted before, successful private firms are often well connected to the CCP or backed by the government in other ways. Because of this, some fear that strategic assets or valuable new technologies could fall into the hands of the Chinese government. On the positive side, European firms may benefit from the additional capital provided by Chinese investors (which may be unavailable locally on similar terms) and/or obtain market access in China by this means.

To check the validity of widespread concerns about Chinese outward FDI, we use the China Global Investment Tracker, a publicly available transaction-level database[1] of Chinese M&A and greenfield investments abroad, compiled by the American Enterprise Institute and the Heritage Foundation on the basis of newspaper articles and other public sources. As well as information on the identity of the Chinese investor and non-Chinese investee, the total transaction value and the Chinese percentage stake, the database includes a broad classification of takeover activities into 14 main sectors and a number of subsectors. We have ourselves constructed a variable indicating whether the acquired firm pertains to one of the strategic sectors targeted by MIC 2025, i.e. the following (sub)sectors identified in the dataset: (1) renewable energy, (2) technology, (3) transport equipment, (4) pharma, or (5) (industrial and construction) machinery.

Chart 8

Chinese FDI in the EU



Source: Own calculations based on China Global Investment Tracker of American Enterprise Institute and Heritage Foundation.

We have found evidence that the recent surge of Chinese FDI into the EU is indeed partly the result of acquisitions in sectors related to MIC 2025. It is hardly a coincidence that the surge in FDI in those sectors occurred in 2015, the year in which MIC 2025 was officially launched (Chart 8). According to our calculations, nearly 40 % of Chinese FDI in the 2015-18 period can be attributed to the strategic sectors promoted in MIC 2025, mostly

1 The database includes only deals with a minimum value of $ 100 million. We have excluded from our calculations two deals involving very large sums but representing only minority stakes: the 10 % stake taken by Geely Auto in Daimler in 2018, and the 5 % stake taken in HSBC by Ping An in 2017. We use December 2018 as the cut-off date. The raw data can be downloaded from http://www.aei.org/china-global-investment-tracker.

transport equipment (the automobile sector in particular) and technology. Zenglein and Holzmann (2019), using a different database and their own classification, find an even higher share of 58 %. Other research demonstrates that government policy plans such as the Belt and Road Initiative and MIC 2025 had a considerable impact on the investment patterns of Chinese SOEs in terms of their regional and industry focus, but did not significantly affected private firms' investment behaviour (Fuest *et al.*, 2019). Other attractive sectors to Chinese investors, unrelated to MIC 2025, are entertainment (including football clubs), real estate and hospitality, finance, and strategic infrastructure (utilities, port and airport logistics, traditional energy). Strategic infrastructure was a popular target for Chinese SOEs in financially distressed EU member states that wanted to raise revenues from privatisation.

Germany is the second-largest recipient of Chinese FDI in the EU (after the UK, where such FDI concerned mostly "flats, finance and football"), and it has seen the strongest inflow of technology-driven takeovers from China. Most of the German firms acquired by Chinese investors are at the cutting edge of wind power, engineering or computer technology. The takeover of the high-tech robotics firm and national champion Kuka by the Chinese company Midea in the summer of 2016 served as a wake-up call for the German authorities. Later that year, the attempted takeover by Fujian Grand Chip Investment Fund of Aixtron, a highly specialist German chip producer and supplier for the semiconductor industry, was blocked by the German government. This decision reportedly followed US concerns about the resulting strengthening of China's competitive edge in semiconductors (Larres, 2016). Scrutiny of Chinese takeover bids in Germany has been tightened markedly since 2016.

Belgium has so far attracted only a limited number of sizeable Chinese investments, and none of them seem to be related to MIC 2025[1]. The offer of the Chinese State Grid in 2016 to take a 14 % stake in the high-voltage network administrator Eandis was rejected after a leaked memo from the Belgian State Security Service raising questions about the deal. Similar offers by State Grid have also been blocked in Germany, but were accepted in Portugal, Greece and Italy.

Greater scrutiny by European authorities, especially in sensitive sectors (see Section 8.2), as well as a tighter Chinese stance on capital outflows and failed deals due to liquidity problems experienced by some highly indebted Chinese buyers, explain the observed decline in Chinese FDI into the EU in 2017 and 2018 (Chart 8; Molnar *et al.*, 2019). The worsening economic relations between China and the US, together with the almost vanished current account surplus in China, suggest that the tighter screening practices and capital controls will remain in place for the foreseeable future. Hence, a return to the outward M&A bonanza of 2016 seems unlikely.

7. Industrial espionage and cybertheft

The least benign channel of appropriating much-needed technological know-how is through industrial espionage and cybertheft. Although little hard data exists, there are strong indications that China has been involved in such practices. Drawing on a number of high-level cases of cyberattacks, a recent report by the Office of the US Trade Representative (USTR, 2018) concludes that China conducts and supports unauthorised intrusion into, and theft from, the computer networks of US companies to access their sensitive commercial information and trade secrets. Although it is difficult to provide irrefutable evidence of direct Chinese government involvement in these criminal activities, proven personal connections with government institutions and public universities point in that direction. For example, in one high-profile indictment, Yanjun Xu, an employee from China's Ministry of State Security, was identified as the mastermind behind the theft of sensitive information related to the design and technology of propellers used in aircraft engines from GE (General Electric) Aviation. In another case, the German auto manufacturer Daimler was the target of cyberattacks originating from China, and the IP addresses of the hackers' computers could be linked to Tsinghua University, "China's MIT". Infiltration, often through complex corporate

1 Examples include investments in the logistics sector (e.g., the establishment of a service and distribution park in the port of Zeebrugge by the Shanghai Lingang group) and the financial sector (the acquisition of Bank Nagelmackers and insurance company Fidea by Anbang).

structures, is another popular method to steal trade secrets, as illustrated by the case of Micron, a US-based company specialised in dynamic random access memory (DRAM) technology. Former employees of Micron's Taiwan subsidiary are believed to have passed on Micron's confidential and proprietary information on DRAM technology (via UMC, another Taiwan-based microchip manufacturer) to Fujian Jinhua, a Chinese SOE start-up created specifically to help meet China's DRAM production goals.

The Belgian State Security Service, charged with the protection of Belgium's scientific and economic potential, also believes that China is actively involved in industrial espionage and cybertheft. It has issued repeated warnings that Belgian companies are poorly protected against these risks (Bové and Van De Velden, 2017).

BOX 1

Huawei

Huawei is probably the best-known example of a Chinese "national champion". Starting out in the late 1980s as an importer of telephone switches from Hong Kong, the company has rapidly grown into one of the largest telecom equipment companies globally. Huawei is poised to become a key player in fifth-generation (5G) mobile telephony, given the portfolio of standard essential patents for 5G it currently owns, the number of technical contributions to 5G standards it makes, and the personnel and other resources it devotes to 5G standard-setting meetings (see IPlytics, 2019). Commentators tend to ascribe Huawei's spectacular rise to a broad mix of Chinese industrial policies, involving the initial protection of the Chinese telecom market from foreign competition, access to large government contracts, and other forms of state backing (including cheap credit, according to some), followed by an aggressive internationalisation strategy and massive R&D spending (Ahrens, 2013; Johnson and Groll, 2019).

Citing national security and foreign policy concerns, the US Department of Commerce announced in May 2019 that it would put Huawei and 68 affiliated entities on its so-called "Entity List", which implies that US companies (or non-US companies making products with a minimum share of US-origin content) would need to obtain a licence in order to export their goods and services, or to transfer technology to Huawei. Together with President Trump's executive order declaring a national emergency over threats to the US telecom sector, this blacklisting would effectively cut off Huawei from its US suppliers, on which it heavily relies for semiconductors and other components used in its products. Earlier in 2018, US Congress had already passed a law largely banning US government and government contractors from employing equipment produced by Huawei or ZTE, another Chinese telecom giant. In August 2019, a set of temporary exemptions on the ban of exports and technology transfer to Huawei was extended by another three months.

A key worry of authorities in the US and several other countries is that Huawei could sell compromised products allowing the Chinese government to spy on domestic companies. Officially, Huawei is a private company owned by its employees, but recent research finds that the overarching holding company is controlled by a trade union committee on which no information is publicly available and which could well be intimately linked to the state (Balding and Clarke, 2019). Moreover, some Chinese laws state that, on demand, Chinese individuals and organisations are obliged to assist the government in its intelligence work. Both Chinese government officials and Huawei staff have denied that such laws apply to Huawei's overseas business (Yang, 2019). Extensive security reviews of Huawei's network equipment

have so far not produced any (public) evidence of "backdoors" purposely designed for espionage (even though technical glitches leading to security risks have been found). Nevertheless, in addition to the US, Japan, Australia and New Zealand too have issued broad bans on Huawei's 5G technology. In Germany and France, security standards for suppliers of 5G network equipment were also strengthened, although without explicitly singling out Huawei.

Belgian telecom companies Proximus and Orange have relied on Huawei for their network base stations for over ten years (whereas Telenet has purchased mostly from ZTE) (Bové *et al.*, 2018). In 2013 Huawei acquired Caliopa, a spin-off from the University of Ghent and the Leuven-based Inter-University Microelectronics Centre (IMEC) to form Huawei Technologies Research & Development Belgium, which conducts research in the fields of optical telecom components and cellular transceivers. The company is currently the only Belgian-based company on the US Department of Commerce's Entity List. The Centre for Cyber Security Belgium (CCB), which falls directly under the authority of the Belgian Prime Minister, stated in April 2019 that it had not yet found evidence that would justify speaking out against Huawei, but also pledged to continue its monitoring (Vanhecke, 2019).

8. EU strategy towards China: A way forward?

A first-best strategy to address existing worries about China's industrial prowess and quest for technological leadership is arguably for the EU to take a proactive stance in strengthening its own industrial base and innovative capacity. The need for an ambitious, coordinated industrial policy is indeed recognised by the European Commission, as exemplified by the renewed EU industrial policy strategy published in September 2017, but perhaps does not occupy the central role it deserves in EU discussions on how to deal with China[1,2]. Since the benefits of a proactive industrial policy will only be reaped in the longer run, it is important to also react more directly to the various concerns Western policymakers and companies have about China's trade and investment practices. The remainder of this section zooms in on the EU's attempts to amend international trade and investment rules.

8.1 WTO reform

One of the main tactics pursued by the EU is that of contributing to the reform of the WTO. The European starting position is that a multilateral trading system based on clear rules, with the WTO at its centre, is necessary to guarantee reasonably free and fair trade. At the same time, it is increasingly acknowledged that the current system is malfunctioning and particularly ill-equipped to deal with the problems posed by China, a country whose self-proclaimed "socialist market economy" system is *sui generis* and has evolved in ways that were largely unanticipated by the negotiators of WTO treaty law (Wu, 2016; Mavroidis and Sapir, 2019). More so than explicit rule-breaking, it is China's unique and opaque economic structure, leading to practices that fall outside the remit of the WTO's current rules and founding principles, that poses the biggest challenge (Blustein, 2019).

1 For example, the latest EU-China Strategic Outlook (EC, 2019, p. 8) does acknowledge that "the EU should foster industrial cross-border cooperation, with strong European players, around strategic value chains that are key to EU industrial competitiveness and strategic autonomy", but refrains from including concrete interventions to that end among the ten action points it proposes.

2 An in-depth discussion of how EU industrial policy should be organised to effectively stand up to China falls outside the scope of this paper.

For this and other reasons, the EU believes WTO modernisation is urgently needed and has already made several proposals in that respect, usually in consultation with like-minded WTO member states[1].

A key sticking point is the long-standing practice in the WTO that members may self-declare as a "developing country" in order to benefit from special and differential treatment, including longer transition periods towards full implementation of some WTO agreements. Currently, no less than two-thirds of the WTO membership self-identify as "developing countries", including China and other major trading nations (Hong Kong (!), South Korea (!), Mexico, etc.). This situation tends to lead to weaker ambitions in multilateral trade negotiations and seems to conflict with the WTO core principles of reciprocity and non-discrimination (Ornelas, 2016). The EU has advocated moving from the crude "developed-developing" distinction to a more granular, case-by-case differentiation that is needs-based, evidence-based and time-limited.

Next, the EU wishes to see a thorough update of the existing WTO rulebook, and in particular a sharpening and extension of the present, rather minimal rules in the areas of SOEs, government subsidies and (forced) technology transfer, which appear to be at the root of the current trade tensions between the US and China[2]. In addition, it sees possibilities to enhance the procedures for establishing additional rules at the WTO. In areas where multilateral consensus is unattainable for the moment, the EU proposes to pursue a plurilateral approach, whereby (changing) coalitions of willing WTO members negotiate agreements (open for other members to join at a later stage).

Another problem is that China and several other WTO members often do not comply with their notification obligations under various agreements, such as reporting on new subsidies. The resulting lack of transparency undermines proper monitoring and enforcement. One suggestion by the EU is to impose "sanctions" for wilful and repeated non-compliance with notification duties, including limiting certain rights related to participation in WTO proceedings, such as chairing WTO bodies, and increased naming and shaming of non-compliant members in various WTO reports and fora. Moreover, the WTO could adopt a general rebuttable presumption according to which all non-notified subsidies would be assumed to harm the interests of other WTO members. It would then be up to the subsidising member to disprove this presumption. However, one needs to remain realistic. Even with full transparency, enforcing WTO commitments will undoubtedly remain difficult, especially when this concerns actions a country takes in its domestic market. As pointed out by Mavroidis and Sapir (2019), whereas WTO members such as the EU and US can always prevent foreign products from entering their markets by putting up anti-dumping, anti-subsidy or safeguard tariffs, they cannot simply force "fair" access to a foreign market protected by discriminatory behind-border measures.

Finally, the EU's short-term priority with regards to WTO reform is to resolve the current crisis surrounding the WTO's Appellate Body, the standing body composed of seven jury members to which countries turn when they want to appeal against a preliminary panel ruling in a WTO dispute settlement procedure. Several countries, and the US in particular, have expressed complaints about the Appellate Body. Most importantly, this body is accused of judicial "overreach", i.e. the creation of its own new rules, unchecked by WTO members, and a tendency to also address issues going beyond the panel reports it was designed to review for legal errors. These concerns are exacerbated by the often ambiguous and (increasingly) incomplete WTO rulebook, and by the tradition of transposing the interpretations given by the Appellate Body to subsequent dispute cases handled by panels (a practice that has no legal basis in the dispute settlement rules) (Payosova *et al.*, 2018a). The US has also challenged a number of procedural matters, such as the overstay of Appellate Body jury members whose four-year term has expired and their quasi-automatic reappointment, as well as the frequent exceeding of the 90-day deadline for appeal proceedings. To show their discontent, US (Obama and Trump) administrations have been blocking Appellate Body appointments for the past few years. For this reason, only three of the full complement

1 For a more detailed overview of the ideas for WTO reform floated by the European Commission, some of which are currently under discussion at the WTO's General Council, we refer to its September 2018 concept paper (EC, 2018a).

2 For example, the WTO Agreement on Subsidies and Countervailing Measures (SCM) does not even mention the term "state-owned enterprise", largely because the SCM agreement was crafted in 1994, before China's WTO accession. China's Protocol of Accession does contain more explicit provisions on SOEs, but is still marked by important omissions and is underenforced (Mavroidis and Sapir, 2019).

of seven jury members remain at the time of writing, which is the absolute minimum required to hear an appeal. If this situation persists, the Appellate Body will effectively shut down by December 2019, when another two jury members will have completed their terms. This risks undermining the whole WTO dispute settlement system, since any party to the dispute could block the adoption of a WTO panel decision by simply demanding an appeal than cannot be fulfilled.

The EU has attempted to break the deadlock with a set of proposals, including a stricter delineation of the Appellate Body's mandate, an expansion of the body's resources, longer-term (non-renewable) appointments of jury members, and the organisation of regular exchanges between the body and WTO members to discuss systemic issues or trends in jurisprudence. Payosova *et al.* (2018a, 2018b) argue that these proposals offer at best only a partial answer to US and others' concerns, and that what is crucially needed is a channel through which the Appellate Body could defer issues of legal uncertainty to WTO committees for further discussion and negotiation among WTO members. This would establish a much-desired link between the WTO's dispute settlement function and its role as a negotiating forum.

In any case, since the proposed changes to global trade rules and mechanisms will take time and may not (fully) materialise, the EU also needs quicker solutions. That is why, in December 2017 and May 2018, the EU revamped its set of trade defence instruments (anti-dumping, anti-subsidy and safeguard measures) aimed at protecting European companies against mispriced imports. These reforms, which constitute the first major overhaul since 1995, should reduce investigation time, improve the methodology for calculating appropriate import duties, increase transparency and predictability, provide additional support to small and medium-sized enterprises, and allow trade unions to be involved in the preparation of investigations. According to the Commission's own estimates, the instruments in place at the end of 2018 protected about 320,000 direct industrial jobs from unfair competition (EC, 2018b).

8.2 Investment screening

The EU has also taken several initiatives related to regulating foreign investments, typically not singling out China, but clearly with the problems around Chinese investment practices in mind. The most concrete of these is the common framework for the screening of FDI into the EU, which entered into force in April 2019 and will fully apply by October 2020[1]. The common framework recognises the benefits FDI generally brings and therefore focuses solely on FDI (not portfolio investment) that could negatively affect security or public order. This is to be interpreted rather broadly, however, with the legislation suggesting that EU member states and the Commission monitor potential impacts on "critical" inputs, infrastructure and technologies, including in the fields of energy, food security, transport, utilities, communication, media, defence, data processing and storage, aerospace, artificial intelligence and robotics, semiconductors, and nano- and biotechnology. One thus observes a significant overlap with the sectors targeted by MIC 2025. The framework legislation also suggests paying special attention to investors directly or indirectly controlled by foreign governments and to investments forming part of "state-led outward projects or programmes". As such, based on transaction-level data for 2018, Hanemann *et al.* (2019) estimate that, theoretically, about 83 % of Chinese M&A deals done in the EU could be subject to screening under the common framework. Of course, this does not mean that all these transactions would necessarily be reviewed in practice, or that all reviews would result in a blocking of investment.

The common EU screening framework first of all creates a platform for the exchange of information among member states and between member states and the Commission. The member state in which the investment takes place has to provide information on request (e.g. on the identity of the investor and the target company, the value of the deal, and the origins of the funding) in case other member states or the Commission raise concerns, and make notification of any FDI undergoing screening. The member state can in turn request the

1 For the full text of the regulation establishing the common framework, see EU (2019).

opinion of others. The Commission may issue opinions of its own when it believes an investment is likely to affect security or public order in more than one member state, or if cross-border projects or programmes of special EU interest (think Galileo, Horizon 2020, etc.) are threatened. Furthermore, the framework imposes some constraints on member states' existing or prospective national-level investment screening mechanisms: among other requirements, national mechanisms should have transparent rules and procedures, cannot discriminate among foreign investors, and need to include the possibility of recourse by investors against screening decisions. The framework does not, however, oblige member states without a national investment screening mechanism to establish one. And importantly, individual member states retain the final say on whether or not to screen and/or eventually block an investment on their territories[1].

At the time the common framework was introduced, 14 out of 28 EU member states had a formal national investment screening mechanism in place, and three more were actively considering it (Hanemann *et al.*, 2019)[2]. Whereas these national mechanisms tend to be heterogenous in scope and design (see Grieger, 2017; Wehrlé and Pohl, 2016), the EU framework is likely to lead to some convergence. Indeed, discussions in the two-year run-up to the framework have already spurred several member states to set up new FDI screening regimes or update their existing ones. At present, Belgium has no such screening mechanism[3]. Nonetheless, under the EU framework the Belgian authorities are expected to respond to FDI-related questions from other EU member states and the Commission, to submit to the Commission an annual report summarising inward FDI activity, and to set up a national focal point for FDI matters. In Belgium, investment promotion and monitoring are now primarily a regional affair, with separate agencies for Brussels, Flanders and Wallonia (Renard, 2017).

In addition to the common framework for FDI screening, the Commission has reworked earlier proposals for an international (public) procurement instrument, which could be adopted by end 2019. This instrument would enable the Commission to investigate cases of alleged discrimination against European companies in foreign procurement markets, to organise consultations with third-country authorities, and, as a last resort, impose price penalties on bids by companies hailing from discriminating countries (thereby giving EU and non-targeted countries' bids a competitive advantage). In its EU-China Strategic Outlook, the Commission also vowed to identify, again by end 2019, how to amend EU (competition) law to better address the distortionary effects of foreign SOEs and foreign state-financed companies on the EU internal market. Moreover, it called for a common EU approach to security risks in 5G networks and for a horizontal sanctions regime to counter cyberattacks (EC, 2019a).

In parallel, the EU has been negotiating a Comprehensive Agreement on Investment (CAI) with China since 2013, which would arguably be an elegant way of addressing current reciprocity gaps (Hanemann *et al.*, 2019). The EU's general aim is to replace the existing bilateral investment treaties all member states (except for Ireland) have signed with China, and which vary significantly in scope, by a single, more ambitious EU-China CAI. Ideally, the CAI would regulate issues of market access, investment protection and dispute settlement, as well as labour and environmental standards. As of June 2019, 21 negotiation rounds on various aspects of the CAI had taken place. Given the multitude of outstanding issues and longstanding fundamental differences in EU and Chinese preferences, it is uncertain whether the deadline for concluding the CAI by the end of 2020 will be met.

1 The EU common framework is much less invasive and comprehensive than current US screening practices (and those of most other OECD countries; Hanemann *et al.*, 2019). Fuelled by concerns over growing Chinese stakes in the US economy, the Committee on Foreign Investment in the United States (CFIUS), responsible for assisting the US President in reviewing the national security aspects of incoming investment, saw its mandate expanded and its resources increased under the November 2018 Foreign Investment Risk Review Modernization Act (FIRRMA). Since FIRRMA, CFIUS may investigate a broader set of transactions (including certain real-estate and portfolio investments). Unlike EU member states, CFIUS is now explicitly allowed to discriminate based on the nationality of the foreign investor (after designating some countries as "of special concern") (see Jackson, 2019 for an extensive overview). China's Ministry of Commerce (MOFCOM) and National Development and Reform Commission (NDRC) also operate a mechanism for conducting national security reviews of foreign investments, in addition to China's list of sectors where FDI is prohibited (Wehrlé and Pohl, 2016).

2 Austria, Denmark, Finland, France, Germany, Hungary, Italy, Latvia, Lithuania, Poland, Portugal, Romania, Spain, UK (screening mechanism in place as of June 2019); Czech Republic, Netherlands, Sweden (considering a screening mechanism).

3 Following the Eandis debacle (see Section 6), the Flemish regional government did include a new paragraph (Article III.60) in its governing decree which allows the government to block FDI in the institutions and enterprises under its control if such FDI would go against the strategic interests of the Flemish community, i.e. if the "continuity of vital processes" would be threatened or if strategic/sensitive information could end up in foreign hands. This amendment does not deal with FDI in private companies (Du Bois, 2018).

Conclusion

As suggested by the article's opening quote from outgoing European Commission President Juncker, one should not be naive about China. The country has a very ambitious, long-term perspective on its economic development goals, best captured by the MIC 2025 initiative, which it pursues vigorously in line with its own interests and economic system. In the quest for technological leadership, China is rapidly becoming a key competitor to the US and Europe, adding to international tensions.

As illustrated throughout this article, several of the concerns Western policymakers and companies have voiced about China's trade and investment practices are indeed justified and supported by the available data. On various occasions, WTO rulings have found China guilty of implementing unwarranted import and export restrictions and other discriminatory measures. Also, European and US firms face much more restrictive FDI regulations in China than vice versa. SOEs are still very much present in China's strategic industrial sectors and, together with politically connected "private" firms, continue to benefit from subsidies, low-interest loans and other government support, which distorts competition with other domestic and foreign companies. Some of China's current policies aimed at international technology transfer seem to be problematic too, as they tend to "force" rather than simply "nudge" Western companies into sharing their know-how with Chinese partners. Involvement of Chinese nationals in industrial espionage and cybertheft, even if without the knowledge of the Chinese government, is unacceptable. Meanwhile, Chinese outward FDI into the EU warrants closer monitoring to avoid strategic assets or valuable new technologies from falling into the hands of the Chinese government, at the expense of European companies and consumers. The recently established EU common framework for FDI screening tries to balance the need to exchange information and harmonise the basic ground rules of such monitoring at the national level with individual member states' sovereignty.

In contrast to the confrontational, unilateral approach of the present US administration to trade with China, the EU has chosen the path of multilateralism for now. It has engaged itself in attempting to modernise the WTO rules and bodies that govern the global trading system, so as to incentivise compliance and to make more explicit what the global trading community considers (in)admissible in terms of SOEs, government subsidies and technology transfer. Since China can no longer be considered a developing country, it is reasonable for advanced economies to demand greater reciprocity from China in its trade and investment relationships. On paper at least, China has made some significant concessions recently. Notably, the new Foreign Investment Law promises to open up previously closed sectors, to increase competition between domestic and foreign firms in areas such as government procurement, and to ban forced technology transfer. Implementation will need to be closely monitored.

Of course, the EU's success in reforming the WTO will to a large extent depend on whether its proposals are able to convince other key trading nations. Hence it is of paramount importance to keep the dialogue with both the US and China alive, and to demonstrate how a reformed WTO could benefit all parties. On a more general level also, continued engagement with China is necessary, given that the country represents a market that is simply too large to be ignored, is already embedded in numerous multinational value chains, and is poised to become an indispensable partner in solving global challenges in areas as diverse as cybersecurity and climate change mitigation.

Finally, China's policies should not be seen only in a negative light. Provided it adapts the Chinese strategies to better fit Europe's economic and political system, the EU can certainly learn from China, for example in terms of the development of a clear long-term vision and the expansion of its industrial base and innovative capacity.

Appendix

Overview of WTO disputes initiated by the EU against China

(as of May 2019)

Case number	Short description of complaint	Initiation [1]	End [2]	Status / outcome
DS339; joined by US and Canada	China's imposition of a 25 % **charge on automobile parts** imported from the EU (equal to tariffs on complete vehicles)	30 March 2006	31 August 2009	**Ruling favouring EU**: China removed import charges
DS372; joined by US	Legal and administrative instruments empowering China's state news agency (Xinhua) to **regulate foreign providers of news and financial information**	3 March 2008	4 December 2008	**Settled**: China and EU reached memorandum of understanding
DS395; joined by US, Canada, Mexico and Turkey	Chinese **export restrictions** (duties, quotas, minimum prices, licensing requirements, etc.) on various forms of **raw materials** (incl. bauxite, magnesium, zinc)	23 June 2009	28 January 2013	**Ruling favouring EU**: China removed export restrictions
DS407	Chinese (provisional) **anti-dumping duties on certain iron and steel fasteners** imported from the EU, without sufficient examination/explanation and based on unreasonable methodology	7 May 2010	N/A	**Pending**: China lowered anti-dumping duties; European Commission is still monitoring the situation
DS425	Chinese **anti-dumping duties on X-ray security inspection equipment** imported from the EU, without sufficient examination/explanation	25 July 2011	26 February 2014	**Ruling favouring EU**: China removed anti-dumping duties
DS432; joined by US, Japan and Canada	Chinese export restrictions (duties, quotas, minimum prices, licensing requirements, etc.) on **rare earths, tungsten and molybdenum**	13 March 2012	20 May 2015	**Ruling favouring EU**: China removed export restrictions
DS460; joined by Japan	Chinese **anti-dumping duties on high-performance stainless-steel seamless tubes** imported from the EU, based on unreasonable methodology	13 June 2013	22 August 2016	**Ruling favouring EU**: China removed anti-dumping duties
DS509; joined by US, Canada and Mexico	Chinese **export restrictions** (duties, quotas, etc.) on various forms of raw materials (incl. chromium, cobalt, copper, lead, tin)	19 July 2016	N/A	**Pending**: China did not renew export restrictions in 2017 or 2018; European Commission is still monitoring the situation
DS549; joined by US, Japan and Taiwan	Chinese legal instruments imposing **conditions with respect to joint ventures and technology transfer** on foreign companies that are less favourable than those applicable to Chinese companies	1 June 2018 (revised on 20 December 2018)	N/A	**Pending**: consultations ongoing

Sources: WTO, EC.

1 Date of the request for consultations.

2 Date of implementation of the final ruling (or of mutually agreed settlement). "N/A" signifies the dispute was still pending as of May 2019.

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How risky is the high public debt in a context of low interest rates?

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Introduction

Since the financial crisis and the ensuing economic recession, government debt has risen considerably. Belgium is no exception to this trend and even now the current level of its public debt is still higher than that observed before 2008. This increased indebtedness may raise concern.

However, interest charges paid by the government have been constantly shrinking over the last few years as a result of a marked fall in interest rates. Rates are now at their lowest level ever. And so the cost of financing government debt has never before been as low as it is today.

These observations obviously raise a lot of questions. What risks are incurred with a high debt in this context of low interest rates and what are the consequences for optimal fiscal policy? How to manage debt when interest rates are low? The objective of this article is therefore to answer these questions and to put the challenges involved into perspective.

This article puts the accent on Belgium and the federal government debt. The first section explains the theoretical aspects of the public debt, showing how the level of optimal debt and debt sustainability are influenced by the interest rate paid on this debt. Some key figures on public debt are given in the second section. The third section focuses on interest rate movements and changes in interest charges and the snowball effect on the debt ratio. The fourth section analyses debt maturity management issues and presents a range of simulation results on the extra interest charges that a rise in interest rates would bring. The fifth and last section examines the issue of debt sustainability risks. The conclusion sums up the main findings to emerge from this article.

1. Theory of public debt in relation to the interest rate

1.1 Optimal debt level

From a theoretical point of view, government deficits and public debt are regarded as acceptable and even desirable if the return on public intervention is higher than the costs incurred by financing the debt. It is clear

that the interest rate plays a very important role here. By comparing debt financing costs and the return on public intervention, it is possible to determine the optimal level of public debt. If the interest rate comes down, that reduces the cost of the debt as well as the requirements associated with the return on public intervention, pushing up the optimal debt level.

Government intervention may concern different types of expenditure on infrastructure investment, education, the functioning of public institutions, security, as well as a reduction in taxation in order to moderate its adverse impact on economic growth. In practice, however, it proves to be difficult to measure the return on public intervention accurately because it is not necessarily financial; it may also consist of an improvement in well-being. It is therefore also difficult to quantify the optimal level of public debt. Owing to these methodological problems, the empirical literature on the optimal debt level is fairly limited and the findings are very divergent.

Fiscal policy can sometimes stray considerably from the macroeconomic optimum. In the last few decades, governments in many countries have shown a lack of budgetary discipline and have consequently pushed up their deficit and debt levels. The literature attributes that lack of fiscal discipline to the "deficit bias". This means that the democratic decision-making process may encourage deviation from an optimal fiscal policy.

Fiscal policy may be too improvident if the population focuses essentially on the short-term benefits of tax cuts or increases in expenditure, without always being aware of any possible adverse consequences in the long term of an excessively expansionary fiscal policy. There may also be a preference for deliberately favouring current generations and transferring the burden of the debt to future generations. The concept known in game theory as the "common pool problem" offers another explanation for the deficit bias. Regarding fiscal policy, this concept means that each interest group or each party in a coalition government looks after its own interests, so that the budget deficit and the public debt may exceed the optimum levels. The deficit bias and its undesirable effects may be counteracted by independent institutions and rules imposing restrictions on the budget.

A public debt that is above its optimum level can have a negative impact on economic activity in the long term. It may trigger a rise in interest rates as governments run the risk of paying a higher risk premium on their debt if it is high, which then narrows the scope for other types of public spending or for reducing the tax burden.

1.2 Maximum debt level

Looking beyond the optimal-debt concept, the literature also examines the concept of maximum acceptable public debt. That corresponds to a country's maximum capacity to repay its debts.

According to the intertemporal budget constraint, the current level of government debt is, by definition, equal to the present value of future primary balances (the primary balance is the result of budgetary operations other than interest charges). The higher the public debt ratio, the bigger future primary balances must be. So, the maximum acceptable debt ratio corresponds to the present value of maximum future primary balances deemed acceptable.

The primary balance can only be raised through higher revenues or expenditure restraint. The maximum debt level is therefore determined by the maximum acceptable level of public revenues and the minimum acceptable level of public primary expenditure. Those levels cannot be established only on the basis of economic elements, as it is essentially social and political considerations that may set the limits here. If the current level of government debt exceeds the present value of future primary balances that the population is prepared to generate, it will end up with a problem of sovereign debt default. However, it is difficult to quantify the theoretical concept of the maximum debt ratio and it may also vary from one country to another.

It is important to note that this intertemporal budget constraint is based on the condition that the implicit interest rate on the government debt (r) is higher than the nominal GDP growth rate (g). This is generally the case in the medium and long term and, in the literature, this is also considered as the normal situation. In fact, according to economic theory, if the difference between the nominal interest rate and nominal GDP growth is not positive in the medium and long term, the result would be a situation of dynamic inefficiency resulting from excess accumulation of capital.

Nevertheless, it is possible that sometimes nominal GDP growth is higher than the nominal interest rate on the debt. A recent article by Blanchard (2019) shows that the United States has frequently witnessed such a situation in the past. According to this study, as long as interest rates are low, and especially lower than the nominal GDP growth rate, government debt would not pose any problems. This observation has struck a resonant chord lately, all the more so as many euro area countries currently find themselves in a situation where the implicit interest rate on their public debt is below the nominal growth of their GDP.

However, the present context of low interest rates cannot be considered as normal in the medium and long run and it would be reckless for fiscal policy and debt management to rely on these conditions lasting.

1.3 Risk of slippage in the debt ratio

Leaving aside exogenous operations which influence the debt without affecting the budget balance, the endogenous evolution of the debt ratio is determined, on the one hand, by the difference between the cost of servicing the debt (r) and nominal GDP growth (g) and, on the other hand, by the primary balance.

When the nominal GDP growth rate is below the implicit interest rate on the debt, the debt ratio in fact tends to increase spontaneously under the impact of a self-sustaining process because interest charges widen the deficit, which in turn pushes up interest charges again and so on. In that case, the government should have a sufficiently high primary balance in order to offset this effect and to stabilise or lower the debt ratio. If the actual primary balance is too small, the debt ratio increases continuously. That explosive process whereby the public debt is fuelled by interest charges on the debt itself is commonly called the "snowball effect".

As long as the nominal GDP growth rate exceeds the implicit interest rate, there is no risk of a snowball effect: even with substantial primary deficits, exceeding the level compatible with debt stabilisation, the debt can increase endogenously, but only up to a point where the debt ratio would finally level off.

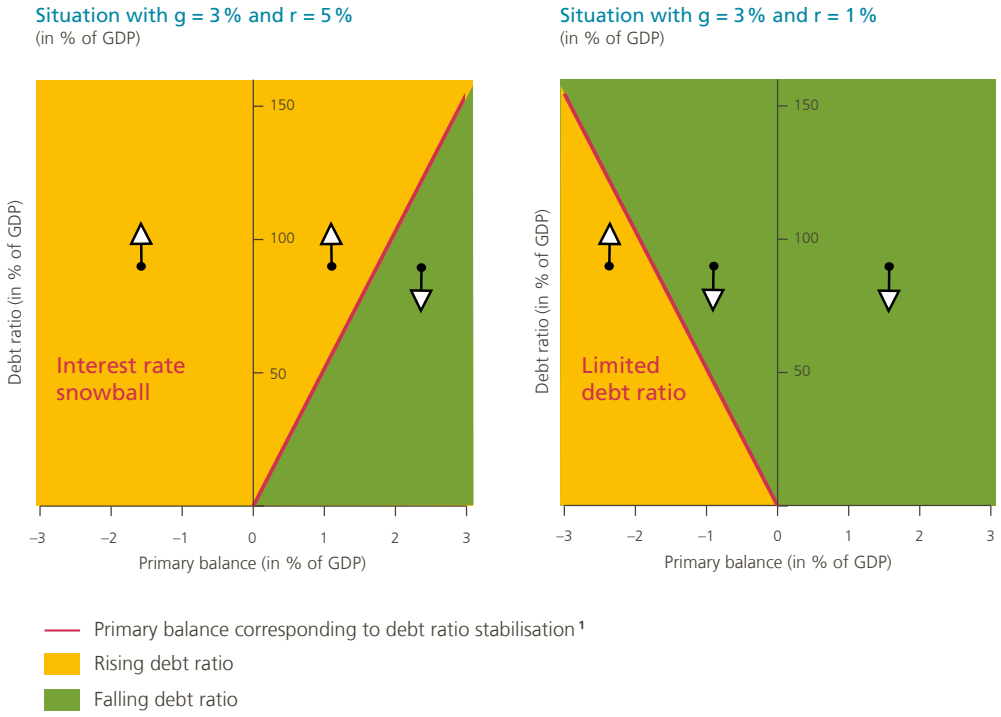
So, the level of the implicit interest rate is crucial for the debt ratio trend and the risk of any slippage from its projected path, as illustrated with theoretical examples in chart 1. The primary balance is shown on the x-axis and the debt ratio on the y-axis. The red lines indicate the size of primary balance required to stabilise the debt ratio.

On the left-hand chart, the implicit interest rate on the government debt is 5 % and nominal GDP growth stands at 3 %. In this situation, if the debt ratio is 100 % of GDP, a positive primary balance of about 2 % of GDP would be required to stabilise the debt ratio. If the primary balance is higher, the debt ratio would come down and vice versa. If the primary balance were to remain insufficient, the debt ratio would continue to rise, starting the snowball effect. The only way to avoid an explosive debt dynamic would then be to increase the primary balance.

On the right-hand side, the implicit interest rate on the government debt is 1 % and therefore less than nominal GDP growth, which is 3 %. In this situation, if the debt ratio is 100 % of GDP, a primary balance of about –2 % is enough to stabilise the debt ratio. A higher primary balance would bring down the debt ratio. However, even

Chart 1

The difference between the interest rate and nominal GDP growth (r – g) and the primary balance determine movements in the government debt ratio



Source : NBB.

1 The primary balance expressed in per cent of GDP that makes it possible to stabilise the government debt ratio (pb_t^*) depends on the debt ratio at the end of the previous year (d_{t-1}) and the difference between the implicit rate on the debt (r_t) and nominal GDP growth (g_t), namely : $pb_t^* = d_{t-1} \cdot \frac{(r_t - g_t)}{(1+g_t)}$.

with a more negative primary balance, the debt ratio would rise but would level out. With a primary balance of –3 % of GDP, the debt ratio would stabilise at about 150 % of GDP.

2. Key figures on the public debt

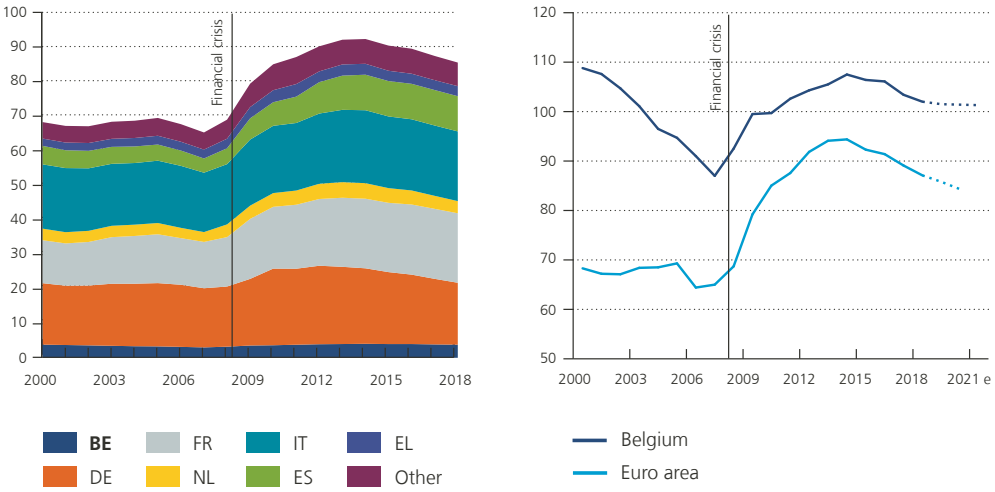
Since the financial crisis, the euro area countries' debt burden has increased significantly. Expressed as a percentage of GDP, the euro area's government debt grew from 65 % in 2007 to 94.4 % in 2014. In the last few years, the rise in GDP (in nominal terms) has gradually brought down the debt ratio, which for the euro area worked out at 85.8 % of GDP in 2018.

Compared with the euro area as a whole, the government debt is still very high in Belgium, running at 102 % of GDP in 2018, and the process of debt reduction is also relatively slower. Within the euro area, only Greece (181 %), Italy (132 %) and Portugal (121 %) have a higher debt ratio than Belgium.

Chart 2

Public debt has risen sharply since the financial crisis. Belgium's debt is high and coming down very slowly

(consolidated gross debt, end-of-period data, as a percentage of GDP[1])



Sources: EC, NBB.

1 The left-hand side of the graph expresses the countries' government debt as a percentage of euro area GDP.

3. Movements in interest rates and charges

3.1 Interest rates

The widespread decline in interest rates is a long-term trend and this trend is not unique to Belgium. Historically, the average rate on 10-year government bonds hit an all-time high in 1982 in many countries. At that time, it stood at more than 13 % in Belgium's case. Except for a slight increase at the end of the 1980s and the beginning of the current decade, interest rates have continued on their downward path to reach an all-time low, thanks to a decline that has been gathering pace in the last few years.

In 2018, the average rate for 10-year sovereign bond issues stood at 0.81 % in Belgium, 0.78 % in France, 0.52 % in the Netherlands and 0.40 % in Germany, levels slightly higher than those observed in 2017.

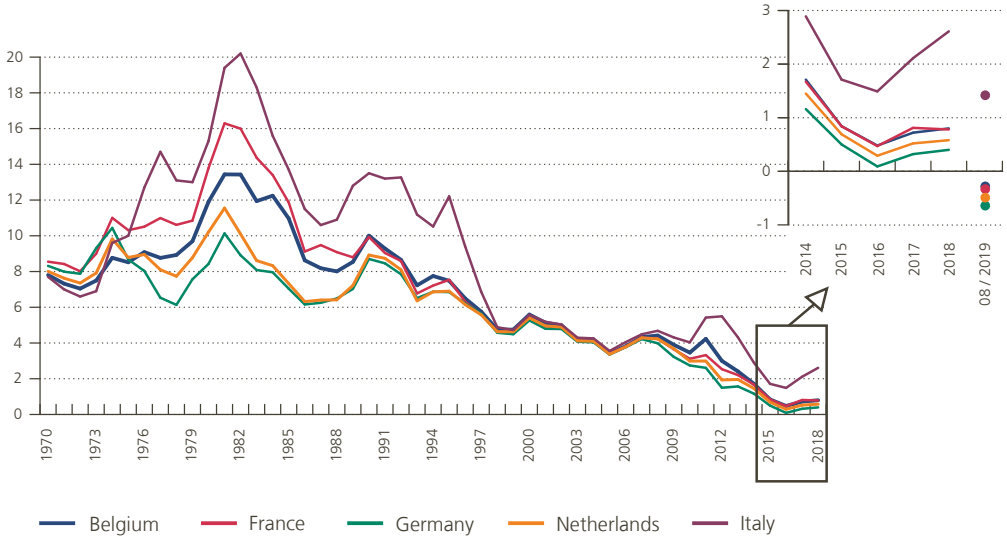
Since the beginning of this year, the reference rate on 10-year Belgian government bonds (OLOs) has embarked on a new descent, reaching an average of 0.15 % for the month of June 2019. In early July 2019, the rate on 10-year OLOs fell below the symbolic 0 % mark and at the end of August 2019, the rate had reached its lowest level ever.

The fall in interest rates has also affected rates associated with other maturities than 10-year OLOs. In Belgium, rates on very short-term Treasury Certificates have even been negative for some years now.

Chart 3

Interest rates on public debt are still historically low

(movements in interest rates 10 years ahead, in %)



Sources: EC, NBB.

3.2 Interest charges

In 1990, interest charges for the general government sector in Belgium accounted for 11.5 % of GDP. Since then, they have come down continuously, dropping to 2.3 % of GDP in 2018. In the same year, they were 1.8 % of GDP on average in the euro area and 0.9 % of GDP in Germany. Debt and interest charges levels in Belgium have remained above the average for the euro area and Germany for almost 30 years.

Cheaper refinancing operations in the last few years have made it possible to reduce the implicit interest rate on the public debt, which is currently about 2 %. As long as the average market rate is below the implicit interest rate, the latter will continue to fall. In the future, the gap between the market rate and the implicit interest rate is nevertheless expected to narrow. Consequently, the decline in interest charges is likely to become much less pronounced.

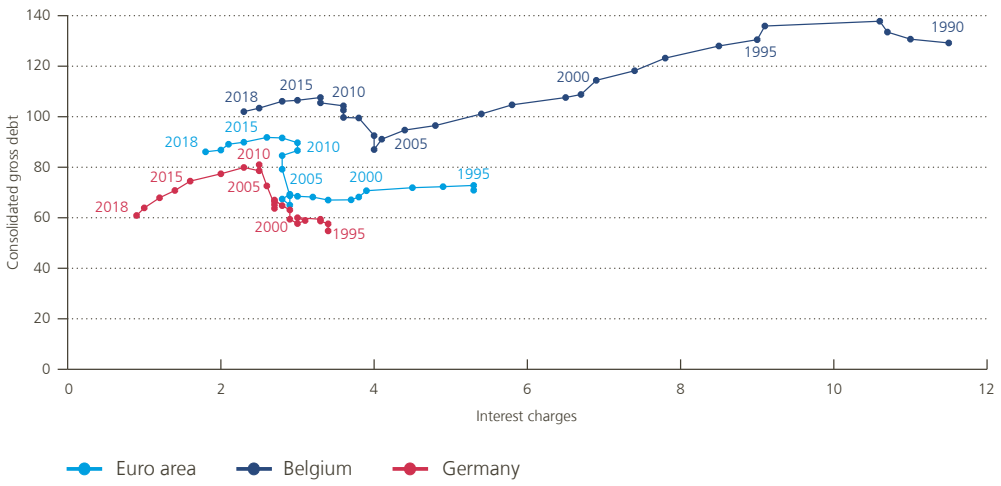
According to the Bank's latest economic projections, interest charges should work out at 1.9 % of GDP in 2021. But in the following years, there should be less and less scope for any further reduction in interest charges associated with low interest rates.

So, in order to cut interest charges further significantly, the debt burden has to be brought down. Before the financial crisis, the decline in the debt ratio was also an important factor in the reduction in interest charges. Since the crisis, this reduction has been mainly the result of falling interest rates.

Chart 4

Interest charges have fallen continuously since 1990

(changes in the public debt and interest charges, in % of GDP)



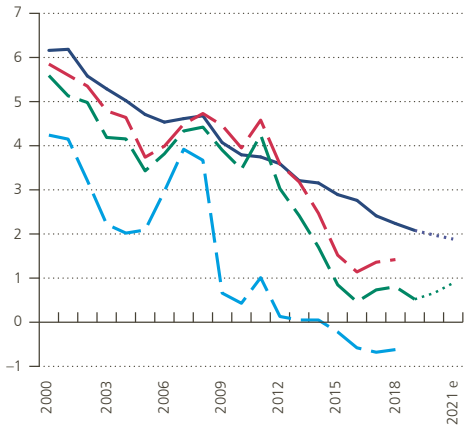
Sources: EC, NBB.

Chart 5

Since the financial crisis, the decline in interest charges has mainly been due to falling interest rates rather than lower debt

Implicit interest rate on public debt and market rate

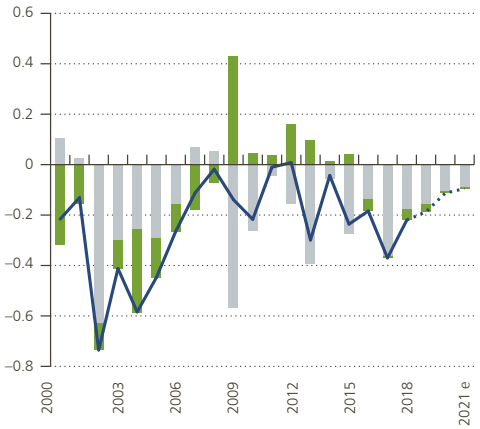
(in percentages)



Implicit interest rate
Short-term rate (3 months)
Long-term rate (10 years)
Very long-term rate (20 years)

Breakdown of changes in interest charges

(in percentage points of GDP)



Change in interest charges

Of which:

Debt ratio effect
Implicit interest rate effect

Sources: NAI, FPS Finance, NBB.

3.3 The risks of a "snowball effect" of interest charges on the debt ratio

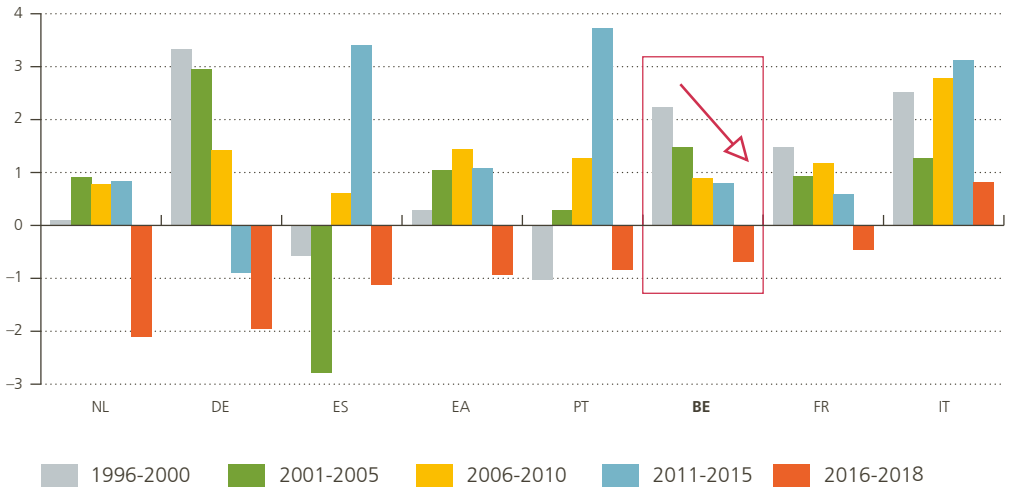
Falling interest rates have reduced the risk of a snowball effect from interest charges on the debt ratio.

In Belgium, the differential between the implicit interest rate (r) and the nominal GDP growth rate (g) has narrowed constantly since 1996. From 2016 onwards, the implicit interest rate has even been below nominal GDP growth. This has also been the case in the Netherlands, Germany and on average in the euro area. Italy stands out as an exception here. Historically, that is something that had not happened over such a long period in Belgium for more than 40 years.

Chart 6

The fall in interest rates has reduced the risk of a snowball effect on the debt ratio

(difference between the implicit interest rate (r) and nominal GDP growth (g), in percentage points)



Source: EC.

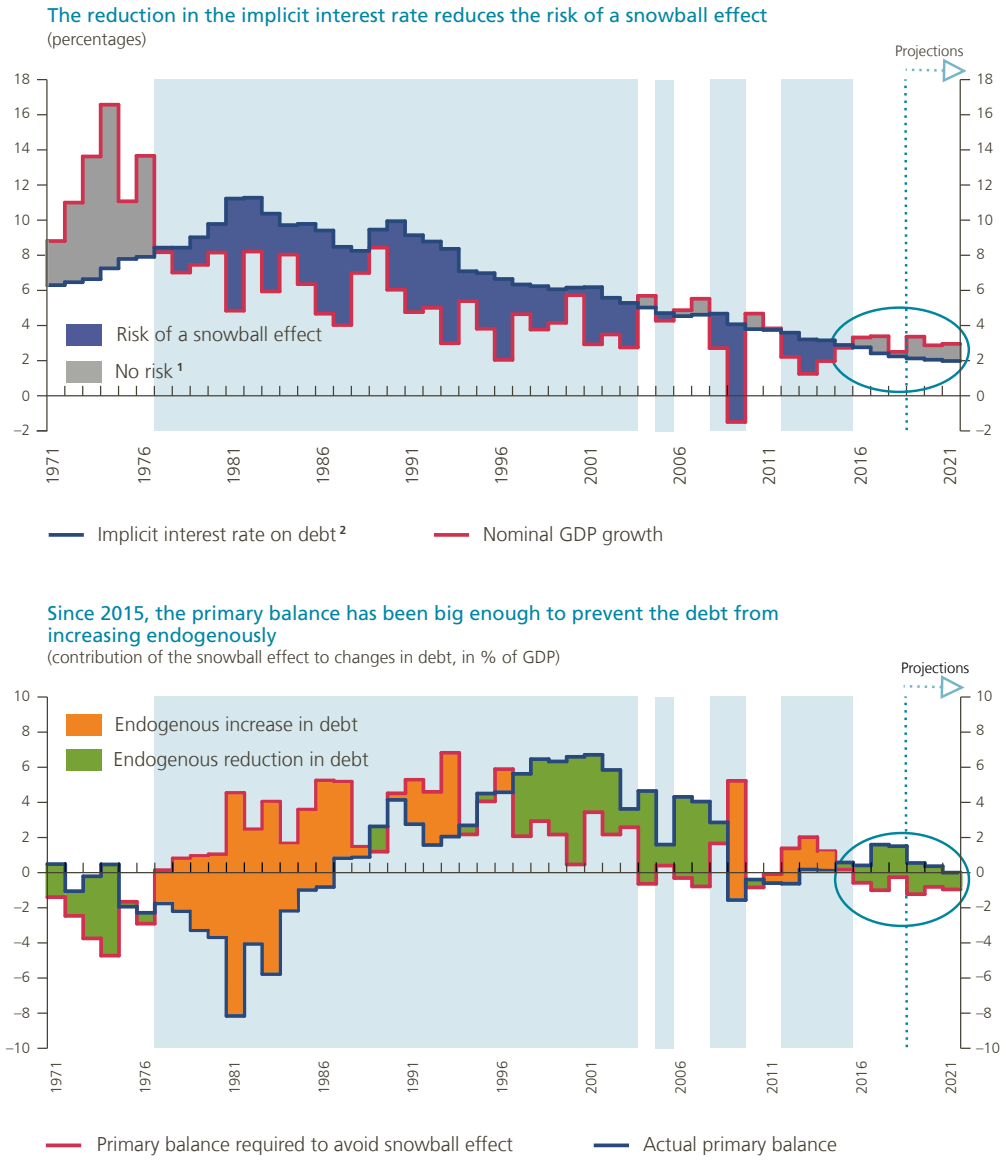
In fact, it was back in the first half of the 1970s that Belgian governments were last spared from the snowball effect over a period of several years. Fuelled by galloping inflation, nominal GDP growth was then above the implicit interest rate on the government debt. Although market interest rates at the time had risen sharply, that increase was only gradually reflected in the implicit rate as loans contracted at lower rates reached maturity and were refinanced at the higher market rate. In that context, in the absence of substantial primary deficits, the government debt ratio followed a downward trend on the basis of its endogenous dynamics.

From 1977 onwards, the implicit interest rate exceeded the nominal GDP growth rate, and the gap tended to widen up to the beginning of the 1980s. Consequently, an ever bigger primary surplus was needed to avoid triggering the snowball effect. At the time, however, deficits were growing incessantly, contributing to a spiralling debt ratio.

From 1984 onwards, the primary balance steadily improved, curbing the endogenous increase in the debt. But it was not until the middle of the 1990s that the primary surplus got large enough to reduce the debt ratio, which reached its historical peak of about 135 % of GDP in 1993.

Chart 7

The snowball effect on the debt ratio



Sources: NAI, NBB.

1 Assuming that the implicit interest rate and nominal GDP growth are kept at a constant level in the coming years.

2 Ratio between interest charges for the current year and the debt situation at the end of the next year.

Between 1996 and 2007, a sufficiently healthy primary balance effectively enabled an endogenous reduction in the national debt at an average pace of almost 3 percentage points of GDP per annum. The debt ratio was thus cut back to 87 % of GDP in 2007. This favourable trend was not only due to high primary surpluses, but also to the declining trend in the implicit interest rate on government debt resulting from the fall in interest rates.

In 2008, the reduction in the debt ratio was abruptly interrupted by the financial crisis and the ensuing recession. In 2009, the debt showed an endogenous increase of 7 percentage points of GDP, resulting from the drop in GDP in nominal terms.

Since the crisis, two different periods can be distinguished. The first one runs from 2012 to 2015. At the time, nominal GDP growth was lower than the implicit interest rate on the debt. During this period of fairly low growth and inflation, the actual primary balance was below the level needed to avoid a self-sustained increase in the debt ratio.

After that, and since 2016, the conditions necessary for reducing the debt ratio have been met once again. The implicit interest rate has continued the fall that began several years ago and nominal growth has overtaken it again. Consequently, the risk of a snowball effect has been avoided. Owing to the currently very low interest rates, even slight primary surpluses are enough to reduce the debt ratio. Based on the Bank's latest macroeconomic projections, this situation is projected to last for the next few years.

4. Debt management: maturity extension strategy

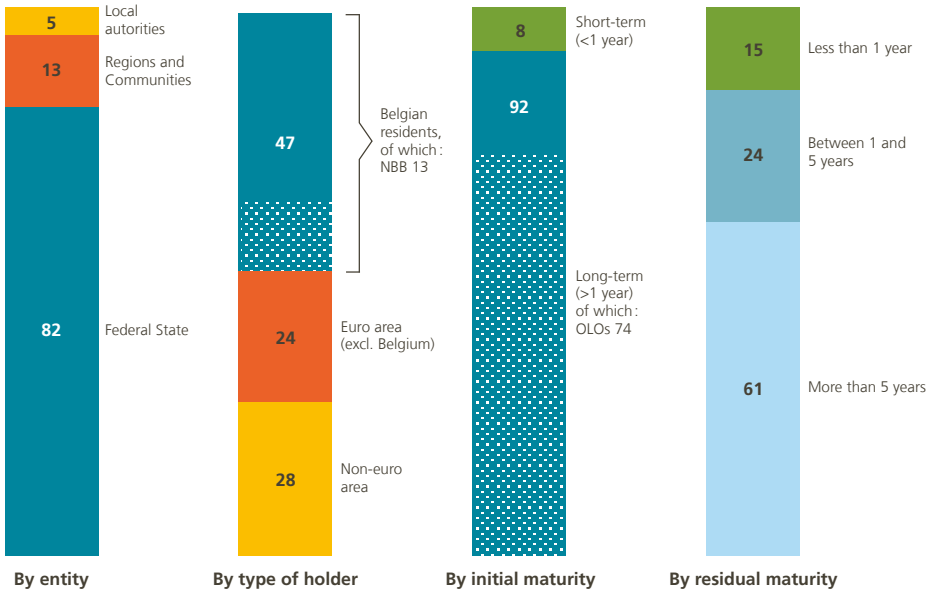
4.1 Characteristics of the Belgian public debt

In 2018, the federal State debt accounted for 82 % of Belgium's total government debt. The debt is almost exclusively held in euro, and about half of it is in the hands of Belgian residents. The NBB holds a sizeable share of the debt (13 % of the total, while this was less than 2 % in 2014), mainly on account of the

Chart 8

The Belgian public debt is largely federal government debt[1]

(breakdown of gross debt of Belgian general government, in percentages of the total at the end of 2018)



Source: NBB.

1 A distinction is made between initial maturity, that is, the maturity at the time the debt is issued, and the residual maturity. The notion of residual maturity of the debt always corresponds to the average residual term of the debt. For example, in 2019, debt issued in 2000 with an initial maturity of 20 years will have a residual maturity of one year.

monetary-policy-related asset purchase operations decided by the ECB. However, the Belgian residents' share has dropped in recent years. If the share held by the NBB is excluded, it came down from more than 60 % in 2000 to 34 % in 2018. The bulk of debt issues in Belgium consist of bonds with long maturity.

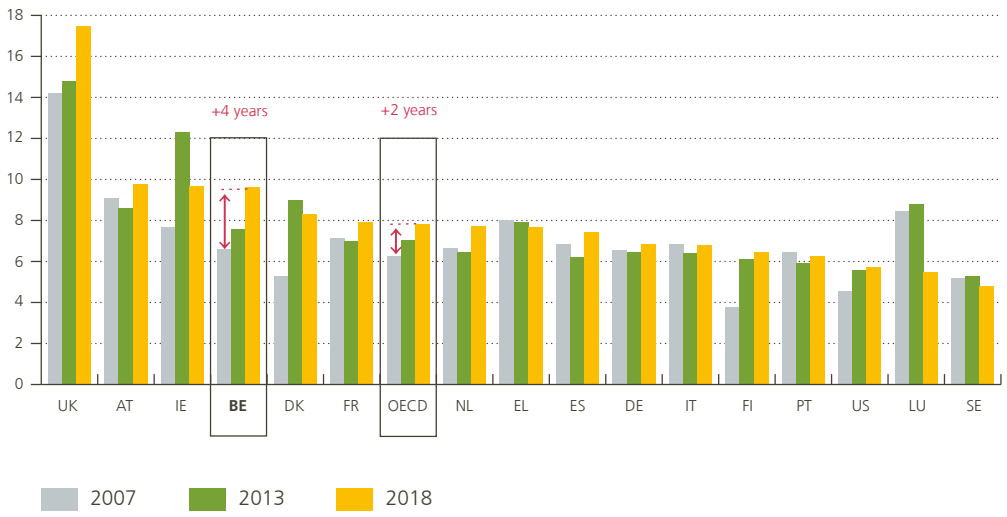
4.2 Extension of the federal debt maturity

An extension of government debt maturities can be observed in several countries. Between 2007 and 2018, the average maturity for public debt in the OECD went up from 6.3 to 7.9 years. This trend is nevertheless more pronounced in some countries, including Belgium. In 2007, the residual maturity of the Belgian federal public debt was barely higher than the OECD average, while it was at 9.6 years at the end of 2018. The residual maturity lengthened particularly between 2013 and 2018, showing one of the biggest increases among the euro area countries. In 2018, only the national debt held by the United Kingdom (17.5 years), Austria (9.8 years) and Ireland (9.7 years) had a higher residual maturity than Belgium's debt.

Chart 9

The extension of the national debt maturity has been greater in Belgium than the average for OECD countries

(residual maturity of the public debt[1], in years)



Source: OECD.
1 Only federal government debt in Belgium's case.

On average, the residual maturity of the debt goes up if the debt issues in the current year have an average higher initial maturity than the average residual maturity of all outstanding debt. Issuing new debt loans at an initial maturity that is sufficiently higher than the average residual duration is a necessary precondition for extending the latter, in order to offset the natural decline in the residual maturity of outstanding debt.

The Belgian Debt Agency started its maturity extension strategy in 2010. In practice, the increase in the residual maturity of the federal public debt is essentially the fruit of issues of very long-term OLOs. In 2018, the initial average maturity of all debt issues taken together was almost 15 years. That pushed up the average residual maturity of all outstanding debt from 9.2 years at the end of 2017 to 9.6 years by

the end of 2018. Among these debt issues are very long-term bonds, some of which will fall due in 2047, 2057 and 2066.

The Belgian Debt Agency has continued to issue a series of OLOs with a very high initial maturity in 2019. The average maturity of all debt issues between 1 January and 30 April 2019 was almost 17 years. Consequently, the average residual maturity of the debt has recently reached an all-time high of almost 10 years.

Keeping the average residual maturity of the federal public debt at a minimum level of 9 years is explicitly mentioned in the latest report from the Belgian Debt Agency on the forecasts for 2018-2019. Moreover, the strategy of extending the debt maturity is considered to be near completion. It should therefore stay close to the level currently observed.

Chart 10

Extension of the residual maturity of the federal government debt from 2010

(residual maturity of the federal debt, in years)

Source: FPS Finance.

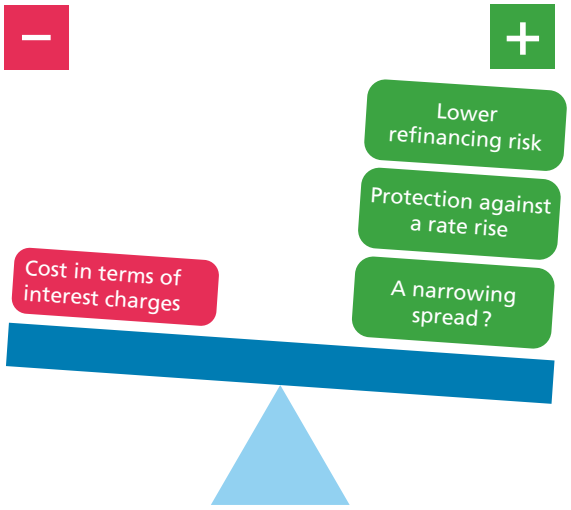
1 Figures as at 24 June for the year 2019.

4.3 Advantages and disadvantages of extending the debt maturity

Extending the residual maturity is a strategy that has many implications. Borrowing over a longer term makes it possible, on the one hand, to scale back refinancing requirements. It reduces the risks associated with an increase in interest rates in the not too distant future, making the public debt more resilient in the event of an interest rate shock. Extending the debt maturity could also have had a favourable (downward) influence on the spread. However, a maturity extension strategy also has a cost in terms of higher interest charges.

Chart 11

Consequences of extending the debt maturity



Source : NBB.

4.3.1 Cost in terms of interest charges

The main disadvantage of extending the residual maturity of the debt is an additional cost in interest charges. The longer the maturity of the loan issues, the higher the interest rate on them (term premium).

It is possible to calculate the difference between the rates associated with the initial maturity of new borrowings (which has pushed up the residual maturity of all outstanding Belgian federal State debt since 2010) and rates associated with the maturity of debt security issues which would have kept the maturity of the entire federal debt at its 2009 level.

From 2010 onwards, the annual costs in interest charges have gradually built up over the years, along with the pace of issues of OLOs with a longer maturity. The extension of the maturity of the debt since 2010 brought additional interest charges in 2018 worth about 0.42 % of GDP, or €1.9 billion, compared with a policy of keeping the maturity at 6 years. This cost corresponds to the sum of additional interest charges paid in 2018 on the medium- and long-term instruments issued since 2010[1].

With no change in policy, there would also be an extra cost of € 200 million on top of this amount in 2019, or some 0.04 % of GDP. The total cost for the year 2019 of extending the maturity of the debt should therefore work out at around € 2.1 billion in 2019, or 0.45 % of GDP.

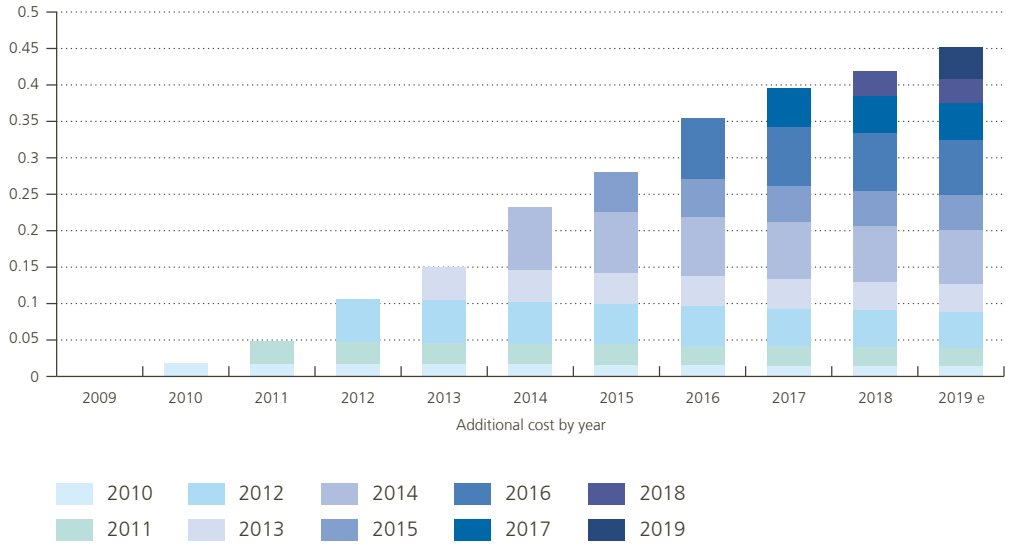
This estimation exercise was conducted on the basis of historical interest rate data. The cost of maturity extension could therefore probably be over-estimated as it is possible that, without any extension of the

1 This estimation exercise assumes that any change in the maturity of the debt is based solely on a variation in the maturity of medium- and long-term debt issues, without changing the share of short-term debt. That basically corresponds to the policy conducted in recent years, although a small decline in the share of borrowings with a term of less than one year has been observed.

Chart 12

Extension of the residual maturity of the debt cost 0.42 % of GDP in 2018

(additional interest charges incurred by the maturity extension, instead of keeping the maturity at 6 years, in % of GDP)



Source: NBB.

average residual maturity of the debt and in the face of the risk of interest rates rising, Belgian debt could have been punished by the markets through a higher risk premium on Belgian OLOs. Moreover, the reasoning is based on annual average interest rates. The results should consequently be interpreted with some caution but should nevertheless give a good idea of the financial consequences of the maturity extension.

4.3.2 Reduction in the financing risk

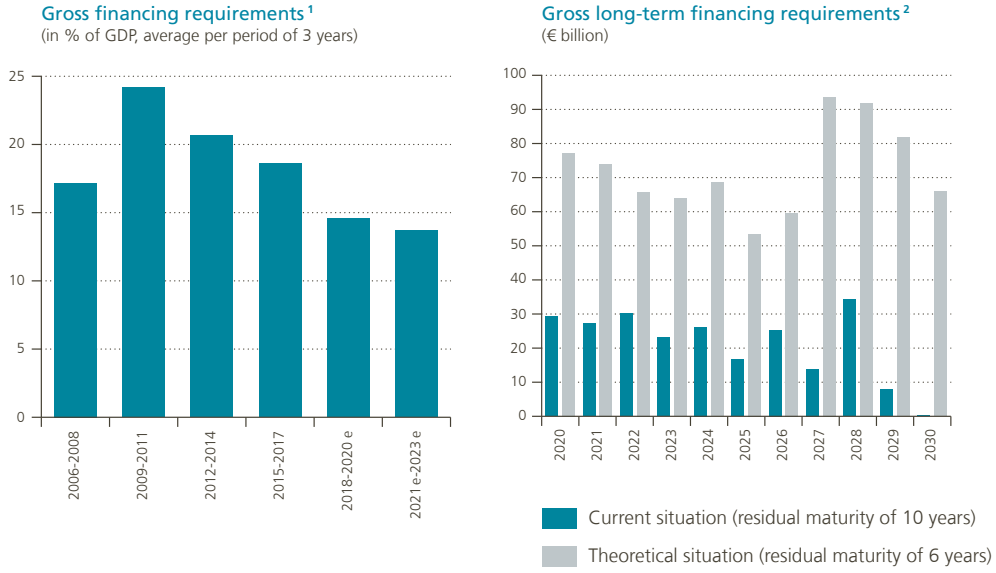
A major advantage of extending the debt maturity is a reduction in the risks associated with borrowing requirements, which may be heavy in countries with a high public debt ratio, such as Belgium. In extreme cases, it may even become impossible to finance deficits or refinance loans. There is also the risk of having to pay more for loans owing to very high borrowing requirements. The financing risk is thus related to the annual amount of public debt that needs to be refinanced. The longer the debt repayment schedule, the more the financing risk diminishes and vice versa.

The Belgian federal State's gross financing requirements have been coming down since the financial crisis. Having been close to 24 % of GDP between 2009 and 2011, they are expected to stabilise around 14 % of GDP over the next few years.

The extension of the debt maturity to around 10 years enables the gross financing requirements to be kept lower than in a situation where the maturity of the debt had been held at 6 years. Hence, the Belgian federal State's debt is now already less subject to the financing risk, which was higher before the increase in the residual maturity of debt.

Chart 13

Borrowing requirements are inversely proportional to the residual maturity of the debt



Sources: IMF, FPS Finance, NBB.

1 Gross financing requirements cover short- and long-term borrowing requirements.

2 In these estimates, only long-term borrowing requirements are taken into consideration. Figures are based on the assumption of a balanced budget from 2021 onwards (stable nominal debt). The gross financing requirements shown here may therefore be considered as minimum values.

4.3.3 Protection against a rise in interest rates

Borrowing long-term helps protect a larger part of the debt from the possibility of a rise in interest rates, as gross financing requirements are lower in that case.

The fact that rates today are at an all-time low could suggest that the extension of the debt maturity began too early. But this needs to be qualified, as real-time market forward rates predicted almost systematically a rise in interest rates. It therefore seems logical that the Belgian Debt Agency would have wanted to benefit from low interest rates over the last few years because financial market participants anticipated a rise almost every year.

Simulations have been made of the impact of a gradual increase in market interest rates on the interest charges paid by the Belgian federal State. The base scenario is with the 10-year OLO rate at 0.52 % on average in 2019 – this is the assumption of the NBB's June 2019 macroeconomic projections – and stable thereafter. Five interest rate rise scenarios have also been set, with the 10-year OLO rate rising to 2025 and being stable thereafter, as is shown in chart 15.

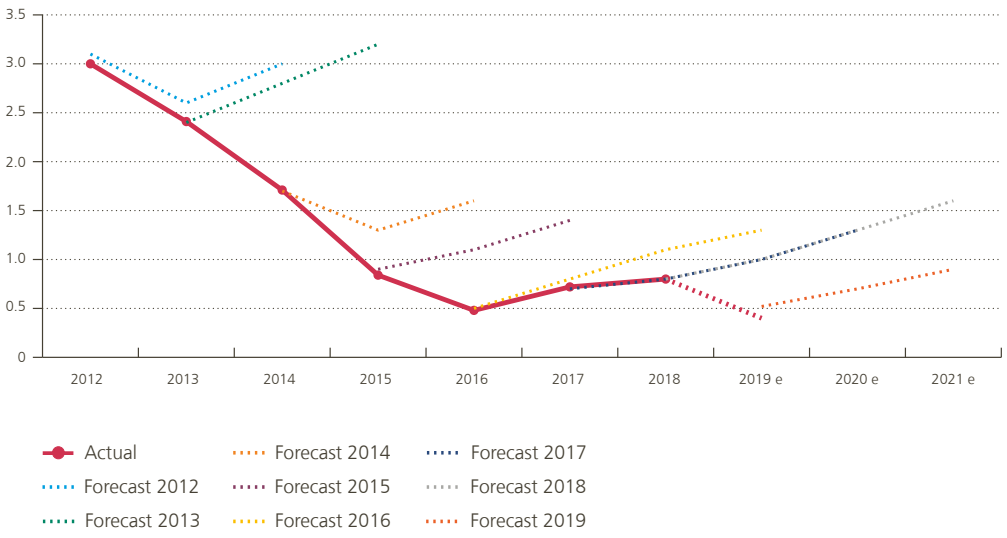
The estimates also assume that, as of 2021, public finances are in balance and so there is no longer any budget deficit adding to the annual borrowing requirements. In this way, borrowing requirements consist solely of replacing medium- and long-term securities that have fallen due. All the estimates presented here may therefore be considered as minimum values.

Regardless of the residual debt maturity, a rate rise will always have an upward impact on interest charges. The higher the rate rise in relation to the base scenario, the higher the additional interest charges to be paid.

Chart 14

An interest rate rise has been predicted for several years

(comparison between actual and forecast interest rates, 10-year OLOs, in %)



Source : NBB.

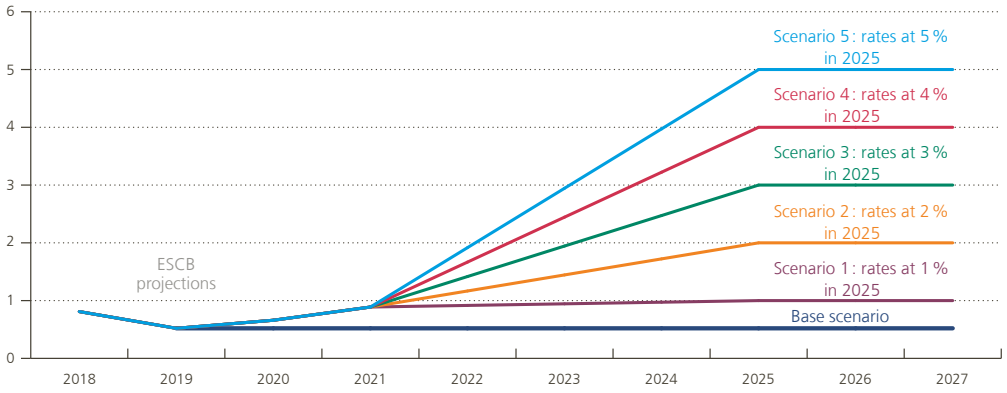
1 Assumptions based on market forward rates as used in December Eurosystem macroeconomic projections between 2012 and 2019 (June for 2019).

As mentioned earlier in this article, one of the benefits of extending the residual maturity of the debt is precisely to reduce borrowing requirements so as to protect a bigger proportion of the public debt in the event of a rise in interest rates. Intuitively, applying the opposite reasoning, if the residual maturity of the public debt had not

Chart 15

Gradual interest rate rise scenarios used in the simulations

(10-year OLOs, in %)

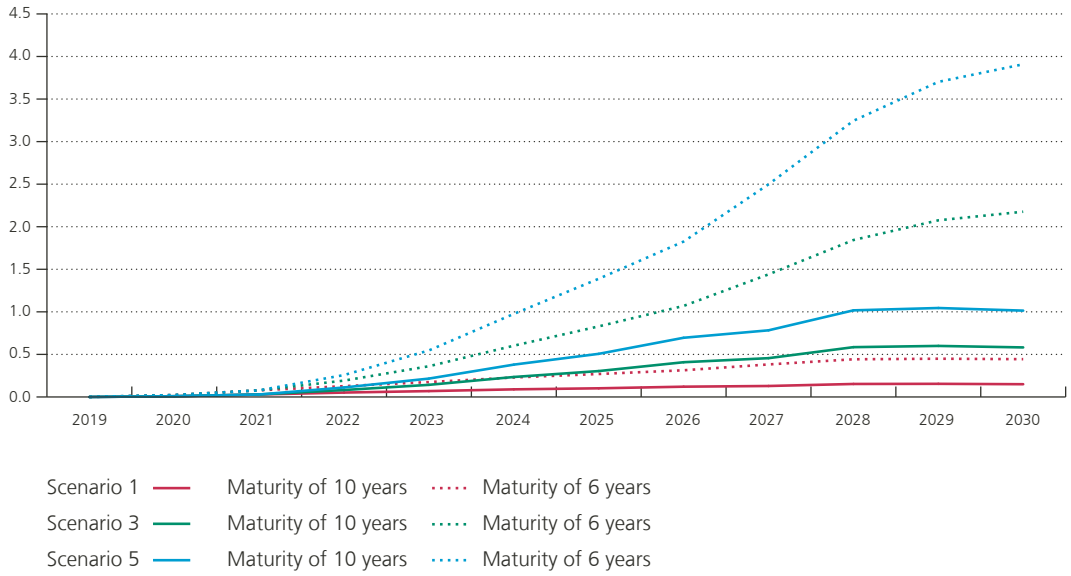


Source : NBB.

Chart 16

The benefits of maturity extension will be proportional to the rise in interest rates

(additional interest charges compared with the base scenario, in % of GDP)



Source: NBB.

been extended since 2010, borrowing requirements today would have been a lot higher than they actually are (the debt has to be refinanced much more frequently), thus triggering an even higher increase in interest charges in the event of a rate rise.

Over time and depending on the different interest rate rise scenarios envisaged, the differences in interest charges between a debt falling due in 6 years and debt with an extended maturity of about 10 years will get bigger. If interest rates do not go up, there will of course be no extra costs because the loans are refinanced at unchanged rates (even though that happens more frequently). If interest rates rise, the difference in interest charges between a maturity of 6 years and keeping the current maturity of 10 years may be considered as an advantage of extending the debt maturity. In particular, according to our estimates and depending on the size of the interest rate rise, in 2030, these gaps would reach:

- 0.3 % of GDP for scenario 1: 10-year OLO rate rising to 1 % in 2025 and stable thereafter
- 0.9 % of GDP for scenario 2: 10-year OLO rate rising to 2 % in 2025 and stable thereafter
- 1.6 % of GDP for scenario 3: 10-year OLO rate rising to 3 % in 2025 and stable thereafter
- 2.2 % of GDP for scenario 4: 10-year OLO rate rising to 4 % in 2025 and stable thereafter
- 2.9 % of GDP for scenario 5: 10-year OLO rate rising to 5 % in 2025 and stable thereafter.

4.3.4 Comparison of the costs and benefits of extending the debt maturity

For the base scenario as well as for each of the five interest rates rise scenarios, it is possible to calculate the difference between the cost of extending the debt maturity to 10 years and the benefit of this strategy, namely the extra interest charges paid each year if the debt maturity had been kept at 6 years instead of 10 years.

In all interest rate rise scenarios, the extra interest charges from not extending the residual maturity of the debt would end up exceeding the annual cost of the extension. This would be when the curves associated with the

different interest rate rise scenarios in chart 17 move into negative territory. The extent to which this is the case depends on the scenario: the bigger the rate rise, the faster this will happen.

Applying the same reasoning not annually, but cumulatively since the start of the extension of the residual maturity of the debt, it is possible to compare the cumulative cost of the extension with the cumulative cost of the extra interest charges if the residual maturity of the debt had not been extended, for each of the different interest rate rise scenarios.

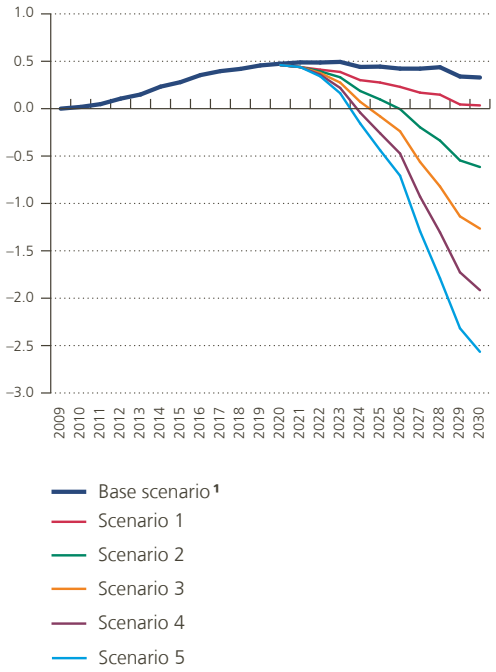
Whether ten-year OLO rates are running at 1 % or 5 % in 2025 (and stable thereafter), the cumulative cost of extending the debt maturity systematically ends up lower than the additional interest charges resulting from keeping the debt maturity at 6 years instead of 10 years. The higher the rate increase, the more likely this tuning point is to come in the near future, which according to our estimates is as early as 2028 for the rise to 5 %, in 2029 for the increase to 4 %, 2030 for the rise to 3 %, 2033 for the rise to 2 % and after 2040 for the rise to 1 % in 2025.

In the absence of any rise in interest rates above their current level, the increase in the residual maturity of the debt can be considered as an undeniably costly hedge. However, it would only take a moderate, yet lasting, rise in rates for this strategy to become more worthwhile, in the long term, than keeping the residual maturity of the debt at its 2010 level.

Chart 17

The benefits of maturity extension will exceed the costs in the event of a rate rise

Annual difference between the cost and benefit of extending maturity rather than keeping it at 6 years
(in % of GDP)



Cumulatively, the maturity extension turns out to be a good move if interest rates rise

Date when the maturity extension is likely to become less costly than keeping the maturity at 6 years

Base scenario	Never
Scenario 1	After 2040
Scenario 2	2033
Scenario 3	2030
Scenario 4	2029
Scenario 5	2028

A very slight rise in rates is enough to make the maturity extension less costly than keeping the status quo

Source: NBB.

1 The annual cost of extending the residual maturity of the debt will gradually decline in future years. That is due to securities issued between 2010 and 2019 gradually reaching maturity. But also, in the long run, keeping the residual debt maturity at 10 years is more expensive than keeping the residual debt maturity at 6 years, as a term premium will have to be paid.

4.3.5 A narrowing interest rate spread?

The last advantage of an extended maturity is a potential positive effect on the interest rate spread between Belgian government bonds and government bonds issued in Germany, the latter being regarded as a low-risk benchmark.

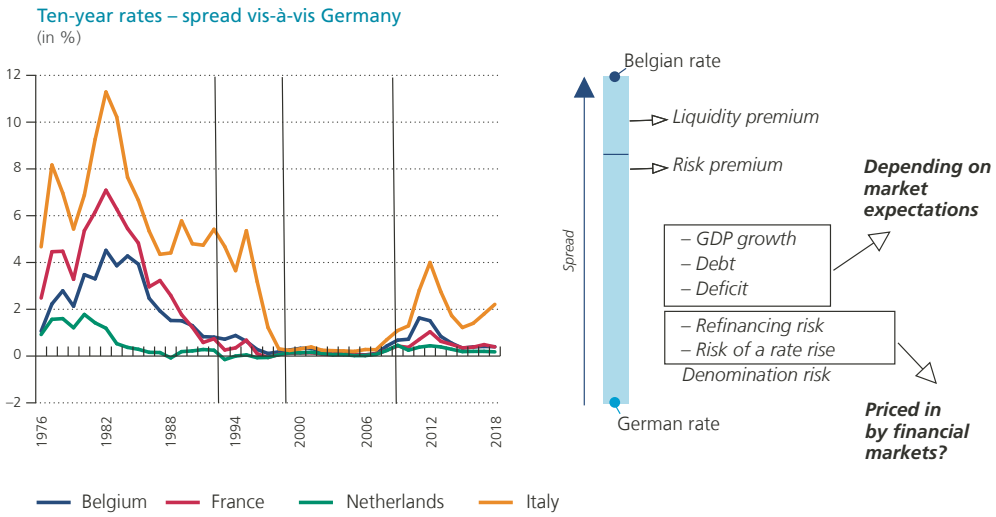
Historically, three major events have been followed by a change in the level of spread relative to the German Bund. First of all, the Maastricht Treaty in 1992 marked the beginning of the gradual convergence of sovereign rates for most European countries, among which was Belgium. After that, the introduction of the euro was the start of a period when sovereign spreads were historically low. This relative convergence of interest rates on the public debt came to an end with the outbreak of the financial crisis, as the markets have paid more attention to risks associated with national debt since then. In 2018, the interest rate premium on Belgian debt via-à-vis German debt was on average around 0.4 %.

Empirical evidence proves that the markets' expectations regarding the macroeconomic and fiscal outlook (economic growth, debt, deficit) do influence the size of the interest rate spreads. A sustainable fiscal policy has its importance here, as market anticipations of healthy public finances may have a favourable influence on spreads, thus reducing interest rates and charges to be paid by the government.

Apart from the expectations regarding macroeconomic and fiscal fundamentals, it is also quite possible that the extension of the residual maturity of the federal public debt has had an effect on the spread between the Belgian and the German rate. Belgium's spread vis-à-vis Germany may have been influenced downwards if the markets considered a longer-term debt to be relatively safer (less financing risk and less sensitive to a rate rise). The maturity extension of the Belgian federal State's debt has been given a positive welcome by the

Chart 18

Maturity extension reduces certain risks that may lead to a wider spread



Sources: EC, NBB.

ratings agencies, which underline the lower interest rate risk over the next decade[1]. There is no doubt that lower financing risks related to government debt are priced in by the financial markets, even though there is no empirical research into this matter.

5. Debt sustainability: a risk analysis

Even though longer debt maturity helps reduce some risk, especially for a country with a high public debt like Belgium, more dimensions must be examined in order to assess sovereign risk. In that respect, many institutions conduct a debt sustainability analysis (DSA) on a regular basis in their surveillance procedures.

5.1 The EC's debt sustainability analysis

In line with other institutions' practice and given the high relevance of debt sustainability analysis for country surveillance, the European Commission has developed a fiscal sustainability assessment framework. A multi-dimensional approach is used to assess and differentiate fiscal sustainability risks in the short, medium and long term.

The short-term dimension is assessed by the S0 indicator, which allows for early detection of short-term risks of fiscal stress (within the coming year) stemming from the fiscal and/or the macrofinancial and competitiveness sides of the economy. Fiscal sustainability challenges over the medium term are captured through the joint use of the medium-term fiscal sustainability indicator S1 and the debt sustainability analysis. The latter pays due consideration to medium-term public debt dynamics over a ten-year horizon. Finally, challenges over the long term are identified through combined use of the long-term fiscal sustainability indicator S2 and the DSA. The joint use of these two tools helps identify long-term challenges arising from population ageing (mostly through the S2 indicator that is particularly suited to this purpose), while capturing potential vulnerabilities stemming from high debt levels (through the DSA tool).

In addition to the elements already mentioned, the Commission's fiscal sustainability framework provides an analysis of additional mitigating and aggravating risk factors. For instance, the assessment of short-term risks is complemented (beyond the S0 indicator) by a focus on forthcoming government borrowing requirements and an analysis of the ease of financing government debt. Borrowing requirement projections over the medium term, stemming from the debt projection model, are also reported and analysed. Furthermore, three main types of additional risk factors – of horizontal nature – are considered in the assessment, in particular: i) the composition of government debt (in terms of maturity, currency and investor base); ii) 'hidden debt' in the form of implicit and contingent liabilities, notably for the part stemming from the banking sector; iii) government assets, and related indicators (net debt and net worth).

The results are summarised in an overall heat map of fiscal sustainability risks per time dimension (short, medium and long term). The EC's Fiscal Sustainability Report 2018 provides the most recent snapshot of the situation, updating the European Commission's Autumn 2018 forecast. While in 2009 more than half of the EU Member States were deemed to be at high risk of fiscal stress in the short run, short-term vulnerabilities are identified in this report in just one country (Cyprus), although risks appear on the rise compared to last year in some countries. Five countries (Belgium, Spain, France, Italy, and Portugal) are deemed to be at high fiscal sustainability

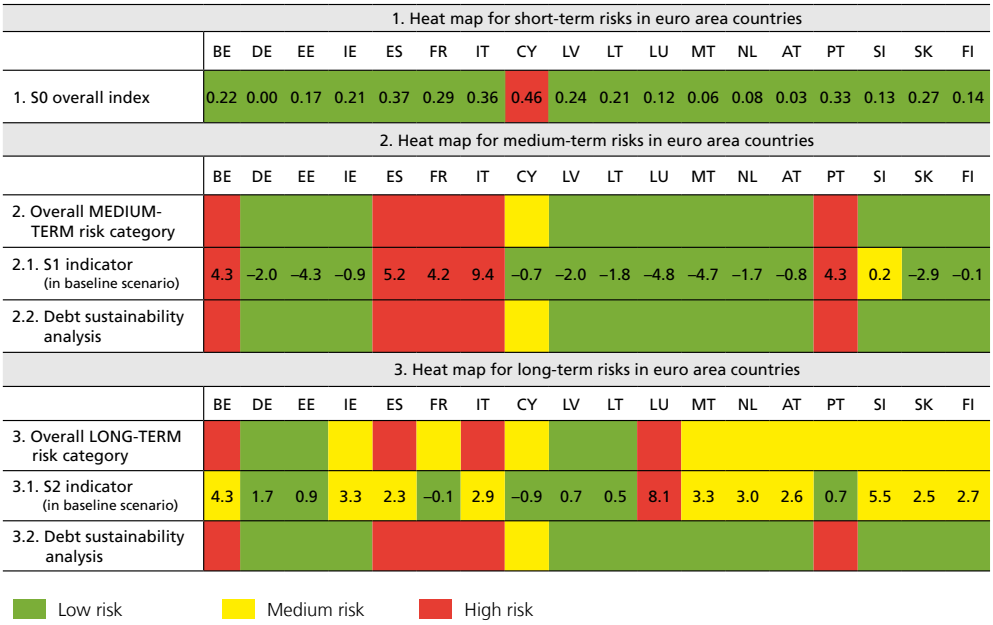
1 "The Belgian Treasury has pushed up the weighted average maturity of the country's debt stock. […] This will reduce gross borrowing requirements significantly in the coming years, as the government is currently replacing the shorter-dated debt that was issued during the euro area sovereign debt crisis with much longer-dated instruments. This has entailed some short-term cost, as it is more expensive for the government to finance itself further out on the yield curve, but it also mitigates a substantial amount of interest rate risk in the coming decade."
Extract from a press release issued by ratings agency Moody's (2017).

risk in the medium term, as a result of inherited high post-crisis debt burdens, weak forecast fiscal positions in some cases and/or sensitivity to unfavourable shocks. In the long term, four countries (Belgium, Spain, Italy and Luxembourg) appear to be at high fiscal sustainability risk.

For Belgium, over the short term (within one year), no significant risks of fiscal stress are foreseen. But over the medium and long term, fiscal sustainability risks appear to be high. This is mainly due to the distance of the public debt ratio from the 60% reference value, projected age-related public spending, and the unfavourable initial budgetary position. The stubbornly high debt-to-GDP ratio over the medium term in the baseline scenario and the sensitivity to possible macro-fiscal shocks also contribute to this assessment.

Chart 19

Debt sustainability risks remain relatively high for Belgium



Source: EC.

5.2 Impact of a steep increase in the interest rate on fiscal consolidation

The EC's fiscal sustainability assessment framework comprises a central benchmark debt path on the basis of explicit assumptions for the underlying variables (GDP growth, interest rates, fiscal position). Various adverse shock scenarios are constructed around the benchmark scenario in order to gauge the resilience of sovereign debt to such developments.

Specific metrics are introduced to evaluate the risks surrounding the debt paths in both the benchmark and the adverse shock scenarios. First, the level of debt at the end of the simulation period is assessed. The motivation for this criterion is justified because high levels of debt are associated, *inter alia*, with a high debt servicing burden and higher sensitivity to adverse shocks. Second, the dynamics of the debt path are evaluated in terms of the projected peak year of debt. Longer horizons to stabilise the debt ratio imply higher uncertainty and higher

debt sustainability risks. Third, a fiscal fatigue criterion is used (only in the benchmark) to assess the likelihood of maintaining sustained primary balances. More precisely, the political feasibility of the cumulative primary surpluses inherent in the respective debt paths is assessed against the EU's historical track record.

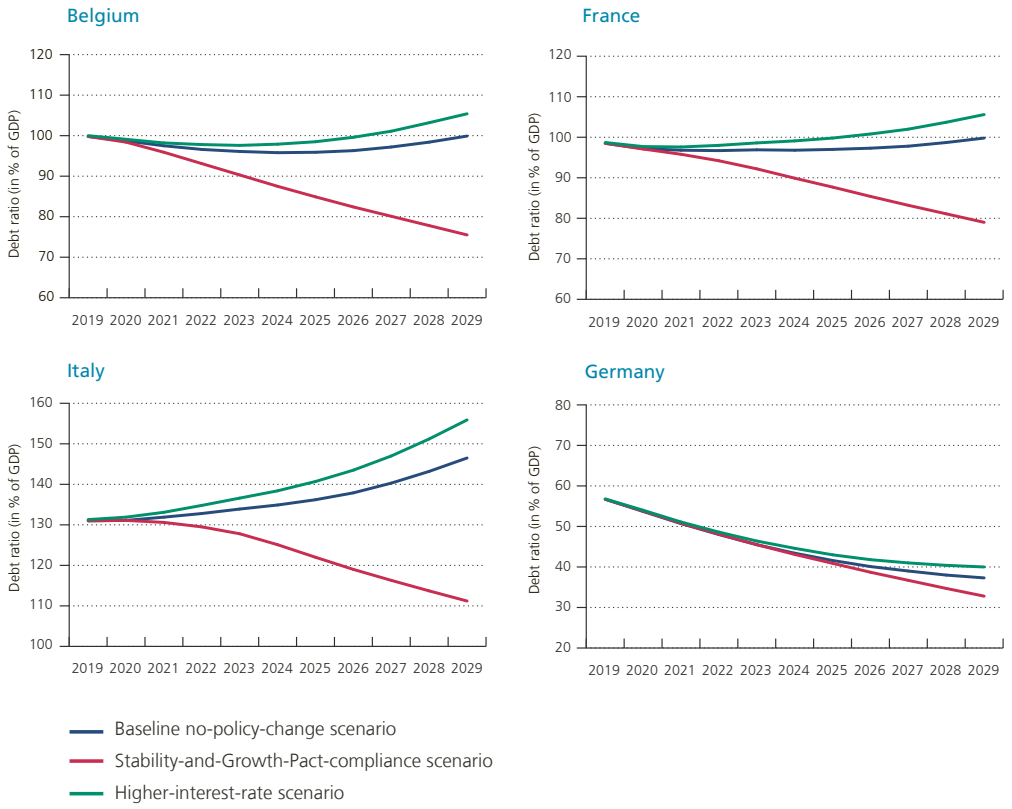
Three scenarios are presented here for Belgium, Germany, France and Italy : the baseline no-fiscal-policy-change scenario, the interest-rate-shock scenario, and the Stability and Growth Pact scenario.

The no-fiscal-policy-change scenario assumes that the government primary balance in structural terms and before ageing costs remains constant at its last forecast value (2020) for the remainder of the 10-year projection horizon. Changes in the structural primary balance are due to population ageing costs. For the other underlying macroeconomic variables (real GDP growth, inflation, real interest rate), the baseline scenario relies on the Economic Policy Committee agreed long-run convergence assumptions. According to this scenario, the debt ratio would be broadly stabilising in Belgium and France up to 2029, thanks to favourable interest rate growth differentials and despite primary deficits. In Italy, debt would remain on a rising path, as the interest rate growth differential is pushing the debt ratio up, and the primary balance is deteriorating. Germany, characterised by primary surpluses at unchanged policy and favourable interest rate growth dynamics, would see its debt ratio fall below 40% of GDP.

Chart 20

An increase in interest payments would further hamper compliance with the requirements of the Stability and Growth Pact

(Debt ratio in % of GDP)



Source : EC.

The interest rate shock scenario implies a standard permanent shock on short- and long-term interest rates on newly issued and rolled-over debt (+1 percentage point), compared to the baseline no-fiscal-policy-change scenario. The impact of this scenario on the debt ratio is rather limited, although the impact is visibly higher for high debt countries, which adds to their sustainability risks. This demonstrates that the high government debt makes Belgium vulnerable to an interest rate increase.

Under the Stability and Growth Pact scenario (a scenario which is not used for determining the DSA risk classification), countries are assumed to comply with the main provisions of European fiscal rules. The scenario assumes strict compliance with respectively preventive arm provisions and EDP (excessive deficit procedure) recommendations for countries under the corrective arm of the SGP. Regarding the former, the structural balance is supposed to converge to its medium-term objective (MTO), following the adjustment path required by the "matrix of requirements of the preventive arm" as defined in the European Commission 2015 Communication and in the Commonly Agreed Position on Flexibility within the Stability and Growth Pact endorsed by the Ecofin Council. Moreover, this scenario is run by taking into account a feedback effect of fiscal consolidation on GDP growth.

Following the SGP requirements would put the debt ratio of the high-debt countries on a steady declining path. It would make them more resilient to positive interest rate shocks and significantly reduce debt sustainability risks.

Conclusion

Belgium has a persistently high government debt, something that has traditionally been branded as one of the country's big weaknesses. This debt rose sharply in the aftermath of the financial and economic crisis, which was also the case in many other countries. Although the debt is coming down again now, the pace is slow and, according to the Bank's latest macroeconomic projections at unchanged policy, the debt ratio in the coming years should remain above 100 % of GDP.

As for interest rates, they are at an all-time low at the moment, after having fallen systematically in the last few years. As a result, government debt financing conditions are currently very favourable. However, it is highly unlikely that interest rates will stay at today's low level for a very long time.

The Belgian Debt Agency has reacted to this situation by extending the average maturity of debt securities issued by the federal government substantially from 6 years in 2009, to around 10 years at present. This debt maturity extension does of course come at a price in the short term, but it offers good protection against a possible rate rise in the future.

Reducing the government debt must remain the key objective of fiscal policy in Belgium. This debt burden certainly makes Belgium vulnerable to a rate rise that may be expected at a later stage. Also, the financial markets seem to be paying more attention to the risks of a slippage in budget discipline or of unsustainable public finances than they did in the period preceding the financial crisis, which is reflected in interest rates. A steady decline in the debt ratio can help avert upward pressure on the spreads between Belgian and German government bonds and those of other euro area countries regarded as low-risk.

It is therefore advisable to build up a sufficiently high primary balance in order to reduce the deficit and the debt ratio and to use the budget margins resulting from low interest rates for supporting sound public finances.

Annex – Relationship between the debt ratio and the interest rate, nominal GDP growth and the primary balance

The debt at the end of a given period (D_t) is the outcome of the sum of the debt at the end of previous period (D_{t-1}) and the difference between the interest charges on the outstanding debt ($r.D_{t-1}$) and the primary budget balance (PB_t [1]).

$$D_t = D_{t-1} + r.D_{t-1} - PB_t$$

This equation can be rewritten by dividing the variables by GDP, nominal GDP growth in year t being expressed as g_t. The lower-case letters d and pb respectively represent the public debt and the primary budget balance as percentages of GDP.

$$d_t = \frac{(1+r_t)}{(1+g_t)}.d_{t-1} - pb_t$$

So, the evolution of the debt ratio can be written as:

$$d_t - d_{t-1} = \frac{(1+r_t)}{(1+g_t)}.d_{t-1} - d_{t-1} - pb_t$$

$$d_t - d_{t-1} = \frac{(1+r_t)-(1+g_t)}{(1+g_t)}.d_{t-1} - pb_t$$

$$d_t - d_{t-1} = \frac{(r_t-g_t)}{(1+g_t)}.d_{t-1} - pb_t$$

The primary surplus that stabilises the debt ratio (pb_t^* where $d_t - d_{t-1} = 0$) is thus given by:

$$pb_t^* = \frac{(r_t-g_t)}{(1+g_t)}.d_{t-1}$$

1 This is a simplification of the real movement in the public debt, as interest payments relate to the debt outstanding during the year. The debt pattern is also influenced by so-called deficit/debt adjustments, e.g. as a result of financial transactions or the impact of exchange rate fluctuations.

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Are we riding the waves of a global financial cycle in the euro area?

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J. Tielens
Ch. Van Nieuwenhuyze *

Introduction

Following financial liberalisation, deregulation and innovations, financial markets have become significantly more integrated since the 1990s. This is the case for both emerging and advanced economies. Various authors (Rey, 2015; Miranda-Agrippino and Rey, 2019; Habib and Venditti, 2019) have found that this has contributed to the emergence of a "global financial cycle". The concept broadly refers to the idea that fluctuations in financial markets occur on a global scale, consisting in co-movements of cross-border capital flows, asset prices, credit flows and leverage across countries.

This article relates to the burgeoning literature[1] on the importance of the global financial cycle (GFC) that has so far mainly focused on the effects of the GFC on capital flows of emerging markets. We contribute to this literature by analysing the impact of the GFC on domestic financial conditions in the euro area countries.

Our results show that domestic financial conditions in the euro area are, on average, strongly correlated with a measure of the global financial cycle. Furthermore, we link the cross-country sensitivity to the global cycle to various determinants, including the size and the composition of the external financial position. A key finding is that sensitivity to the GFC depends on the net international investment position. Countries with net liabilities seem to react twice as strongly to the GFC as countries that have net assets.

Several policy implications can be drawn from these findings. First, the strong correlation between financial conditions in the euro area and the global financial cycle makes it useful for macroprudential policy to monitor this global cycle and/or to help address extreme sensitivity to its boom/bust profile. Secondly – and importantly in view of the current debate in the literature – this correlation tends to suggest the presence of a "financial dilemma" in the euro area, along the lines of Rey (2015) for emerging economies. Such a dilemma implies that whenever the financial account is open, monetary and financial conditions are largely in the hands of global factors and less in those of an independent monetary policy. We show that this dilemma in the euro area is particularly present when countries have a negative net external position. This calls for co-ordination between

* We would like to thank P. Butzen and P. Ilbas for useful comments and suggestions. We are very grateful to M. Habib and F. Venditti for sharing their measure of the global financial cycle and to H. Dewachter for developing an earlier version of the financial conditions index used in this article.

1 The concept of the "global financial cycle" was introduced in the 2015 Rey paper and presented at the 2013 Kansas City FED Jackson Hole Symposium. Follow-up work was presented at the 2014 IMF Mundell-Fleming lecture. The paper attracted attention and responses from academics and policymakers, such as B. Bernanke at the 2015 IMF Mundell-Fleming lecture. A growing literature followed, concentrating on evidence in favour of or against the global financial cycle.

macroeconomic (structural), macroprudential and monetary policy in the euro area so that their respective objectives can be better attained.

The remainder of this article is structured as follows. First, we review the current literature on the global financial cycle and its implications. In section 2 we construct, for the euro area countries, a composite measure of their domestic financial conditions (Financial Conditions Index – FCI) and analyse to what extent the FCI is correlated with the global financial cycle. Section 3 sheds some light on cross-country heterogeneity in sensitivity to the GFC which we link to various determinants, including the size and composition of the external financial position. Section 4 presents our methodology and empirical results. Given these results, we evaluate recent developments in section 5. Section 6 draws several policy implications before we conclude.

1. The global financial cycle: evidence, drivers and implications

Following financial liberalisation, deregulation and innovations, financial markets have become significantly more integrated since the 1990s. This is the case for both emerging and advanced economies (see box 1). Various authors (Rey, 2015; Miranda-Agrippino and Rey, 2019 and Habib and Venditti, 2019) have found that this has contributed to the emergence of a "global financial cycle" (GFC). The concept broadly refers to the idea that fluctuations in financial markets occur on a global scale, consisting in co-movements of cross-border capital flows, asset prices, credit flows and leverage across countries.

In the literature, the global financial cycle is in general proxied by the common component of a large panel of asset returns (e.g. 858 asset price series in Miranda-Agrippino and Rey, 2018; stock market returns in 63 economies in Habib and Venditti, 2019). It is usually shown to be related to two main drivers: the degree of global risk aversion and "centre" country economic policies, in particular, US monetary policy[1]. The latter might influence financial conditions and capital flows around the world through the international role of the dollar in credit markets (BIS, 2017) and the leverage of global banks (Bruno and Shin, 2015a,b).

The literature on the effects of the financial cycle has concentrated on the impact on capital flows and domestic financial conditions. Examples of the former include contributions by Habib and Venditti (2019) and Davis *et al.* (2019). These contributions confirm the findings of Forbes and Warnock (2012) stressing the role of global factors, such as US interest rates or global investors' risk aversion in international gross capital flows, and episodes of extreme capital flows. Habib and Venditti (2019) point out that "financial" shocks matter more than US monetary policy, while Davis *et al.* (2019) find that global factors also determine net capital flows. Along the same lines, Avdjiev *et al.* (2018) highlight the importance of distinguishing capital flows across financing instruments and sectors. Most of the research finds evidence of a global cycle in capital flows, in particular for emerging markets (Ghosh, Qureshi, Kim and Zalduendo, 2014). These findings have been somehow challenged by Cerutti, Claessens and Rose (2017), who indicate that global factors do not explain more than 25 per cent of capital flow variations across countries.

Although the impact of the GFC on domestic financial conditions forms part of the original analysis by Rey (2015), the literature on that subject is scarcer. Apart from the contributions by Rey (2015), Obstfeld *et al.* (2017) also look into the transmission of global factors to domestic financial and macroeconomic outcomes. Again, the largest effects are found for emerging countries.

The analysis of the sensitivity of domestic financial conditions to global factors is closely related to the discussion regarding the validity of the classical Mundell-Fleming "trilemma" in international economics, which postulates that countries face a trade-off amongst the objectives of exchange rate stability, free capital mobility and

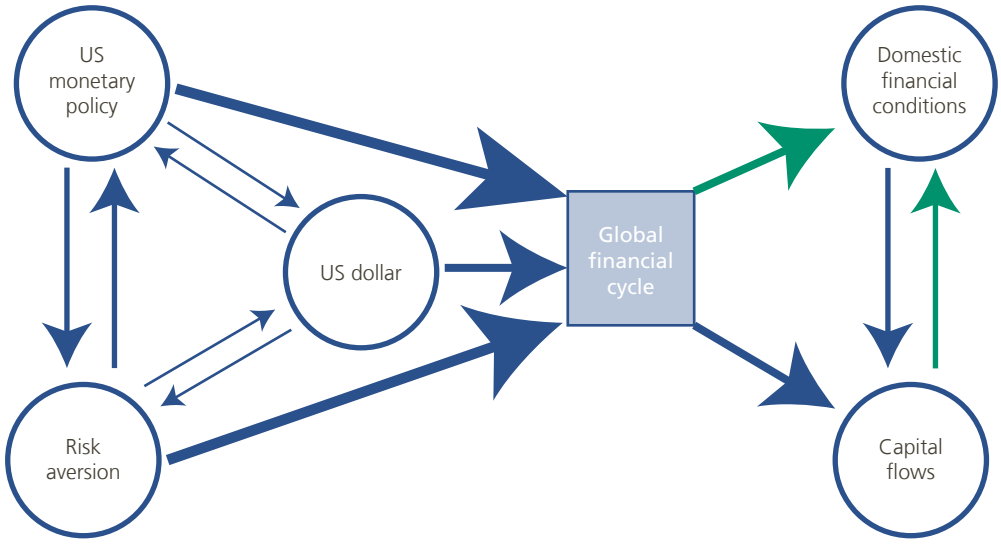
1 The global financial cycle is sometimes also linked to conventional measures of investors' risk aversion, such as the VIX. Note that this measure rather captures one of the drivers of the global financial cycle and not the cycle as such.

independent monetary policy[1] (i.e. in a world of free capital mobility, to run an independent monetary policy is feasible if and only if the exchange rate is floating). According to Rey (2015), the existence of a global financial cycle transforms this "trilemma" into a "dilemma": running an independent monetary policy or allowing capital to flow freely. Thus, while it remains true that fixed exchange rates do not allow for an independent monetary policy, cross-border capital flows would transmit the monetary policy stance of the "centre" economy worldwide, even to economies with floating exchange-rate regimes. This boils down to spill-over effects of US monetary policy (with the US being the "centre") on monetary and financial conditions in other economies and thus limiting monetary independence[2] in those countries. Rey (2019) therefore characterises the FED as a "hegemon", essentially describing the FED as the de facto central banker of the world. On the other hand, several authors provide evidence in favour of the trilemma, based on the finding that floating exchange rates insulate economies' monetary and domestic financial conditions from global factors (Shambaugh, 2004; Obstfeld, Shambaugh and Taylor, 2005; Klein and Shambaugh, 2015; Obstfeld, Ostry and Qureshi, 2017). So far, most of the literature has looked into the evidence for EMEs, as EMEs are in principle more subject to the swings of the global cycle given their dependence on dollar borrowings.

Our article contributes to this burgeoning literature in several ways. We aim to fill in a gap by concentrating on the effects of the GFC on financial conditions in the euro area countries. Given the specific features of the euro area, i.e. the single currency, and the high degree of financial integration, we link the cross-country sensitivity to the global cycle to various determinants, including the size and the composition of cross-border financial holdings. Furthermore, we analyse whether the evidence favours a financial trilemma or dilemma in the euro area. Finally, we draw conclusions for the various economic policy domains in the euro area.

Chart 1

Mechanism of the global financial cycle and our contribution[1]



1 Based on Habib and Venditti (2018). The relations on which we focus in this article are indicated in green.

1 Economic system configurations have been designed in line with the "trilemma" throughout history: during the gold standard (approximately from the 1870s to the 1930s), exchange rate stability and free capital mobility were assured, at the expense of monetary autonomy. By contrast, the Bretton Woods era (in the aftermath of WWII) was characterised by monetary independence and exchange rate stability, while capital mobility was restricted. The period thereafter (since 1973) has seen an increase in economies with free capital mobility, monetary autonomy and exchange rate flexibility.

2 In the context of the trilemma/dilemma discussion, monetary independence goes further than the setting of the short-term policy rate, and also includes the fact that monetary policymakers can steer the broader domestic financial conditions.

BOX 1

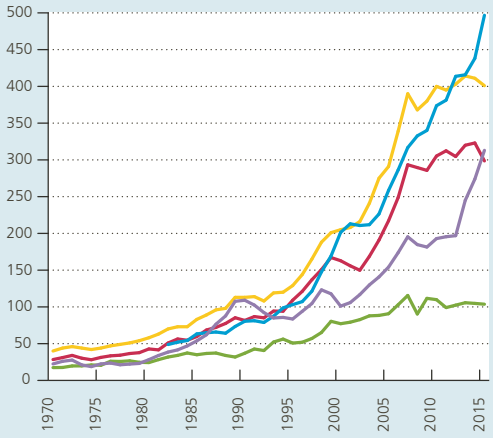
Financial globalisation: a state of play

The three decades preceding the global financial crisis of 2008-2009 were marked by a massive increase in gross capital flows worldwide. This was the result of capital controls being taken down, a decrease in both financial regulation and transaction costs, and the emergence of financial innovations (Gourinchas and Rey, 2014 & BIS, 2017). Consequently, cross-border holdings of financial assets and liabilities (expressed as a ratio of GDP) – which can be referred to as a measure of "financial globalisation" or international financial integration (Lane and Milesi-Ferretti, 2001) – underwent a remarkable surge. In Europe in particular, financial openness accelerated more markedly from the late 1990s, after the introduction of the euro helped boost cross-border transactions.

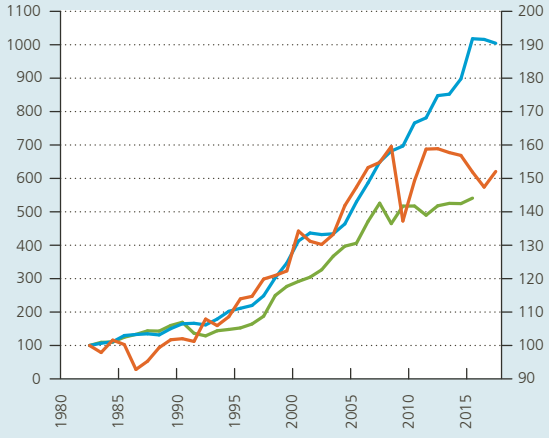
Thus, between 1980 and 2007, the sum of cross-border financial claims and liabilities, scaled by annual GDP, rose from around 60 % to almost 400 % for advanced economies (G7 average), and from roughly 25 % to more than 110 % for emerging market economies (BRICS average).

Real and financial globalisation

Financial globalisation [1, 2, 3]
(selected countries, total external assets and liabilities, in % GDP)



Real [4] **and financial** [5] **globalisation**
(total exports and imports & external assets and liabilities, in % GDP, index 1982 = 100)



Sources: Lane and Milesi-Ferretti, World Bank, NBB.
1 The G7 countries are Canada, France, Germany, Italy, Japan, the UK and the US.
2 The Brics countries are Brazil, Russia, India, China and South Africa.
3 The euro area figures relate to the euro area as a whole and do not include intra-euro area assets or liabilities.
4 Total exports and imports, in % of GDP.
5 Total external assets and liabilities, in % of GDP.

Financial globalisation is in part related to real globalisation since international trade both depends on and generates financial linkages. Trade needs to be financed and it therefore induces cross-border payment flows. It may also require hedging, when denominated in foreign currency or when conducted in a risky environment. Finally, it can boost foreign direct investments, for instance when companies decide to establish global value chains to optimise production costs. Trade thus induces the accumulation of international assets and liabilities and, usually, countries that are more involved in trade are also more financially open.

Nevertheless, financial globalisation is also characterised by intricate financial links established solely for financial purposes (BIS, 2017). As the demand for, and supply of, financial products and services increases with the wealth of businesses and households, financial openness tends to increase with the income level. It is therefore no surprise that financial globalisation has grown much more rapidly than international trade since the 1980s. However, in some countries, part of the financial integration might contain an "artificial" component related to tax-optimisation strategies which inflate assets and liabilities to a similar extent (e.g. through cross-border intragroup loans, see also section 3). Since the global financial crisis of 2008-2009, the growth in cross-border asset positions in relation to GDP (i.e. capital flows) has slowed down significantly[1]. Three factors may be put forward to explain this development. The first is precisely a deceleration of international trade and a demand-induced weakness in trade-intensive physical investments. The second is a decline in cross-border activity by banks, concentrated in bank loans, and largely confined to European banks (BIS, 2017). And the third is simply an increase in the relative weight of emerging market economies in global GDP while, at the same time, these economies tend to be less financially integrated (i.e. hold lower external assets and liabilities) compared to advanced economies.

Nonetheless, the outstanding external assets and liabilities of both emerging and developed economies remain close to their highest level. Like Rey (2015), we take this as a starting point to analyse whether this has implications for the evidence in favour of the global financial cycle and its transmission.

1 For a detailed description of the evolution of financial globalisation since the global financial crisis, see Lane and Milesi-Ferretti (2017).

2. Financial cycles in the euro area

2.1 Financial conditions index

The previous section showed that the literature finds evidence of a global financial cycle in both capital flows and financial conditions. Our work mainly relates to this second branch of literature (e.g. impact of the GFC on asset prices and credit growth, as in Obstfeld *et al.*, 2017). Since we want to broaden our scope as much as possible, this also raises the question concerning which financial conditions we should consider; that question is closely linked to the discussion on exactly what a financial cycle is.

Although there is currently no generally accepted definition of the financial cycle, it is often described as a cyclical movement common to multiple financial sector segments, such as credit and real estate markets (see e.g. Borio, 2012 and Drehmann *et al.*, 2012). To operationalise this definition, composite indicators are a useful tool for extending the standard univariate approach (e.g. credit-to-GDP gap as financial cycle measure)

to more holistic approaches where the financial cycle is extracted from a large range of relevant data. The methodology behind our composite indicator, the financial conditions index (FCI), is described in box 2.

The FCI offers a view on the properties of the financial cycles in the euro area countries. Understanding the development of the financial cycle is key for macroprudential policy. The literature suggests that the financial cycle is subject to a boom/bust profile. During the boom phase, systemic risks are building up and the peaks of the cycle can serve as early warning signals for financial crises.

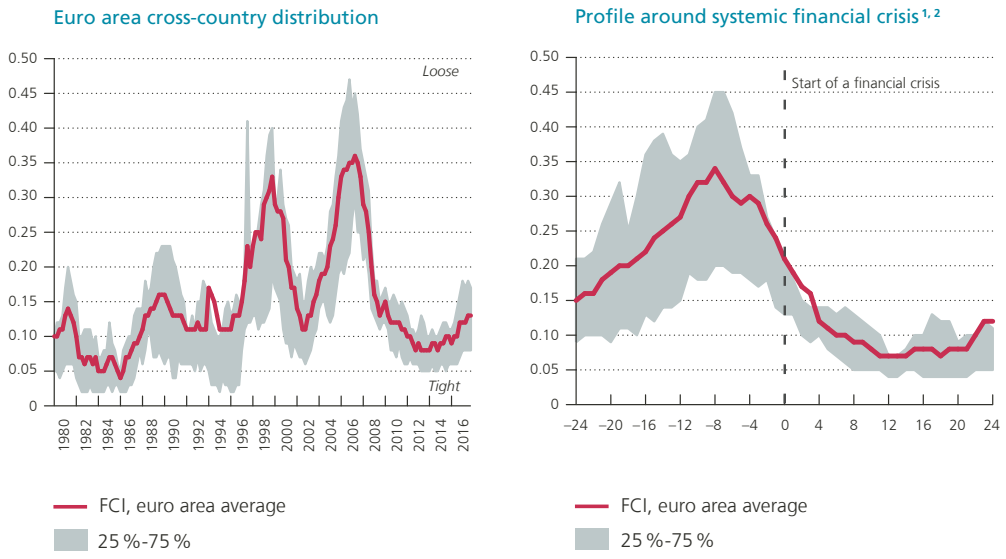
Notwithstanding its importance, empirical analysis regarding the features of the financial cycle in Europe is scarce. A limiting factor is the lack of a consensus definition for the financial cycle, regarding both its composition and its methodology. The difficulty of obtaining harmonised long-term series in Europe also plays a role. Merler (2015) and Schüler *et al.* (2015) were among the first to characterise the financial cycle in Europe. Both authors find – as "stylised facts" – that financial cycles are in general longer than the traditional business cycle, thereby confirming the findings of Borio *et al.* (2012). Both authors point to the existence of a financial cycle in the euro area with a clear boom/bust profile around financial crises, illustrating its early warning capabilities. However, financial cycles show strong heterogeneity/divergence across euro area countries, with varying amplitudes and different cyclical positions[1].

As shown in Chart 2, the FCI largely confirms these findings. Note that our financial cycle measure is more broadly defined than the concepts utilised in Merler (credit and house prices) and Schüler (credit, house, equity and bond prices). The average FCI in the euro area (Figure 2 – left panel) shows evidence of a boom-bust profile and reaches its highest peak before the global financial crisis of 2008. On average, the FCI results in persistent cycles that operate at lower frequencies than the classic business cycle. Figure 2 (right panel) depicts how the

1 Germany's "safe-haven" status is likely to contribute to its diverging financial cycle, resulting in higher demand for German government bonds when global risk aversion increases. Furthermore, in the first part of the sample, German house prices deviated from the general rising trend due to the oversupply caused by house-building incentives after German reunification. These elements might explain the "atypical" behaviour of the German FCI.

Chart 2

Financial conditions index as a measure of the financial cycle



Sources: ECB, NBB.

1 Number of quarters before (–) or after (+) the start of a financial crisis.

2 Crisis events as in Lo Duca et al. (2017) and defined as all systemic crises with at least partly domestic origin and considered by European national authorities as relevant from a macroprudential perspective.

FCI starts to increase well ahead of systemic crises and reaches its peak around 2 years before a crisis starts. It can be shown that the FCI has good early warning properties (AUROC [1] above 0.85), that outperform those of univariate financial cycle measures such as the credit-to-GDP gap [2]. These properties hold for a majority of countries, although the FCI shows some cross-country heterogeneity (in particular in the build-up phase). The following section analyses this in more detail.

1 Area Under the Receiver Operating Characteristics. This measure roughly captures the probability of correct prediction, with 1 corresponding to perfect prediction and 0.5 to no predictive power (equivalent to tossing a coin).
2 For more details regarding the early warning performance of the FCI relative to other methods measuring cyclical systemic risk, see "Cyclical systemic risk measurement" (2019), ECB Occasional Working Paper, forthcoming.

BOX 2

Financial conditions index (FCI)

The FCI is a broad-based composite indicator of domestic financial conditions, aggregating five financial risk dimensions [1] (credit developments, real estate, private sector debt, banking sector and financial market conditions) into an overall indicator using time-varying weights based on the data correlation structure. The current version of the indicator contains 17 variables.

In a first step, the variables are transformed by means of order statistics [2] such that higher values indicate looser financial conditions and lower values correspond to tighter financial conditions. The order statistic of variable $x_{i,t}$ at time t is denoted by $z_{i,t}$, and $x_{i,[k]}$ denotes the k-th value in the (ascending) series of the variable x_i. These order statistics are calculated on the basis of the empirical distribution function and take a value between 0 (bust) and 1 (boom).

$$z_{i,t} = F(x_{i,t}) := \begin{cases} \frac{k}{T} \; for \; x_{i,[k]} \leq x_{i,t} < x_{i,[k+1]} \\ \\ 1 \; for \; x_{i,t} \geq x_{i,[T]} \end{cases}$$

In a second step, the sub-indices are compiled on the basis of an unweighted average of the order statistics of all the variables assigned to the specific sub-indices, where N_j denotes the number of variables assigned to the sub-index S_j and $z_{i,t}$ denotes the order statistic for each of these variables.

$$S_{j,t} = \frac{1}{N_j} \sum_{i=1}^{N_j} z_{i,t}, \qquad j = 1, \ldots, 5$$

1 The selection of risk dimensions is based on the categories suggested for monitoring cyclical systemic risk in ESRB recommendation ESRB/2014/1, with the exception of the risk category "external imbalances". The exclusion of this category benefits the analysis in the rest of this article, as we avoid endogeneity issues between our measure of domestic financial conditions and international capital flows.
2 The use of order statistics is relevant as it makes the resulting statistic(s) less sensitive to extreme realisations of the variable (see Holló *et al.*, 2012).

In a third step, the sub-indices are aggregated into an overall indicator of the financial cycle by applying both an index-specific and a time-varying weighting function, following Holló *et al.* (2012). Denoting the vector of index-specific weights by w and the vector of the value for the sub-indices at time t by $\boldsymbol{S}_t$, the financial cycle indicator, FCI_t, can be constructed as the weighted quadratic form of the sub-indices.

$$FCI_t = (\boldsymbol{w} \circ \boldsymbol{S}_t)' \boldsymbol{Q}_t (\boldsymbol{w} \circ \boldsymbol{S}_t)$$

with $\circ$ the Hadamard-product and $\boldsymbol{Q}_t$ a time-varying weighting matrix reflecting the time-varying (positive) bilateral co-movement between the respective variables. The latter is constructed by taking – element-wise – the maximum between zero and the time-varying pair-wise correlations between each combination of sub-indices. The pair-wise correlations are constructed using an exponentially weighted moving average (EWMA) filter for the variance-covariance matrix. In operationalising this statistic, the index-specific weights are equal to 0.2 (or 1/number of $\boldsymbol{S}_t$).

FCI composition: 17 data series

Series (17)	Transformation	Sample (max)
Sub-index 1: Credit developments (3 series)		
Bank credit gap NFPS	gap, % points	1970 Q4
HH bank loan growth	y-o-y %	1998 Sep
NFC bank loan growth	y-o-y %	1998 Sep
Sub-index 2: Real estate (5 series)		
Price-to-income ratio, level	level	1970 Q1
Price-to-income ratio, gap	gap, % points	1971 Q1
Affordability[1], level	level	1996 Q1
Affordability[1], gap	gap, % points	1997 Q1
Nominal house prices, gap	gap, % points	1970 Q1
Sub-index 3: Private debt (3 series)		
Debt-to-GDP ratio NFPS	y-o-y difference	1971 Q4
Debt service ratio HH	y-o-y difference	1981 Q4
Debt service ratio NFC	y-o-y difference	1981 Q4
Sub-index 4: Banking sector (4 series)		
Financial sector assets	y-o-y %	2000 Q1
Bank lending margin	level (-)	2003 Q1
Credit spread HH loans (vs 10Y sovereign)	level (-)	2003 Jan
Credit spread NFC loans (vs 10Y sovereign)	level (-)	2003 Jan
Sub-index 5: Financial markets (2 series)		
Real equity prices	y-o-y %	1981 Q1
Bond yield: 10Y sovereign	level (-)	1970 Q1

Sources: ECB, NBB.
Note: Gap measures calculated using a Hodrick-Prescott filter consistent with the Basel credit gap (lambda = 400 000).
1 Estimates of the over/undervaluation of residential property prices: average of different valuation measures for all types of property.

Next, we use a weight of 0.98 in the EWMA for the variance-covariance matrix which assigns a significantly larger weight to more recent observations. In any given period, the FCI maximum (minimum) value of 1 (0) can be attained only if each of the sub-indices reaches the maximum (minimum) value at a time where the cycles are also perfectly coincident.

Input and output

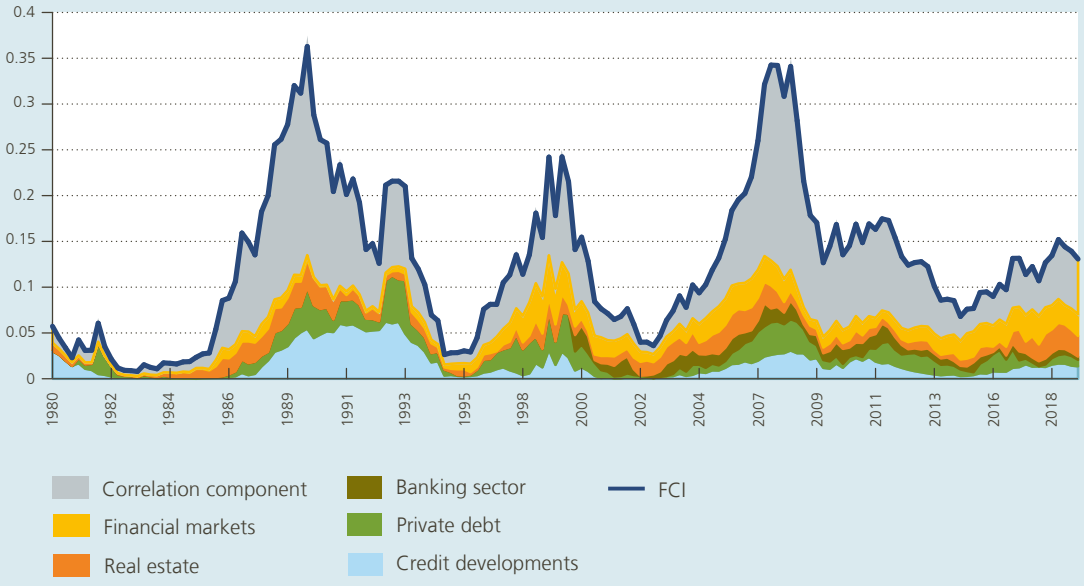
As an input, 17 variables are used which are presumed to be relevant for shaping the financial cycle. The selection is based on the empirical literature and availability over a longer time period. Our sample contains the euro area countries. The data go back as far as 1970Q1, but the length of the time series varies across series and countries[1]. The data set is mixed in terms of frequency (monthly and quarterly), nominal and real variables, levels, data in differences and gap measures (using a recursive HP-filter). The indicators with quarterly frequency are transformed to a monthly frequency using standard linear interpolation[2].

1 Provided the financial cycle can take more than 20 years, preference was given to long-term series. In the case of missing variables, the sub-indicators take the average over the other variables. If data are missing at the level of the sub-indicators, weights are adjusted (1/number of sub-indicators). The use of order statistics and weighted averages limits the impact of this changing composition on the aggregate index.

2 The indicator is calculated using a balanced sample at the end. To cater for different publication lags, missing observations are replaced by the latest observation.

Financial conditions index (FCI) for Belgium and sub-components

(1980Q1-2019Q2)



Source: NBB

The main output is the composite FCI indicator on a monthly or quarterly basis (transformed by taking averages). The chart below illustrates the FCI and its sub-components for Belgium.

By construction, the FCI offers an absolute interpretation for financial conditions, as the variable is contained between 0 and 1. In any given period, the maximum (minimum) value of 1 (0) can be attained only if each of the sub-indices reaches the country-specific maximum (minimum) value at a time where the cycles are also perfectly coincident. Moreover, increases in the FCI can arise because of either an increase in (some of) the individual sub-indices (risk dimensions) or because of an increase in the co-incidence in the cycles of the respective sub-indices. The financial conditions indicator thus explicitly takes into account the correlation between the financial variables. This correlation or co-movement is an essential feature of financial cycles and tends to be strong around financial crises. As an intermediate product, the (unweighted) sub-indices – which average the order statistics of the variables – can be used to monitor tensions in the specific risk categories.

2.2 Synchronisation and correlation of the FCI with the global financial cycle

Based on the correlation between the individual countries' FCI and the average euro area FCI, synchronisation of financial cycles is – on average – relatively high (average bilateral correlation of 0.74). However, there is substantial cross-country heterogeneity, with weaker correlations for some countries (0.18 for Germany) and stronger correlations for others (0.94 for France). Note that in contrast to the business cycle, large economies may deviate markedly from the average euro area financial cycle.

The key question we raise in this article concerns the degree of synchronisation between the financial cycle in the euro area and the global financial cycle. As a starting point, we therefore calculate the correlation between the average euro area FCI[1] and a measure of the global cycle. For the latter we use the "Global Stock Market Factor" of Habib and Venditti (2019). This factor is extracted from a global panel of stock market returns. Alternative measures include the Miranda-Agrippino and Rey factor (2019) which captures the common component in 858 asset price series. Since the various measures of the GFC tend to be highly correlated (Habib and Venditti, 2019), the results are in general robust to the choice of GFC measure.

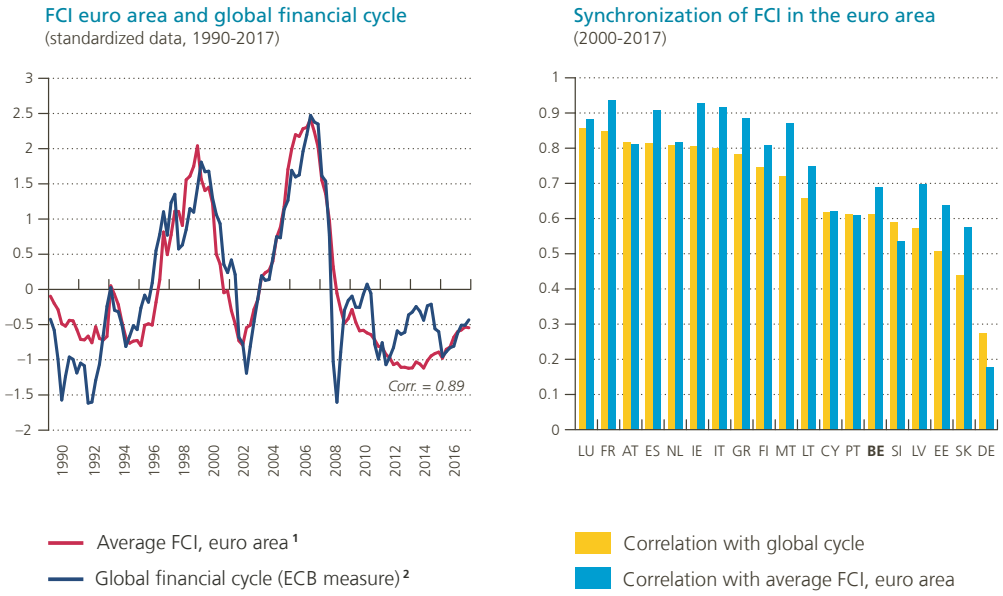
It turns out that the average euro area FCI and the global financial cycle measure are highly correlated (0.89). The high correlation is remarkable, given that the two measures have different purposes (domestic financial conditions versus global financial cycle), are derived from completely different datasets (broad spectrum of macrofinancial series versus stock market returns) and are based on different methodologies (composite index versus factor analysis).

The strong correlation with the global financial cycle also holds at the level of the individual countries, albeit to varying degrees. The correlation ranges from 0.27 (Germany) to 0.86 (Luxembourg) and is largely in line with the synchronicity of each country's cycle within the euro area.

1 Throughout this paper we use the average FCI as representing the euro area financial cycle. Alternatively, one could apply a principal component analysis. The variance of our euro area average largely corresponds with the result of a principal component analysis (selecting two factors) and has the advantage of being simple.

Chart 3

Are financial conditions in the euro area correlated with the global financial cycle?



Sources: ECB, NBB.

1 Financial conditions index, euro area cross-country average.

2 Global financial cycle measure from Habib and Venditti (2019).

3. How sensitive are euro area countries to the global financial cycle?

So far, we have shown that domestic financial conditions in the euro area are closely linked to the global financial cycle. At the same time, the correlation with the GFC differs across countries, suggesting that the countries' co-movement with the GFC is influenced by country-specific factors. Which features can magnify or attenuate countries' sensitivity to the GFC? The most natural candidates are the policy variables of the financial trilemma, i.e. financial account openness and the exchange rate.

Most of the literature analysing the sensitivity of financial conditions to the GFC has been concentrating on these variables, and in particular on the exchange rate regime (Rey, 2015; Obstfeld *et al.*, 2017). In general, the evidence is mixed, resulting in varying conclusions regarding the existence of a financial trilemma (the exchange rate matters) or dilemma (the exchange rate is irrelevant). Since euro area countries share the euro as single currency, the exchange rate cannot explain the differences in the impact of the GFC across countries. The only remaining variable is the financial account openness (i.e. the degree of financial integration).

In fact, the external assets and liabilities form a key channel through which global financial conditions are transmitted to an economy. Apart from financial openness, which we can quantify by means of the gross position defined as the sum of external assets and liabilities scaled by GDP, we add other dimensions of the countries' external funding as potential determinants for their sensitivity to the GFC.

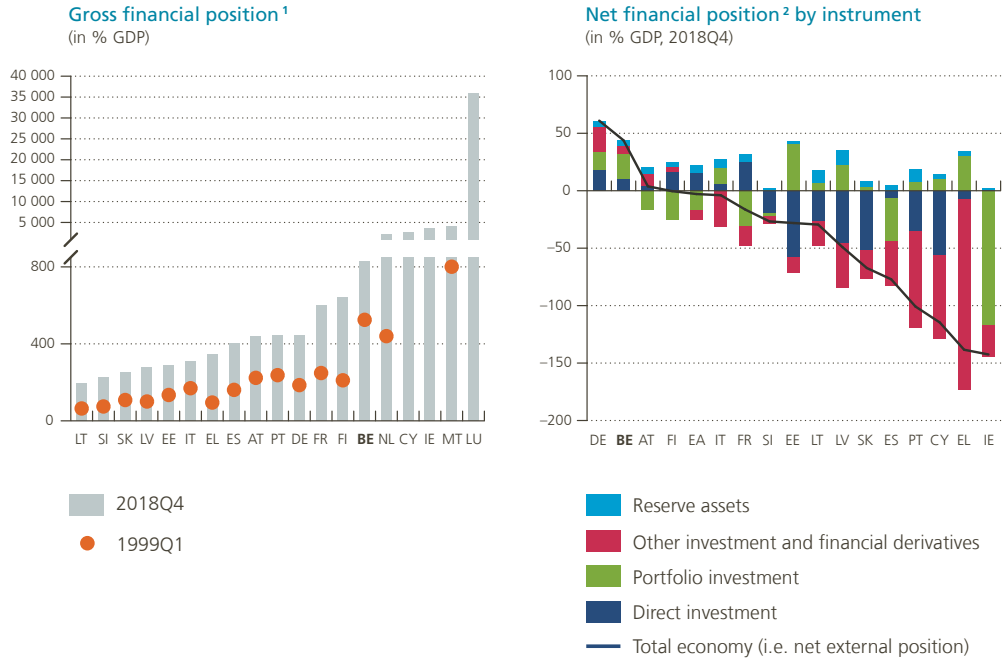
These other dimensions include the composition of the external funding in terms of instruments (direct, portfolio and other investment). Also, apart from the gross position, we analyse the possible role of the net position, which equals the difference between the external assets and liabilities scaled by GDP (i.e. the net international investment position – NIIP). A last dimension, as a complement to the stocks, comprises the gross and net capital flows, including their breakdown by instrument.

The external funding is a natural candidate to influence the impact of the GFC, not only because a strong relationship between domestic credit growth and international capital flows is an established fact (Lane and McQuade, 2013) but also because the literature has shown that the global financial cycle has a significant influence on capital flows themselves (Forbes and Warnock, 2012), be it in gross or net terms (Davis *et al.*, 2019) or by type of capital flow (Avdjiev *et al.*, 2018). Global factors, such as US interest rates or global risk aversion act as "gatekeepers" for capital in- and outflows to and from emerging economies (Ghosh, Qureshi, Kim and Zalduendo, 2014). Habib and Venditti (2019) provide evidence of a "global capital flows cycle". Moreover, it has been shown that, during financial crises, some capital flows tend to be more volatile than others (Bussière, 2016). As such, we expect that the size and composition of the external funding plays an essential role in determining countries' sensitivity to the GFC, particularly in the euro area, where there are wide cross-country variations in the size and composition of the external funding, whereas the exchange rate is the same for all countries.

Figure 4 shows the cross-country variation in the gross and net external position. As advanced economies, the euro area countries show a high degree of financial integration. In all economies the stock of external assets and liabilities exceeds GDP. As explained in box 1, financial integration has increased markedly, particularly in the euro area where the euro acted as a catalyst for cross-border financial flows since the creation of the EMU. Although that process has come to a halt since the financial crisis, with lower capital flows, the outstanding stocks are still close to their highest levels. As mentioned in box 1, apart from the macroeconomic fundamentals, the fiscal regime and presence of large multinationals in some countries contributes to "accounting-inspired" flows that inflate assets and liabilities to a similar extent (e.g. cross-border intragroup loans), making part of the integration artificial and volatile. In these "financial centres", the gross position takes extreme values (above 1000% GDP).

Chart 4

Gross and net financial position



Sources: ECB, IMF, NBB.

1 Sum of the external assets and liabilities.

2 Difference between the outstanding assets and liabilities, by financing instrument.

The net position is unaffected by these "artificial" flows, insofar as they drive up assets and liabilities to the same extent. Nonetheless, the NIIP also shows substantial cross-country differences, ranging at the end of 2018 from –143 % (Ireland) to 61 % GDP (Germany). Most of the countries in the euro area are net debtors (liabilities exceed assets). The NIIP is the aggregate net wealth of the domestic sectors, and large negative values are considered unsustainable. The NIIP is monitored closely within the enhanced European economic governance framework (European Semester) since it is one of the indicators included in the Macroeconomic Imbalance Procedure (MIP). Values below –35 % GDP can be considered as an excessive imbalance. The chart further decomposes the NIIP according to the type of funding. Among the net debtors, a large part of the funding consists of other investment, which is mainly bank-related funding.

In the next section, we analyse whether the size and composition of the external position of the euro area countries can explain the difference in sensitivity to the GFC. For this purpose, we constructed a dataset for the 19 euro area countries on a quarterly basis since 1990, relying on Eurostat/ECB and on the IMF Balance of Payments Statistics for historical data. The dataset contains both external assets and liabilities, capital in- and outflows and a breakdown by main "functional" categories (direct, portfolio and other investment). Series that showed a break between the two sources were retropolated. Where necessary we interpolated the annual observations linearly to obtain quarterly data.

4. Empirical results on sensitivity to the global financial cycle

This section provides empirical evidence on (i) whether domestic financial conditions in the euro area countries move in line with the global financial cycle and (ii) to what extent this co-movement is magnified or attenuated by features of their external funding. Therefore, we let various variables "interact" with the GFC, such as the gross and net external position, as well as the gross and net capital flows. To that end, we estimate the following panel regression specification:

$$FCI_{it} = \alpha_i + \beta GFC_t + \delta GFC_t \times Z_{it} + \sum_{k=1}^{K} \gamma_k x_{it,k} + \varepsilon_{it}$$

in which FCI_{it} denotes the domestic financial conditions index of country i and GFC_t is the global financial cycle (taken from Habib and Venditti, 2019). To gain insight into what drives countries' sensitivity to the GFC, Z_{it} captures the various features of their external funding, which we let interact, one-by-one, with GFC_t. E.g. if $Z_{it} = NIIP_{it}$, defined as assets minus liabilities scaled by GDP, δ indicates the degree to which countries' sensitivity to the GFC depends on their net international investment position. We make a similar assessment in the other regressions that test for the relevance of the gross external position ($Z_{it} = GIIP_{it}$, sum of external assets and liabilities scaled by GDP), gross flows ($Z_{it} = Gross\ flows_{it}$, average of in- and outflows scaled by GDP) and net flows ($Z_{it} = Net\ flows_{it}$, difference between out- and inflows scaled by GDP). α_i captures country fixed effects and $\boldsymbol{x}_{it}$ is a vector of lagged macroeconomic control variables taken from the literature (domestic and global inflation, domestic and global real growth, real and financial openness of the country; see Rey, 2015; Obstfeld *et al.*, 2017; Davis *et al.*, 2019; Habib & Venditti, 2019 who use a similar framework to analyse the impact of the GFC).

All models are estimated using ordinary least squares on a sample of euro area countries. Standard errors are clustered at the country level. All variables are at the quarterly frequency running from 1990Q1-2017Q4. Stationarity is verified along the lines of Im, Pesaran & Shin (2003). We drop the countries identified as "financial centres" from the analysis as their gross capital flows materially exceed GDP and are typically very volatile.[1]

1 We consider Luxemburg, Malta, Cyprus, Ireland and the Netherlands as financial centres since the sum of their external asset and liabilities exceeds 1000 % GDP. Note that Belgium is a borderline case with the gross position amounting to 826 % GDP at the end of 2018 (due to a large share of intragroup loans). Also, Slovenia is excluded from our analysis due to a lack of sufficiently long series.

All models include quarterly dummies and a linear time trend. In unreported results, we document the results presented below to be robust to various modifications to aforementioned set-up.[1]

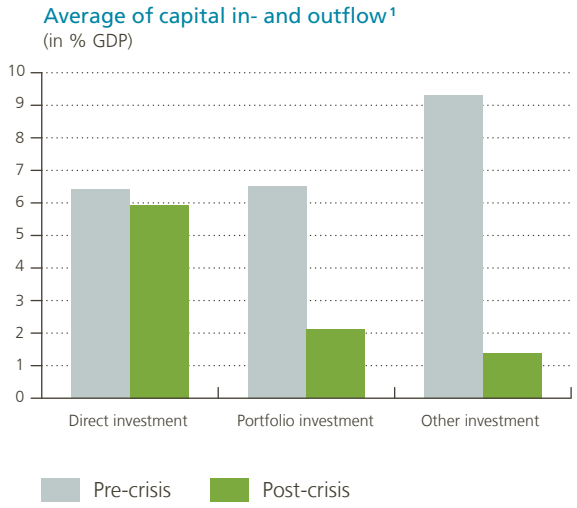
Table 1 (in annex) summarises the main results. Column (1) shows that domestic financial conditions in the euro area are positively related to the global financial cycle. Quantitatively, a 1.0 standard deviation (s.d.) increase in GFC_t is associated with a 0.27 s.d. increase in the FCI_{it}. It is worth emphasising at this point that the regression coefficient indicates correlation – not causality (see also Rey, 2015 for a discussion). Importantly, column (2) reveals that this co-movement is stronger for countries that have a negative net external position (negative coefficient). In order to better appreciate the quantitative significance of this result, specification (3) replaces the interaction term with $GFC_t \times NIIP_{it,<0}$, where

$$NIIP_{it,<0} = \begin{cases} 1 \; if \; NIIP_{it} < 0 \\ 0 \; if \; NIIP_{it} \geq 0 \end{cases}$$

The interaction term in column (3) indicates that this increased co-movement is sizeable: in absolute terms, a 1.0 s.d. increase in the GFC_t is on average associated with a 0.43 s.d. (0.21 s.d.) increase in the FCI_{it} for countries with a negative (positive) net external position. In other words, the domestic financial conditions of countries that have a negative net external position comove approximately twice as strong with the global financial cycle than in the countries with a non-negative net position. Specification (4) suggests that this is more generally true for countries with a relatively small net external position[2]. Countries with a relatively large net position seem to be insulated from the global financial cycle.

Chart 5

Other investment less stable than other funding sources



Sources: ECB,NBB.

1 Averages over pre-crisis (2002Q4-2007Q4) and post-crisis (2008Q1-2018Q4) period for euro area capital in- and outflows.

1 A battery of robustness tests all confirm our baseline results: e.g. (i) trimming, (ii) the inclusion of financial centres, (iii) the use of an alternative measure for GFC_t taken from Miranda-Agrippino and Rey (2019), (iv) inclusion of lags of the dependent variable and (v) Driscoll-Kraay standard errors (to account for possible cross-sectional and temporal dependence in the error term ε_{it}).

2 Countries with a net external position below the first quartile are considered to have a relatively small position. We also tested the co-movement with the GFC of countries with NIIP<-35 % GDP as this is the threshold used in the MIP to identify macroeconomic imbalances. It turns out that those countries are the most sensitive to the GFC, which provides an additional justification for close monitoring of these countries.

The importance of the gross position $(Z_{it} = GIIP_{it})$, for the euro area countries' sensitivity to the GFC is analysed in column (5). Contrary to our expectations and the literature (Rey, 2015), we find the gross position insignificant for the co-movement of domestic financial conditions with the GFC. A possible explanation might be that financial integration in the euro area has reached such a high level that an additional increase or decrease makes no difference for the transmission of global factors. This might also explain the differences in relation to the findings in the literature which mainly hold for emerging economies, which are far less financially integrated than the euro area countries.

In Table 2, we disentangle the net external position of the country into three sub-categories: other investment (OI), direct investment (DI) and portfolio investment (PI). Column (2) reveals that the increased co-movement arises mainly as a result of net positions in OI and – to a smaller extent – DI[1]. The crucial role of other investment in countries' sensitivity to the GFC is not surprising as the literature also found that the GFC had the strongest impact on the other investment capital flows (Habib and Venditti, 2019). Moreover, Broner *et al.* (2013) and Bussière *et al.* (2016) showed that, around crises, other investment experiences the sharpest drop. In particular, the banks' debt funding flows proved the most sensitive to the "sudden stop" during the 2008 financial crisis (Milesi-Ferreti and Tille, 2011). Consistent with the findings of Bussière *et al.* (2016), other investment displayed the highest volatility of all capital flows in the euro area during the financial crisis, while direct investment was far more stable (see Chart 5). Consequently, financial conditions in countries that finance themselves more through other investment are more likely to reflect an inherent boom/bust profile.

While an advantage of our analysis is that we aggregate all financial conditions into one figure, it might also be relevant to look at the reaction of the various financial sub-indexes. Remember that the FCI_{it} is a composite indicator which aggregates five risk dimensions (credit developments, real estate, private sector debt, banking sector and financial market conditions). We therefore decompose our results from Table 1 column (3) and replace FCI_{it} with each of these five risk dimensions. Figure 6 plots the coefficient of $\hat{\beta}$ and $\hat{\beta}+\hat{\delta}$ for each subcategory of FCI_{it}. Coefficient $\hat{\beta}$ ($\hat{\beta}+\hat{\delta}$) then quantifies the co-movement of the various financial conditions with the global financial cycle for countries with a positive (negative) net external position.

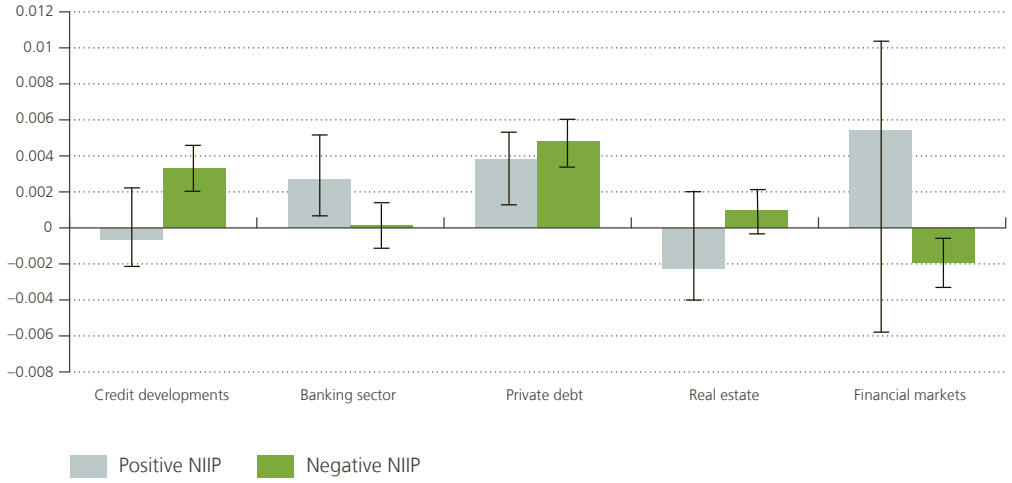
Interestingly, the decomposition shows a diverse picture. Credit developments and private sector leverage tend to respond as expected: lending and leverage increase in countries with a negative NIIP and the impact of an upturn in the GFC is magnified. Note that the "shielding" of countries with a positive NIIP is strongest for credit developments, although the coefficient is not significant. Also, real estate markets in countries with a negative NIIP are more vulnerable to GFC movements. However, the response is smaller than in the case of credit and leverage developments. Moreover, as shown by the countercyclical reaction in countries with a positive NIIP, house prices in the euro area tend to behave differently, which confirms the evidence that these markets in the euro area are "separated along national lines". The most counter-intuitive results are found for the banking sector and the financial markets. For the banking sector, statistical significance might play a role as this sub-indicator holds less observations than the other indices. In the case of financial markets, safe-haven flows addressed to countries with a positive NIIP, in particular Germany, might play a role.

In sum, our results presented in this section show that domestic financial conditions in the euro area tend to co-move strongly with the global financial cycle, in particular in those countries that have a negative net international investment position and finance themselves through other investment. The impact of capital flows on sensitivity to the GFC is analysed in the next section against the background of recent developments.

1 We performed a similar estimate with the breakdown of the gross position. All detailed gross positions are insignificant and thus confirm the result for the total gross position.

Chart 6

Some financial conditions are more sensitive than others [1]



Source: NBB.

1 Y-axis shows the coefficient on the global financial cycle, calculated as $\hat{\beta}$ ($\hat{\beta}+\hat{\delta}$). Vertical bars indicate the 95% confidence interval surrounding the estimated coefficients.

5. Recent developments and role of capital flows

The effects of the GFC and sensitivity to its boom/bust profile were most evident during the financial crisis of 2008. To estimate the impact of a future global shock, it is worthwhile to analyse whether policies in the euro area since then have (intentionally or unintentionally) contributed to a reduction in sensitivity to the GFC.

Regarding the NIIP, Chart 7 (left panel) shows a mixed picture, with about half of the countries recording an improvement since the crisis. While in the majority of countries a flow adjustment took place (i.e. an improvement in the current account), stock imbalances as measured by the NIIP have been persistent in the euro area. Some of the largest net debtors even saw a further deterioration in their negative NIIP, given slow economic growth and the cost of the debt burden [1]. In the light of this, as mentioned before, the NIIP is monitored under the Macroeconomic Imbalance Procedure (MIP), and NIIP<-35% GDP can be considered as excessive. Despite this monitoring framework, large negative NIIP values continue to exist.

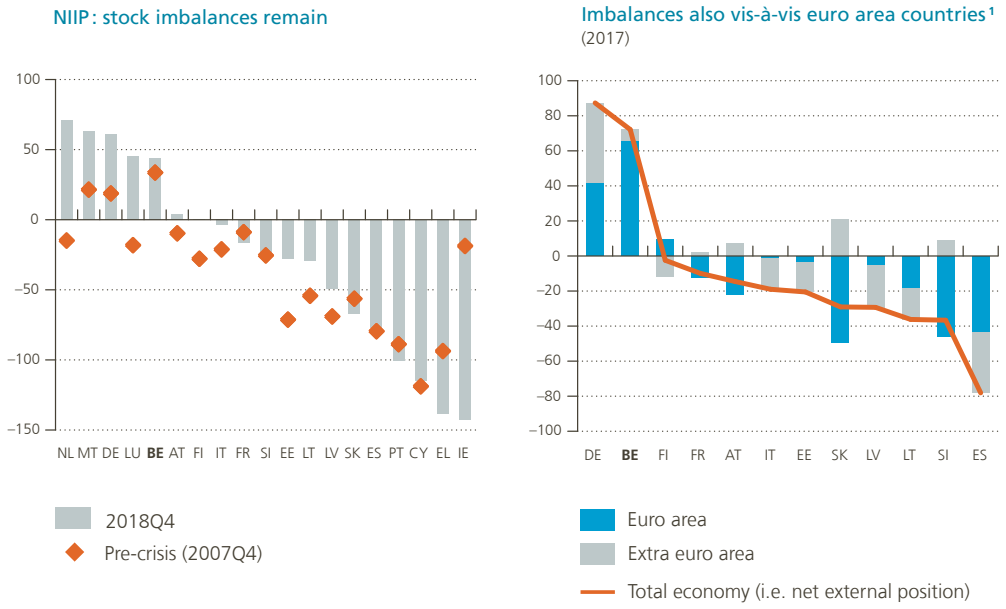
A geographical breakdown, shows that a large part of the net claims and liabilities is vis-à-vis other euro area countries [2], which also explains why at the level of the euro area, the consolidated NIIP is only slightly negative. This is important, as it shows that the significance of the NIIP for sensitivity to the GFC is rather due to debt sustainability issues (the overall NIIP figure), than to spill-over effects coming from the direct holdings of external assets and liabilities (the extra-euro area part of the NIIP). So, even if a country does not hold extra-euro area assets, most likely it would still find itself vulnerable to the global financial cycle due to debt sustainability issues. The importance of intra-euro area balances and capital flows for financial conditions has also been raised by Merler (2015).

1 This cost is reflected in development of the investment income balance (part of the balance of payments). It should be noted that in the aftermath of the financial and sovereign debt crisis, policies in the euro area limited these costs for the net debtors via monetary policy and the "official" ESM funding.

2 Based on the Finflows database of the European Commission (JRC-ECFIN), pre-release version of July 2019. The Finflows dababase contains yearly bilateral financial investment positions between OECD, EU, and offshore countries (stocks and flows) from 2001 to 2017.

Chart 7

Has the net financial position improved since the financial crisis?

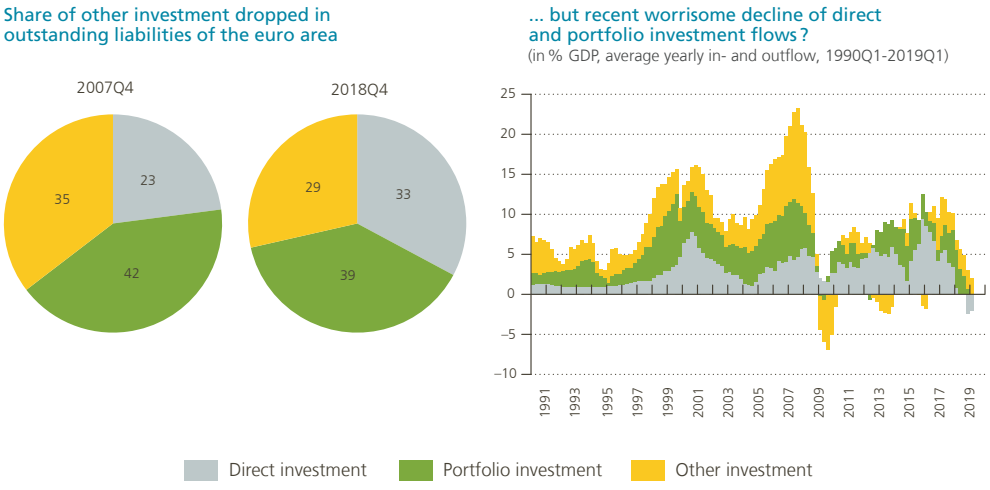


Sources: EC, ECB, NBB.

1 Geographical breakdown based on "Finlows database" of the European Commission (JRC-ECFIN). Pre-release version of July 2019.

Chart 8

Has the financing mix improved since the financial crisis?



Sources: ECB, NBB.

While the NIIP did not improve, adjustment in the financing instruments might have contributed to a lower sensitivity. Since the financial crisis, we have seen a drop in the dependence on other investment. Both capital in- and outflows of other investment declined relative to other financing instruments. As a result, the share of other investment in the outstanding liabilities of the euro area was down from 35 % at the end of 2007 to 29 % in 2018. Most of this reduction can be related to the drop in the cross-border funding of banks, with the latter re-focusing on their domestic markets. While this is a positive trend in view of our results, the development of the other funding sources is not irrelevant. In that context, we notice a recent setback in all (gross) capital flows, with negative flows for direct and portfolio investment.

In order to shed some light on the importance of the recent capital flows we perform additional estimations, where we let the different flows interact with the global financial cycle. We run estimations for both gross and net flows, and for their breakdown by instrument (Table 3). The results confirm that sensitivity to the GFC is mainly driven by other investment (flows). In line with the result for the positions, it is the net rather than the gross flows which are significant. Viewed in terms of exposure to the GFC, the current setback in gross capital flows is therefore not necessarily good or bad news, although it does indicate a decline in financial integration.

The finding that net flows are more significant corroborates the idea that sustainability issues are at the root of sensitivity to the GFC. Gross flows, together with the gross position, are less important. These findings contrast with those of Farhi *et al.* (2012) and Rey (2015) for a sample of emerging and advanced countries. We attribute our finding to the fact that gross flows and positions might lose some of their significance in the euro area given the level of financial integration reached and the smaller potential for mismatches between assets and liabilities (e.g. no exchange risk on the euro area exposures).

6. Policy implications

Besides the fact that domestic financial conditions in the euro area seem strongly linked to the global financial cycle (GFC), our econometric results show that cross-country sensitivity to the GFC depends crucially on the net international investment position. Countries with net liabilities react twice as strongly as countries that have net assets. Moreover, especially those which finance themselves by other investment (mainly debt funding of banks) prove vulnerable to the boom/bust profile of the global financial cycle.

These observations have various important policy implications for macroprudential, monetary and structural policies and the co-ordination between these domains. In this section we discuss the rationale behind these lessons.

First, the importance of the global financial cycle for euro area financial conditions adds a new "target" for macroprudential policy: mitigating and preventing exposure to the boom/bust profile of the global financial cycle[1]. An effective macroprudential policy indeed requires close monitoring of the global factors influencing domestic financial conditions. Moreover, it provides support to the idea that macroprudential policy in the euro area should be differentiated across member states, taking into account cross-country variations in sensitivity to the GFC.

While national policies can in general not influence the global cycle, they certainly can take measures to influence their exposure to this cycle. Our results clearly show that if a country wishes to reduce its exposure to the GFC, it could either limit the size of its net liabilities or change its financing mix. The most efficient way to improve the NIIP might be by reducing other investment liabilities, i.e. the cross-border debt funding of domestic banks.

1 Macroprudential policies are still at the development stage, and in practice still largely in search of clear targets. According to Smets (2014), macroprudential policy should have four targets: i) mitigate and prevent excessive credit growth and leverage, ii) mitigate and prevent excessive maturity and liquidity mismatch, iii) limit excessive exposure concentrations and iv) limit bail-out expectations. We thus add to this: mitigate and prevent exposure to the boom/bust profile of the global financial cycle.

Note that for both remedies (i.e. improving the NIIP and making its composition more robust), there are already policies in place within the EU, although they do not intentionally "target" the exposure to the GFC. These policies are part of the structural macroeconomic framework within the EU: the European Semester (within the MIP, NIIPs <35 % GDP can be qualified as excessive) and initiatives such as the banking union or the Capital Markets Union (CMU), which aim to broaden the financing sources in the EU and make them more robust.

Given the challenges macroprudential policy might experience to directly influence the NIIP and its composition due to the limited macroprudential toolkit and the difficulty of going beyond bank-related flows, these other (structural) policies have an important role to play. It should also be noted that within the EMU, the measures should be in line with the free movement of capital and should thus differ from capital flow management measures (CFM)[1].

Secondly, the strong correlation between domestic financial conditions in the euro area and the global financial cycle tends to confirm a financial dilemma for the euro area, along the lines of Rey (2015) for emerging economies[2]. Such a dilemma implies that whenever the financial account is open, monetary and financial conditions are largely in the hands of global factors and less in those of an independent monetary policy. We show that this dilemma in the euro area is particularly present when countries have a negative net external position.

Consequently, as a third lesson, apart from the call by some for international monetary policy co-ordination (Rajan, 2014), this calls in the euro area for co-ordination between macroeconomic (structural), macroprudential and monetary policy in order to reach their objectives. Addressing the negative external position and, more broadly, ensuring debt sustainability, as is currently done under the European Macroeconomic Imbalance Procedure (MIP), would most likely help to insulate the countries during risk-on/risk-off global regimes, thereby also contributing to financial stability objectives and independent monetary conditions in the euro area.

Finally, our work offers an interesting basis for further analysis in the domain of international finance, and in particular the transmission of global shocks and the policy implications for the euro area. It encourages research that looks into the need for co-ordination between policy domains as well as the need for international co-operation. Also, it illustrates the potential of closing the data gaps, such as a detailed geographical and sectoral breakdown of the NIIP. Based on the latter, additional insights might be obtained regarding countries' sensitivity to the GFC and the associated transmission mechanisms.

1 CFMs (IMF, 2012) are defined as measures that are designed to limit capital flows via administrative and price-based restrictions on capital flows.

2 In a recent update (Miranda-Agrippino and Rey, 2019) also questions the monetary independence of large and advanced economies, such as the euro area.

Conclusion

In this article, we analysed whether domestic financial conditions in the euro area countries are driven by a global financial cycle. To measure this effect, we constructed a financial conditions index (FCI) for the euro area countries, summarising their domestic financial conditions, and compared this index with a measure for the global financial cycle relying on the recent literature (Habib and Venditti, 2019).

Our results contribute to a burgeoning literature on the global financial cycle (GFC), which mainly looks into the effect of the GFC on capital flows of emerging economies. We complement these results with findings regarding the impact of the GFC on domestic financial conditions in the euro area countries.

First, we find a clear financial cycle for the euro area, with peaks that can be related to crisis events. There is, however, substantial heterogeneity across the euro area countries.

Secondly, financial conditions in the euro area are strongly linked to the global financial cycle. However, euro area countries show varying sensitivities to the global cycle.

In this article we link this cross-country sensitivity to the global cycle to various determinants, including the size and composition of the external financial position. A key finding is that sensitivity seems to depend crucially on the net international investment position. Countries with net liabilities seem to react twice as strongly as countries that have net assets. Among the countries with net liabilities, especially those which finance themselves by other investment (mainly debt funding of banks) prove vulnerable to the boom/bust profile of the global financial cycle.

Our results have several policy implications. First, it is useful for macroprudential policy to monitor the global financial cycle and/or help to address extreme sensitivity to its boom/bust profile. Secondly, the strong correlation between financial conditions in the euro area and the global financial cycle tends to confirm a financial dilemma for the euro area, along the lines of Rey (2015) for emerging economies. Such a dilemma implies that whenever the financial account is open, monetary conditions are largely in the hands of global factors and less in those of an independent monetary policy. We show that this dilemma in the euro area is particularly present when countries have a negative net external position.

At the same time, our results call for co-ordination between macroeconomic (structural), macroprudential and monetary policy to reach their objectives. Addressing the negative net external position and, more broadly, ensuring debt sustainability, as is currently done under the European Macroeconomic Imbalance Procedure (MIP), would most likely help to insulate the countries during risk-on/risk-off global regimes, thereby also contributing to financial stability objectives and independent monetary conditions in the euro area.

Annex: Tables

Table 1

Co-movement of the domestic / global financial cycle and role of NIIP

Dependent variable	Baseline	NIIP level	Negative NIIP	High vs. Low NIIP	GIIP Level
FCI_{it}	(1)	(2)	(3)	(4)	(5)
GFC_t	0.058***	0.037***	0.028**	0.041***	0.050**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
$NIIP_{it} \times GFC_t$		–0.0005**			
		(0.00)			
$NIIP_{it,<0} \times GFC_t$			0.030**		
			(0.01)		
$NIIP_{it,low} \times GFC_t$				0.041*	
				(0.02)	
$NIIP_{it,high} \times GFC_t$				–0.032	
				(0.03)	
$GIIP_{it} \times GFC_t$					0.000
					(0.00)
Domestic inflation$_{it-1}$	–0.686	–0.413	–0.487	–0.358	–0.544
	(0.56)	(0.57)	(0.59)	(0.55)	(0.60)
Domestic growth$_{it-1}$	–0.270	–0.409*	–0.473*	–0.369	–0.531**
	(0.20)	(0.22)	(0.23)	(0.21)	(0.22)
World inflation$_{t-1}$	0.045	0.041	0.028	0.087	–0.006
	(0.14)	(0.14)	(0.14)	(0.13)	(0.15)
World growth$_{t-1}$	–0.511	–1.002	–0.894	–1.029	–0.789
	(0.82)	(0.94)	(0.92)	(0.91)	(0.89)
N	1.454	1.136	1.136	1.136	1.136
R^2 adj.	0.399	0.410	0.396	0.428	0.388
Countries	13	13	13	13	13
Macroeconomic controls	x	x	x	x	x
Country fixed effects	x	x	x	x	x

Notes: The asterisks *, **, and *** indicate statistical significance at the 10 %, 5 % and 1 % level, respectively. Standard errors are reported in parentheses. The dependent variable, FCI_{it}, is the domestic financial conditions indicator. GFC_t proxies the global financial cycle and is taken from Habib and Venditti (2019). $NIIP_{it}$ = (*External assets*$_{it}$ – *External liabilities*$_{it}$)/GDP_{it} quantifies the net external position of country *i*. $NIIP_{it,<0}$ is a dummy variable taking the value 1 if $NIIP_{it} < 0$. Indicator variable $NIIP_{it,low}$ ($NIIP_{it,high}$) takes the value 1 if the country has a net position below (above) the first (third) quartile. $GIIP_{it}$ = (*External assets*$_{it}$ + *External liabilities*$_{it}$)/GDP_{it} quantifies the gross external position of country *i*. The set of national control variables also includes *Financial openness*$_{it}$ = (*External assets*$_{it}$ – *External liabilities*$_{it}$)/GDP_{it} and *Real openness*$_{it}$, which is a dummy variable if the sum of a country's exports and imports (over GDP) is larger than the cross-sectional mean. All specifications include a linear time trend and quarterly dummies.

Table 2

Sensitivity to GFC and type of external funding

Dependent variable	Net position	Negative net position
FCI_{it}	(1)	(2)
GFC_t	0.042***	0.020
	(0.011)	(0.023)
$Net\ OI_{it} \times GFC_t$	–0.001	
	(0.000)	
$Net\ DI_{it} \times GFC_t$	–0.000	
	(0.000)	
$Net\ PI_{it} \times GFC_t$	–0.000	
	(0.000)	
$Net\ OI_{it,<0} \times GFC_t$		0.049**
		(0.017)
$Net\ DI_{it,<0} \times GFC_t$		0.026*
		(0.015)
$Net\ PI_{it,<0} \times GFC_t$		0.004
		(0.016)
N	858	858
R^2 adj.	0.598	0.556
Countries	13	13
Macroeconomic controls	x	x
Country fixed effects	x	x

Notes: The asterisks *, **, and *** indicate statistical significance at the 10 %, 5 % and 1 % level, respectively. Standard errors are reported in parentheses. The dependent variable, FCI_{it}, is the domestic financial cycle indicator. GFC_t proxies the global financial cycle and is taken from Habib and Venditti (2019). $Net\ PI_{it}$ is the net portfolio investment position of country i, scaled by GDP. A similar definition applies to $Net\ DI_{it}$ (direct investment) and $Net\ OI_{it}$ (other investment). $Net\ PI_{it,<0}$ is an indicator variable taking the value 1 if $Net\ PI_{it}<0$ (similarly for DI and OI). All specifications include a linear time trend and quarterly dummies.

Table 3

Co-movement of the domestic / global financial cycle and role of net capital flows

Dependent variable	Direct investment (DI)	Portfolio investment (PI)	Other investment (OI)	Total investment
FCI_{it}	(1)	(2)	(3)	(4)
GFC_t	0.036***	0.038***	0.036***	0.034***
	(0.01)	(0.01)	(0.01)	(0.01)
$Net\ flows_{it} \times GFC_t$	–0.004***	–0.004***	–0.001	0.003
	(0.00)	(0.00)	(0.00)	(0.00)
$Net\ DI\ flows_{it} \times GFC_t$	0.001			–0.003
	(0.00)			(0.00)
$Net\ PI\ flows_{it} \times GFC_t$		0.003		–0.004
		(0.00)		(0.00)
$Net\ OI\ flows_{it} \times GFC_t$			–0.004**	–0.008**
			(0.001)	(0.00)
N	1.105	1.105	1.105	1.105
R^2 adj.	0.430	0.443	0.457	0.460
Countries	13	13	13	13
Macroeconomic controls	x	x	x	x
Country fixed effects	x	x	x	x

Notes: The asterisks *, **, and *** indicate statistical significance at the 10 %, 5 % and 1 % level, respectively. Standard errors are reported in parentheses. The dependent variable is the domestic financial cycle indicator, FCI_{it}. GFC_t proxies the global financial cycle and is taken from Habib and Venditti (2019). Net $flows_{it}$ is the difference between out– (+) and inflows (–). $Net\ DI\ flows_{it}$, $Net\ PI\ flows_{it}$ and $Net\ OI\ flows_{it}$ break down the net capital flows into net flows of direct, portfolio and other investment, respectively.

Table 4

Co-movement of the domestic / global financial cycle and role of gross capital flows

Dependent variable	Direct investment (DI)	Portfolio investment (PI)	Other investment (OI)	Total investment
FCI_{it}	(1)	(2)	(3)	(4)
GFC_t	0.028*	0.028*	0.030*	0.029*
	(0.01)	(0.01)	(0.01)	(0.01)
$Gross\ flows_{it} \times GFC_t$	0.002**	0.002	0.000	0.011
	(0.00)	(0.00)	(0.00)	(0.01)
$Gross\ DI\ flows_{it} \times GFC_t$	–0.002			–0.011
	(0.00)			(0.01)
$Gross\ PI\ flows_{it} \times GFC_t$		–0.001		–0.010
		(0.00)		(0.01)
$Gross\ OI\ flows_{it} \times GFC_t$			0.002	–0.009
			(0.00)	(0.01)
N	1.105	1.105	1.105	1.105
R^2 adj.	0.420	0.418	0.420	0.427
Countries	13	13	13	13
Macroeconomic controls	x	x	x	x
Country fixed effects	x	x	x	x

Notes: The asterisks *, **, and *** indicate statistical significance at the 10 %, 5 % and 1 % level, respectively. Standard errors are reported in parentheses. The dependent variable is the domestic financial cycle indicator, FCI_{it}. GFC_t proxies the global financial cycle and is taken from Habib and Venditti (2019). $Gross\ flows_{it}$ is the average of the in- and outflows (% GDP) of country *i*. $Gross\ DI\ flows_{it}$, $Gross\ PI\ flows_{it}$ and $Gross\ OI\ flows_{it}$ break down the total gross capital flow into direct, portfolio and other investment, respectively.

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Abstracts from the Working Papers series

372. Do SVARs with sign restrictions not identify unconventional monetary policy shocks?, by J. Boeckx, M. Dossche, A. Galei, B. Hofmann, G. Peersman, June 2019

Based on structural vector autoregressions (SVARs) identified through sign restrictions, more and more empirical literature has shown that unconventional monetary policies implemented after the outbreak of the Great Financial Crisis (GFC) had expansionary macroeconomic effects. In a recent paper, Elbourne and Ji (2019) conclude that these studies fail to identify true unconventional monetary policy shocks in the euro area. In this note, the authors show that their findings are actually fully consistent with successful identification of unconventional monetary policy shocks by the earlier studies and that their approach does not serve the purpose of evaluating SVAR identification strategies.

373. Research and development activities in Belgium: A snapshot of past investment for the country's future, by S. Vennix, July 2019

Recent changes in company law regarding the accounting and disclosure of research and development (R&D) expenditure in financial statements have triggered this research on the importance of such activities and their impact at microeconomic level. Using survey data, a solid sample of 1,964 R&D companies was compiled. Based on this sample, some of the main characteristics of R&D firms are presented, such as sector of activity, age, geographic location, etc.

In 2016, these 1,964 R&D entities together employed nearly 279,000 people and generated € 45 billion worth of value added, which represents 6 % of Belgium's domestic employment and 10.6 % of the country's gross domestic product. By means of statistical techniques, the microeconomic impact of R&D efforts on average annual growth of value added, average annual employment growth and average annual growth of labour productivity is investigated. Following this research, the conclusion is that R&D investment has generally had a positive impact on average annual growth of value added and average annual employment growth for periods of four years or longer. In a shorter timespan (less than four years), such a positive impact of R&D involvement could not be demonstrated. For the average annual growth of labour productivity, no evidence of any difference between the R&D and the non-R&D group was found.

374. State dependent fiscal multipliers with preferences over safe assets, by A. Rannenberg, July 2019

The author examines the effect of fiscal policy at the zero lower bound if households have preferences over safe assets (POSA) calibrated consistent with evidence on household savings behaviour and individual discount rates, and empirical estimates of the effect of the supply of US government debt on government bond yields. POSA attenuate the effect of changes in the household's permanent income on its consumption today and this implies a wealth effect from government bonds. It therefore strongly increases the multiplier of a permanent expenditure change, moving it much closer to the multiplier of temporary expenditure changes. The result becomes even stronger with credit constrained households and firms.

375. Inequality, the risk of secular stagnation and the increase in household debt, by A. Rannenberg, August 2019

The author investigates the effect of rising income inequality on the natural rate of interest in an economy with "rich" households with preferences over wealth and "non-rich" households, a housing market and credit market frictions. Simulating the increase in interpersonal and functional income inequality over the 1981-2016 period replicates the downward trend in the natural rate of interest estimated by Laubach and Williams (2016), with most of the increase in the debt-to-income ratio of the bottom 90 % of households and the upward trend in house prices observed during this period.

Conventional signs

%	percent
e	estimate
i.e.	*id est* (that is)
e.g.	*exempli gratia* (for example)

EUR	euro
USD	US dollar
BRL	Brazilian real
RMB	Renminbi

List of abbreviations

Countries or regions

BE	Belgium
DE	Germany
EE	Estonia
IE	Ireland
EL	Greece
ES	Spain
FR	France
IT	Italy
CY	Cyprus
LT	Lithuania
LU	Luxembourg
LV	Latvia
NL	Netherlands
AT	Austria
MT	Malta
PT	Portugal
SI	Slovenia
SK	Slovakia
FI	Finland
EA	Euro area
DK	Denmark
SE	Sweden
UK	United Kingdom
EU	European Union
EU28	European Union, including Croatia
CN	China
US	United States

Other abbreviations

AUROC	Area under the receiver operating characteristics
BIS	Bank for International Settlements

BQ	Blanchard-Quah
BRICS	Brazil, Russia, India, China, South Africa
CAI	Comprehensive Agreement on Investment
CBO	Congressional Budget Office
CCB	Centre for Cyber Security Belgium
CCP	Chinese Communist Party
CFIUS	Committee on Foreign Investment in the United States
CFM	Capital flow management measure
CMU	Capital Markets Union
DI	Direct investment
DRAM	Dynamic random-access memory
DSA	Debt sustainability analysis
DSGE	Dynamic stochastic general equilibrium
EC	European Commission
ECB	European Central Bank
EC JRC	European Commission Joint Research Centre
EME	Emerging market economy
EMU	European Monetary Union
ESCB	European System of Central Banks
ESM	European Stability Mechanism
ESRB	European Systemic Risk Board
EWMA	Exponentially weighted moving average
FCI	Financial Conditions Index
FDI	Foreign direct investment
FED	Federal Reserve
FG	Forward guidance
FIRRMA	Foreign Investment Risk Review Modernization Act
FPS	Federal Public Service
FRED	Federal Reserve Economic Data
GDP	Gross domestic product
GE	General Electric
GFC	Global financial cycle
GIIP	Gross international investment position
G7	Group of Seven
HICP	Harmonised index of consumer prices
HP	Hodrick-Prescott
HSBC	Hong Kong & Shanghai Banking Corporation
IMEC	Inter-University Microelectronics Centre
IMF	International Monetary Fund
IRC	International Relations Committee
ISDP	Institute for Security & Development Policy
IT	Information technology
M&A	Mergers and acquisitions
MFN	Most-favoured nation

MIC 2025	Made in China 2025
MIIT	Ministry of Industry and Information Technology
MIP	Macroeconomic imbalance procedure
MIT	Massachusetts Institute of Technology
MOFCOM	Ministry of Commerce (China)
MTO	Medium-term objective
NAI	National Accounts Institute
NBB	National Bank of Belgium
NBER	National Bureau of Economic Research
NDRC	National Development and Reform Commission
NFPS	Non-financial private sector
NIPP	Net international investment position
NK	New Keynesian
OECD	Organisation for Economic Cooperation and Development
OI	Other investment
OLO	Linear bonds
PI	Portfolio investment
PPI	Producer Price Index
PSA	Peugeot société anonyme
R&D	Research and development
SAFE	State Administration of Foreign Exchange
SASAC	State-owned Assets Supervision and Administration Commission
SCM	Subsidies and Countervailing Measures
SGP	Stability and Growth Pact
SITC	Standard International Trade Classification
SOE	State-owned enterprise
SPF	Survey of Professional Forecasters
TIER	Regulations on the Administration of the Import and Export of Technologies
UMC	United Microelectronics Corporation
USTR	Office of the United States Trade Representative
VAR	Vector autoregression
VIX	Volatility Index
VMA	Vector moving average
WDI	World Development Indicators
WIOD	World Input-Output Database
WTO	World Trade Organisation
WWII	World War II
ZTE	Zhongxing Telecommunication Equipment Corporation

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