Economic Review

September 2017

National Bank OF BELGIUM
Eurosystem

ISSN 1780-664X

Economic Review

September 2017

National Bank OF BELGIUM

Eurosystem

Contents

SUSTAINABLE AND GREEN FINANCE: EXPLORING NEW MARKETS 7

THE WORLD IS A VILLAGE... THE INTEGRATION OF BELGIAN FIRMS INTO THE WORLD ECONOMY 25

THE POTENTIAL GROWTH OF THE BELGIAN ECONOMY 37

A BETTER UNDERSTANDING OF DEVELOPMENTS IN THE NUMBERS CLAIMING DISABILITY INSURANCE 55

THE CYCLICAL AND STRUCTURAL DETERMINANTS OF THE LOW INTEREST RATE ENVIRONMENT 69

THE GLOBAL FINANCIAL SAFETY NET: IN NEED OF REPAIR? 87

ABSTRACTS FROM THE WORKING PAPERS SERIES 113

CONVENTIONAL SIGNS 117

LIST OF ABBREVIATIONS 119

Sustainable and green finance : exploring new markets

S. Ben Hadj
J. De Mulder
M.-D. Zachary

Introduction

The growing attention to sustainable and green finance is linked to a number of recent developments at global level, such as the increasing concern over inequality, both between the developed and the developing countries and within the rich countries. In the context of the globalisation of the economy, society is also attaching more importance to respect for social values, so that trade in certain goods or services, such as weapons, is considered unethical, and the same applies to exploitation, inhuman working conditions and the use of child labour. Moreover, the financial crisis that erupted in 2008 raised a number of questions concerning the sustainability of the prevailing growth and profit model of financial institutions. Likewise, there is growing environmental awareness (e.g. concerning pollution of the soil and the oceans), which involves an intergenerational aspect (namely the "legacy" being left for subsequent generations).

One specific aspect concerning the environment is global warming. Many reports not only present the facts of global warming and its human origins but also examine its potential consequences. Although the estimates diverge, it seems that global warming will also have a substantial impact on the economic system, unless we succeed in limiting the rise in temperature to 2°C above pre-industrial levels. The widespread conviction that immediate action must be taken has led to a number of rounds of climate negotiations and agreements (for instance in Kyoto and Paris).

These societal choices and the global constraints confronting the economy are expressed in savers' demand for "ethical" financial products, and in the need to fund new corporate investment projects (such as green investment).

To illustrate sustainable and green investment and finance, this article focuses mainly on developments concerning the climate, and more particularly energy. Nevertheless, there are of course other sustainable initiatives, for example those pursuing social or ethical objectives or relating to organic farming.

The article comprises five sections. Section 1 explains why the need for sustainable and green finance is increasing and discusses the demand for that form of financing. Section 2 examines the supply of sustainable and green finance. Section 3 takes a closer look at the promising example of the booming market in green bonds. Section 4 summarises the situation in Belgium, and finally, section 5 sets out the main challenges and policy implications.

1. Demand for green finance

Against the backdrop of today's climate related issues, demand for green finance is best illustrated by reference to green investment. Investment in green energy is a typical example of the changing demand for funding for the purpose of producing energy.

This type of investment is the logical corollary to the global climate negotiations. In the latest round of negotiations at the Paris Conference in 2015 (COP21), a general agreement was reached on a global objective (namely to limit the rise in temperature to less than 2°C above

pre-industrial levels). The worldwide objective was then translated into targets per country or per major economic region. The EU undertook to achieve some objectives, which were then divided among the various Member States. In Belgium's case, the national target then needs an additional breakdown among the three Regions.

In the specific case of Belgium, but also for some other countries such as Germany, the switch to a form of energy production with lower CO_2 emissions is more challenging because of the decision in principle to phase out nuclear power. If energy can no longer be generated by nuclear power plants, a larger proportion of the production must come from alternative (renewable) sources, necessitating additional changes in the energy production mix.

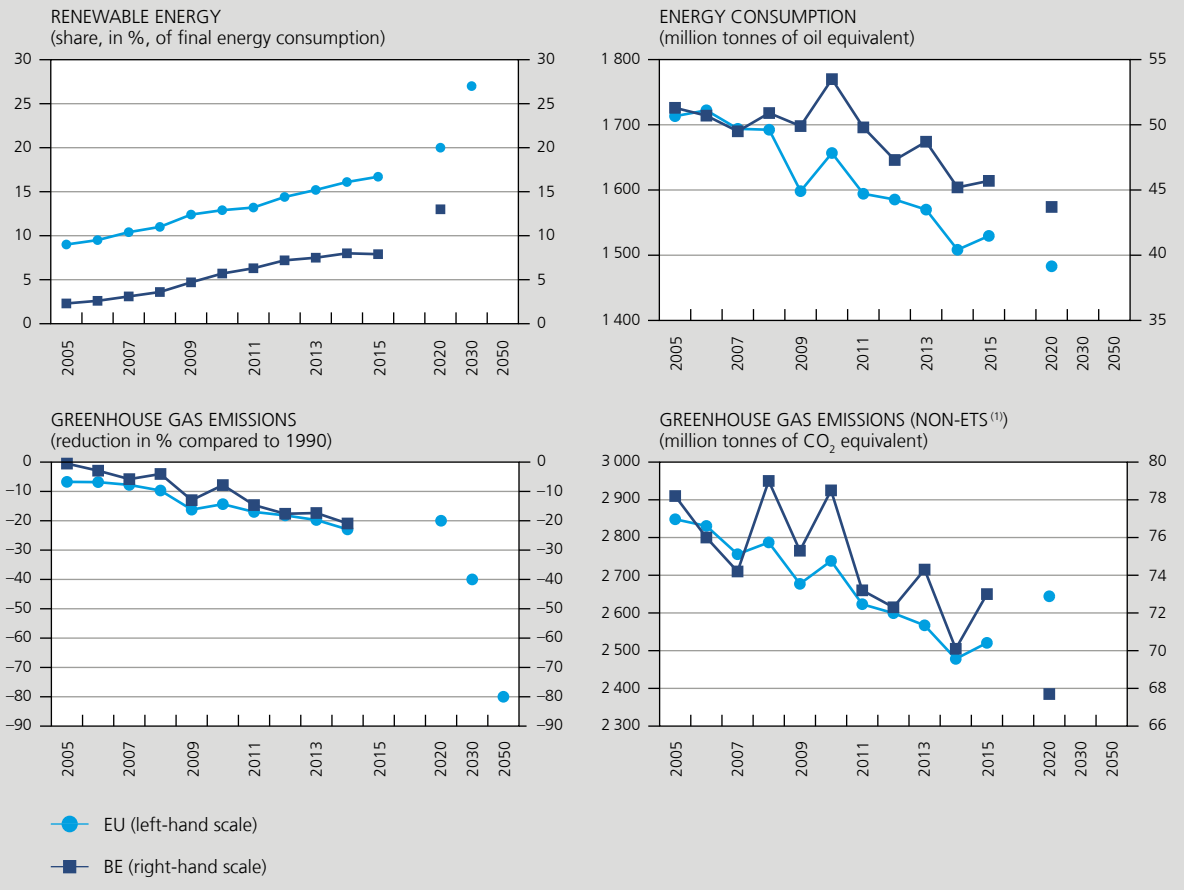
Massive investment is needed throughout the world in various spheres, including of course in green energy capacity, but also in energy efficiency or in public transport, etc. However, it should be stressed that this essential investment will not only entail huge costs. Apart from the favourable impact on the climate and the avoidance of the harmful effects of an excessive rise in temperatures, it will stimulate economic activity in the short term and in so doing will help to rescue European and other countries from the low-growth trap.

1.1 Climate targets

The EU's climate objectives concern three areas, namely renewable energy, energy efficiency, and greenhouse gas emissions. They target three reference years, namely 2020, 2030 and 2050.

The objectives for 2020 were set in 2007; in 2009, they were incorporated into legally-binding texts. Thus, in 2020, 20 % of the EU's energy will have to come

CHART 1 CLIMATE TARGETS OF THE EU AND BELGIUM



Source: EC.
(1) "Non-ETS" refers to the emissions of branches not taking part in the EU Emissions Trading System.

from renewable sources. The aim is also to improve energy efficiency by 20 % relative to a reference scenario. Achieving that entails keeping primary energy consumption to a maximum of 1 483 Mtoe[1] in 2020. Finally, greenhouse gas emissions in 2020 are targeted to be 20 % lower than their 1990 level. To reach this target, a distinction was made between ETS and non-ETS branches. ETS stands for "EU Emissions Trading System" and concerns large firms operating in the energy and industry sectors and in intra-European aviation. For these branches which together account for around 45 % of greenhouse gas emissions in the EU, a system was set up whereby emission rights are allocated and can be traded between them. The aim is to reduce the emissions of those branches by 21 % over the period 2005-2020. For non-ETS branches such as households, agriculture and transport (excluding aviation), the target reduction over the same period is 10 %.

The objectives set at EU level for renewable energy, energy efficiency and emissions of non-ETS branches have been translated into binding national targets. For Belgium, the targets – for 2020 in each case – correspond to a 13 % share for renewable energy, maximum energy consumption of 43.7 Mtoe and a 15 % reduction in greenhouse gas emissions.

In 2014, new targets were agreed at EU level for 2030. The share of renewable energy is to go up to at least 27 % by then, energy efficiency has to be at least 27 % higher, and greenhouse gas emissions should be reduced by at least 40 % compared to 1990. That last target corresponds to reductions of 43 % and 30 % respectively for the ETS and non-ETS branches. The targets (except for the reduction for ETS branches) are to be allocated among the Member States.

In the even longer term, by 2050, the EU is aiming to cut emissions by 80-95 %.

The available data indicate that things are moving in the right direction, both in the EU as a whole and in Belgium. As regards greenhouse gas emissions, the EU has already achieved its target for 2020[2], but that is certainly not true of Belgium. As regards the share of renewable energy and energy efficiency, there is still a long way to go to reach the 2020 targets in both the EU and Belgium; generally speaking, that is all the more true, of course, for the longer-term targets.

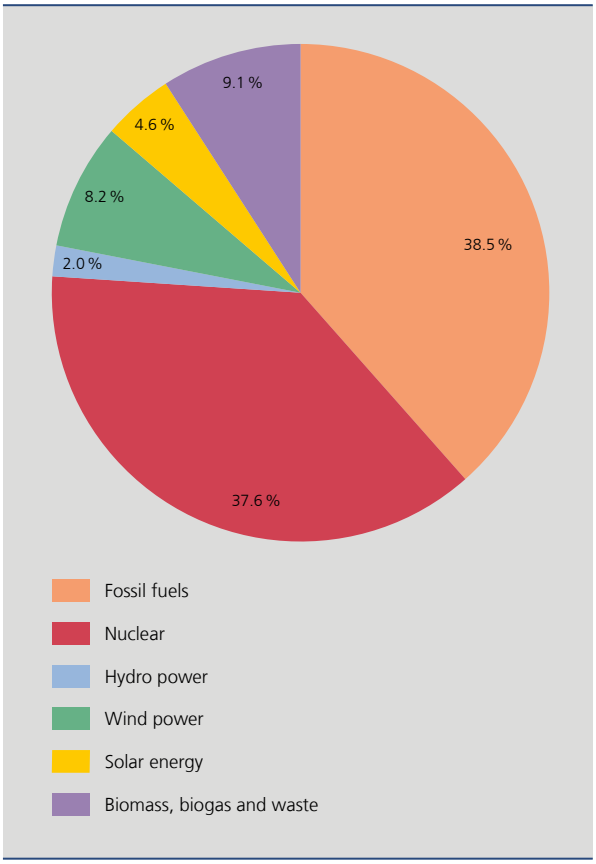
(1) Mtoe stands for million tonnes of oil equivalent.
(2) It is of course still possible that the target may not be met, e.g. if the economic growth up to 2020 generates higher emissions.

1.2 Modification of the energy production mix

The federal government's commitment to phasing out nuclear energy is an additional challenge for Belgium. The available numbers show that nuclear energy accounted for around 38 % of total electricity production in Belgium in 2015. That proportion was rather low since, as in the previous year, part of the nuclear generating capacity was out of service. For reference, the figure for 2013 was 51 %. Nuclear power stations do not emit any CO_2 during the electricity generation process, so that it would be better not to replace them with fossil fuels if the climate goals are to be met. In 2015, fossil fuels represented roughly 38 % of electricity production, with gas accounting for the major share (over 30 %).

However, replacing nuclear energy with renewable energy sources such as wind and solar power raises another problem. Both renewable sources depend on climatic conditions and therefore do not supply stable quantities of energy (they are intermittent sources). It will therefore

CHART 2 ELECTRICITY PRODUCTION MIX IN BELGIUM IN 2015
(in % of the total)



Source: FEBEG.

undoubtedly be necessary to invest in gas power stations which can be deployed flexibly in order to ensure continuity of supplies at all times in the future. However, that inevitably implies CO_2 emissions, which will make it difficult to achieve the emission targets.

Another solution is of course to import (even) more electricity. Since 2000, Belgium has almost always been a net importer of electricity. On average, net imports account for around 9 % of consumption. In 2014 and 2015, that proportion was significantly higher – namely 20-24 % – because the nuclear power stations were partly out of service, but in 2016 the figure dropped back to around 7 %. If insufficient production capacity is created in Belgium to meet the future demand for electricity, then more electricity has to be imported. Of course, that requires sufficient interconnections. Work is currently in progress on that by the installation of new links with Germany and the United Kingdom.

Increased imports could help enable a country to fulfil its international obligations regarding greenhouse gas emissions, since those emissions will take place elsewhere. However, if the imported electricity is produced from fossil fuels, then that merely implies a transfer which does nothing towards achieving the ultimate goal, namely a reduction in total emissions worldwide. In principle, electricity generation based on fossil fuels should be curbed by the ETS mechanism, since the cost of the emission rights is passed on in the selling price. In practice, however, the import price does not incorporate the whole of the environmental cost since the current carbon price reflects only part of the externalities resulting from pollution (see below).

Increased structural dependence on imports also implies a number of risks. If the total supply at some point is insufficient to meet demand [1], the purchase price could go up sharply in the event of scarcity on the European market. And even if other (neighbouring) countries have sufficient supplies, systematically higher use of the available import capacity could mean that in times of crisis additional imports may not be possible, potentially leading to black-outs. In general, the country becomes subject to the closure of production units in neighbouring countries and dependent on the availability of networks abroad, which could be detrimental to Belgium's supplies.

1.3 Green investment

It is clear from the foregoing that massive green investment will be necessary in the future. Of course, it is hard to put a figure on the financial resources that will be needed, because a lot of assumptions have to be made concerning a multitude of uncertain factors over a long time horizon. However, a number of recent publications by international institutions indicate that the amounts involved are enormous.

For instance, on its website, the EC states that "Average annual additional investments are projected to amount to € 38 billion for the EU as a whole over the period 2011-2030". The IMF states that "The 2030 Agenda is a trillion-dollar one […]" (IMF, 2016). The International Energy Agency estimates that "Around USD 3.5 trillion in energy sector investments would be required on average each year between 2016 and 2050, compared to USD 1.8 trillion in 2015", and according to IRENA, "[…] cumulative additional investment would still need to amount to USD 29 trillion over the period to 2050 […] in addition to the investment of USD 116 trillion already envisaged […]" (IEA and IRENA, 2017).

2. The supply of sustainable and green finance

2.1 Concept

Before presenting a detailed analysis of the available supply of sustainable and green finance, we need to clarify exactly what this concept covers. Sustainable and green finance is intended to reconcile economic performance with a social and environmental impact by choosing to invest in companies or public entities that contribute to sustainable development, regardless of the sector in which they operate. By influencing governance and the behaviour of players, this type of finance ought to encourage the development of a responsible and sustainable economy.

Despite the consensus on these general principles, there is currently no unanimously accepted definition and there are no checks – at Belgian, European or global level – which can establish whether the financial products claiming to be sustainable and green actually fit that description.

In reality, there are varying approaches to sustainable and green finance mainly because of differences in local or national cultures, each with its own particular concerns. For example, the social aspect carries greater weight in France, while Switzerland and Germany attach more importance to the environment. In the United Kingdom, governance is considered crucial, whereas in the Scandinavian countries and the United States, ethical values predominate.

(1) For example, in the event of unexpected production disruptions or at peak consumption times.

Nevertheless, there are various recognised approaches to sustainable and green investment. They are identified and classified by the Global Sustainable Investment Alliance (GSIA[1], 2016). In Belgium, they are also recognised by Febelfin. Promoters and investors interested in sustainable and green finance can adopt the following principles:

- exclusion principle: products are selected by excluding certain sectors, companies or countries[2] on the basis of ethical criteria on account of their activity (tobacco, alcohol, arms, gambling, etc.) or the adoption of certain specific practices (forced labour, corruption, animal testing, etc.);
- ESG integration: according to this approach, investors take systematic and explicit account of ESG criteria in their financial analysis: E stands for Environmental, S for Social and G for Governance.
- "best in class" approach: "best in class" funds select the countries or companies that perform best in terms of sustainability, i.e. according to environmental, social and governance (ESG) criteria;
- selection on the basis of international standards (normative control): only countries and companies that respect a series of international standards and treaties[3] are funded with money originating from sustainable products;
- thematic approach: funds in this category prefer to invest in countries and companies in a particular sector or in those that encourage certain practices (renewable energy, water supply, reduction of greenhouse gas emissions, employment, working conditions, etc.). In principle, the other aspects of sustainability such as respect for the environment, social conscience and good governance are also borne in mind. For example, account must also be taken of the social practices and governance of companies active in the renewable energy sector;
- visible social impact: this approach concerns the financing of businesses endeavouring to resolve specific environmental or social problems;
- shareholder commitment: the shareholders actively try to exert beneficial influence over the attitude of the companies that they invest in via direct dialogue with the management and/or by exercising their right to vote at the general assembly, e.g. by trying to draw attention to respect for the environment, social conscience or good governance.

Compared to "traditional" investment, sustainable and green investment (demand) have a number of adverse features that tend to make them difficult to finance (supply). Those features concern the return and the risk, on the one hand, and the associated transaction and information costs on the other (SEO Economisch Onderzoek, 2009).

Sustainable projects' returns and risks are influenced by the fact that they are often innovative and complex, involving advanced technology and R&D. In many cases, they are capital-intensive projects with a long investment horizon, so that the associated returns risks are more difficult to assess.

In the case of green financing, there is the additional problem that the externalities associated with energy production, such as greenhouse gas emissions, are not adequately reflected in the market price. Green technologies that reduce CO_2 emissions therefore offer no price advantage over conventional sources.

Another relevant point is the government's importance in the energy sector. As it is often a question of large-scale projects, the government plays a key role in granting the necessary permits. It is also the government that decides on the award of subsidies, the levying of charges or taxes, etc. Moreover, green energy investment often involves long-term projects, so that there is always the risk that a new government may change the "rules of the game" ("regulatory risk").

Regarding the transaction and information costs, it should be noted that sustainable project developers are often new players, so that potential investors cannot derive any information from their investment history. Moreover, those new players seldom have sufficient own funds, reducing the scope for offering collateral.

In addition, potential lenders generally know little about the new projects and procedures, making it difficult to value the projects.

Furthermore, sustainable investment projects are definitely not homogenous products. They may relate to known technologies or the development of entirely new ones. They may also range in size from quite small to very large projects. For example, known technologies may concern small systems for individuals, such as solar panels, but may also concern large systems such as wind parks (offshore). As for new technologies, they may be developed by small start-ups or by very large-scale projects such as ITER[4].

(1) Federation of organisations promoting sustainable investment, responsible for increasing the impact and visibility of those organisations at global level. For Europe, the member is Eurosif (European Sustainable Investment Forum), itself a federation of eight national forums, including Belsif for Belgium.

(2) Where a country is concerned, the reference is to the securities issued by the country in question.

(3) Examples include the UN Framework Convention on Climate Change, the European Convention on Human Rights, the European Convention on the Rights of the Child, the Forced Labour Convention, the Convention on Cluster Munitions, etc.

(4) ITER is an international research project on nuclear fusion, involving collaboration between China, the EU, India, Japan, Russia, South Korea and the United States. In 2013, work began in the south of France on construction of an experimental reactor, scheduled to become operational from 2035 (www.iter.org).

All these various characteristics concerning such aspects as size (initially and after a certain time lapse), risk, return, costs, etc. imply that the various forms of sustainable investment have different financing needs.

The financial sector plays a crucial role in the energy transition because part of the private finance for sustainable and green projects is channelled through that sector. The growth of this investment must be accompanied by redirection of capital consistent with a low carbon economy. Since the market for sustainable and green financial products is growing rapidly, adequate regulation is required and the financial sector must take account of the risks (and opportunities) associated with climate change. Although climate change has not created any new risk categories, the direct and indirect consequences for the financial system may take the form of market risk, credit risk or other specific risks for insurance companies. The transmission operates mainly via three different channels:

- material risks: the material damage caused by climate change and natural disasters could impair business solvency and be detrimental to the development of international trade. Those risks are particularly relevant for the insurance industry since it concludes insurance contracts covering such losses. It is important for the insurance sector to maintain sufficient funds in view of those risks. Uninsured risks may also affect the financial system if they damage corporate profitability and firms' ability to repay their debts;
- liability risk: this risk has both a technological and a legal dimension. First, scientific progress, in medicine for example, may make it possible to demonstrate a causal connection between a polluting industry and the health of consumers and workers. Such a finding could give rise to multiple legal actions which could damage the financial soundness of the industry found guilty. Also, there is a legal vacuum concerning this liability question. Retroactive changes to legislation may facilitate claims against polluting firms, subsequently leading to the bankruptcy of those firms and, via a cascade effect, also bankrupting the investors;
- risks associated with the transition to a low-carbon economy: if that transition takes place without proper preparation, or is precipitated by irreversible environmental damage, it could also affect the soundness of the financial system. A sudden revaluation of financial assets and commodities, and a rapid change in energy costs, could trigger economic and financial crises in the vulnerable sectors.

These three risks are exacerbated by the uncertainty inherent in the climate models, which makes it more difficult to reach decisions in the financial sector and heightens the danger of underestimating the damage associated with climate change.

2.2 Factors hampering the development of sustainable and green finance

Government bodies are becoming increasingly aware of the importance of a green transition, and that has led among other things to the establishment of market mechanisms such as the carbon market to penalise pollution. Nonetheless, the efforts are currently insufficient to completely overcome the various factors which are holding back the development of a capital market capabale of financing this transition (DNB, 2017). The barriers to the development of a funding method that supports the transition may be due to imperfections on the financial markets or gaps in economic policies.

2.2.1 Financial markets

In theory, according to the Nobel prize-winning economist Roland Coase, the establishment of carbon markets[1] or emission rights should be an instrument for limiting the externalities resulting from greenhouse gas emissions. The European Commission (EC) launched the European market in 2005 to reduce those emissions while leaving the industry some flexibility. In practice, the carbon price covers only part of the externalities caused by pollution. According to the EC's figures, the market covers around

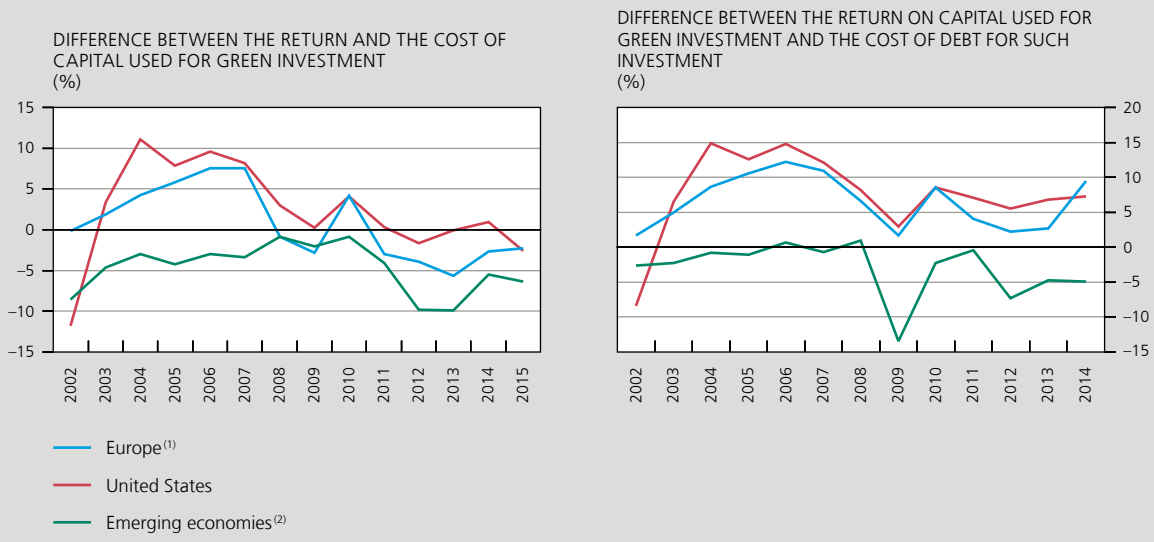
CHART 3 CARBON PRICE ON THE EUROPEAN MARKET IN ENVIRONMENTAL QUOTAS

(€/tonne of CO_2 equivalent)

Source: Thomson Reuters Eikon.

(1) There are various carbon markets in the world, specific to each country or region. The European market is the largest in terms of trading volume.

CHART 4 COST OF FINANCING GREEN INVESTMENT FOR LISTED COMPANIES



Source: OECD Business and Finance Outlook 2015.
(1) Europe refers to the European Union plus Switzerland.
(2) EME: emerging market economies.

45 % of the greenhouse gas emissions in the European Union (i.e. the 28 EU Member States plus Iceland, Liechtenstein and Norway). The collapse of the price, which has hovered around € 5 per tonne of CO_2 equivalent since 2013, is due mainly to the granting of relatively generous quotas in view of the downturn in economic activity during the crisis. In that period, industrial activity declined so that the pollution automatically diminished and the emission quotas were accumulated.

At present, that mechanism is insufficient to encourage the transition to a sustainable economy. Scientists estimate that each additional tonne of CO_2 equivalent released into the atmosphere reduces social welfare by $ 37 to $220 (Moore and Diaz, 2015). In view of that assessment, a price of € 5 per tonne is clearly too low, both to internalise the effects of pollution and to prompt industrialists to change their production methods. Moreover, that mechanism does not apply to certain polluting sectors, such as air transport outside Europe. A further point is that quotas are allocated in abundance in order to avert "carbon leakage", i.e. the relocation of production activities to less strictly regulated countries.

(1) This return on capital is calculated as the average yield on the shares of companies in the Global Clean Energy Index.
(2) The pay-back period measures the time necessary to recoup the initial amount of the investment in comparison with the cumulative cash flows.
(3) According to the OECD's calculations.

The failure of the carbon market therefore implies that firms which take account of climate change in their investment strategy gain only a small competitive advantage over polluting firms.

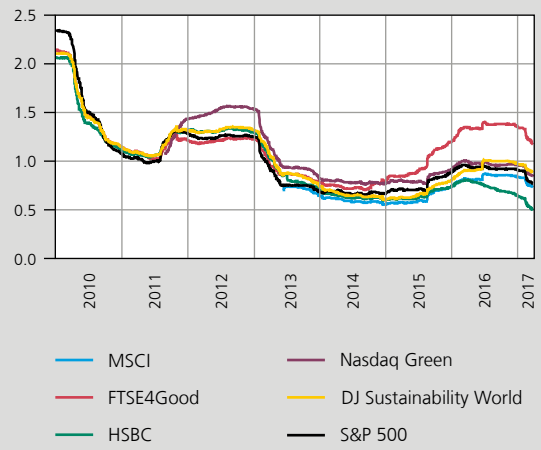
It also seems that sustainable and green investment projects cannot generate a financial reward for their environmental and other efforts. For example, investment in green energy offers too low a return to attract large-scale private finance on the equity market. The main stumbling block impeding the development of a capital market for green energy is the inadequate return on capital invested in those projects (1). Since 2008, the return on that capital has in fact dropped below the cost of capital (see left-hand side of chart 4). It follows that, according to the equity market, green investment does not create enough value. The insufficient return is attributable mainly to the high cost of capital resulting from the greater technological risk and the lack of a stable investment policy.

Moreover, the projects in question involve a relatively long investment period, so that they are riskier. For most of them, the pay-back period (2) (3) exceeds five years, on average.

Finally, the problem of the return on capital is due partly to the fact that most of the current investment projects are funded by debt, which makes the return on equity

CHART 5 HISTORICAL VOLATILITY[1] OF GREEN SHARE INDICES[2] AND THE S&P 500 MARKET INDEX

(in %)



Source : Thomson Reuters Eikon.

(1) The volatility is calculated as the standard deviation of daily returns over the last two years.

(2) MSCI is the index that comprises the global firms demonstrating the best environmental and social practices in their sector of activity. FTSE4Good is the index comprising the 40 best European firms in terms of environmental practices. HSBC is the HSBC Climate Change Index. Nasdaq Green is the Nasdaq Green Economy Index. DJ Sustainability World is the Dow Jones Sustainability World Index.

less relevant for the investors (see the right-hand side of chart 4). To attract more private capital, it is imperative to find a way of improving the financial benefits of the positive externalities of green investment in the light of social welfare. In that context, public entities have a key role to play in establishing mechanisms offering financial compensation for the favourable effects of green energy in particular and sustainable investment in general.

Despite the challenges mentioned above concerning profitability, the equity market does not appear to see green and sustainable investment as riskier than the average. The volatility of some of the indices representing such investment, published by FTSE, MSCI, HSBC, Nasdaq and Dow Jones, is located on either side of the historical trend in the volatility of a "traditional" market index such as the S&P 500. Only the FTSE4Good index comprising the 40 best European firms in terms of environmental practices seems to indicate a higher risk, which is probably due to the greater volatility on the European markets during that period. The volatility of the green and sustainable indices implies that investors do not appear to be influenced by the intrinsic risk factors of green and sustainable projects, such as a long pay-back period. That representation of the risk contrasts with the high cost of capital and the long-term character of green and sustainable projects.

Various factors may explain this perception of a limited risk. First, the indices only provide information on projects funded partly by equity for some listed companies. However, in practice, that is not the preferred financing structure for investment with a risk profile like that of green and sustainable projects. It raises the question whether green indices (and more generally the equity market indices) are representative of the "typical" green and sustainable investment projects which are often carried out by young (unlisted) companies and usually tend to be financed by debts. Another point is that projects which reach the stage of offering shares in their capital to the public are often more mature and therefore less risky.

2.2.2 Economic policy and challenges of climate change

Not only the financial markets fall short in internalising the cost of pollution and in promoting green and sustainable investment projects but also the fact that government policy is insufficiently geared to the climate goals is a major hindrance to the development of sustainable finance.

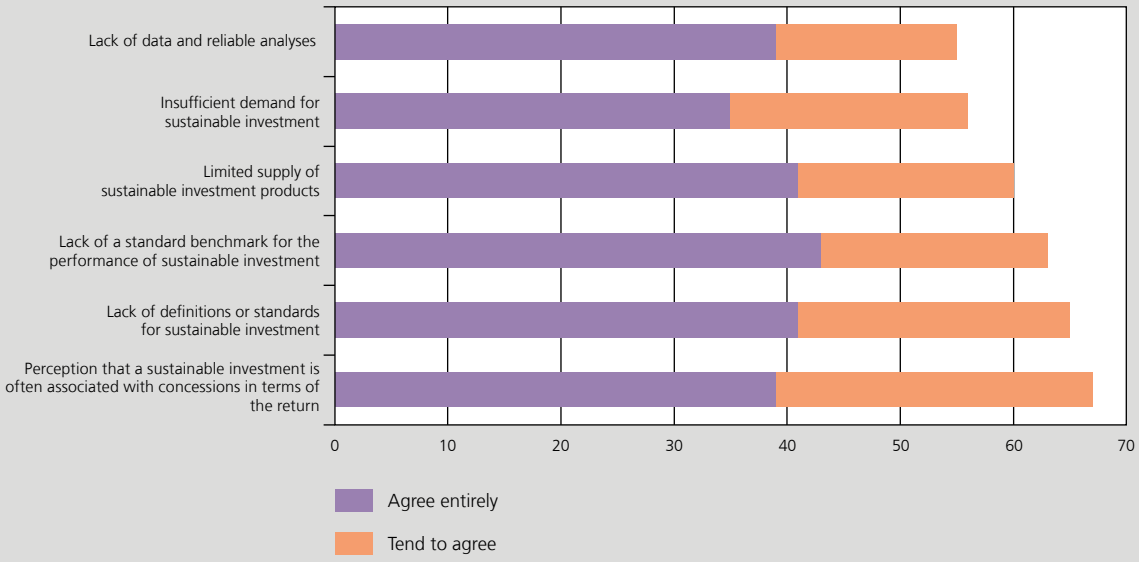
These are some of the public policies that could be adapted :

- Fiscal policy that indirectly encourages pollution : it consists mainly of measures dating from the period before climate goals were explicitly taken into account ; reforming those measures is expensive or difficult (e.g. the tax concession for company cars).
- The ambitiousness of the climate goals and of the restrictions on greenhouse gases at national and international level.
- Government policy on climate : sustainable and green projects are long-term projects requiring some stability in government policy in order to attract investors. Political uncertainty can heighten the risks that those investment projects entail, and consequently increase their capital cost and impair their profitability.
- The polluter's legal liability : clear legislation on corporate liability permitting legal action in cases where pollution has an adverse impact on well-being or health could help to internalise the external costs attributable to the polluter.
- A carbon price that is too low to discourage investment with a significant carbon footprint.

Within the financial sector, too, a number of factors are hampering the development of sustainable and green finance. Examples include :

- Reluctance regarding long-term (illiquid) investment projects, in view of the distortions and risks that

CHART 6 RESULTS OF A SURVEY (1) CONCERNING THE FACTORS HAMPERING THE GROWTH OF GREEN AND SUSTAINABLE FINANCE



Source: Morgan Stanley Institute for Sustainable Investing and Bloomberg L.P.

(1) The survey was conducted in 2016 on the basis of telephone calls to 402 asset managers in the United States having at least $ 50 million in assets under management. All the firms surveyed offer green and sustainable investment products.

the projects may imply for the banking sector's balance sheets. Conversely, the growing proportion of long-term liabilities for the financial sector (e.g. for insurers and pensions funds) also offers funding potential.

– Information asymmetry and reporting that fail to reflect the climate risks (such as the amount of stranded assets, i.e. the assets devalued due to sudden and substantial changes in legislation, environmental constraints, or technology shocks) (OECD, 2017). A transparent policy on climate risks could reveal the vulnerability of some non-sustainable projects and therefore encourage the internalisation of the environmental risks.
– A non-existent or inadequate ethical investment code: the lack of a code of conduct recognised by the business federations.

2.2.3 Obstacles to green finance according to the asset managers

For asset managers, the absence of any definition or standards is the main impediment to sustainable investment. According to a survey conducted in 2016 among a panel of asset managers in the United States, the lack of transparency – in the absence of a consensus on what constitutes a sustainable and green product, and with no code of conduct in the industry and no recognised supervisory body to ensure compliance with the rules – is one of the biggest obstacles to sustainable finance (1). This survey reveals that the lack of a standard definition of sustainable investment is an even greater barrier than the profitability of such investment. The absence of a standard performance benchmark which takes account of the positive external effects of this kind of investment ranks third. The limited supply and the fact that demand is deemed insufficient are also significant factors. Finally, the lack of data and reliable analyses is another serious problem hampering the development of sustainable finance. However, it should be noted that the sample of this panel is distorted by a selection bias (probably exerting upward influence on the findings) since the managers polled sell sustainable investment products and are therefore already convinced, in principle, of the commercial potential of this market.

(1) In the poll, sustainable finance was defined as investment in firms or funds that aim to link the financial return to a beneficial impact on society and the environment.

3. A promising example: green bonds

Apart from the equity market where, as explained above, numerous factors are holding back sustainable and green investment, asset managers, investors and issuers can also turn to the bond market. Here, green bonds which have

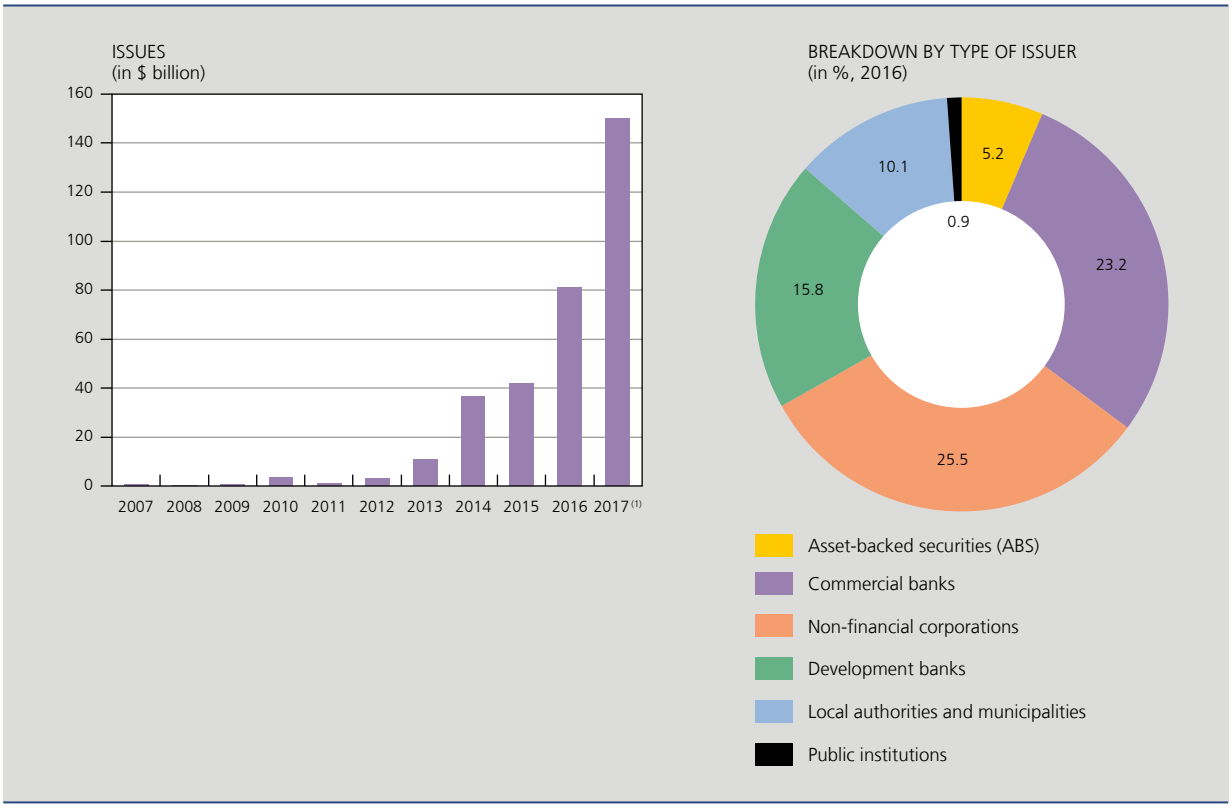
been developed to exploit the potential of bonds and bond markets are making rapid progress. They provide fairly cheap capital in the medium and long term for environmental projects.

Green bonds are a recent (2007) type of bond, often labelled, intended for funding environment-friendly projects or activities in such fields as energy efficiency, renewable energy and transport. The green bond market was initially dominated by international public institutions such as the European Investment Bank (EIB) and the World Bank, which responded to the demand from a number of institutional investors interested in environmental questions (Natixis, 2017). Since then, the private sector has gradually entered the market. In 2013, it gained significantly in importance when entities such as the International Finance Corporation (IFC) and non-financial corporations such as EDF, Toyota and Unilever issued green bonds amounting to billions of dollars. Demand for subscription to these bonds often exceeded the amount offered, demonstrating that investors were very interested in this product.

At global level, the amount of green bonds issued has increased substantially in recent years. In 2016, it totalled $ 81 billion (eight times the 2013 figure) and that is expected to virtually double in 2017. Moreover, the issuers on this market have diversified – from development banks to private firms and local authorities – as have the underlying investments – renewable energy, energy efficiency, transport infrastructure, buildings and waste. If we consider the entire market for green bonds worldwide, the biggest issuers in 2016 were non-financial corporations (25.5 % of the amounts issued), commercial banks (23.2 %) and development banks (15.8 %). Issues by local authorities and municipalities made up roughly 10 % of this market (compared to 6 % in 2015).

The steady pace of issues in turn attracted a very varied group of institutional investors from both the public and the private sector, ranging from Swedish pension funds to "responsible" American asset managers and from ethical Dutch banks to socially responsible French investment projects. This enthusiasm is due partly to the growing importance that investors attach to sustainable development.

CHART 7 GREEN BOND ISSUES AT GLOBAL LEVEL



Source : Climatebonds.net.
(1) Forecasts.

In addition, green bonds appear to exhibit the same financial characteristics as traditional bonds of the same issuer (see for example OECD and Bloomberg Philanthropies, 2015). That includes the credit quality, the yield and the issue price. In fact, it is estimated that the credit profile of green bonds is identical to that of the same issuer's other bonds ("plain vanilla", or traditional bonds ultimately redeemed at par, paying a fixed interest rate via an annual coupon). Owing to the strong demand for green bonds, one might think that their issuers could offer an interest rate lower than that on traditional bonds. In practice, the effect is small, however; while the keen demand at the moment when green bonds are issued can sometimes lead to a slightly lower yield than on a traditional bond, that effect is generally very small and has little impact on the general yield (Mirova, 2014). For example, chart 8 shows the yield curve of traditional bonds (EIB) and green bonds (GB) issued by the European Investment Bank and by the Nordic Investment Bank. The differences are minimal and are not significant. Finally, it should also be noted that the substantial demand for green bonds should be viewed in perspective, since the market currently represents only a tiny fraction of the global bond market (estimated at around $ 100 000 billion).

In the context of sustainable finance, green bonds offer several advantages: they have a direct link with identifiable projects, without any loss of yield or liquidity. They are also increasingly often accompanied by reporting on the environmental and social effects. Apart from financial considerations, the growth of the green bond market has also been stimulated by the aim of developing financial tools specifically for combating climate change, which explains why green bonds are often issued by development banks. It was also the aim to create a new market so that green bonds could develop into a fully-fledged asset category with their own specific funds and specialist investors. Today, a deep, liquid and diversified market in green bonds amounting to several billion dollars seems a realistic prospect.

From the issuers' point of view, green bonds are a preferred financing instrument for diversifying their investor base, more specifically in order to attract long-term responsible investors. By issuing green bonds, firms can also promote their sustainable development strategy and build up their reputation in that area (Shishlov *et al.*, 2016).

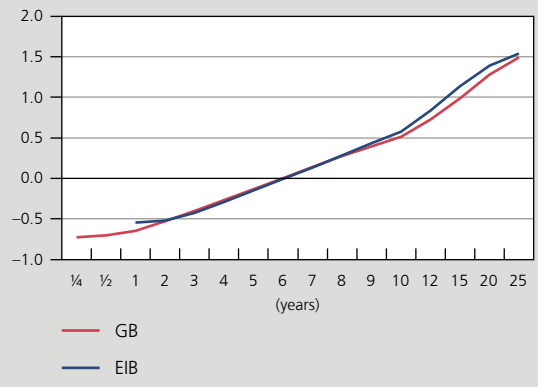
This type of financial instrument is also suitable for investors attracted by the more extensive information available on the underlying asset (increased transparency obligation) and more generally by the corporate strategy of the issuer (Ministère de l'Environnement, de l'Énergie et de la Mer, 2016). One of the major advantages of non-sovereign green bonds is therefore the extra transparency and predictability that they offer investors. Green bonds also enable investors to diversify their portfolios, in particular by acquiring assets which are not at risk of becoming stranded. Finally, these instruments help investors to implement their own long-term climate strategy and to promote it among savers (Banque de France, 2016).

However, green bonds also generate additional costs compared to traditional bond issues. For the issuer, those costs concern the need to label the securities, and the reporting requirement; for the investor, they include the time entailed in analysing that type of bonds.

Furthermore, the market is subject to credibility risks. In this connection, there is no clear definition of what "green" means, and there is insufficient confidence in the follow-up and assessment of green bonds, especially as that implies closer supervision of the funded projects on the part of investors. There is no legal rule on what qualifies for funding via "green bonds". Failing that, the market focuses mainly on transparency so that investors can judge the quality of the issue. That is why the leading market players have established tacit rules. Examples include the Green Bond Principles (GBPs), laid down by the International Capital Market Association (ICMA, 2016), which identifies the various types of green bond and the factors which must be taken into account when issuing them. The GBPs specify a number of good practices to be respected: defining in advance the activities potentially eligible for funding via green bonds, establishing a mechanism for independent

CHART 8 YIELD CURVE OF TRADITIONAL BONDS (EIB) AND GREEN BONDS (GB) ISSUED BY THE EUROPEAN INVESTMENT BANK AND BY THE NORDIC INVESTMENT BANK

(in %)



Source: Thomson Reuters Eikon.

supervision over the ecological character of the issue, and producing a public annual report permitting monitoring of the projects' progress. The Climate Bonds Initiative (CBI) has devised standards facilitating voluntary certification of the impact on the climate. There are also numerous rating agencies that conduct non-financial audits. However, labelling and external assessment are not compulsory according to the existing approaches.

There is another risk inherent in green bonds: market players are particularly worried about the reputation risk associated with "greenwashing", i.e. the issue of green bonds to fund projects which are not "green" or which do not fulfil the commitments, thus damaging investor confidence. That risk is all the greater since there is no definition of "green" projects, the external checks are not standardised and, above all, are not compulsory, and the reporting methodologies are divergent.

Other specific risks may also arise. For instance, issuers may be confronted by a "green default" risk, or in other words, the risk of being held legally liable for failure to comply with the commitments concerning the green character of the project. Finally, it is also necessary to take account of credit risk and counterparty risk. Those risks relate primarily to the investment projects funded, which involve new players or relatively innovative spheres of activity, and to the long or very long period of time associated with such investment.

4. Some points concerning Belgium

In Belgium as in the European Union, interest in sustainable and green finance is on the rise. That is evident, for example from the recent development of legislation on the subject. Also, there have been some financial sector initiatives and moves concerning labelling which have contributed to the spread of financial products in that category, particularly savings accounts for consumers and investment funds classed as sustainable.

4.1 Legislative framework

In Belgium, the first initiative aimed at promoting sustainable and green investment dates from 2002 (1). It led to the adoption of a Programme Law specifying that institutions providing supplementary pensions for self-employed persons must include in their annual report information on the degree to which they take account of social, ethical and environmental aspects in their investment strategy. A 2003 Law (2) made provision for a similar transparency measure for all supplementary pension institutions.

In 2012, two provisions of the Law on certain forms of collective investment portfolio management (3) (aimed at UCIs) are worth mentioning. The first concerns the prospectus, which must specify the degree to which social, ethical and environmental aspects are taken into account in implementing the investment strategy; the second relates to the annual report, which must supply information on the way in which those aspects were taken into consideration.

In regard to controversial investment, Belgium adopted a Law in 2006 on the financing of controversial weapon systems (4). This legislation meant that Belgium played a pioneering role here, but the implementation of the Law is still posing problems as the list of firms engaging in activities that it prohibits has not been published (5).

Finally, for completeness, it should be noted that a draft Resolution is currently being debated in Parliament whereby members are asking the federal authorities to refrain from investing in fossil fuels.

At European level, a Directive (6) was adopted in 2014 requiring listed companies with more than 500 employees to include environmental and social information in their financial reports.

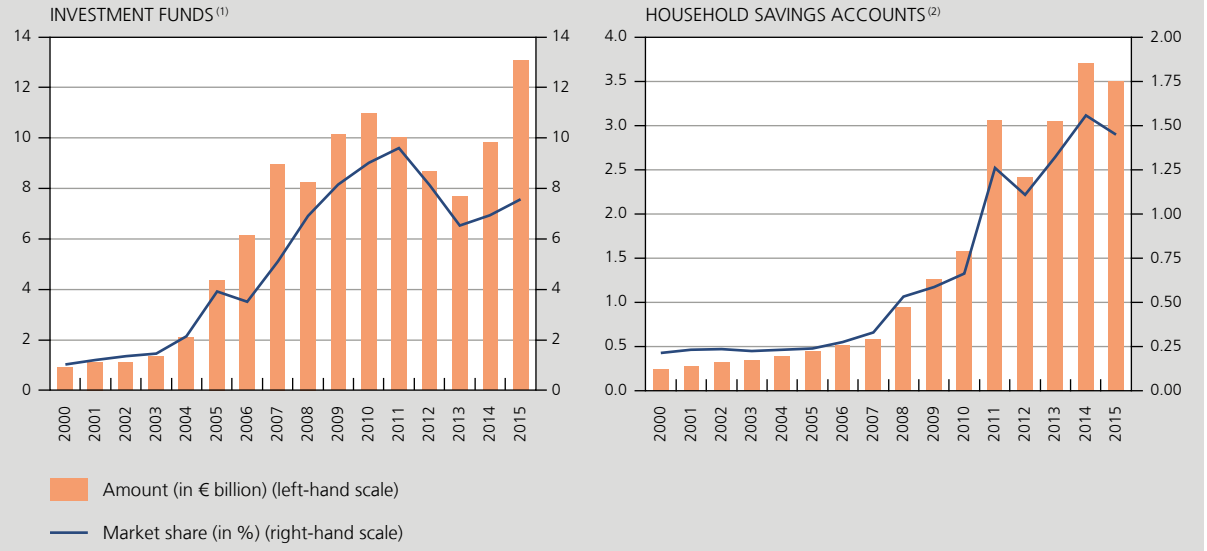
In addition, a new Directive (IORP II) on institutions for occupational retirement provision (7) was adopted in 2016. It emphasises the importance of good risk management, including the risks associated with climate change and the use of resources, ecological risks, social risks and the risks relating to the depreciation of assets resulting from changes in the regulatory framework (stranded assets). However, although the Directive encourages IORPs to improve their management of the environmental risks, it does not contain any binding provisions on the subject.

4.2 Private initiatives

Although there is still no legal framework in Belgium defining and regulating sustainable investment like the one

(1) *Moniteur belge/Belgisch Staatsblad* of 31 December 2002.
(2) *Moniteur belge/Belgisch Staatsblad* of 15 May 2003.
(3) *Moniteur belge/Belgisch Staatsblad* of 19 October 2012.
(4) The Law of 8 June 2006 (*Moniteur belge/ Belgisch Staatsblad* of 9 June 2006) regulating economic and individual activities concerning weapons, as amended by two subsequent laws, prohibits among other things the financing of any Belgian or foreign company whose activity consists in the manufacture, use, repair, marketing, sale, distribution, import or export, warehousing or transport of anti-personnel mines, cluster munitions and/or dummy ammunition and armouring containing depleted uranium or any other type of industrial uranium within the meaning of this law with a view to their proliferation.
(5) The Law of 20 March 2007 stipulated that, by no later than 1 May 2008, a public list must be published of firms proven to engage in one of the activities prohibited by the Law, firms owning a stake of more than 50 % in those firms, and collective investment institutions holding financial instruments of one of the said firms. However, that list has not yet been published.
(6) Directive 2014/95/EU.
(7) Directive (EU) 2016/2341.

CHART 9 SUSTAINABLE AND GREEN INVESTMENT IN BELGIUM



Sources: Forum Ethibel, on the basis of data from the BEAMA and financial institutions, NBB.

(1) Investment funds marketed in Belgium by open-ended investment companies (BEL and LUX), funds with capital protection, bond funds, etc. Share of those funds in the total funds invested in UCIs.

(2) Savings accounts intended to finance solely projects concerning the social economy or the environment. Share of these accounts in the total assets invested in savings accounts in Belgium.

developed in France in 2016[1], various certificates and labels relating to the sustainable and green character of investment are nevertheless available. They are awarded by entities such as Forum Ethibel, a non-profit organisation involved in the rating, independent monitoring and certification of financial products. Created in 1992, the Ethibel Pioneer label is awarded to investment funds that invest solely in equities and bonds of firms which are among the leaders in their sector in all aspects of corporate social responsibility. The funds may also include government bonds and bonds issued by international institutions. In 2004, Forum Ethibel launched a second label, called Ethibel Excellence, to meet the needs of financial institutions and investors. It is awarded to funds investing in firms which perform above average in their sector in all aspects of corporate social responsibility, or in government bonds and bonds issued by international institutions. On the Belgian market, there are currently six funds with such a label.

Unlike labels guaranteeing a sustainable portfolio composed on the basis of very strict selection criteria drawn up by the label manager (in this case Forum Ethibel), the certificates give investors a guarantee that the statements made by the fund manager are true, namely that they meet all the non-financial criteria imposed by the label manager and predefined in a specification. The certificate therefore does not say anything about the intrinsic quality of the product or about whether the investment conforms to the label manager's own standards concerning ethical or sustainable investment. Just over twenty investment and savings products have received this certificate.

Other labels have also been introduced recently. For example, in the sphere of economic solidarity, the *Financité et Fairfin* label (created in 2014) is issued for products that permit direct investment in the social economy, such as shares in a cooperative society or bonds of a non-profit organisation. It certifies that, on the basis of social criteria, the products fund activities that generate social and environmental benefits.

In 2013, Febelfin (the Belgian financial sector federation) and BEAMA (Belgian Asset Managers Association) harmonised their definitions of sustainable financial products. That harmonisation was based on transparency concerning (1) controversial activities, (2) the way in which the strategy for composing and managing sustainable products is implemented, and (3) external supervision. Apart from this

(1) The first public ISR (Investissement Socialement Responsable) label was launched in France in 2016. It is intended to guarantee the extra-financial quality of the products and facilitate the spread of this type of investment.

transparency, the approach also implies some minimum requirements that must be met by firms or public authorities which may be financed with funds derived from sustainable financial products. Certain activities are excluded, such as the financing of the arms industry or the financing of projects, businesses or countries which clearly violate the principles of the United Nations Global Compact.

4.3 Some figures

On the basis of data from the BEAMA and financial institutions, the amount invested in sustainable investment funds in Belgium came to around € 13 billion in 2015, representing roughly 7.6 % of the Belgian investment fund market. After contracting between 2010 and 2013, that market has been expanding again for two years.

In addition to investment funds, banks also offer solidarity savings products and/or sustainable savings products for individuals. These are savings accounts from which the funds are used by credit institutions to finance projects in the sphere of the social economy and economic solidarity, or environmental projects. The amount saved by Belgian households in this type of product came to € 3.5 billion in 2015, or 1.45 % of the outstanding total on savings accounts in Belgium.

5. Main challenges and implications for public policy

The analysis elements presented above highlight two major obstacles which the government should remove in order to facilitate further expansion of sustainable and green finance. This concerns the lack of transparency in regard to financial products in this category (G20 Green Finance Study Group, 2016) and the general failure to take account of externalities, be they negative or positive (Paris Europlace, 2016).

The definition and implementation of common standards is an essential precondition for developing the market and ensuring confidence in that market. Improved market standardisation should aim to increase transparency for investors in order to reduce the reputation risk and transaction costs. Various institutions and countries have set their own rules for the valuation and labelling of green assets, but the diversity in that regard indicates that great heterogeneity persists. That is due partly to the continuing dilemma between opting for a flexible label that leaves some scope for initiative and market dynamics, and choosing a label which is more exacting and therefore ensures greater integrity and investor confidence. The idea of a voluntary label stricter than the current labels is relevant, but is only practicable for a region where there is unanimity on the meaning of "sustainable", e.g. a potential European label.

Other initiatives could also foster growth of the sustainable finance market. The development of equity or bond indices enhances the comparability of the financial products offered and reduces the cost of access to information for investors. In the case of green bonds, for example, some stock exchanges (London, Oslo, Stockholm) have launched dedicated exchange listings, which facilitate access to information and encourage expansion of the secondary market.

In parallel with the introduction of common standards and specific equity or bond indices, it is also appropriate to set up bodies to oversee sustainable financial products in order to prevent "greenwashing". Centralised control and certification would probably also facilitate a reduction in the labelling and reporting costs associated with these assets.

Another possible move would be for the government to oblige private market players to take account of negative externalities (e.g. by setting a high carbon price) or the financial risks associated with assets which could become stranded. Such measures could indirectly drive up the cost of polluting investment and reduce the relative cost of sustainable investment without increasing the risks to financial stability.

Establishment of mechanisms that encourage the holding of sustainable assets is another conceivable approach. Such mechanisms could take the form of adjustments to the rules on holding securities to finance the energy transition, e.g. via a "green supporting factor" which could take the form of less stringent requirements for capital made available for funding those assets and investing in them, as proposed by the Fédération française des banques (2016).

Government bodies, and particularly the regulators, have begun issuing recommendations for addressing these challenges by means of transparency, on the one hand, and incentive schemes on the other.

For instance, the Task Force on Climate-related Financial Disclosures (TFCD) of the Financial Stability Board (FSB) has recommended transparency based on four principles:

– governance: the TFCD advocates disclosure of the organisation's governance concerning the risks and opportunities relating to climate change;

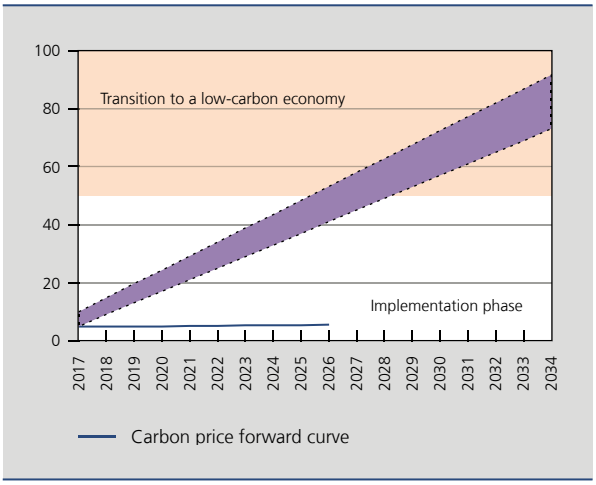
– strategy : the TFCD advises disclosure of the actual and potential risks and opportunities that climate change implies for the organisation of the business, its strategy and its financial planning. The organisation may explain how various climate change scenarios would affect its strategy ;
– risk management : the TFCD recommends disclosure of the practices implemented to identify, assess and manage the risks resulting from climate change ;
– metrics and targets : the TFCD advocates transparency regarding the tools and targets used to assess and manage the risks and opportunities associated with climate change.

In addition, since the regulators need to have full information on the risks, transparency must extend to the whole of the financial sector and, in particular, the sectors most vulnerable to climate change.

The regulators may supplement the static picture obtained from the transparency process in two ways : (1) by introducing "carbon" stress tests that can identify the vulnerabilities of financial institutions when confronted with extreme changes concerning climate and energy, and (2) by introducing a target "corridor" for future changes in the carbon price.

This corridor indicates the minimum price for emission rights ensuring that this mechanism has a deterrent effect on pollution. A maximum price must also be set in order to ensure a smooth transition without jeopardising the stability of the economic and financial fabric.

CHART 10 CARBON PRICE "CORRIDOR"
(in €/tonne)



Sources : Report of the Canfin-Grandjean Commission, Thomson Reuters Eikon.

The minimum and maximum prices must gradually rise to bring about the transition leading to a low-carbon economy (the orange zone in chart 10), during which the emission price becomes sufficiently high to force polluting industries to change. The starting price may appear low compared to the real cost of emissions, but the signal of a rising price can help to initiate the change. Of course, this mechanism is totally ineffective unless it is implemented worldwide, in order to prevent the most polluting industries from relocating to countries with less stringent environmental rules.

Reconciliation of the operation of the financial markets with social and environmental goals is a general objective that can be sub-divided into various aspects : optimisation of long-term performance and improved internalisation of the externalities in the valuation of assets, reallocation of capital to low-carbon assets, and better awareness of the risks associated with climate change.

To achieve these objectives, government policy can focus on three main points : the creation of opportunities in the sphere of sustainable and green investment, extension of the time horizon for investors, and establishment of environmental targets.

Developing the opportunities for sustainable investment

Government policy on this subject tries to introduce incentive schemes in order to lower the capital cost for sustainable projects. Among other things, this approach involves identifying the projects in question and the assets used to fund them (loans, bonds, equities). In this connection, the first aim of government policy should be to boost the return on those assets in order to bring them to the attention of a large number of investors, and thus steer private investment towards sustainable financial products, such as green bonds. Examples of specific instruments which may be used include "risk-sharing", whereby the risk is shared between public and private players, or the creation of incentives such as the "green supporting factor" mentioned earlier.

Extending the time horizon for investors

This point requires changes in investors' strategy and behaviour so that they optimise the return on their assets in the long term, instead of in the short term. The government's role is to create demand for these long-term approaches by establishing a favourable regulatory framework (reporting obligations regarding long-term risks, limits on remuneration based on short-term performance, etc.). The underlying idea is that if the financial market

players extend the time horizon for their decisions, they must necessarily take account of the new constraints resulting from climate change by anticipating the changes that will affect certain economic sectors, and the inevitable political and regulatory constraints that will undoubtedly try to limit the effects of those changes.

Aiming at an environmental target in the legislation

In order to achieve a global environmental target, explicit economic targets could be set ("green" share, percentage of capital devoted to renewable energy, ceiling on the financing of energy sources emitting the most greenhouse gas, etc.). Each country could choose the most appropriate ways of meeting the international obligations, depending on the structure of its domestic financial system.

Conclusion

The increasing interest in sustainable and responsible investment is linked to a number of recent developments at global level. One of the most important developments is awareness of the climate change caused by economic activity. The need to limit global warming and the commitments that countries have made on that subject have triggered debate on the importance of transforming production processes and their financing. As regards energy production, transport, and energy efficiency in particular, massive investment in green projects will be needed in the near future to meet the climate targets. However, those projects feature some characteristics (long-term horizon, use of new technologies, complexity, associated risks and uncertain returns) that necessitate a change in the current financial market framework.

A number of factors still hinder the supply of sustainable and green finance. For one thing, the carbon market in its current form does little to penalise polluting industries and therefore fails to take full account not only of harmful effects on the climate but also of the beneficial impact of sustainable and green investment. Moreover, the returns on this investment do not yet appear sufficiently attractive for potential investors. In addition, some of the economic policies or rules prevailing on the financial markets are still inadequate to encourage a smooth transition for the financing of the economy and avoid the creation of stranded assets. These imperfections, coupled with the relative absence of transparency, the lack of any shared definitions, and the need for a body to supervise financial products labelled as sustainable, are slowing down the development of these products. Conversely, green bonds, which are usually dedicated to clearly identified projects, are proving to be a promising example of a sustainable financial product.

In order to meet the growing demand, the supply of sustainable and green finance will have to address a number of challenges, and the public authorities have a major role to play here. They have various mechanisms at their disposal for channelling the flow of funds towards more environment-friendly industrial projects that also show greater respect for social and ethical criteria or those relating to better governance. These mechanisms concern incentives (definition of binding targets, consideration of externalities), legislation (establishment of supervisory bodies, consideration of the long-term risks) and market transparency (labelling, creation of equity and bond indices).

Bibliography

2° Investing Initiative (2015), *Politiques publiques pour le secteur financier et transition énergétique*, July.

Banque de France (2016), "Les green bonds : solution au financement de la transition ou effet de mode ?", *Bulletin n° 208*, November-December.

Bayot B., A. Cayrol, A. Marchand and V. Verdonck (2016), "L'investissement socialement responsable en Belgique", *Report 2016*, Financité, December.

Climate Bonds Initiative (2017), *Green bonds highlights 2016*.

Commission Canfin-Grandjean (2016), *Mobilizing climate finance : a roadmap to finance a low-carbon economy*.

DNB (2017), "Bottlenecks in funding of green investments", *DNBulletin*, January.

EC (2017), *Climate action* : https://ec.europa.eu/clima/policies/strategies/2030_fr.

Eurosif (2016), *European SRI study* 2016.

FEBEG (2017), *Statistiek elektriciteit* : https://www.febeg.be/statistiek-elektriciteit.

Fédération française des banques (2016), *Réussir le financement de la transition énergétique*, September.

G20 Green Finance Study Group (2016), *G20 Green Finance Synthesis Report*.

Global Sustainable Investment Alliance (2016), *Global sustainable investment review*.

ICMA (2016), *Green bond principles. Voluntary process guidelines for issuing green bonds*, June.

IEA (2016), *Electricity information 2016*, Paris.

IEA and IRENA (2017), *Perspectives for the energy transition – Investment needs for a low-carbon energy system*.

IMF (2016), *Delivering on the 2030 Agenda*, Press Release 16/455, 9 October.

Ministère de l'Environnement, de l'Énergie et de la Mer (2016), *Les obligations vertes au service de la transition énergétique et écologique*, Théma, September.

MIRA (2016), *Duurzaam sparen en beleggen in België : actualisatie tot 2015*, December.

Mirova (2014), *Green and social bonds : what's at stake for investors ?*, September.

Moore F.C. and B. Diaz Delavane (2015), *Temperature impacts on economic growth warrant stringent mitigation policy*, Nature Climate Change.

Natixis (2017), Poussée d'énergie sur le marché des Green bonds, *Market insights*, February.

OECD and Bloomberg Philanthropies (2015), Green bonds – Mobilising the debt capital markets for a low-carbon transition, *Policy perspectives*, December.

OECD (2017), Green financing : Challenges and opportunities in the transition to a clean and climate-resilient economy, *Financial Market Trends*, Vol. 2.

Paris Europlace (2016), *Initiative finance verte et durable de la place de Paris*.

SEO Economisch Onderzoek (2009), *De kapitaalmarkt voor duurzame projecten*, Amsterdam.

Shishlov I., R. Morel and I. Cochran (2016), *Beyond transparency : unlocking the full potential of green bonds*, Institute for Climate Economics, June.

Task Force on Climate-related Financial Disclosures du Financial Stability Board (2016), *Recommendations of the Task Force on Climate-related Financial Disclosures*.

Trends (2017), *Les "green bonds" : plus qu'un effet de mode*, 6 April.

The world is a village... The integration of Belgian firms into the world economy (*)

E. Dhyne
C. Duprez

Introduction

Production fragmentation is a pervasive phenomenon in the world economy. Firms buy inputs from others and may sell their output for intermediate use, giving rise to a sequencing of production stages (1). This fragmentation has been mostly viewed as an international process, with some countries specialised in early stages of production (design of the product), some in medium stages (early production stages) and others in final stages (final assembly, marketing, distribution), but this procedure may also occur locally. Newly available international input/output tables have enabled an analysis of international supply linkages and the extent to which value added is sequentially created along the global value chains (see Timmer *et al.*, 2014, Koopman *et al.*, 2014). Sectoral linkages within countries and how they affect technological diffusion have also been studied, mostly using input/output tables (see Acemoglu *et al.*, 2012).

However, little work has been done on domestic production network at the firm level due to data availability (2). The goal of this paper is to provide a description of the integration into the globalised economy of firms that are not directly involved in international trade. To do so, we provide a detailed description of the organisation of a domestic production network and how it integrates itself in the global value chains (GVC).

At the firm level, these questions have mostly been addressed by analysing the decision to export or to import. The widely used new trade models with heterogeneous firms (see the review by Melitz and Redding, 2014) display a positive relation between the level of technological efficiency of a firm and its export status (see for example Bernard and Jensen, 1999, Ottaviano and Mayer, 2007) (3). In related literature, there are firm-level studies that stress the link between imported intermediate inputs and productivity (Antràs *et al.*, 2016, Bernard *et al.*, 2009, Amiti and Konings, 2007).

Recent research, however, has questioned the exclusive focus on exporting (or importing) firms. Some empirical papers have shown that many firms are potentially exporting indirectly through trade intermediaries or other manufacturing firms (4). More generally, one finds evidence that many firms are indirectly connected to the rest of the world. Some firms supply parts and components that are

(*) This article was originally published in the *International Productivity Monitor* (spring 2017) with the title "It's a small, small world... A Guided Tour of the Belgian Production Network". It has benefited from comments made on previous versions by participants to various CompNet network workshops and conference, especially J. Amador, R. Baldwin, E. Bartelsman, F. di Mauro and M. Timmer, and to OECD Global Forum on Productivity workshop organised in June 2016 in Lisbon. The authors would finally like to thank two anonymous referees of the *International Productivity Monitor* and A. Sharpe for their fruitful comments on the last version of this paper.

(1) See e.g. Antràs and Chor (2013) and Fally and Hillberry (2014) for theoretical frameworks highlighting the role of the sequentiality of production.

(2) Atalay *et al.* (2011) use transaction data to characterise the organization of the production network in the US but their sample only covers large firms and their main customers. Bernard *et al.* (2016b) use the collection of the main supplier/customer relations for Japanese firms but do not observe the size of the transactions. To our knowledge, the Belgian B2B transaction data is the first micro dataset available that provides an exhaustive description of the inter-firm linkages, including the magnitude of those transactions.

(3) The impact of export activities on TFP growth has also been addressed to test the learning-by-exporting assumption, but empirical evidence is not as clear.

(4) For instance, Bernard *et al.* (2010) have shown that wholesalers and retailers play a major role in the US exports. Similarly, Bernard *et al.* (2016a) have found that a significant share of the products sold abroad by Belgian manufacturing exporters is related to products not directly produced by those firms.

then integrated into exports. Others buy inputs whose parts or components are imported.

Exporting and importing firms therefore act as connectors of the domestic production network to the rest of the world. Dhyne and Duprez (2015) documented that phenomenon using a sample of around 350 000 Belgian firms [1]. In their sample, the number of exporting firms is relatively small (less than 5 % of firms), of which almost half export less than 10 % of their turnover. However, almost 80 % of their sample supplied inputs to the rest of the world, either directly or indirectly through third companies. Overall, almost 20 % of their sample, on average, ultimately exported at least 10 % of their output, and almost 10 % exported at least 25 % of their output. This situation is even more striking when it comes to imports. Almost all Belgian firms use foreign inputs, obtaining supplies directly or indirectly from importers, particularly in the case of energy and commodities.

Our paper brings additional evidence on indirect international trade by characterising how close firms are from world markets, either as a source of inputs or a destination for output. The data used make it possible to identify potential commercial channels through which a domestic firm can source foreign inputs or serve foreign demand. Using a similar dataset, Dhyne and Rubinova (2016) found evidence of a performance premium that rises with the proximity to foreign demand. We extend this result by showing that the same applies to the import side. In the spirit of Antràs *et al.* (2016), we also find a stronger impact of the distance to foreign inputs on the firm performance than that normally associated with the distance to foreign demand.

Describing and understanding the organisation of domestic production networks at a very disaggregate level is crucial to understanding the evolution of total factor productivity in advanced economies (see Oberfield, 2013). Over the last decades, the development of information and communication technologies and the reduction in transport costs have completely overhauled the organisation of production and corporate boundaries. Efficient or cost-saving production may require fragmentation of the production process among multiple producers. Firms have more and more intensively outsourced or offshored tasks they were doing in-house and concentrated on the business activities where they are most efficient. For example, it has been commonly observed in many countries that firms have increasingly outsourced support activities like catering, cleaning and security services to specific service providers (see Goldschmidt and Schmieder, 2017).

These changes have led to the organisation of production in very complex networks reshaping the way technological or trade shocks propagate within an economy. Analysing the spread of shocks through the network may provide very useful insight for understanding the global TFP slowdown observed in the last decade and why the technology gap between frontier firms and laggards has been widening. While these important questions are clearly beyond the scope of our paper, we intend to contribute to this literature by providing a first description of the production network and illustrate how the integration of individual firms into the Belgian production network and the global economy affects productivity.

This article is structured as follows. Section 1 presents the new database. Section 2 provides an initial set of network-related statistics that describe the Belgian production network and its development over the 2002-2014 period. Section 3 is dedicated to the analysis of the proximity of Belgian firms to foreign markets, while section 4 investigates the link between our measures of proximity and the firm's economic performance. The final section presents some tentative conclusions.

1. The Belgian production network

In order to document firms' involvement in the international fragmentation of production as well as the organisation of the production network, we use two datasets which are available for the 2002-2014 period. The first dataset managed by the National Bank of Belgium provides firm-level information [2] on exports and imports by product and by foreign country.

The second dataset comes from the annual declarations of deliveries by business customers to the Belgian tax administration. It records for every VAT-registered business the annual value of its deliveries to any other VAT affiliate, as long as this amount is greater than or equal to € 250 per year. This annual value of sales from firm *i* to firm *j* is called a transaction. This transaction is not split between the potentially multiple goods and services

(1) While also considering Belgian data, their analysis is restricted to the sample of firms registered in the Central Balance Sheet Office of the National Bank of Belgium, which only covers around 50% of the VAT affiliates considered in this paper.

(2) The term firm refers to any legal entity registered to the tax administration under a VAT number. It is therefore a legal concept of a firm that is used. This concept covers all kinds of organisations from the Belgian affiliates of multinationals to the local corner shop or the self-employed. A given firm may have more than one plant operating under the same VAT number. The trade between those plants is not observed in our data. Alternatively, some organisations may decide to use more than one VAT number to handle specific activities (e.g. a first firm/VAT number will deal with production, a second one with domestic business relations and a third one with exports). Trade between the different VAT affiliates is observed.

traded between firms *i* and *j*. It only represents the total value traded between those two firms. However, we may observe bilateral trade between those two firms. In this case, we observe both the transaction between *i* (as a seller) and *j* (as a buyer) and its reverse transaction between *j* (as a seller) and *i* (as a buyer). This dataset therefore provides all the linkages between all Belgian firms. This data, described in Dhyne, Magerman and Rubinova (2015), enables us to fully characterize the local production network.

Merging these two datasets therefore gives a full picture of any domestic or international linkages that involve at least one Belgian firm. We will discuss in the next two sections some facts about the organisation of the domestic production network and its interrelation with world markets, but first it is useful to discuss the specificities of such a dataset.

The firm-to-firm transaction data can be viewed as a kind of input-output matrix where each row and each column is a firm. In that respect, it is therefore a very suitable tool for analysing the organisation of production chains at national level, in the same way world input/output tables (Timmer *et al.*, 2014) provide a description of the contribution of a given industry in a given country to global value chains. Still, this dataset departs from traditional I/O tables in a number of ways.

First, we have no information of what is traded between two firms. We are therefore not able to distinguish between intermediate inputs and investment inputs. In our data, buying an investment good is considered as an intermediate purchase. Conversely, an investment is part of the final demand in an input-output framework.

Second, the manner in which wholesale and retail trade intermediaries are recorded is fundamentally different from that of standard I/O tables. In standard I/O tables, the contribution of the wholesalers and retailers to the economy and their intermediate deliveries to other sectors is measured in terms of the value added generated by wholesalers and retailers. In our transaction data, we observe gross transactions to or from trade intermediaries. The contribution of wholesalers and retailers in the network is therefore much larger than in standard I/O tables. These firms, as shown in section 2, play a crucial role in the domestic production network. They are in fact most of the time the ultimate step between the producer and the final consumer. They are also a key player in connecting firms.

Third, there is no intra-firm trade in our dataset, which means that the diagonal of our firm-to-firm I/O matrix is 0. On the contrary, in standard I/O tables, the main action is in the diagonal. This affects measures of production fragmentation, as the Antràs *et al.* (2012) upstreamness indicator.

2. Some stylised facts on domestic trade

Before looking at how Belgian firms are involved in GVCs, we first describe the Belgian production network. It is worth noting that, with the only exception of section 4, we do not consider any firm characteristics such as size or productivity level. By so doing, we obtain the largest coverage of the Belgian economy available for our analysis. This means we use the set of all legal entities that are registered with a VAT number both for tax declarations and in international trade data. Each year, we observe between 676 000 and 861 000 VAT declarants, which is twice the number of firms that have to report their annual financial statement to the NBB's Central Balance Sheet Office. The difference is due to the self-employed or fiscal representatives of foreign firms that do not have to file a financial statement.

Characteristic 1 – Belgian firms typically have a small number of domestic customers and domestic suppliers

On average, we observe around 20 domestic business customers[(1)] for each firm (see table 1). This indicates that the density of the production network, which is equal to the ratio between the observed transactions and the potential number of transactions[(2)] is very small (around 2.3E-5 in 2014). If we exclude from our sample firms that are operating as wholesaler or retailer (NACE Rev 2 45 to 47), the average number of domestic business customers falls to 10. This illustrates how important the distribution sector is in connecting the other firms not only to final demand but also to firms themselves, especially on the domestic market.

The distribution of the number of customers and suppliers is highly skewed. 25 % of the firms in our sample have no Belgian business customers in 2014[(3)] and 25 % have at most three domestic suppliers. The median firm has only two Belgian customers but nine domestic suppliers. By contrast, 1 % of the firms have at least

(1) By customers, we only refer to business customers. Firms may also serve final demand and may have many households in their client portfolio but these transactions are not observed in our dataset.

(2) The potential number of transactions in a production network is given by the product of the number of firms and the number of firms minus 1.

(3) The firms that have no Belgian business customers are firms that are either only serving foreign markets or domestic final demand. By construction, the average number of domestic suppliers is equal to the average number of domestic customers.

TABLE 1 FIRM PRODUCTION NETWORK CHARACTERISTICS

	2002	2007	2010	2014
Number of firms	676 016	737 326	770 902	860 735
excluding wholesalers and retailers	486 508	549 747	585 079	680 651
Number of domestic transactions	13 312 924	15 008 281	16 201 273	17 304 408
excluding transactions implying wholesalers or retailers	4 416 893	5 382 637	5 878 684	6 975 793
Average number domestic customers	19.7	20.4	21.0	20.1
Network's density (in %)	0.0029	0.0028	0.0027	0.0023
Number of exporters	29 056	24 463	22 550	21 464
Number of importers	32 711	35 164	42 361	46 151

Source: own calculations.

300 domestic customers and 1 % have at least 175 domestic suppliers.

Characteristic 2 – Belgians firms typically trade locally on the domestic market

Geography matters on the domestic market. Even in a small country like Belgium, the organisation of the production network is mostly local. 25 % of the domestic transactions involve domestic partners located within a 6 km range. The median domestic transaction involves two firms separated by less than 20 km. Only 1 % of the domestic transactions are between firms 155 km or more apart. This is well documented in Dhyne and Duprez (2016), who have also pointed to significant cultural trade barriers within Belgium.

(1) Note that in table 2 the correlation between labour productivity and the number of customers/suppliers increases over time. This may reflect the fact that the gap between productive and unproductive firms has widened over time.

Characteristic 3 – Larger firms and more productive firms tend to manage a larger number of domestic customers or domestic suppliers

When firm-level characteristics are available, simple correlations between size or labour productivity (in level) and the number of customers and suppliers show that the ability to manage large portfolio of customers and suppliers increases with firm size and firm efficiency, as shown in table 2 [(1)].

Characteristic 4 – The network's organisation changes significantly every year

Between 2002 and 2014, the structure of the Belgian network changed dramatically. Not only do we observe a large increase in the number of sampled firms and in the number of transactions, but we also observe a

TABLE 2 CONNECTIVITY AND FIRMS CHARACTERISTICS [(1)]

	2002	2007	2010	2014
Correlations between:				
Employment and number of customers	0.400***	0.405***	0.401***	0.398***
Employment and number of suppliers	0.633***	0.626**	0.604***	0.615***
Labour productivity [(2)] and number of customers	0.032**	0.057***	0.056***	0.066***
Labour productivity and number of suppliers	0.038***	0.070***	0.069***	0.074***

Source: own calculations.
Note: The coefficients *** and ** are significant at the respective thresholds of 1 and 5 %.
(1) All variables are in logarithms.
(2) Labour productivity is measured as value added per employee.

high transaction replacement rate. Every year, on average 43 % of the transactions between firms from the previous year are not repeated and 44 % are newly created. In 2014, only 13 % of the transactions observed in 2002 were still open [1].

3. How close are Belgian firms from world markets?

Because we have a full description of both international and domestic transactions, we are able to identify the various channels used by a Belgian firm to access foreign supply of inputs or to serve foreign demand for goods and services. Importers and exporters are able to directly access some foreign markets (according to the countries they are importing from/exporting to and the products and services they trade with these countries), but they may be able to reach more foreign markets by trading with other Belgian importers or exporters.

More generally, a domestic firm that may not directly import or export may source foreign inputs or sell its products abroad indirectly by trading respectively with a Belgian importer or a Belgian exporter. Indirect access to foreign markets is reflected in the phenomenon of the so-called carry-along trade described in Bernard *et al.* (2016a).

In Dhyne and Rubinova (2016), the Belgian production network was used to identify how far a firm was from foreign demand. Here, we extend this approach to the import side and we characterise firms by the number of transactions they need to import foreign inputs or by the number of transactions needed for their products to be exported. As shown in chart 1, if firm A is an importer which sells to firm B (which is not importing), firm B is considered to be a 1st rank M-customer as it is just two transactions away from imported inputs. If firm C (which is not importing) is not a customer of firm A but of firm B, firm C is three transactions from the imported inputs and is called a 2nd rank M-customer. If firm C is an exporter, while firms A and B only serve the domestic market, B is considered to be two transactions from the foreign demand or a 1st rank X-supplier, while A is three transactions away from the foreign demand or a 2nd rank X-supplier.

We define the distance between a given firm and foreign demand as the smallest number of transactions that are needed for that firm's products to cross the border. Similarly, we define the distance between a given firm and foreign inputs by the smallest number of transactions that are needed for that firm to consume foreign inputs. These two measures

(1) 28% and 20% of the 2002 transactions were still observed respectively in 2007 and 2010. Note that the high churn rate is partly due to new or exiting firms.

CHART 1 CLOSENESS OF BELGIAN FIRMS TO FOREIGN SUPPLY / DEMAND

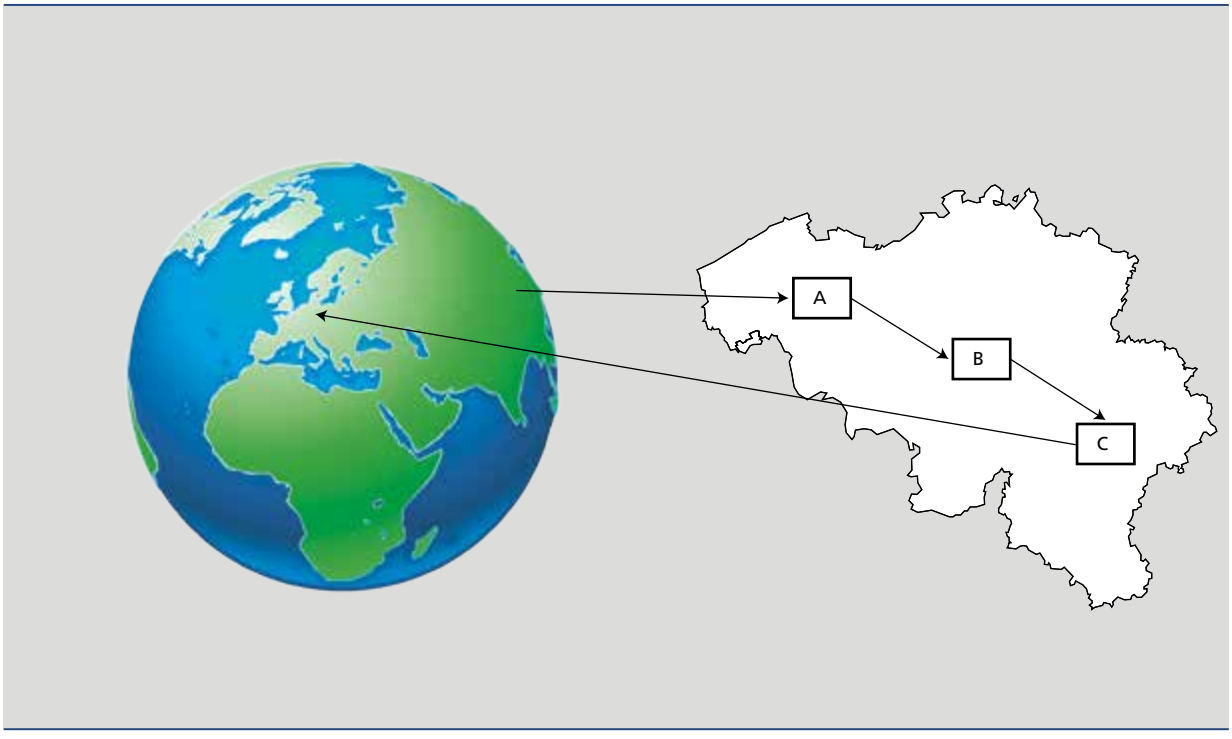


TABLE 3 DISTRIBUTION OF NUMBER OF TRANSACTIONS NEEDED TO SELL OR BUY FROM THE REST OF THE WORLD
(in 2014, in % of the number of enterprises)

	Number of transactions to sell to the rest of the world						
	1	2	3	4	≥ 5	∞ (1)	Total
	Panel A: All transactions						
Number of transactions to buy from the rest of the world							
1	1.7	2.3	0.7	0.1	0.0	0.7	**5.4**
2	0.8	25.8	24.2	3.3	0.3	22.1	**76.4**
3	0.0	1.3	3.6	0.8	0.1	10.0	**15.8**
4	0.0	0.0	0.0	0.0	0.0	0.1	**0.1**
≥ 5	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
∞ (1)	0.0	0.4	1.2	0.4	0.0	0.2	**2.3**
Total	**2.5**	**29.8**	**29.7**	**4.5**	**0.4**	**33.1**	**100.0**
	Panel B: Relevant transactions						
Number of transactions to buy from the rest of the world							
1	1.3	1.3	0.6	0.1	0.0	0.5	**3.9**
2	0.8	20.1	25.0	5.4	0.6	19.5	**71.3**
3	0.1	2.2	5.2	1.7	0.2	12.2	**21.6**
4	0.0	0.0	0.1	0.1	0.0	0.7	**1.0**
≥ 5	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
∞ (1)	0.0	0.3	1.1	0.5	0.1	0.2	**2.3**
Total	**2.1**	**23.9**	**32.1**	**7.8**	**0.9**	**33.1**	**100.0**
	Panel C: Essential transactions						
Number of transactions to buy from the rest of the world							
1	0.9	0.5	0.6	0.3	0.1	0.4	**2.8**
2	0.4	5.7	10.1	9.5	4.3	13.9	**43.8**
3	0.3	4.4	8.4	7.8	3.6	12.2	**36.7**
4	0.1	0.9	1.9	2.0	1.1	7.2	**13.2**
≥ 5	0.0	0.1	0.1	0.1	0.1	0.7	**1.1**
∞ (1)	0.0	0.2	0.5	0.8	0.5	0.3	**2.4**
Total	**1.7**	**11.8**	**21.6**	**20.6**	**9.7**	**34.6**	**100.0**

Source: own calculations.
(1) An infinite number of transactions means that there is no X-trajectory or M-trajectory that connects the firms to the foreign markets.

characterise the Belgian economy's degree of participation in GVCs and its exposure to foreign demand or supply.

Characteristic 5 – A large fraction of Belgian firms are at most three transactions from foreign markets

Results obtained applying this approach to all domestic transactions and international transactions observed in 2014 are presented in table 3 (Panel A).

Our first measure of the integration of Belgian firms into GVCs is based on the (smallest) number of transactions involved in the X and M trajectories, disregarding the size of those transactions. As the reporting threshold of a domestic transaction is very low (€ 250 in a given year), any firm that is able to sell at least € 250 worth to an exporter is, according to the analysis conducted in Panel A, a 1st rank X-supplier even if this transaction is not important for both the buyer

and the seller. Similarly, a firm that buys at least € 250 worth from an importer is a 1st rank M-customer.

To restrict our analysis to relevant transactions, we follow Dhyne and Rubinova (2016) and only consider transactions that represent a minimum fraction of the supplier's total sales or of the customer's total input consumption. We consider that a transaction between two firms is relevant if it represents at least 1 % of either the total sales of the supplier or the total input consumption of the customer. Concerning international trade relations and according to this definition of a relevant transaction, a firm is an exporter (resp. importer) if at least 1 % of its total sales (resp. total expenses) are made abroad.

As can be seen from Panel B of table 3, this new definition of the X- and M-trajectories has a relatively limited impact on our results. Considering only relevant transactions in 2014, 58.1 % of Belgian firms were still at most three transactions from foreign demand. Similarly, still 96.7 % of Belgian firms were at most three relevant transactions from foreign supply. Globally, 56.6 % of Belgian firms were at most three relevant transactions from both foreign demand and foreign supply, compared to 60.4 % when considering any transaction. This confirms the strong integration of a majority of Belgian firms into the GVCs.

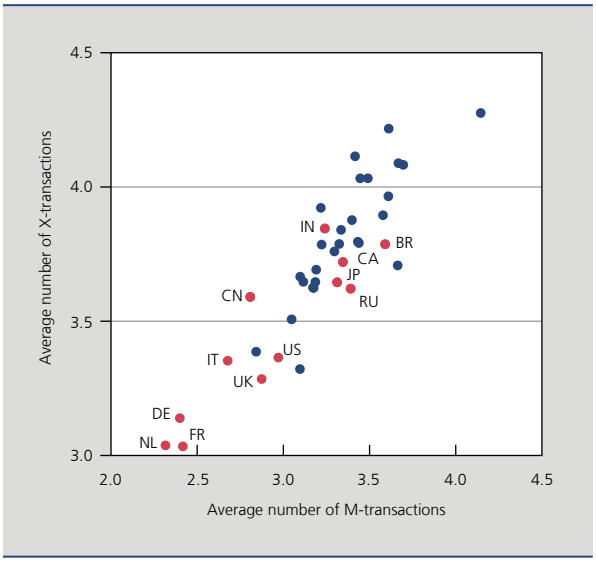
Restricting even further the number of transactions to essential transactions accounting for at least 10 % of total sales or total input consumption of a firm naturally increases the (smallest) number of transactions needed to reach the foreign market but does not affect the share of firms connected to either world supply or world demand, as shown in Panel C.

At a macro level, the results presented in table 3 can be summarised by the distance to the foreign market averaged across firms. In 2014, considering only those firms connected to export markets, the average number of transactions needed ranges between 2.6 (any transactions) and 3.4 (only essential transactions). On the import side and considering only the firms connected to import markets, the average number of transactions is smaller, ranging respectively between 2.1 and 2.6.

Characteristic 6 – Belgian firms need more transactions to source from / serve more geographically remote or smaller markets

It is well documented that the gravity variables affect the probability of a firm exporting to or importing from a given country. As a result, the number of firms directly exporting or importing varies a lot across countries of origin or of destination. Indeed, as more remote / smaller markets are more costly to serve or to source from, fewer firms will be able to establish a direct link with those markets. As expected, this is naturally reflected in the average number of transactions required to reach those countries. The probability that a non-exporting firm will trade with either an exporter to or an importer from these markets declines with the remoteness or the smallness of the markets. Chart 2 shows that Belgian firms need on average more transactions to reach more distant markets or less important markets, for both the export and import side.

CHART 2 AVERAGE NUMBER OF TRANSACTIONS NEEDED TO SOURCE FOREIGN INPUTS AND SERVE FOREIGN DEMAND, BY MARKET



Characteristic 7 – The global connectedness of Belgian firms to foreign markets does not vary by country

Strikingly, if we apply our measure of GVC participation by country of origin or of destination, we find that the share of firms that are not connected to a given export or import market do not vary strongly across country. Considering the 40 main partner countries and relevant transactions only, we find that on average around respectively 33.3 % and 2.1 % of Belgian firms cannot reach demand or source inputs from a particular foreign market. For both imports and exports, we do not observe any significant difference of that share across countries as it varies between 33.3 % and 33.4 % for the export side and from 2.10 % and 2.12 % for the import side. This means that Belgian firms that are able to connect with an exporter or with an importer can reach any of the

40 main markets. Given Characteristic 6, markets only differ according to the number of transactions needed to reach them.

As the share of firms not X-connected to any particular foreign market is almost constant and equal to the share of firms not X-connected at all, this finding suggests that the Belgian production network can be viewed as the sum of two components: the first one, covering 66 % of the firms, is to some extent exposed to both world demand and supply fluctuations, the second is only exposed to import shocks.

TABLE 4 TOTAL FACTOR PRODUCTIVITY AND GVC PARTICIPATION

Explanatory variables	(1)		(2)	
Employment (in logarithm)	0.132***	(0.009)	0.112***	(0.009)
International trade status				
Only exporting	0.343***	(0.034)	0.261***	(0.030)
Only importing	0.512***	(0.068)	0.442***	(0.067)
Both exporting and importing	0.872***	(0.078)	0.660***	(0.078)
Export suppliers				
Rank 1	0.230***	(0.028)	0.223***	(0.028)
Rank 2	0.142***	(0.033)	0.139***	(0.033)
Rank 3	0.109**	(0.049)	0.111**	(0.050)
Import customers				
Rank 1	0.311***	(0.067)	0.291***	(0.066)
Rank 2	0.295***	(0.066)	0.289***	(0.065)
Rank 3	0.175**	(0.075)	0.179**	(0.075)
Number of				
destination countries		–	0.042***	(0.005)
destination countries squared		–	–0.002***	(0.000)
sourcing countries		–	0.025***	(0.009)
sourcing countries squared		–	–0.002**	(0.000)
domestic customers		–	6.1E–05***	(2.1E–05)
domestic customers squared		–	–5.9E–10***	(1.8E–10)
domestic supplier		–	0.002**	(0.000)
domestic supplier squared		–	–3.8E–07***	(1.0E–07)
Financial participations				
Member of a Belgian group	0.194***	(0.018)	0.184***	(0.017)
Belgian multinational	0.132	(0.031)	–0.012	(0.028)
Belgian affiliate of a foreign multinational	0.553***	(0.037)	0.471***	(0.044)
Time dummies	Yes		Yes	
Sector dummies	Yes		Yes	
R^2	0.302		0.311	
Number of observations	1 181 027		1 181 027	

Source: own calculations.

Note: Standard errors are clustered at the sector level (NACE Rev 2 classification at two digits). ***, ** and * coefficients are respectively significant at the 1, 5 and 10 % level. The sample covers the 2002-2014 period.

4. Productivity and closeness to word markets

Finally, we have undertaken an econometric analysis of the relationship between total factor productivity in level (hereafter TFP) and the distance to foreign markets. This exercise is limited to the 195 412 firms whose financial statements we observe and for which the information required to estimate TFP using the Wooldridge-Levinhson-Petrin estimator (employment, material inputs, value added, capital stock) is available [(1)]. Estimated TFP is available for the 2002-2014 period.

As mentioned above, the empirical literature provides considerable evidence of a positive correlation between firm-level productivity and the international trade status of firms (for Belgian firms, see Muûls and Pisu, 2009). Dhyne and Rubinova (2016) also document a clear productivity ranking according to the distance to export markets. Here, we extend this type of analysis by controlling also for distance to import markets and other firm characteristics (firm size, number of customers, number of suppliers, number of destination markets, number of sourcing markets, etc.). Distance to foreign markets is computed considering the number of relevant transactions (see section 3). The numbers of customers/suppliers/destination markets/sourcing markets are also evaluated considering only the relevant transactions.

While we cannot interpret the results presented in table 4 as causal relations because of endogeneity issues between TFP (in level) and some of our explanatory variables, we still observe significant correlations between efficiency and our control variables.

As commonly observed, the most productive firms tend to be the largest ones. They also tend to be more deeply integrated into the global economy. Two-way traders are the most efficient firms in the Belgian economy, followed by firms that only import and then firms that only export.

Firms that are active on international markets are followed in the productivity ranking by 1st rank M-customer and 1st rank X-supplier. We observe a clear productivity ranking based on the two distances to foreign markets. M-customers that are closer to foreign inputs are more efficient, reflecting their potentially greater ability to source better inputs (see Dhyne and Duprez, 2017). Similarly X-suppliers that are closer to foreign demand are more efficient. As the productivity premium is higher for importers than for exporters, we find the distance to imports has a greater influence than the distance to exports.

The less efficient firms are those which are more than four transactions away from the foreign markets. These firms suffer a productivity handicap of 66 % in comparison to the most efficient ones.

Total factor productivity also seems to be related to the number of transactions a firm is able to engage in. Among the exporting firms, serving more markets increases efficiency. Similarly, sourcing inputs from more markets is related to higher efficiency. The marginal effect of the number of destination or sourcing markets declines but remains positive in the observation range in our sample.

A positive (non-linear) relation is also observed between efficiency and the number of domestic customers and domestic suppliers but the impact of these local transactions on efficiency is much more limited than the impact of international transactions.

Finally, as expected, firms that are members of a Belgian or a foreign group tend to also be more productive. Foreign affiliates of multinationals have the largest productivity premium.

Conclusion

The purpose of this article has been to provide some facts about the degree of integration of the Belgian economy into global value chains and to describe the organisation of the domestic production network.

Using a unique dataset that makes it possible to observe any domestic or international transactions involving at least one Belgian firm, we find that (1) most Belgian firms have a limited number of domestic suppliers or domestic business customers, (2) most of their domestic transactions are local, and (3) larger and more efficient firms are able to manage bigger customers or suppliers portfolios.

In terms of GVC participation, we find that even if the share of directly exporting or importing firms is small in the Belgian network (between 2 and 5 % of Belgian VAT affiliates), (4) Belgian firms require on average between 2.6 and 3.4 transactions to serve foreign demand and between 2.1 and 2.6 transactions to source foreign inputs. (5) Only one-third of Belgian firms are totally disconnected from demand from the rest of the world and this share does not vary by destination countries, but (6) firms that can export indirectly need more transactions to reach

(1) See Wooldridge (2009) for more details on this estimator.

more remote and less important foreign markets. We also find a clear productivity ranking of Belgian firms according to their closeness to foreign markets.

These results have some important policy implications.

First, they illustrate the potential damage associated with rising protectionism. Our findings suggest that restraining imports would not only hamper direct importers but almost the entire production network as well.

Second, they could also affect the way policy-makers should address the competitiveness issue. Because exporters or importers are essential for the integration of an economy into global value chains, the economic debate on the competitiveness of a country has mostly focused on changes in its exporters' competitive position [1]. However, focusing only on the competitiveness of the exporting/importing firms does not seem to be sufficient in itself to characterise the competitiveness of an economy.

It is also important to look at the firms that are indirectly connected to international markets. These firms tend to lag behind in terms of technological efficiency. As described in Andrews *et al.* (2016), their technological gap has tended to widen during the recent period, jeopardising their ability to survive and flourish in the global value chains. Evidence based on the CompNet Database [2] also suggests that, when Belgian firms are compared to their German or French counterparts, it was the less efficient Belgian firms that suffered a sharp deterioration in their competitiveness over the 1998-2011 period, being unable to compensate for the increase in labour costs with productivity gains (see NBB 2013 Annual Report). This may push more firms out of the internationally integrated value chains and have a negative long-run impact on the growth potential of the Belgian economy, as trade and especially international trade can serve as a vector of technological spillover.

This paper also points out the potential for new information from the analysis of production networks. This type of data allows a better understanding of the exposure of an economy to external shocks and how shocks propagate throughout the economy.

(1) In the public debate, imports are mostly considered as bad for domestic producers. However, imports as a source of better quality inputs for domestic producers is also a key determinant of the competitiveness of an economy as shown in section 4.
(2) See CompNet (2014).

Bibliography

Acemoglu D., V. Carvalho, A. Ozdaglar and A. Tahbaz-Salehi (2012), "Network origins of aggregate fluctuations", *Econometrica*, 80, 1977–2016.

Amiti M. and J. Konings (2007), "Trade Liberalization, Intermediate Inputs, and Productivity: Evidence from Indonesia", *American Economic Review*, 97(5), 1611-1638.

Andrews D., C. Criscuolo and P. N. Gal (2016), The Best versus the Rest: *The Global Productivity Slowdown, Divergence across Firms and the Role of Public Policy*, OECD Productivity Working Papers, 5.

Antràs P. and D. Chor (2013), "Organizing the Global Value Chain", *Econometrica*, 81(6), 2127–2204.

Antràs P., D. Chor, T. Fally and R. Hillberry (2012), "Measuring the Upstreamness of Production and Trade Flows", *American Economic Review*, 102, 412–416.

Antràs P., T. Fort and F. Tintelnot (2016), *The Margins of Global Sourcing: Theory and Evidence from U.S. Firms*, mimeo.

Atalay E., A. Hortaçsu, J. Roberts and C. Syverson (2011), "Network structure of production", *Proceedings of the National Academy of Sciences of the United States of America*, 118(3), 5199-5202.

Bernard A. and J.B. Jensen (1999), "Exceptional exporter performance: cause, effect, or both?" *Journal of International Economics*, 47(1), 1-25.

Bernard A., J. B. Jensen and P. Schott (2009), "Importers, exporters, and multinationals: a portrait of firms in the U.S. that trade goods" in Dunne,T., Jensen, J.B.,Roberts,M.J. (Eds.), Producer Dynamics: New Evidence from Micro Data. University of Chicago Press, Chicago.

Bernard A., J. B. Jensen, S. Redding and P. Schott (2010), "Wholesalers and Retailers in US Trade", American Economic Review, 100(2), May, 408-413.

Bernard A., E. Blanchard, I. Van Beveren and H. Vandenbussche (2016a), *Carry-Along Trade*, mimeo.

Bernard A., A. Moxnes and Y. Saito (2016b), *Production Networks, Geography and Firm Performance*, mimeo

CompNet Task Force (2014), *Micro-based Evidence of EU Competitiveness: The CompNet Database*, ECB, Working Paper Series, February, 1634.

Dhyne E. and C. Duprez (2015), "Has the crisis altered the Belgian economy's DNA?", NBB, *Economic Review*, September, 29-40.

Dhyne E. and C. Duprez (2016), "Three regions, three economies?", NBB, *Economic Review*, December, 65-80.

Dhyne E. and C. Duprez (2017), *Local sourcing and production efficiency*, mimeo

Dhyne E., G. Magerman and S. Rubinova (2015), *The Belgian production network 2002-2012*, NBB, Working Paper Series, 288.

Dhyne E. and S. Rubinova (2016), *The supplier network of exporters: Connecting the dots*, NBB, Working Paper Series, 296

Fally T. and R. Hillberry (2014), *A Coasian Model of International Production Chains*, mimeo.

Goldschmidt D. and J. Schmieder (2017), "The Rise of Domestic Outsourcing and the Evolution of the German Wage Structure", *Quarterly Journal of Economics*, April.

Koopman R., Z. Wang and S.-J. Wei (2014), "Tracing Value-Added and Double Counting in Gross Exports." *American Economic Review*, 1042, 459-94.

Melitz M. and S. Redding (2014), "Heterogeneous firms and trade" in Handbook of International Economics, vol. 4.

Muûls M. and M. Pisu, (2009), "Imports and Exports at the Level of the Firm: Evidence from Belgium", *The World Economy*, 32(5), 692-734.

NBB (2014), Annual Report 2013.

Oberfield E. (2013), *Business Networks, Production Chains, and Productivity: A Theory of Input-Output Architecture* Mimeo.

Ottaviano G. and T. Mayer (2007), *The happy few: the internationalisation of European firms*, Bruegel Blueprint, 3.

Timmer M.P., A.A. Erumban, B. Los, R. Stehrerand and G.J. de Vries (2014), "Slicing Up Global Value Chains", *Journal of Economic Perspectives*, Spring.

Wooldridge J. (2009), "On estimating firm-level production functions using proxy variables to control for unobservables", *Economic Letters*, 104(3), 112-114.

The potential growth of the Belgian economy

R. Basselier
G. Langenus
P. Reusens

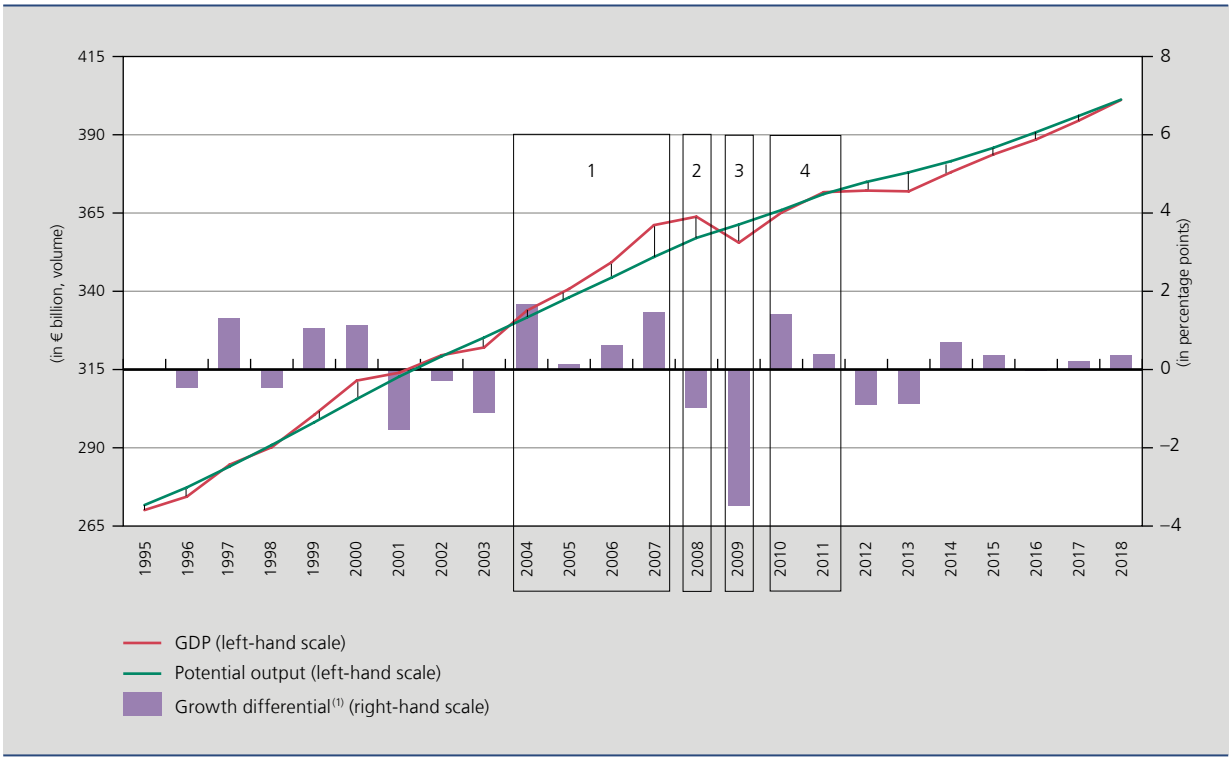
Introduction

In the aftermath of the great recession, economic growth in many advanced countries, including Belgium, remained subdued for quite a long time. This gave rise to concerns that these economies had embarked on a structurally lower growth trajectory – known as secular stagnation (Mendieta-Muñoz, 2017). After all, deep recessions can have devastating long-term consequences for economic growth, due to lasting negative effects on the skills and motivation of the long-term unemployed and due to falling investment in capital and R&D, hampering future innovations (DeLong and Summers, 2012; ECB, 2011). In fact, growth in the advanced countries had been on a downward trend for some time, and more specifically since the beginning of the 21st century. Going forward, growth in economic activity is expected to be slowed down even further by population ageing exerting negative effects on both the size of the labour force and the average productivity growth. Against this backdrop, this article analyses the developments and determinants of the growth potential, focusing on Belgium and the 1995-2021 period. It also suggests policy measures to address the current and future impediments to this growth potential.

To this end, the article draws on the concept of "potential output", which differs from the "actual GDP". Potential output reflects the hypothetical output that may be produced through normal use of the available production factors, i.e. without causing inflationary pressures. When an economy is at its potential, there are no imbalances in goods, services and labour markets, implying stable inflation. In the short run, by contrast, the economy is subject to a whole host of shocks and actual production may therefore temporarily diverge from its potential counterpart – creating an "output gap". If clearly positive, an output gap implies excess utilisation of production factors and may cause rising wages and prices, while a strongly negative output gap implies declining wage and price pressures. In addition to level differences between actual GDP and potential output, the difference in growth between the two series also matters. The rate at which potential output grows – i.e. potential growth – determines how fast an economy can grow in a balanced way. The difference between actual GDP growth and potential growth determines the evolution of the output gap. Four situations may emerge, depending on the difference between potential and actual GDP on the one hand and the difference between potential and actual growth on the other.

These situations can be illustrated using figures for Belgium released by the European Commission (EC), relating to the period between 1995 and 2018. A positive output gap emerged in the period between 2004 and 2007 (Situation 1), when GDP was growing faster than potential output. The onset of the financial crisis and its resultant recession pushed down GDP growth sharply, causing it to dip significantly below potential growth in 2008 and particularly in 2009. The positive output gap disappeared in the course of 2008 (Situation 2) and even turned negative in 2009 (Situation 3). In 2010-2011, GDP bounced back up and its growth was substantially larger than the potential growth, ending the negative output gap (Situation 4). Note that these four situations do not necessarily occur in the same order: in 2012-2013, another substantially negative output gap emerged, due this time to the advent of

CHART 1 POTENTIAL OUTPUT, GDP AND OUTPUT GAP



Source: EC.
(1) The difference between actual GDP growth and potential growth (in percentage points).

the European sovereign debt crisis, which proved to be the next squeeze on growth.

Potential output is not merely an interesting research field for academics but is also important to various policy-makers. First, the output gap is an important variable in the budget analysis and, more specifically, for determining the structural budget balance – i.e. the balance when the economy is at its potential and adjusted for temporary measures and factors. For Belgium, based on estimated elasticities of government revenues and expenditures, an increase in the output gap by one percentage point is expected to result in an improvement of the budget balance of nearly 0.61 percentage point of GDP (EC, 2014a). The structural balance is calculated by removing this cyclical impact from the actual general government balance. This structural balance is highly relevant to policy-makers, both to help assess current budget policies and to help draw up and evaluate medium-term objectives (MTOs). Second, the analysis of the output gap is important for the monetary authorities to gauge potential price pressures: a continued positive output gap may imply that the economy is about to overheat, which may push up inflationary pressures. Conversely, a negative output gap signals excess capacity in the economy, which may suggest downward pressure on inflation. And lastly, potential output circumscribes the extent to which an economy can grow in a balanced way: a persistently low potential growth may hence point to the need for structural reforms.

Unlike actual GDP, potential output cannot be observed directly – it must be estimated. Several methods exist, which will be discussed in the next section. This article will focus specifically on the production function approach, a method applied by most international institutions. Section 2 will use this method to analyse Belgium's potential growth developments and determinants, and compare these with its main neighbouring countries, the euro area and the United States. We will discuss factors that have influenced potential growth in the past, as well as impediments that could slow it down in the (near) future. Section 3 then turns to a broader concept of financially *sustainable growth*, which unlike traditional potential growth estimates, also explicitly factors in financial imbalances in the economy. Much like Borio (2012), this analysis factors out the unsustainable part of actual production that results from these financial imbalances. Section 4 draws conclusions and proposes policy measures that may offer a response to current and future challenges to potential growth in Belgium.

1. Potential output estimation methods

As an economy's potential output cannot be observed directly, it must be estimated. Several estimation methods are available, varying from purely statistical and semi-structural econometric methods to structural production function methods.

1.1 Overview of the different methods

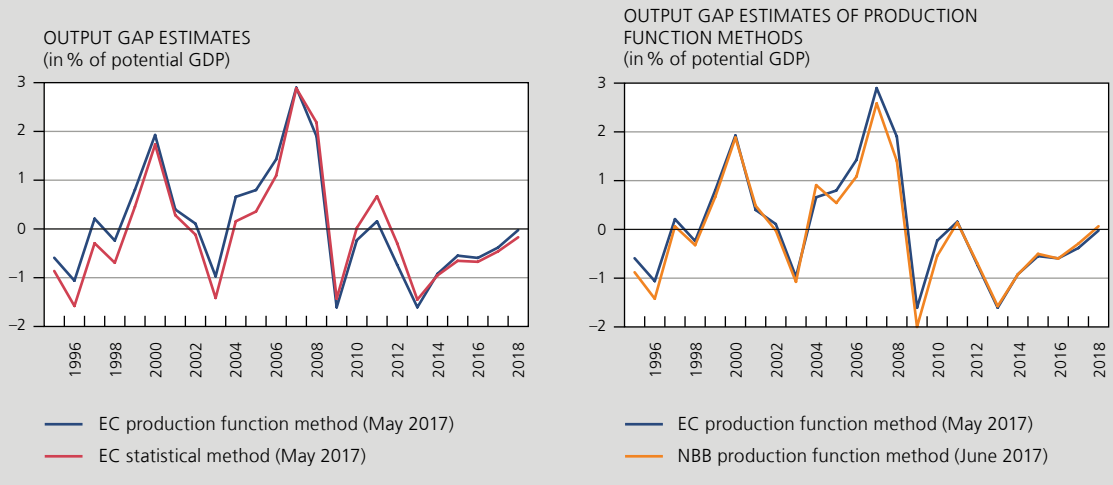
Statistical trend decomposition methods extract a trend component from the evolution of actual GDP, using some form of statistical filtering, with the Hodrick-Prescott (HP) filter the most prevalent. The method's underlying hypothesis is that the trend component around which actual GDP varies equals the potential output. The biggest drawbacks are that this trend component approach relies on an arbitrary choice of the amount of trend smoothing, that it comes with statistical inaccuracies at both the beginning and end of the observed period and, most importantly, that the method disregards the economic relationships underpinning the potential output (IMF, 2015 ; Hamilton, 2017).

Semi-structural econometric models extract a trend in output based on economic relationships such as the Phillips curve (relationship between inflation and unemployment) and the Okun relationship between output and unemployment. These relationships are factored into econometric unobserved component models, but, here too, estimated potential output heavily relies on the precise choice of parameters and the model used.

Lastly, structural production function methods estimate potential output based on total factor productivity and the production factors labour and capital. With potential output driven by the production factors' structural components, the observed production factors still need to be adjusted for cyclical and erratic short-term fluctuations. This is achieved by a combination of statistical and econometric methods. It should be noted that, in this approach, the issue related to the extraction of the structural component is shifted to the level of the production factors, such that those results are also sensitive to the precise method of extraction. The main advantage of the production function method is that it is economically grounded in bottom-up or growth accounting principles, allowing for a breakdown into the contribution of each production factor. It is for this reason that this method is traditionally favoured by policy institutions such as the NBB, the EC, OECD and IMF.

Of course, the existence of such a broad range of estimation methods results in different estimates of potential output and the corresponding output gap. It is not possible to establish unambiguously which method produces the most accurate results, as potential output is never observed. A visual comparison of the outcomes of two different methods – i.e. the production function method and the statistical method of the EC – shows estimates for the Belgian output gap to be relatively similar, but still to diverge in some years by up to 0.5 percentage point.

CHART 2 OUTCOMES OF VARIOUS OUTPUT GAP ESTIMATES



Sources : EC, NBB.

The differences in the estimates produced by the NBB and the EC, both the result of a production function method, are in the same range.

1.2 Production function method

In a production function, the level of production (Y) is determined by three factors: labour (L), capital (K) and total factor productivity (TFP). Just like actual output, potential output may also be modelled using a production function of the structural production factors: structural labour (L^*), structural capital stock (K^*) and structural total factor productivity (TFP^*). Most growth analyses opt for the Cobb-Douglas production function with constant returns to scale, obtaining potential output (Y^*) via

$$Y^* = TFP^* (L^{*\alpha} K^{*1-\alpha})$$

where α and $1-\alpha$ equal the output elasticities of labour and capital, which can be estimated based on the percentage of income spent on labour and capital, respectively[1]. Potential growth g_{Y^*} is then written as the weighted sum of growth in the production factors

$$g_{Y^*} = g_{TFP^*} + \alpha g_{L^*} + (1-\alpha)\, g_{K^*}$$

The structural labour component (L^*) reflects the potential volume of hours worked and equals the product of structural employment – as expressed in number of people – and a structural number of hours worked per person. To determine structural employment expressed in number of people, the number of structurally inactive and unemployed people are removed from the working-age population, using the structural participation and unemployment rates. The actual way in which these structural components are estimated may differ from one economic institution to the next. The estimated structural unemployment rate, for example, can be the statistically adjusted unemployment rate, the non-accelerating inflation rate of unemployment (NAIRU) or the non-accelerating wage rate of unemployment (NAWRU).

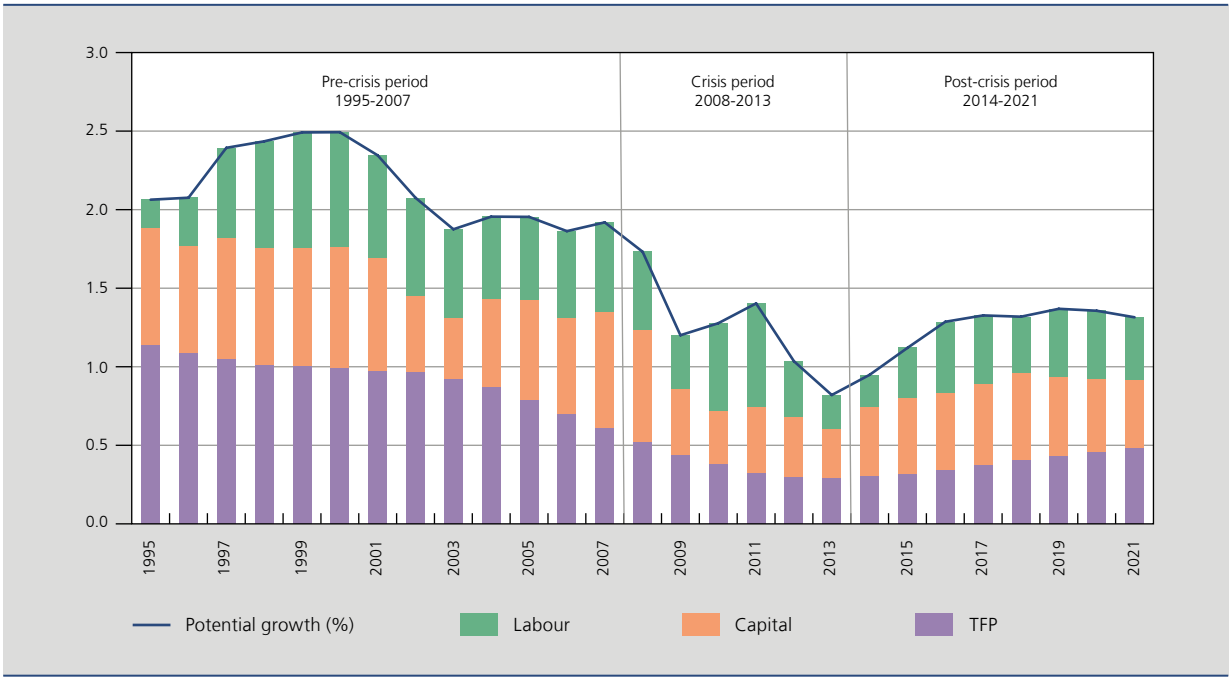
The structural capital stock (K^*) is typically assumed to equal the observed capital stock, although the definition of capital stock is not necessarily uniform across the various economic institutions. Projections of the future capital stock draw on the formula

$$K_t = (1-\delta_t)\, K_{t-1} + I_t$$

(1) The EC assumes output elasticities of labour and capital of 0.65 and 0.35 for all European countries (EC, 2014b).

CHART 3 BELGIAN POTENTIAL GROWTH AND ITS DETERMINANTS

(contributions in percentage points, unless otherwise stated)



Source: EC.

where δ_t is the depreciation rate and I_t represents new fixed capital formation.

Total factor productivity (*TFP*) is highly volatile and derived as a residual, as it reflects the remaining part of output that cannot be explained by capital and labour. The structural total factor productivity (*TFP**) is calculated by smoothing, usually by means of statistical filtering.

2. Potential growth in Belgium

This section analyses the development of Belgium's potential growth and its determinants between 1995 and 2021, drawing on the EC's most recent spring estimates. Using the production function, the evolution of potential growth may be explained by its economic determinants. As discussed in section 1.2, potential growth equals the sum of (i) the structural growth rate of TFP, (ii) the product of output elasticity of labour and the growth rate of potential labour, and (iii) the product of the output elasticity of capital and the growth rate of the capital stock.

Roughly three major sub-periods can be discerned: the pre-crisis period between 1995 and 2007, the crisis period between 2008 and 2013 comprising both the financial crisis and the European sovereign debt crisis, and the post-crisis period from 2014 up to 2021. The first period shows a rather high potential growth of up to 2.5 % in some years, which is largely driven by the contribution of total factor productivity. However, this contribution had clearly been declining since the early 2000s, causing a gradual contraction in potential growth to an average 2 % in the five years leading up to the crisis. During the crisis period, the TFP contribution continued to shrink and the contributions of capital and labour were also down, albeit to a lesser degree, leading to potential growth halving in the period and hitting a record low of 0.8 % in 2013. Since 2014, all three components' contributions have been trending upwards. That said, the recovery has been slow and Belgium's potential growth has so far failed to return to its average 2 % pre-crisis rate.

Chart 4 compares the average contributions of the determinants of potential growth, as calculated for the three periods defined above, to the weighted average of

CHART 4 AVERAGE CONTRIBUTIONS TO POTENTIAL GROWTH BY PERIOD

(in percentage points)

Source: EC.

(1) Weighted average for Belgium's three main neighbouring countries.

(2) Data for the euro area are only available from 1999.

Belgium's three main neighbouring countries, the euro area and the United States. Potential growth in Belgium typically evolves similarly to that of its neighbouring countries and the euro area. In the 1995-2007 pre-crisis period, its potential growth averaged 2.1 %, on a par with the euro area, but 0.4 percentage point higher than in its three neighbouring countries. A comparison with the United States reveals that American potential growth was a lot higher still – at 3 % on average – thanks to significantly larger contributions of both TFP and capital.

All (groups of) countries suffered major losses during the crisis period and potential growth nearly halved in Belgium (–0.9 percentage point) and in its neighbouring countries (–0.7 percentage point). In the euro area and in the United States, the decrease was even more dramatic, equalling –1.4 and –1.8 percentage point respectively. For Belgium, the drop was mainly due to a reduced contribution from TFP (–0.5 percentage point), while those from capital (–0.25 percentage point) and especially labour (–0.1 percentage point) were relatively minor when compared with the figures for the euro area.

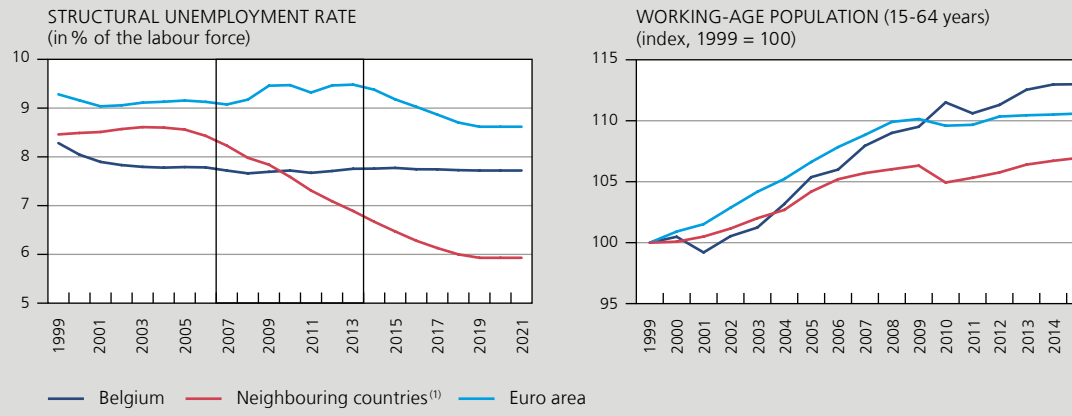
As for the post-crisis period between 2014 and 2021, Belgium, its neighbouring countries and the euro area are all projected to be looking at a very subdued average potential growth of around 1.2 %. For Belgium, this implies a stabilisation relative to the crisis period, while for its neighbouring countries this means an uptick by 0.3 percentage point and for the euro area an even stronger improvement of 0.5 percentage point. The United States is expected to enjoy a much more robust recovery : potential growth is projected to revert back to 2 % on significantly higher contributions of capital and particularly labour. However, potential growth, which about halved in the crisis period, would not return to pre-crisis levels in any country or group of countries, mostly because TFP growth remains relatively low when compared with the pre-crisis period.

2.1 Labour

Even during the crisis, labour continued to make a robust contribution to potential growth in both Belgium and its neighbouring countries, unlike in the euro area and the United States, which both saw the component's contribution shrink substantially. In part, this observation is reflected in the diverging trends of the labour force and actual unemployment rates, which to some extent may translate into structural unemployment due to hysteresis effects. In particular, the long-term unemployed typically lose part of their knowledge, skills and motivation, causing a permanent destruction of human capital. Even when the economy recovers and employers are willing to hire again, this group of long-term unemployed is often no longer in demand (EC, 2009). In the euro area, both actual and structural unemployment rates moved noticeably higher during the crisis, while they remained relatively stable in Belgium. Combined with its system of temporary unemployment which was expanded to include white-collar workers during the crisis, Belgium's fairly rigid labour market, marked by a high measure of labour protection, resulted in labour hoarding (De Mulder and Druant, 2011). What is more, Belgian employment in the public sector remained more or less stable, whereas it shrank in the neighbouring countries. Finally, it is remarkable that, on average, the structural unemployment rate continued to decline during the crisis in the neighbouring countries, but this was completely driven by Germany which introduced its Hartz reforms between 2002 and 2005 to make its labour market more flexible and to activate the unemployed. More recently, Germany imposed additional structural reforms under its Agenda 2010 programme. Despite the spectacular fall in structural unemployment rates, it were labour force trends that caused the contribution of the structural labour component in the neighbouring countries (see chart 4 above) to remain rather limited on balance : the labour force grew quite slowly during the entire period and even shrank in 2010. This may be down to important ageing effects, in Germany in particular, but also to endogenous factors dampening labour supply. Germany experienced a net outflow of migrants in 2010 and in the Netherlands, in particular, many unemployed left the workforce altogether, two phenomena likely to have been accelerated by poor labour market prospects.

Like many other advanced economies, Belgium faces an ageing population, which will increasingly depress the labour component's contribution to potential growth. As the latest demographic outlook by the Federal Planning Bureau (FPB) suggests, the country's working-age population will start to shrink as early as 2021. Participation and employment rates will need to be boosted in order to keep employment levels steady. Although both rates are expected to continue to edge up in the next few years on the back of recent measures to reduce early retirement, the EC estimates that the structural employment gap between Belgium and its neighbouring countries may widen up to 10 percentage point on the assumption of no policy change. Closing this gap offers a major potential to raise the employment rate and to combat the negative effects of population ageing. Table 1's breakdown of the employment rate shows there is still plenty of scope to bolster the employment rate, especially in targeted groups at risk such as older

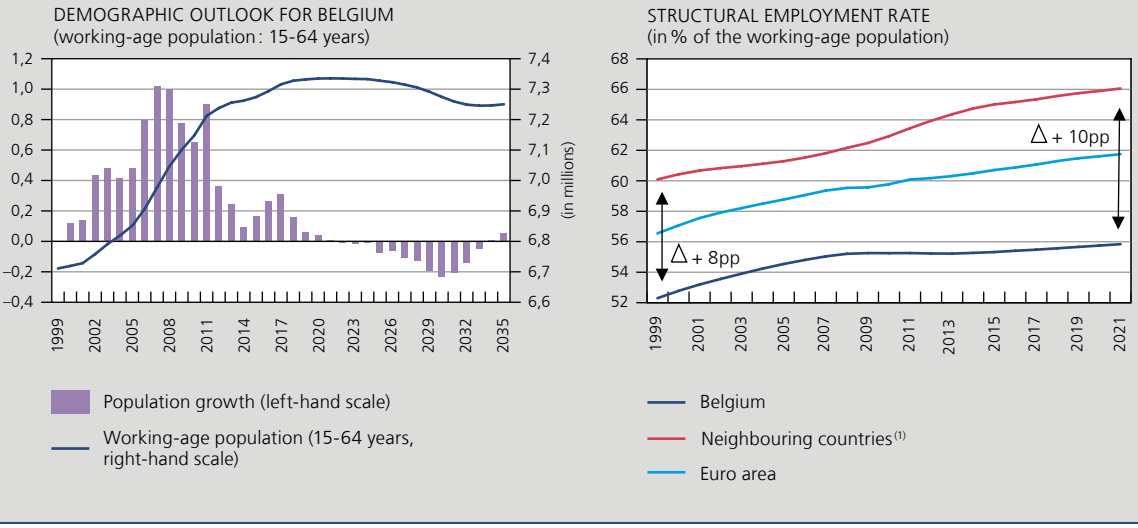
CHART 5 DETERMINANTS OF THE STRUCTURAL LABOUR COMPONENT



Source: EC.
(1) Weighted average for Belgium's three main neighbouring countries.

workers, women, the low-skilled and non-EU citizens. Note also that tighter conditions for early retirement have already sparked a sharp increase in the employment rate of older workers compared with 2010 and that this upward trend is expected to continue in the coming years. Finally, Belgium's percentage of young people not in work and not in any type of education or training continues to surpass the EU 2020 target of 8.2 %, although a recent fall in the number of early school leavers has helped to improve the percentage to 9.9 %.

CHART 6 CHALLENGES TO THE BELGIAN STRUCTURAL LABOUR COMPONENT



Sources: EC, FPB.
(1) Weighted average for Belgium's three main neighbouring countries.

TABLE 1 EMPLOYMENT RATE FOR TARGETED GROUPS (AT RISK) AND 2020 OBJECTIVES

(in % of the corresponding population group)

	Belgium		Objectives
	2010	2016	2020
Working-age population (20-64 years)	67.7	67.7	73.2
Women (20-64 years)	64.6	63.0	69.1
Older workers (55-64 years)	37.3	45.4	50.0
Low-skilled	48.9	45.6	n.
Difference between residents and non-EU citizens	28.5	27.3	16.5

Source: EC.

2.2 Capital

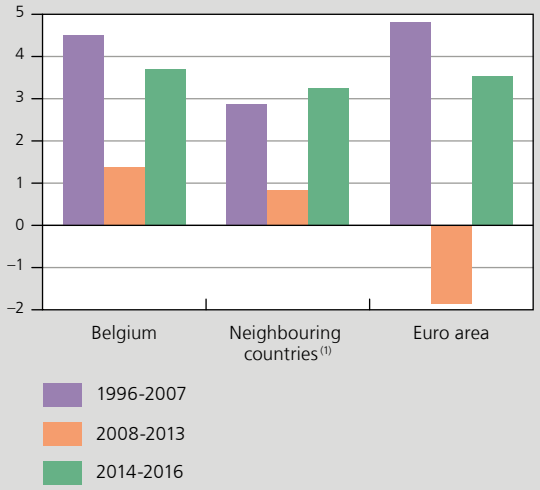
In the pre-crisis period, the capital component represented just over a quarter of total Belgian potential growth. Although this contribution also came down during the crisis period, it gained in importance in the overall breakdown of total potential growth as the contribution of the total factor productivity came down even more strongly. During the crisis, the contribution by the capital stock was eroded by sharply lower investment growth in the wake of falling general demand, increased uncertainty and tighter borrowing conditions, particularly for companies with weak balance sheets (see section 2.3). However, compared with the euro area at large, Belgium's investment growth and, hence, its capital component declined to a lesser extent. Investment has been recovering since 2014 though growth rates have remained below their pre-crisis levels to date. All in all, capital's expected contribution in the post-crisis period between 2014 and 2021 remains below pre-crisis figures on average.

2.3 TFP growth

TFP growth in Belgium has been weakening already since the beginning of this century. However, this is quite a widespread phenomenon, and is also happening in the rest of the euro area and in the United States. Further on in this section, this global structural decline in TFP growth is explained by the phasing-out of favourable global factors from the past and by the emergence of global structural barriers. Since 2013, there has been evidence of a limited recovery, but Belgian TFP growth nonetheless has remained rather low compared with other countries. This section therefore also investigates more closely several structural barriers specific to Belgium.

CHART 7 AVERAGE ANNUAL INVESTMENT GROWTH

(in %, at current prices)

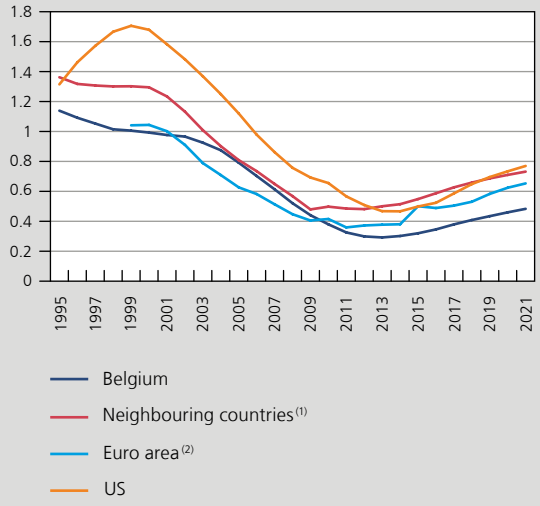


Sources: EC, NAI, NBB.
(1) Weighted average for Belgium's three main neighbouring countries.

One key driver for the general decline in TFP growth in the advanced economies is the weakening stimulus of certain

CHART 8 STRUCTURAL TFP GROWTH

(in %)



Source: EC
(1) Weighted average of Belgium's three main neighbouring countries.
(2) Data for the euro area are only available from 1999 onwards.

favourable global factors that had strongly boosted productivity growth in the past. First, trade liberalisation after the Second World War, which was accompanied by a fall in trading costs and thus had a productivity-enhancing effect, has slowed down or even ground to a halt (Crafts, 2012). Indeed, interest in trade liberalisation is dwindling, with policy-makers in some major economies even advocating a return to protectionism. In their article earlier in this edition of the Economic Review, Dhyne and Duprez warn of the damage that increased protectionism could cause, as the most productive companies, which are often the most integrated in the global economy, would be predominantly affected. Second, substantial productivity gains had been recorded since the middle of the 1990s thanks to rapid ICT developments. This was evident in the ICT sectors themselves, but also in sectors that started deploying new ICT products or software that made the use of labour and capital more efficient (Rigo, 2005). However, the positive impact of this on TFP growth seems to have started to gradually fade away since the beginning of the 2000s (IMF, 2017a). Surprisingly, whereas the rapid roll-out of computer technology in the 1990s provided a sharp boost to TFP growth, today's state-of-the-art technology – e.g. smartphones, 3D printing, artificial intelligence – has so far not had any similar effect. Gordon (2016) believes the reason is that recent innovations, such as the switch from one type of smartphone to another, are relatively less revolutionary than, say, the advent of electricity, the car and the computer, and are more aimed at communication or entertainment. By contrast, Mokyr (2014) argues that the added value of these new forms of production as measured in the national accounts are underestimated, as new technologies, such as apps and platforms, are not yet adequately captured in the statistics. Also, a similar development has occurred in the accumulation of human capital. Previously, the improved quality of education sparked a much more rapid growth in labour productivity, as higher education levels generate greater innovation and facilitate the integration of these innovations in the production process (Rigo, 2005). However, the creation of additional human capital through a further broadening of education is reported to have slowed down in the course of the previous decade (IMF, 2017a).

Furthermore, there are global factors that have been hampering productivity structurally for quite some time. One is the impact of population ageing, which weighs on productivity gains because older workers are typically less productive (IMF, 2017a). According to a study by Ariu and Vandenberghe (2014) based on Belgian firm-level data, the ageing labour force is believed to have dented TFP growth by an annual average of about 0.2 percentage point over the 1991-2013 period. Given that the average age of the labour force will continue to rise in the near future, this will probably lead to an additional future loss of TFP growth. In addition, the advanced economies are seeing a gradual shift away from a production economy to a services economy, which is also reflected in the increasing allocation of the labour and capital factors of production towards the services sector, where TFP is growing at a slower rate (Dhyne and Fuss, 2014). The transformation into a services economy is also clearly evident in Belgium : in 2016, no less than 77 % of value added was generated by the services branches, compared with 70 % in 1995.

Moreover, the recent financial crisis has had an additional negative impact on TFP growth in the advanced economies. First, low general demand and high economic and political uncertainty during the crisis caused a sharp drop in investment growth, as discussed in Section 2.2 [1]. This had a negative feedback effect on TFP growth because the implementation of new innovations may sometimes require new capital, one example being the need for more efficient computers to implement certain new ICT applications (IMF, 2017a). Second, the misallocation of capital across companies has increased considerably since the crisis (IMF, 2017a). This can be partly explained by tighter borrowing constraints, especially for firms with a high refinancing risk, which have resulted in less investment in R&D and, consequently, in lower TFP growth at these firms (Aghion *et al.*, 2012 ; IMF, 2017b). The increasing misallocation of capital has also been driven by the rise in the number of "zombie firms" [2] since the mid-2000s. This can be explained, inter alia, by the fact that banks have granted payment delays and even further credit lines to these zombie firms in order to avoid incurring losses on their loan portfolios (McGowan *et al.*, 2017). Inefficient insolvency rules may have contributed to this, along with the fact that accommodative monetary policy with historically low interest rates implies low opportunity costs for banks. The rise in the number of zombie firms is bad for productivity not just because these firms have a low productivity, but also because their long-term survival impedes the growth of the more productive firms.

There are also several structural factors specific to Belgium that weigh on TFP growth. The relatively high R&D expenditure is not yet being sufficiently translated into the actual creation of profitable new products. While R&D expenditure in Belgium (2.5 % of GDP in 2015) is above the euro area average (2.1 %), sales of new innovations, exports of medium & high tech products and the number of international patent applications are well below the EU average. Next, Belgium scores above average when

(1) As far as investment in R&D is concerned, it was mainly in 2009 that companies in Belgium and the euro area cut back their investment spending.

(2) In the literature, zombie firms are defined as firms that are more than ten years old with a ratio of operating income to interest expenditure that is less than one over three consecutive years (McGowan *et al.*, 2017). In the case of Belgium, this group should be interpreted rather cautiously, since interest charges are to a certain extent influenced by intra-group loans.

it comes to the quality of education, even though the PISA test[1] does indicate differences between the Belgian regions. However, training is not just relevant for young people as longer careers and continuing technological changes also necessitate further education in the form of permanent training. Belgium scores less well on this last item: in 2016, barely 7.5 % of workers aged 18-64 had recently received training, whereas the average percentage for the euro area is almost twice as high, according to figures from the EC. In comparison with its neighbouring countries, Belgium also has a poor public infrastructure, and in particular a highly saturated road and rail network, which leads to severe mobility problems. In a recent survey conducted by the international consultancy CSA on behalf of Ernst & Young (2017), as many as 65 % of the 116 Belgium-based companies surveyed report that these mobility issues have a negative impact on their investment decisions in Belgium. Also, firms in Belgium express their concerns about the heavy administrative burden for companies, excessive regulation and the complex tax system (Ernst & Young, 2017; EC Country Report, 2017)[2]. Moreover, the average Belgian seems to be less entrepreneurial and more risk averse than their EU counterparts, which translates into a smaller number of start-ups, hence making the reallocation of resources more difficult (NBB, 2017).

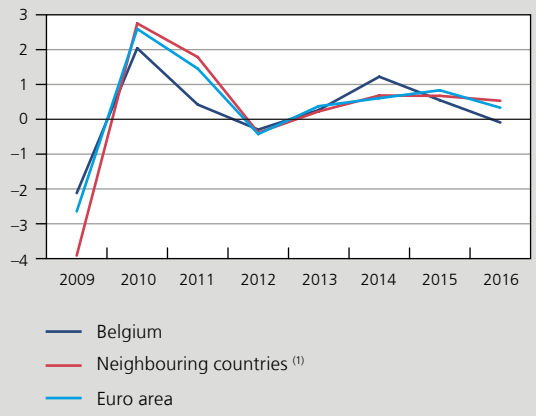
Finally, the fact that the TFP recovery since 2013 has remained relatively weak in Belgium compared with the

(1) The Programme for International Student Assessment (PISA), an international survey commissioned every three years by the OECD, examines the knowledge and skills of 15-year-olds. The most recent PISA survey dates back to 2015 and focused on students' scientific literacy.

(2) According to an "Ease of Doing Business" indicator compiled by the World Bank. Belgium was only 42nd in the ranking in 2016. By way of comparison: the United States lies in 8th place, while Germany, the Netherlands and France hold the 17th, 28th and 29th spots, respectively.

CHART 10 LABOUR PRODUCTIVITY PER EMPLOYEE IN THE TOTAL ECONOMY

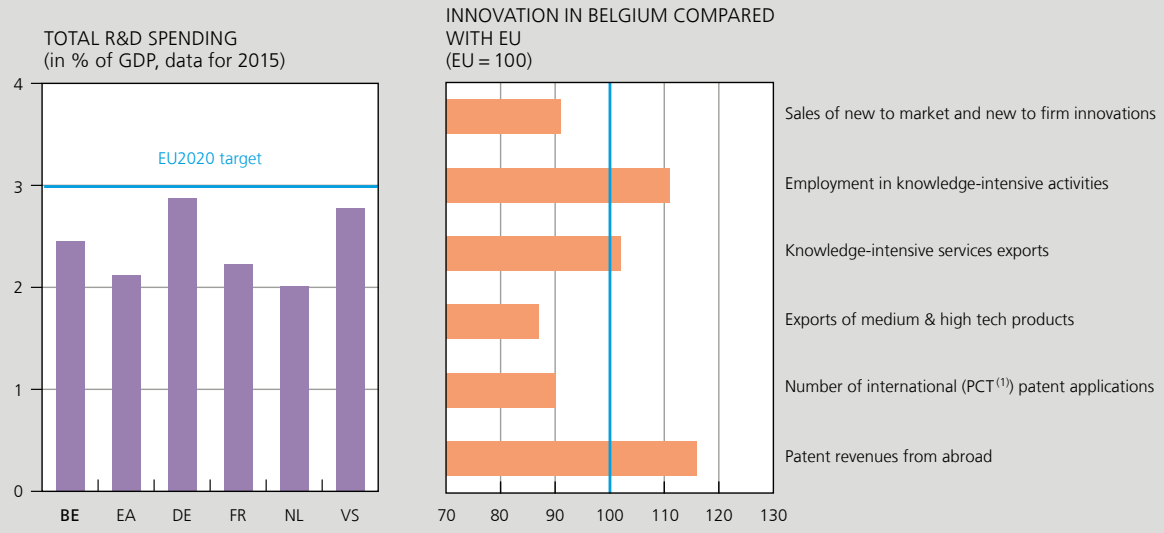
(year-on-year percentage changes)



Sources: EC, NAI, NBB.

(1) Weighted average for Belgium's three main neighbouring countries.

CHART 9 R&D SPENDING AND MEASURES OF INNOVATION IN BELGIUM



Sources: EC, 2016 European Innovation Scoreboard.

(1) The Patent Cooperation Treaty (PCT) provides the recognition of patent rights in the member countries.

neighbouring countries, the euro area and the United States, could perhaps be partly associated with the recent policy of wage cost moderation. That policy has had a positive impact on job creation, which has proved to be very significant in the last few years, but seems to have supported economic growth only to a lesser extent. The combination of the two has resulted by definition in a high labour intensity of growth, the downside being weaker labour productivity, such that the higher labour contribution to the growth is partly offset by a lower TFP contribution.

3. From potential to sustainable growth ? (1)

Traditional methods to estimate the output gap can sometimes produce inaccurate results in real time, which are then substantially revised in the subsequent years. In 2007, for instance, EC estimates pointed to a slightly negative output gap between 2005 and 2008, for both Belgium and the euro area. Afterwards, those estimates were drastically revised and the output gap turned out to be highly positive, meaning that growth during that period was unsustainable.

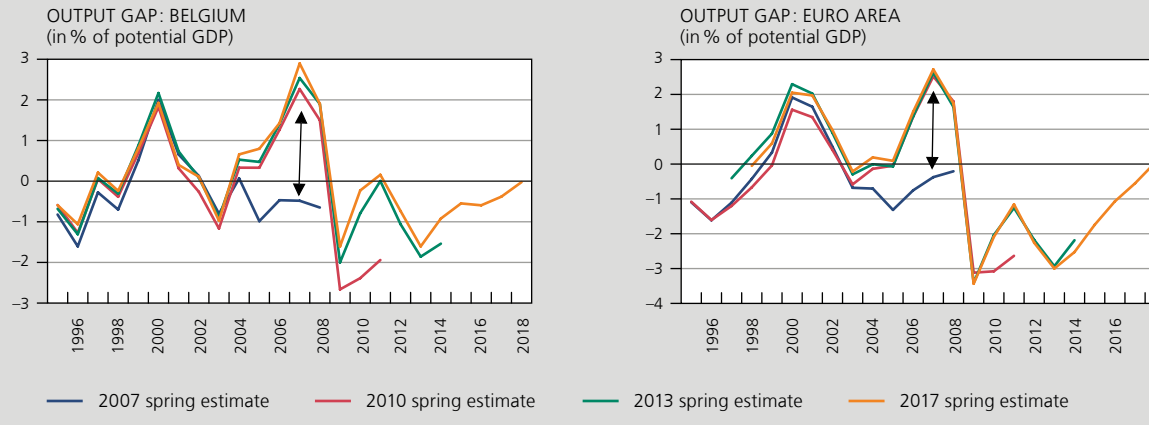
This pattern of a severely underestimated output gap in the run-up to the recent financial crisis was even more relevant for countries such as the United States and Spain, where GDP was driven by bubbles in credit and residential property prices. It only became clear later, after the burst of these financial bubbles and the corresponding plunge in GDP, that the output gap had been strongly positive and that the economy had been on an unsustainable trajectory. Thus, in the run-up to the financial crisis, the financial imbalances caused the potential growth to be overestimated.

In the aftermath of the financial crisis, the revealed importance of financial imbalances for the real economy prompted policy-makers to put control mechanisms in place, their aim being to counter major imbalances and their adverse effects on the economy. The countercyclical capital buffer (CCyB), which was introduced into the Basel III framework, obliges banks to retain additional capital at times when credit grows too fast with the goal to counter the build-up of the credit bubble, as well as to make banks themselves more resilient to a potential financial crisis. Also the Macroeconomic Imbalance Procedure (MIP), introduced by the EC in 2011, factors in some financial indicators, in addition to the traditional macroeconomic variables, in order to timely detect and correct potential imbalances in the EU countries.

Also, starting with Borio (2012), several researchers expanded the concept of potential growth to one of *sustainable growth*, which adjusts for the unsustainable part of GDP that is driven by financial imbalances. Compared with traditional potential output measures, this new indicator should evolve more steadily during crisis times, implying that its corresponding finance-neutral output gap shows a more positive output gap and hence a greater degree

(1) The model and results presented in this section are drawn from an ongoing research project in collaboration with Gerdie Everaert (Ghent University) and Tino Berger (University of Göttingen).

CHART 11 OUTPUT GAP ESTIMATES OVER TIME



Source: EC.

of overheating in the buildup of the financial imbalances and vice versa after the reversion of the financial imbalances (IMF, 2015). Finance-neutral estimates of the output gap should therefore be less prone to ex-post revisions, enabling policy-makers to better assess the structural government budget balance in real time. For example, if an increase in GDP is driven by a bubble in credit and residential property prices, the structural balance calculated on the basis of the financial neutral output gap would not improve, because it would correctly identify the GDP increase as being only temporary (IMF, 2015). In this respect, it is important that sustainable output models are able to distinguish between growth in residential property prices and credit underpinned by healthy economic fundamentals on the one hand and unsustainable increases reflecting financial imbalances on the other – a tough job in real time as boom-and-bust episodes are often detected only with the benefit of hindsight (Turner *et al.*, 2013, IMF, 2015).

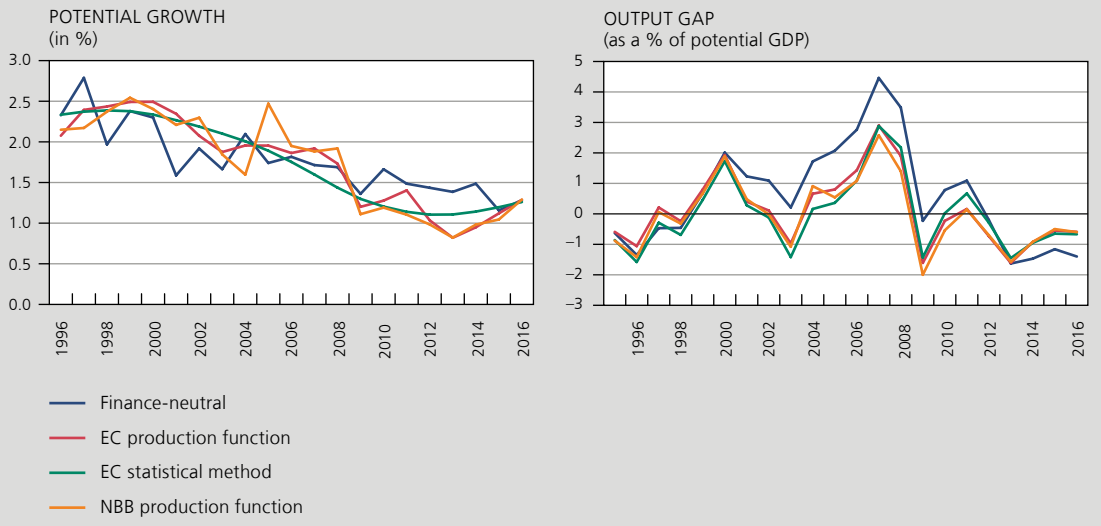
3.1 Modelling sustainable production

To estimate sustainable output, we have developed a multivariate econometric model combining two approaches from the literature: (i) the literature about "semi-structural econometric methods" in which the output gap is estimated based on the evolution of several macroeconomic variables such as GDP, unemployment and inflation (e.g. Domenech and Gomez, 2006 and Basistha and Nelson, 2007) and (ii) the literature in which financial cycles are estimated based on financial variables such as credit growth and residential property prices (e.g. Claessens *et al.*, 2012 and Koopman *et al.*, 2016). This model decomposes all variables into a trend component, a financial cycle component, a business cycle component and a residual component. The financial cycle component is largely driven by the cyclical part of the financial variables and is assumed to have a lower frequency than the business cycle, in line with Borio (2012) and Koopman *et al.* (2016).

The model's crucial assumption is that the trend component of each variable in the model has a lasting effect and is therefore sustainable, whereas the financial and business cycle component of each variable will eventually disappear, making them currently unsustainable. For that reason, sustainable output is defined as the trend component of GDP, which equals the output level at which both financial and business cycles are neutral. The finance-neutral output gap is the difference between GDP and the sustainable output.

Subsequently, the gap in each of the financial variables – i.e. the deviation between the financial variable and its trend component – is interpreted as a measure of financial imbalance. The literature also focuses on similar measures to capture cyclical financial risks. Borio *et al.* (2016),

CHART 12 COMPARISON OF THE FINANCE-NEUTRAL GROWTH AND OUTPUT GAP ESTIMATE TO THE TRADITIONAL POTENTIAL GROWTH AND OUTPUT GAP ESTIMATES FOR BELGIUM (1)



Sources: EC, NBB.

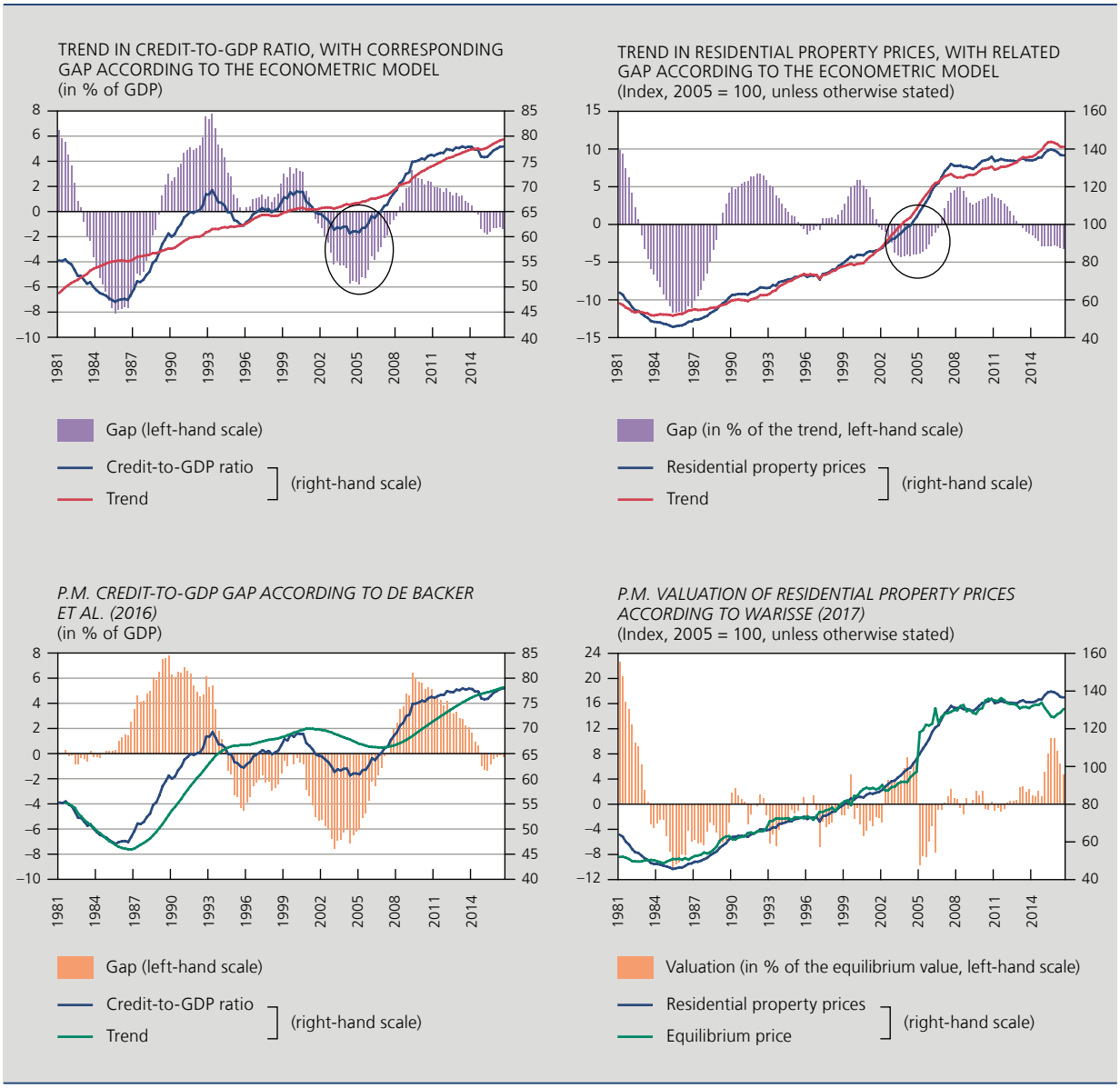
(1) Although the finance-neutral output gap is estimated on a quarterly basis, the output gap is presented here as an annualised figure to allow for easier comparison with the other methods. More specifically, the annualised finance-neutral output gap is calculated as the difference between actual annual GDP and the estimated sustainable production. Note that the outcomes for 2016 were obtained by extrapolating the estimates of the first three quarters.

IMF (2015) and Turner *et al.* (2013), for instance, use deviations of the growth of real credit and residential property prices from their long-term trend or their average, as indicators of financial imbalances in credit and residential property prices. De Backer *et al.* (2016) compute Belgium's credit gap as the deviation of the credit-to-GDP ratio from the Hodrick-Prescott filtered trend, which is in line with the ESRB recommendations for the calculation of the countercyclical capital buffer discussed above. In addition to the often studied cyclical financial risks, there also exist structural systemic risks, such as a possibly unsustainable structural trend trajectory in the credit-to-GDP ratio (De Backer *et al.*, 2016). However, this article does not take into account such risks as it is assumed that the trend component of the credit-to-GDP ratio and residential property prices coincide with their equilibrium values.

To estimate the finance-neutral output gap for Belgium, we use seasonally-adjusted quarterly series for the period from 1981 up to the third quarter of 2016 for real GDP (in logs), inflation, unemployment, real bank[(1)] credit to private non-financial firms (in logs), real residential property prices (in logs) and the real credit ratio (as a % of GDP).

(1) Like De Backer *et al.* (2016), we use bank credit rather than a more general credit measure that also includes debt securities, as the data on this latter category are greatly influenced by inter-company loans and are only available as from 1995.

CHART 13 MEASURES OF FINANCIAL IMBALANCES IN THE CREDIT-TO-GDP RATIO AND RESIDENTIAL PROPERTY PRICES IN BELGIUM



Sources: De Backer *et al.* (2016), Warisse (2017), NBB.

3.2 Results

Compared with traditional estimates of the output gap for Belgium, the estimates of the finance-neutral output gap point to a more positive gap exceeding the traditional estimates by around one percentage point between 2001 and 2011. The opposite is true for the most recent period (2014-2016): the finance-neutral estimate of the output gap is around 0.5 percentage point more negative than the traditional estimates.

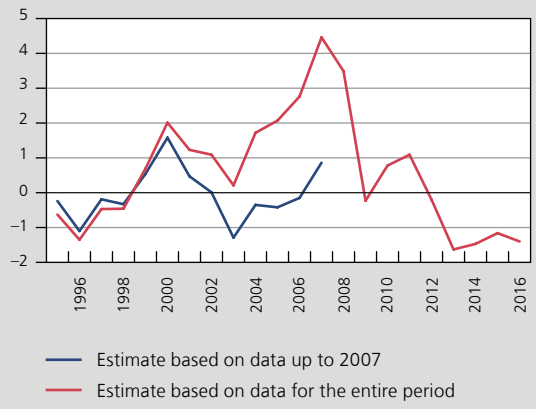
The upper part of Chart 13 shows the model estimates for the gap in the credit-to-GDP ratio and residential property prices, calculated as the deviation of the financial variable from its trend component. The lower part of the chart shows two alternative indicators: the credit-to-GDP gap as calculated by De Backer *et al.* (2016), obtained using a one-sided Hodrick-Prescott method, and Warisse's (2017) estimate for the valuation of the residential property prices, obtained using an econometric method based on the fundamental economic determinants of the residential property prices.

The estimated measures of the financial imbalances are relatively similar to the alternative indicators. In particular, the estimated credit-to-GDP gap of the econometric model and that of De Backer *et al.* (2016) move particularly closely in step for the period from 2000: both estimates identify a negative gap rising up to around 6 % for the 2001-2006 period, a positive gap of up to 4 % for the 2008-2013 period and a negative gap averaging around 1 % since 2014. However, the estimated gap in residential property prices of the econometric model and that of Warisse's model (2017) diverge for the period since 2000, which may be explained by the fact that Warisse's equilibrium house price factors in property taxation and demographics. As the econometric model does not take into account these house price determinants, we would not recommend using it to assess the (over)valuation in residential property prices.

The most important conclusion is that the difference between the output gap estimate of this new method and that of the traditional approaches cannot be attributed to the factoring in of financial variables. In the new method, a larger output gap in the run-up to the great recession comes with negative financial gaps; gaps that may be narrowing, but that remain negative nonetheless. In other words, the output gap as estimated by this method is not found to be larger in these years due to unsustainable imbalances in credit growth or in residential property prices. This result suggests that, unlike the previously mentioned other countries, Belgium did not see its growth pushed up excessively by financial bubbles in the run-up to the great recession. The differences between the output gap estimates of the new model and the estimates of the traditional approaches rather seem to point to the general model uncertainty.

CHART 14 FINANCE-NEUTRAL ESTIMATES OF BELGIUM'S OUTPUT GAP OVER TIME

(in % of potential GDP)



Source: NBB.

What's more, the econometric model does not solve the issue of the real time inaccurate estimates, as its estimates are also still subject to major ex-post revisions. Chart 14 shows the estimates of the finance-neutral output gap at two point in time, using the data up to 2007 and those up to 2016. Output gap revisions for the 2004-2007 period still amount to three percentage point, which is comparable to revisions of the traditional output gap methods, as shown earlier in chart 11.

Conclusion

Despite the relevance of the potential output and the output gap to many policy-makers, no uniform estimation method currently exists. The range of various models therefore results in different estimates. International institutions typically use a production function method, enabling them to break down potential growth by the various production factors.

Like in many other advanced economies, potential growth in Belgium fell substantially during the crisis period and it is not yet back to its previous pace.

The contribution of total factor productivity has declined the most, due to the impact of the financial crisis, but also due to global trends that had already been reducing productivity growth in advanced economies for even longer. Moreover, in Belgium specifically, recent wage restraint policies have also adversely affected (labour) productivity as they have led to strong employment growth and only rather moderate growth in economic activity. Both the labour and capital contributions of growth also declined in Belgium during the crisis period, but these decreases were fairly limited compared with those in other euro area countries. This was mainly thanks to a more robust investment growth and Belgium's high level of protection in the labour market.

In the near future, population ageing is expected to have a further negative impact on (potential) growth. To offset this negative effect of an ageing population and to safeguard future prosperity, a joint improvement of the potential growth determinants should be pursued. First of all, there is still a lot of scope to further increase the employment rate, especially for targeted groups (at risk) such as older workers, women, young workers, the low-skilled and non-EU citizens. Additionally, attracting, training and efficiently employing additional foreign employees could reduce the population ageing problem (Bundesbank, 2012). Another important agenda item is to boost productivity growth and investment through structural reforms. In order to create an environment conducive to investment and innovation, it is crucial to encourage the entrepreneurship culture in Belgium and to simplify the administrative burden for businesses, excessive regulation and the complex tax system. In addition, the mobility problem should be addressed through targeted investment in infrastructure, more attractive public transport and the deployment of new technologies.

Since the recent financial crisis, the traditional output gap methods have been criticised because of the difficulty of correctly assessing the structural and cyclical components of GDP in real time. And it is precisely such real-time accuracy that is essential for policy-makers. Recent research has therefore proposed an alternative concept of sustainable output, taking into account financial imbalances. The estimates based on such an alternative method for Belgium are not clear-cut and the traditional production function method may therefore still be preferable. Today's econometric methods of estimating the sustainable output do not have economic foundations in the same way that production function methods do, and therefore cannot be broken down into the various production factors. More importantly, for Belgium, the sustainable output method does not solve the issue of substantial ex-post revisions. Lastly, the choice and specification of the relevant financial imbalances remains highly uncertain and the "best choice" tends not to become clear until after a financial crisis. More generally, estimates of potential output and potential growth remain uncertain to some degree and they should therefore be interpreted with caution.

Bibliography

Aghion P. G., P. Askenazy, N. Berman, G. Cette and L. Eymard (2012), "Credit Constraints and the Cyclicality of R&D Investment: Evidence from France", *Journal of the European Economic Association*, 10(5), 1001–1024.

Ariu A. and V. Vandenberghe (2014), *Assessing the Role of Ageing, Feminising and Better-Educated Workforces on TFP Growth*, NBB, Working Paper 265.

Basistha A. and C.R. Nelson (2007), "New measures of the output gap based on the forward-looking new Keynesian Phillips curve", *Journal of Monetary Economics*, 54, 498–511.

Borio C. (2012), *The financial cycle and macroeconomics: What have we learnt?*, BIS, Working Paper 395.

Borio C., P. Disyatat and M. Juselius (2016), "Rethinking potential output: embedding information about the financial cycle", *Oxford Economic Papers*, 1–23.

Bundesbank (2012), "Potential growth of the German economy – medium-term outlook against the backdrop of demographic strains", *Monthly Report*, April, 13–28.

Claessens S., M.A. Kose and M.E. Terrones (2012), "How do business and financial cycles interact?", *Journal of International Economics*, 87, 178–190.

Crafts N. (2012), *Western Europe's Growth Prospects: a Historical Perspective*, CEPR, Discussion Paper 8827.

De Backer B., H. Dewachter, S. Ferrari, M. Pirovano and C. Van Nieuwenhuyze (2016), "Credit gaps in Belgium: identification, characteristics and lessons for macroprudential policy", NBB, *Financial Stability Report*, 135-157.

DeLong J. B. and L. Summers (2012), "Fiscal policy in a depressed economy", *Brooking Papers on Economic Activity*, Spring, 233-274.

De Mulder J. and M. Druant (2011), "The Belgian labour market during and after the crisis", NBB, *Economic Review*, June, 89-104.

Dhyne E. and C. Fuss (2014), "Main lessons of the NBB's 2014 conference 'Total factor productivity: measurement, determinants and effects'", NBB, *Economic Review*, December, 63-75.

Doménech R. and V. Gómez (2006), "Estimating Potential Output, Core Inflation, and the NAIRU as Latent Variables", *Journal of Business & Economic Statistics*, 24:3, 354-365.

EC (2009), *Impact of the current economic and financial crisis on potential output*, Occasional Papers 49.

EC (2014a), *Adjusting the budget balance for the business cycle: the EU methodology*, Economics Papers 536.

EC (2014b), *The Production Function Methodology for Calculating Potential Growth Rates & Output Gaps*, Economics Papers 535.

EC (2017), *Country Report for Belgium*.

ECB (2011), "Trends in potential output", *Monthly Bulletin*, January, 73-85.

Ernst & Young (2017), *Buitenlandse investeringen: dreigingsniveau 4 En marche!*, Barometer van de Belgische Attractiviteit, May.

Gordon R. (2016), *The Rise and Fall of American Growth : The U.S. Standard of Living since the Civil War*, Princeton University Press, New Jersey.

Hamilton J.D. (2017), *Why You Should Never Use the Hodrick-Prescott Filter,* NBER, Working Paper 23429.

IMF (2015), *Steady as She Goes— Estimating Potential Output During Financial "Booms and Busts"*, IMF, Working Paper 233.

IMF (2017a), *Gone with the Headwinds : Global Productivity,* IMF, Staff Discussion Paper, 17-04.

IMF (2017b), *Financial Frictions and the Great Productivity Slowdown*, IMF, Working Paper, 17-129.

Koopman S.J., R. Lit and A. Lucas (2016), *Model-based business cycle and financial cycle decomposition for Europe and the U.S.*, Tinbergen Institute Discussion Paper, 16-051/IV.

McGowan M.A., D. Andrews and V. Millot (2017), *The walking dead ? Zombie firms and productivity performance in OECD countries*, OECD, Working Paper 4.

Mendieta-Muñoz I. (2017), *Is Potential Output Growth Falling ?*, University of Utah Department of Economics, Working Paper 2017-03.

Mokyr J. (2014), "Secular Stagnation ? Not in your Life", in *Secular Stagnation : Facts, Causes and Cures*, CEPR Press, Washington.

NBB (2017), "A dynamic and inclusive economy", Report 2016, 152-176.

Rigo C. (2005), "The potential growth of the Belgian economy and its determinants", NBB, *Economic Review*, 2005-3, 45-64.

Turner D. (2013), *Uncertainty about potential output and the implications for underlying fiscal balances*, OECD, Working Party No. 1 on Macroeconomic and Structural Policy Analysis.

Warisse C. (2017), "Analysis of the developments in residential property prices: Is the Belgian market overvalued?", NBB, *Economic Review*, June, 61-77.

A better understanding of developments in the numbers claiming disability insurance

Y. Saks(*)

Introduction

During their working life, workers may become sick for varying periods of time. In Belgium, a distinction is made between the first year of sickness (primary incapacity for work) and longer periods of sickness (if the incapacity exceeds one year, it is referred to as invalidity leave).

The INAMI/RIZIV manages and controls compulsory health insurance. In that respect, the Institute is responsible for the payment of benefits to private sector workers declared unfit for work.

An INAMI/RIZIV medical officer acknowledges disability on the basis of a medical examination of the person. In principle, that decision never becomes final. The person may be recalled for another examination after a certain time, or may undergo retraining and return to work. In some cases, disability may be recognised up to the retirement date.

As at 31 December 2016, the INAMI/RIZIV recorded over 390 000 people as disabled workers and in receipt of invalidity benefits, namely 366 000 people covered by the private sector employee scheme and around 24 500 covered by the scheme for the self-employed. That represents over 5 % of the Belgian population in the 15-64 age group.

The number of disabled workers has been rising steadily for twenty years. This article aims to break down that increase into the proportion that can be explained by such factors as population ageing and changes in the activity rate, and the residue which cannot be attributed to such factors.

In the rest of the article, we shall focus on former private sector employees, because that is the category of claimants that has increased the most. The scheme for self-employed people differs from the employee scheme, in particular as regards the length of the period of sickness during which no benefits are payable, and the amount of the benefits. Public employees granted long-term sick leave or retiring on grounds of disability are also disregarded. They come under a separate scheme specific to the public sector.

Section 1 describes the current situation regarding disability insurance in Belgium. Section 2 proposes a simple method of examining the importance of the various factors that can be directly observed. It also looks at the changes in the composition of the population of new disability claimants, and the economic and institutional determinants of the system. Section 3 discusses the measures adopted. Finally, the article ends by summing up the main findings of the simulations and the lessons that can be drawn from them.

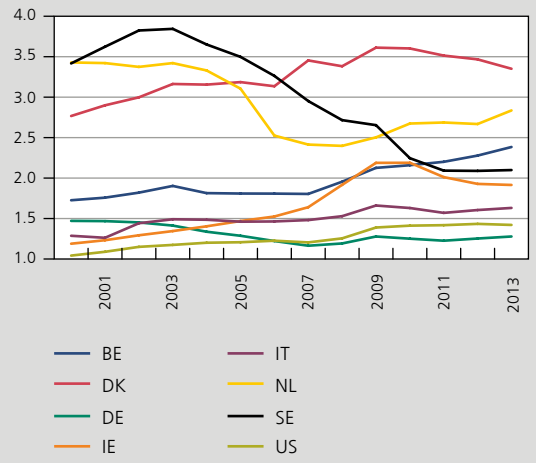
1. Trend in the numbers claiming disability insurance benefits

Disability insurance is a scheme that guarantees a replacement income in the event of disabling sickness or handicap during working life. For the purposes of international

(*) The author wishes to thank Tamara Malyster and her colleagues in the Benefits Service – Finance and Statistics Department of the National Institute for Health and Disability Insurance (INAMI/RIZIV).

CHART 1 PUBLIC EXPENDITURE RELATING TO DISABILITY [1] – CASH BENEFITS

(in % of GDP)



Source: OECD.

(1) Government expenditure relating to sickness, handicap and industrial accidents. It consists mainly of cash disability benefits covering payments made on account of the claimant's total or partial incapacity to pursue a remunerated occupation, plus expenditure on compensation for industrial accidents and occupational diseases.

comparison, we use the OECD's statistical data. They make no distinction between primary incapacity (less than one year) and disability (one year or more) and also include expenditure relating to industrial accidents. Expressed as a percentage of GDP, public expenditure on the provision of replacement incomes for the sick and disabled workers has been rising in many European countries and in the United States since the 2008 economic and financial crisis. The Netherlands and Sweden are exceptions: in those countries, the sickness schemes which were used as a means of early withdrawal from the labour market have been fundamentally reformed (see below). These aggregate statistics also illustrate how the Belgian situation has changed.

The number of disabled workers in a population depends on various factors. The figure increases with the inflow of new disability claimants and declines with the outflow (return to work, death or retirement).

The inflow in a given year depends on the population covered by disability insurance and on the disability incidence rate. The population covered varies mainly according to changes in the labour force.

In Belgium, the labour force has expanded in recent decades, notably as a result of the increased participation of women in the labour market and, more recently, the extension of working life.

The statutory retirement age for women was gradually raised between 1997 and 2008, from 60 to 65 years. Obliging women to work for an extra five years also adds five years to the period of disability insurance cover, which may lead to more disability claimants and longer periods of disability for those in that situation. A similar effect will be seen when the statutory retirement age is raised to 66 years in 2025 and 67 years in 2030. Once they attain the statutory retirement age, workers cease to come under the disability scheme and become pensioners; their benefits are then financed by the pension system.

The incidence rate also has a direct impact on the inflow. That rate varies, more particularly, according to personal characteristics. There is a steadily increasing correlation between the incidence of disability and age (see section 2.1). In other words, even if the incidence rate were constant over time, an ageing labour force would result in a higher number of disability claimants, all other things being equal.

The disability incidence rate also depends on other factors. American studies (see Case and Deaton, 2017) show that the household's level of income and level of education have a statistically significant influence on the probability of being on invalidity benefits, even if age is taken into account. However, the direction of the causality between health (or, in a narrower sense, disability) and income or level of education is ambiguous. On average, people with a higher level of education tend to have a healthier life style and be better informed about how their behaviour affects their health (physical activity, healthy diet, moderate consumption of tobacco or alcohol, etc.). The direction of the causality may also be the opposite: those who are less healthy often encounter problems at school or at work. These differences in health according to the level of education are a major source of inequality because they persist throughout life and are reflected in many spheres: career prospects and income, but sometimes also marriage and family situation.

The disability incidence rate also varies according to the context of people's lives. A safer working environment, a lower proportion of heavy manual labour, and the switch to a services economy all help to reduce the incidence of many causes of disability (particularly physical injuries at work). Although these social changes may have created new risks (stress, hyperconnectivity, etc.), they should not necessarily result in a permanent deterioration in mental and physical capacity for gainful employment.

A greater outflow from disability contributes to a reduction in the number of disabled people. There are three

types of outflow from disability: rehabilitation permitting a return to the labour market, switch to the pension system, and death. The policies and measures taken are intended to help restore fitness for work. Owing to the nature of the disability insurance and the selection to enter the scheme, the rate of return to work is low (see OECD, 2010 and HCE, 2014).

2. Contributions of the various factors to the rise in the number of people on disability benefits in Belgium

In Belgium, the number of disabled workers under the employee scheme increased from 164 751 in 1993 to 366 293 in 2016. The starting point for our analysis (1993) is arbitrary: it is dictated by the availability INAMI/RIZIV data.

The first factor here is the growth of the population in the 15-64 age group. However, over those 23 years, that growth – at 9 % in total – was far outpaced by the number of persons on invalidity benefits, which more than doubled, rising by 122 %.

The major part of the increase is therefore not attributable solely to the growth of the population. If the number of people on invalidity benefits is compared to the population in the 15-64 age group, it is clear that the disability rate is rising over time. It is particularly women who have contributed to that rise. The increase in the number of claimants over the observation period was much steeper among women (it tripled) than among men (+47 %). That difference is not due to the growth rates of the male and female population, which were similar during that period. The rising female participation rate over the past twenty years and alignment of the statutory retirement age are undeniably factors which have greatly influenced the increase in the number of women registered as incapacitated over the period.

In addition, if we look at the male population on its own, we also see a rise in the disability rate, particularly from the start of the 2008 economic and financial crisis.

We shall demonstrate the respective contributions of the changes regarding the age group distribution, the population eligible for benefits, and health to explain the rise in disability in Belgium, on the basis of the simple approach developed by Duggan and Imberman (2009).

2.1 Change in the age structure

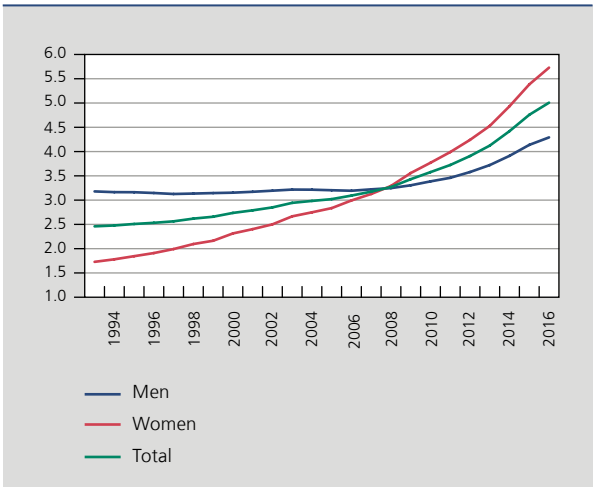
The disability rate, measured here as the number of disabled workers in an age group in relation to the corresponding population, goes up with age. The ratio rises very steeply; thus, the prevalence of disability among men is almost six times higher in the over-55 age group than in the 30-34 age group. It is not surprising that disability is age-dependent, given that many health indicators likewise vary according to age. The right-hand panel of chart 3 shows subjective health in Belgium according to the latest health survey[1]. The female disability rate is currently slightly higher than the male rate, whereas in the past it was men who had the higher disability rate.

To quantify the impact of population ageing on the rise in disability, we conduct a counter-factual analysis. "Counterfactual" means scenarios such as "What would have happened if a particular observed characteristic had differed from the one prevailing at that time?". The results of the scenario are then compared with what actually happened to estimate the impact of the variable considered.

The results of the comparison are presented in table 1 for men and women respectively. The first columns show the number of persons on invalidity benefits in 1993 (base year). By taking the number of instances of disability in a given age group and dividing it by the size of that age

CHART 2 PROPORTION OF THE POPULATION IN THE 15-64 AGE GROUP ON INVALIDITY BENEFITS[1]

(in %, Belgium)

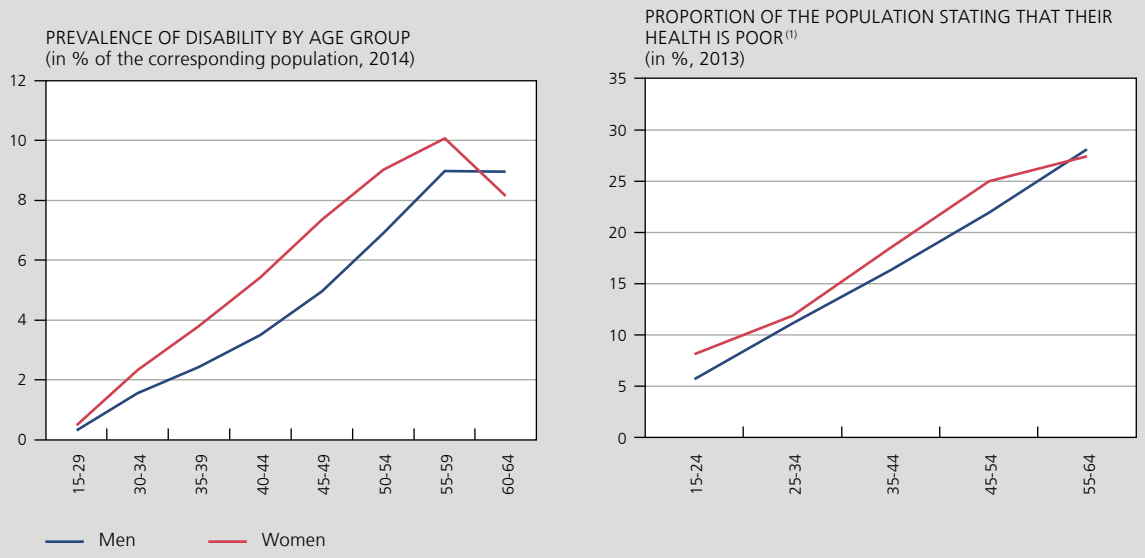


Sources: DGS, INAMI/RIZIV.

(1) Disabled workers under the private sector employee scheme.

(1) That survey conducted every five years by the Scientific Institute of Public Health aims to describe the state of health of the population resident in Belgium and to determine their health care needs.

CHART 3 DISABILITY, SUBJECTIVE HEALTH AND AGE IN BELGIUM



Sources: DGS, INAMI/RIZIV, WIV-ISP (Scientific Institute of Public Health).
(1) State of health considered average, poor or very poor.

group within the corresponding population, we obtain the disability prevalence rate. We find that, in 1993, the prevalence was higher overall for men. The breakdown by age group shows higher prevalence rates for women up to the age of 40 years, after which the rates are much higher for men. For example, in the 55-59 age group, the disability rate for male workers (over 9 %) was almost twice the figure for female workers (4.6 %).

The next columns relate to the population broken down by age. Between 1993 and 2016, there was a substantial shift within the working-age population towards the older age groups for all categories below 45 years of age, for both men and women. This unbalanced demographic structure is due to the sharp rise in the birth rate after the Second World War. Most members of the baby-boom generation were between 30 and 45 years of age in 1993.

The counterfactual number of disabled workers is calculated by taking the prevalence by age in 1993 and multiplying it by the number recorded in the population in 2016. We thus obtain the expected number of disabled workers.

For men, the simulated number comes to 136 000 persons, whereas in reality there were over 157 000 claimants.

To calculate the impact of the change in the age structure within the male population, we compare the expected change in the prevalence, namely 0.53 % (Δsim = 3.70–3.17), with the actual change in the prevalence, namely 1.11 % (Δ = 4.28–3.17). Thus, ageing accounts for almost half of the observed increase in the number of persons on invalidity benefits (Δsim/Δ = 48 %) among male workers between 1993 and 2016 [1].

For women, there is the additional problem of the change in the statutory retirement age. In 1993, the retirement age was still set at 60 years, so that the number of women on invalidity benefits in the 60-64 age group was virtually zero. We therefore imputed a notional prevalence rate for that age group based on the prevalence rate for the preceding age group and the age-related increase in disability. The result obtained for women is very different from that calculated for their male counterparts. In fact, the expected change in prevalence is barely 0.22 % (Δsim = 2.39–2.17), whereas the observed change is considerable, at 3.6 % (Δ = 5.72–2.17). The share attributable solely to the change in the age structure is therefore 6 % [2] for women.

A more significant difference between men and women is the change in the rate of disability insurance cover; we shall examine that in the next section.

(1) To test the robustness of this order of magnitude, other simulations were carried out by changing the observation window. Thus, over the period from 1993 to 2014, the change in prevalence due to ageing came to 68 %, compared to 54 % over the period from 1993 to 2015. It is only from 2016 onwards that the proportion drops below 50 %. The results of the breakdown are inevitably affected by the choice of base year.
(2) If we modify the observation window, that percentage remains in the same region, namely between 6 and 8 %.

TABLE 1 SHARE OF GROWTH IN THE NUMBER OF WORKERS ON DISABILITY INSURANCE (DI) AMONG MEN AND AMONG WOMEN ATTRIBUTABLE TO THE CHANGE IN THE AGE STRUCTURE

	Prevalence of disability in 1993		Population in 1993		Population in 2016		Expected number of persons on DI in 2016		Actual number of persons on DI in 2016		Difference between the observed and simulated numbers
	Number	In % of the population	Number	In %	Number	In %	Prevalence rate In 1993	Simulated number	Number	In % of the population	
Men											
From 15 to 29 years	2 958	0.28	1 065 371	31.6	1 032 615	28.1	0.28	2 867	3 549	0.34	682
From 30 to 34 years	4 362	1.06	412 104	12.2	362 449	9.9	1.06	3 836	6 192	1.71	2 356
From 35 to 39 years	6 640	1.69	391 794	11.6	373 898	10.2	1.69	6 337	10 421	2.79	4 084
From 40 to 44 years	9 248	2.54	364 372	10.8	372 133	10.1	2.54	9 445	14 647	3.94	5 202
From 45 to 49 years	13 070	3.86	338 189	10.0	397 836	10.8	3.86	15 375	21 595	5.43	6 220
From 50 to 54 years	16 780	6.41	261 875	7.8	412 524	11.2	6.41	26 433	31 528	7.64	5 095
From 55 to 59 years	25 563	9.44	270 794	8.0	385 494	10.5	9.44	36 391	37 605	9.76	1 214
From 60 to 64 years	28 294	10.45	270 747	8.0	337 933	9.2	10.45	35 315	31 745	9.39	–3 570
Total	**106 915**	**3.17**	**3 375 246**	**100.0**	**3 674 882**	**100.0**	**3.70**	**135 999**	**157 282**	**4.28**	**21 283**
Women											
From 15 to 29 years	2 818	0.28	1 024 073	30.8	1 013 656	27.8	0.28	2 789	5 827	0.57	3 038
From 30 to 34 years	4 616	1.16	397 822	12.0	363 135	10.0	1.16	4 214	10 199	2.81	5 985
From 35 to 39 years	7 022	1.85	379 664	11.4	371 398	10.2	1.85	6 869	16 387	4.41	9 518
From 40 to 44 years	8 743	2.49	351 625	10.6	364 132	10.0	2.49	9 054	22 482	6.17	13 428
From 45 to 49 years	10 615	3.22	330 171	9.9	387 875	10.7	3.22	12 470	32 247	8.31	19 777
From 50 to 54 years	10 617	4.04	262 843	7.9	404 432	11.1	4.04	16 336	42 420	10.49	26 084
From 55 to 59 years	12 825	4.56	281 156	8.5	387 578	10.6	4.56	17 679	45 150	11.65	27 471
From 60 to 64 years	14 925 (1)	5.05 (2)	295 552	8.9	348 704	9.6	5.05	17 609	33 458	9.59	15 849
Total	**72 181**	**2.17**	**3 322 906**	**100.0**	**3 640 910**	**100.0**	**2.39**	**87 020**	**208 170**	**5.72**	**121 150**

Sources: DGS, INAMI/RIZIV.

(1) In 1993, the statutory retirement age for women was 60 years. The observed number of women on DI in the 60-64 age group was almost zero (187 persons), as most of them already came under the pension system. The number of women on DI is therefore calculated on the basis of the female population aged between 60 and 64 years and an imputed prevalence rate.

(2) The disability prevalence rate for women aged between 60 and 64 years in 1993 was imputed at 5.05 % (i.e. 4.56 % × the observed rate of increase in prevalence between the 55-59 age group and the 60-64 age group for men).

2.2 Change in the proportion of people eligible for insurance

Even if there are no changes in the regulatory framework, the disability insurance cover rate may vary if, as is generally the case, there are eligibility conditions, such as the fact of having (had) a paid occupation. The scheme is in fact designed as social insurance; in other words, it is necessary to have contributed (i.e. to have (had) income from an activity of which part was deducted in the form of social contributions) in order to be entitled to insurance benefits.

The large increase in the activity rate of women therefore had a very substantial influence on the rise in the number of disabled workers. According to the labour force surveys (LFSs), that rate increased from 50.4 % in 1993 to 62.9 % in 2016, representing a rise of almost 13 percentage points, whereas the rate for men displayed only a very small increase over that same period, rising from 70.8 % in 1993 to 72.3 % in 2016.

According to the administrative statistics on the INAMI/RIZIV employee scheme, the persons entitled to benefits (namely those covered by disability insurance) are paid employees in the private sector and unemployed job-seekers, minus pre-pensioners who, in principle, owing to the top-up paid by their former employer, never have anything to gain from claiming disabled status and are therefore not considered eligible for benefits.

We use these administrative data to perform a new simulation, based on the same principles as before (see table 2). We find that the percentage of men eligible for benefits increased slightly overall between 1993 and 2016, in line with the movement in the male activity rate. Conversely, for women, we find that the percentage eligible for benefits increased very considerably for all age groups except the youngest (15-29 years).

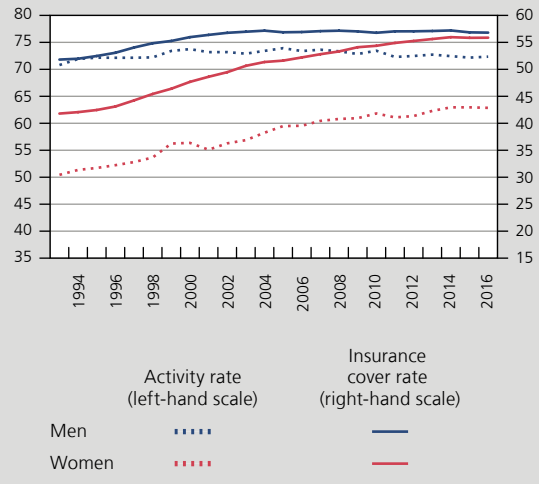
The simulated numbers are calculated by using the 1993 prevalence rates for 2016 and adjusting them to take account of the growth of the population eligible for benefits. The simulation therefore adjusts for both the change in the age structure and the change in the insurance cover rate.

For men, the increase in the simulated number of disabled persons exceeds the actual increase. That is due to the strong rise in the activity rate in the last two age groups, so that the increase in the prevalence rate is substantial. The simulation therefore explains the whole of the increase in the number of men on invalidity benefits.

For women, the expected change in the prevalence is 3.0 % (Δsim = 5.21–2.17), whereas the observed change is larger at 3.6 % (Δ = 5.72–2.17). The share explained solely by the increase in the population eligible for benefits represents almost 80 % of the rise in the number of women on invalidity benefits.

CHART 4 CHANGE IN THE ACTIVITY RATE AND DISABILITY INSURANCE COVER[1]

(in % of the corresponding working-age population)



Sources: DGS, INAMI/RIZIV.

(1) The disability insurance cover rate is the ratio between the population (potentially) eligible for benefits according to the INAMI/RIZIV definition and the corresponding age group.

2.3 Change in the average state of health of the population

We have demonstrated that population ageing and increased participation in the labour market can explain the whole of the rise in the number of disabled men and more than 86 % of the rise recorded among women. However, these simulations take no account of another factor which has also changed, namely medical progress over this 23-year period.

The probability of remaining in good health during working life undeniably increased during the observation period. Here, we present the recorded mortality rates, namely the number of deaths in relation to the size of the corresponding population.

Over the observation period, the mortality rates by age and sex declined on average. The reduction in male mortality in the oldest age groups in the working-age

TABLE 2 SHARE OF GROWTH IN THE NUMBER OF WORKERS ON DISABILITY INSURANCE (DI) AMONG MEN AND AMONG WOMEN EXPLAINED BY THE CHANGE IN THE POPULATION ELIGIBLE FOR BENEFITS

	Disability in 1993			Population in 1993			Population in 2016			Number of persons on DI in 2016 (simulated)		Number of persons on DI in 2016 (observed)		Difference between actual and simulated numbers
	Disability rate (in % of the total population)	Number of persons on DI (in % of persons insured)	Number of persons on DI	Number	Number of persons insured	Percentage of persons insured	Number	Number of persons insured	Percentage of persons insured	Simulated disability rate	Number of persons on DI	Disability rate	Number of persons on DI	
Men														
From 15 to 29 years	0.28	0.62	2 958	1 065 371	480 057	45.1	1 032 615	403 969	39.1	0.24	2 489	0.34	3 549	1 060
From 30 to 34 years	1.06	1.60	4 362	412 104	273 367	66.3	362 449	269 642	74.4	1.19	4 303	1.71	6 192	1 889
From 35 to 39 years	1.69	2.76	6 640	391 794	240 288	61.3	373 898	268 941	71.9	1.99	7 432	2.79	10 421	2 989
From 40 to 44 years	2.54	4.22	9 248	364 372	218 958	60.1	372 133	258 540	69.5	2.93	10 920	3.94	14 647	3 727
From 45 to 49 years	3.86	6.41	13 070	338 189	203 917	60.3	397 836	271 752	68.3	4.38	17 418	5.43	21 595	4 177
From 50 to 54 years	6.41	11.31	16 780	261 875	148 377	56.7	412 524	275 849	66.9	7.56	31 196	7.64	31 528	332
From 55 to 59 years	9.44	21.07	25 563	270 794	121 342	44.8	385 494	228 961	59.4	12.51	48 235	9.76	37 605	–10 630
From 60 to 64 years	10.45	45.40	28 294	270 747	62 328	23.0	337 933	109 721	32.5	14.74	49 808	9.39	31 745	–18 063
Total	**3.17**	**6.11**	**106 915**	**3 375 246**	**1 748 634**	**51.8**	**3 674 882**	**2 087 375**	**56.8**	**4.67**	**171 800**	**4.28**	**157 282**	**–14 518**
Women														
From 15 to 29 years	0.28	0.57	2 818	1 024 073	490 109	47.9	1 013 656	392 880	38.8	0.22	2 259	0.57	5 827	3 568
From 30 to 34 years	1.16	1.77	4 616	397 822	260 058	65.4	363 135	269 237	74.1	1.32	4 779	2.81	10 199	5 420
From 35 to 39 years	1.85	3.35	7 022	379 664	209 525	55.2	371 398	264 283	71.2	2.38	8 857	4.41	16 387	7 530
From 40 to 44 years	2.49	5.35	8 743	351 625	163 484	46.5	364 132	252 753	69.4	3.71	13 517	6.17	22 482	8 965
From 45 to 49 years	3.22	8.45	10 615	330 171	125 636	38.1	387 875	264 972	68.3	5.77	22 388	8.31	32 247	9 859
From 50 to 54 years	4.04	13.66	10 617	262 843	77 734	29.6	404 432	261 781	64.7	8.84	35 754	10.49	42 420	6 666
From 55 to 59 years	4.56	22.12	12 825	281 156	57 975	20.6	387 578	222 469	57.4	12.70	49 214	11.65	45 150	–4 064
From 60 to 64 years	5.05 (1)	50.00 (2)	14 925 (1)	295 552	29 850 (2)	10.1 (2)	348 704	105 558	30.3	15.14	52 777	9.59	33 458	–19 319
Total	**2.17**	**5.10**	**72 181**	**3 322 906**	**1 414 371**	**42.6**	**3 640 910**	**2 033 933**	**55.9**	**5.21**	**189 545**	**5.72**	**208 170**	**18 625**

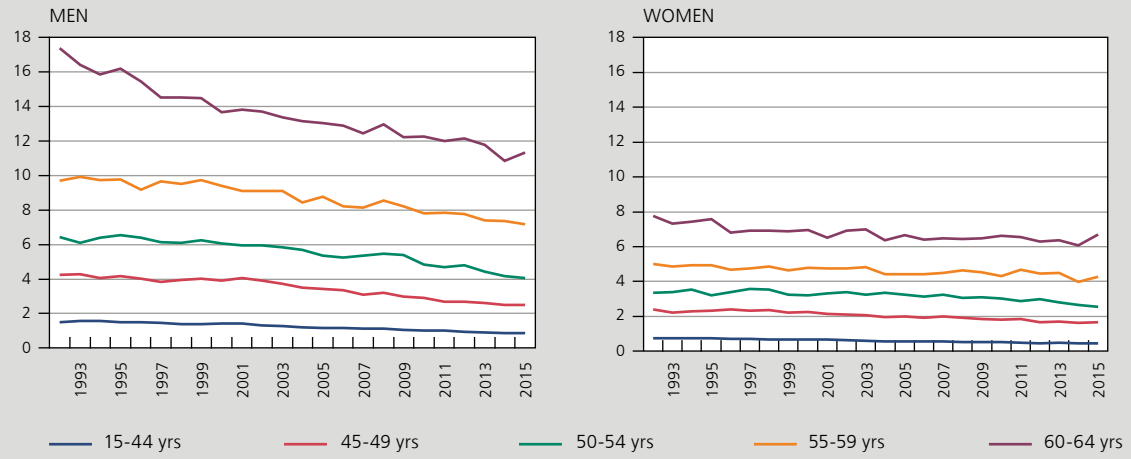
Sources: DGS, INAMI/RIZIV.

(1) The disability prevalence rate for women aged between 60 and 64 years in 1993 was imputed at 5.05 %, as in the previous simulation.

(2) To neutralise the effect of the increase in the female retirement age, the size of the population eligible for benefits was also imputed for women aged between 60 and 64 years.

CHART 5 MORTALITY RATES RECORDED IN BELGIUM

(annual number of deaths per thousand of the corresponding population)



Source: DGS.

population[1] is considerable. For women, too, these rates continued to fall, albeit to a lesser degree.

In general, if the mortality rate is a good way of measuring the (opposing) trend in health, that decline probably contributed to the reduction in the incidence of disability over time. However, the dynamics of the disability insurance system are complex, and one might speculate that the fall in the mortality rate may have resulted in an increase in the number of people on invalidity benefits.

Nevertheless, it seems likely that the downward trend in the mortality rate is at least partly reflected in a decline in the morbidity rate and an improvement in the functional capabilities of the population of working age.

In line with our overlapping simulations, and taking the trend in recorded mortality rates – at first sight – as an indicator of the improvement in the average state of health, we performed a new simulation in which the 1993 disability rates were adjusted for both the change in the cover rate and the changes in the sickness figures. For men, the expected number of disabled workers was smaller than the observed number, and the unexplained residue is 13 %. For women, this new simulation explains 81 % of the increase, leaving 19 % unexplained.

(1) Disability insurance concerns persons aged between 15 and 64 years. The health situation during retirement has no direct influence on the system's dynamics.
(2) In 2016, many of the reasons were not classified.

2.4 Emergence of new risks and reasons for disability

The INAMI/RIZIV breaks down the reasons for claiming disability into groups of illnesses. Two categories gained in importance during the period from 1995 to 2016: diseases of the musculoskeletal system (e.g. back pain and related problems) and mental health and behavioural disorders.

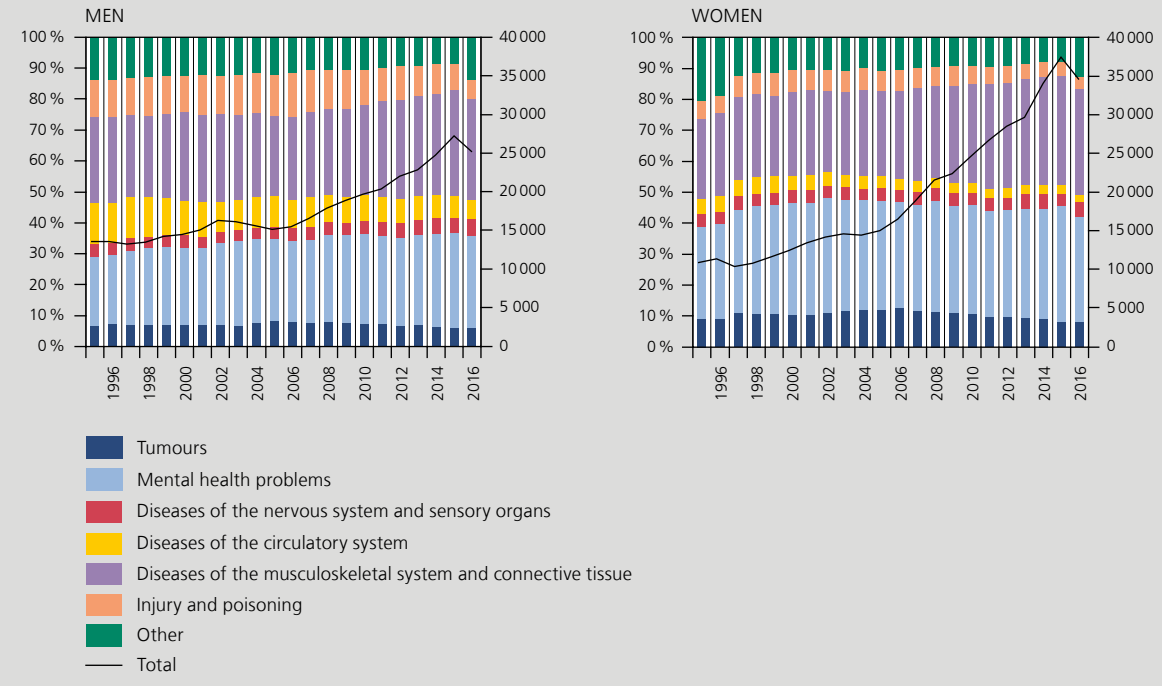
The percentage claiming disability on account of diseases of the musculoskeletal system thus increased from 28 % in 1995 to 33 % in 2016 for men, and from 26 % to 34 % for women. In the case of mental health problems, the increase was almost 8 percentage points for men (from 22 % of the inflow in 1995 to 30 % in 2016) and over 4 points for women (from 30 % in 1995 to 34 % in 2016)[2].

Conversely, the proportion of injuries and poisoning as reasons for disability declined over the period: for male employees, they accounted for over 12 % of cases in 1995, compared to the current figure of 6 %. That is due to the lesser weight of industry in employment in Belgium, but also to the safer working conditions that workers enjoy, compared to the early 1990s.

Advances in medical science and public health measures (against smoking, for example) have helped to reduce the number of disability cases due to cardiovascular disease and cancer, and that is also reflected in the mortality rates.

CHART 6 DISABILITY INFLOW AND REASONS

(number of persons claiming disability, right-hand scale; in % of the total inflow, left-hand scale)



Source: INAMI/RIZIV.

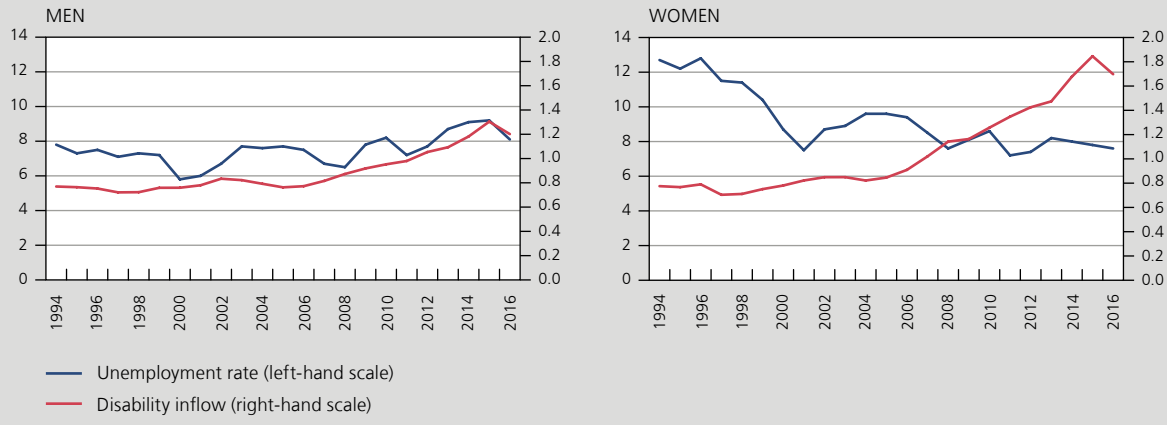
On the other hand, the aggregate statistics from the INAMI/RIZIV do not indicate any downward trend in the age of new disability claimants compared to previous decades. The average age for becoming disabled increased between 2004 and 2016 (from 45 to 46 years for men and from 43 to 45 years for women).

2.5 Business cycle and institutional factors

Since the economic and financial crisis, there has been a closer correlation in some countries between the numbers claiming disability and the deterioration in economic activity. The composition of the inflow could also fluctuate

CHART 7 DISABILITY INFLOW AND UNEMPLOYMENT RATES

(in % of the population eligible for benefits and the labour force in the 15-64 age group respectively)



Sources: DGS, INAMI/RIZIV.

with the cycle; during the last recession, the average age of new disability applicants was lower (Coe and Rutledge, 2013).

Without conducting a formal econometric analysis, we can also see in the Belgian data that the unemployment rate and the disability inflow rate tend to move in parallel, at least for male private sector workers during the most recent period.

Changes in the rules specific to disability insurance can obviously influence its attractiveness, e.g. if the replacement rates are increased. During the observation period, there were no major reforms of the rules on disability under the private sector employee scheme, so that this factor can be excluded *a priori*[1].

On the other hand, the relative attractiveness of disability insurance may also vary as a result of changes in other social security schemes. Belgium is most likely in that situation (Jousten *et al.*, 2012). As was seen in the Netherlands and the United States, in particular, there is a certain "communicating vessels" effect between the various schemes for early withdrawal from the labour market. Disability insurance is not formally part of those arrangements, but we find that the number of disabled workers has risen in recent years; on the one hand, since the early 2000s, the early retirement schemes and the status of "older unemployed persons" exempt from seeking work have been gradually phased out, and access to time credit for older workers has become more difficult, and on the other hand, the statutory early retirement age will be raised at the same time as the statutory retirement age.

(1) Harmonisation of blue-collar and white-collar employee status, which differed in particular as regards the provisions on primary incapacity, would be worth examining.

3. Current and future measures

The rise in the number of long-term sick (more than one year) and the associated disability insurance costs prompted the federal government to take a series of measures which, via closer monitoring, aim to improve sickness prevention, facilitate a return to work, and limit the inflow into disability. Thus, the Law of 20 December 2016 containing various labour law provisions concerning incapacity for work was adopted, as were some new measures for monitoring workers' health, in order to improve the organisation of reintegration processes during periods of incapacity. Such measures can be effective, as the situation in the Netherlands has shown (see box).

Disability insurance: the case of the Netherlands

In the Netherlands, the number of disability insurance claimants increased very rapidly between the 1970s and the mid-1990s, after which a number of reforms were implemented to counteract inappropriate use of the scheme.

Disability insurance in the Netherlands has two characteristics. First, the coverage is very wide: all employees can claim disability benefit, whether the cause of the illness or disability is occupational or not. Also, persons with a relatively low degree of disability can receive earned income without that affecting their disability benefits. While this aggregation of income may be a way of avoiding inactivity traps, it did give rise to some abuse in the Netherlands. In most other countries, aggregation is prohibited or is offset by an equivalent loss of benefits; that encourages those with minor disabilities to leave (self-screening), so that only seriously sick people remain in the system.

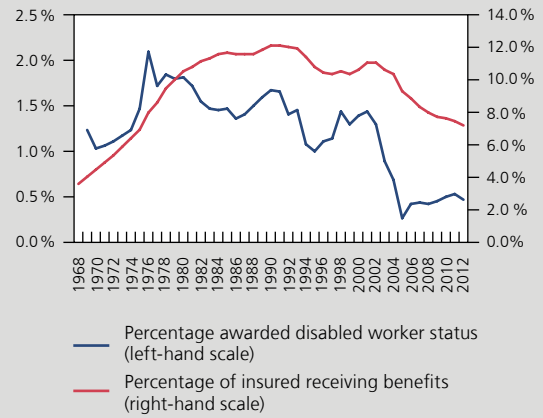
Apart from the institutional characteristics specific to the Dutch scheme, the increase in the number of claimants was due to the relative attractiveness of the scheme compared to unemployment insurance, in the context of a serious downturn in the economy (oil shocks, etc.).

The attraction of the disability scheme compared to the unemployment scheme was due to factors concerning both workers and employers. For the workers, there was no time limit on disability benefits, in contrast to unemployment benefits. Moreover, there were no checks on their efforts to find work. Finally, the amounts received for disability were sometimes considerably higher than the unemployment benefits, at least in certain branches of activity, where collective labour agreements had made provision for top-up payments in the event of sickness. For employers, having

some workers classed as disabled could also be a cheaper solution than redundancy, because it obviated the need to make redundancy payments. Those payments could be substantial, especially in the case of staff with long service. Disability insurance was therefore used as a route to early withdrawal from the labour market.

DISABILITY INSURANCE AWARD AND ENROLMENT RATES PER INSURED WORKER IN THE NETHERLANDS

(in %)



Source: Koning and Lindeboom (2015).

From 1996 onwards, successive Dutch governments began reforming this insurance system. The various packages of measures were phased in and overlapped. However, the reforms can be divided into three main groups.

Changing employer incentives

The idea behind this type of reform was to make employers bear the costs of sick leave for their staff. That was done partly by privatising disability insurance: Dutch employers now finance part of the insurance and may use private insurers to provide this service for them. Also, since 1998, the contributions paid by employers have been adjusted according to the actual claims by their staff on the disability insurance (experience-rating). The idea was that adjusting the employers' social contributions according to the firm's behaviour would ultimately make it possible to reduce the differences between employers. The rules governing that adjustment are often complex (and therefore difficult for employers to understand) because they cannot be uniform and, more particularly, they have to be different for small businesses. In the Netherlands, this system worked up to a certain point: once employers realised the impact of this tariff system on their costs – which took them several years – the experience-rating system was totally revised and drastically trimmed.

These reforms clearly helped to reduce the number of new claimants entering the system, even if the initial effect was considered smaller than expected.

Stricter control of the inflow into the scheme

This reform, introduced in 2002, is considered to have produced the best results. As the chart shows, the inflow declined as soon as it was implemented. The "gate-keeper protocol" stipulates the action that the employer and

the sick worker are expected to take in the initial weeks of absence, without any intervention by the disability insurance scheme, which at this stage acts simply as the "gate-keeper".

In the first six weeks of sickness, the employer and the worker must provide an initial assessment of the worker's medical and functional limitations. A reintegration plan is then devised within the firm, comprising a number of steps and specifying a date for returning to work. In the absence of such a plan, there is no entitlement to disability benefits. The waiting period before invalidity benefits could be granted, if appropriate, was originally one year. In 2004, it was extended by an additional year. These stricter arrangements for returning to work make it possible to eliminate from the system any persons who should not be making use of it.

The reduced disability inflow was also reflected to some extent in an increase in unemployment benefit claimants. According to the review of the literature by Koning and Lindeboom (2015), the research findings are not unanimous on that subject.

Tougher eligibility criteria and incentives for returning to work

Irrespective of the success of the reforms limiting the disability insurance inflow, the Dutch law-makers aimed at an even more efficient approach, this time by trying to increase the rate of disability outflow. In 2006, the old Law governing disability (*Wet op de Arbeidsongeschiktheidsverzekering* – WAO) was rescinded and replaced by a Law on work according to capability (*Wet Werk en Inkomen naar Arbeidsvermogen* – WIA). That Law introduced three major changes.

First, a distinction is made between total, permanent disability and other types of disability (temporary and/or partial). For the first group, the replacement rate was raised to 75 % of the wages previously received. In addition, employers are no longer financially responsible for persons in this category. Next, the criteria governing eligibility for disability benefits were tightened up in the case of persons with a low degree of disability (less than 35 %). In fact, those persons are assumed capable of continuing in their job (if necessary, with adjustments) or registering as unemployed. Finally, a system of wage subsidies was introduced to encourage partially disabled persons to make full use of their potential on the labour market.

In Belgium, the new measures concerning reintegration plans aimed at the socio-professional reintegration of sick employees came into force in December 2016. It is therefore too soon to assess the results. The effectiveness of the measures will be assured not only by the texts of the laws and the administrative circulars but also by their implementation in practice.

The regional governments have taken similar measures to increase the likelihood that sick job-seekers will return to employment. An initial assessment was carried out for this particular group (De Coninck *et al.*, 2017). Among those fulfilling their reintegration plan, 14 % found another full-time job. However, the researchers point out that in many cases the reintegration plans are abandoned, so that the overall rate of returning to work is much smaller. This study also shows that older workers and persons on invalidity benefits are under-represented among the persons fulfilling their plan. It also seems that the success of the scheme requires considerable coordination between the job-seeker, the medical officer and the employer. Supplementary resources should be made available in order to increase the involvement of employers – and even the family doctor – in this type of task.

Conclusion

On the basis of public data obtained from the INAMI/RIZIV, this article has quantified the various factors leading to the growth in the number of disabled workers in Belgium between 1993 and 2016.

We distinguish between men and women because the increase in the activity rate of women and the alignment

of their statutory retirement age had a major impact on that growth.

The simulations show that, over the observation period, population ageing and the rise in activity rates account for 100 % of the growth among men and more than 86 % of the increase for women. However, those percentages take no account of the trend in the average state of health, which has also continued to improve. If we also adjust the historical disability rates to allow for this last factor, we find that just over 10 % of the increase in disabled men and 19 % of the increase in disabled women remains unexplained during the period from 1993 to 2016. The decomposition results are inevitably sensitive to the observation window and the assumptions made.

It therefore appeared that a small proportion of the increase in the number of people on invalidity benefits is due to the greater relative attractiveness of the system or to other unobserved factors. This unexplained part of the increase could be attributable either to disabled worker status being awarded more readily than before, or more probably to the fact that the characteristics of the applicants have changed.

As regards the reasons for the inflow, in Belgium as in other countries (OECD, 2010), there has been a structural shift towards diseases of the musculoskeletal system and mental health problems. On the other hand, the Belgian aggregate statistics do not show any trend in the age of new claimants. Future developments in disability insurance and analysis of the effects of the measures introduced merit further research.

Disability insurance, like unemployment insurance and social security in general, has to be designed to balance the protection it provides with the economic distortions in terms of labour market participation that it causes. The measures taken to ensure the speedier reintegration of sick workers while restricting the inflow into the disability scheme could improve the well-being of those concerned while at the same time reducing the budgetary costs, making the system more efficient.

Bibliography

Case A. and A. Deaton (2017), *Mortality and morbidity in the 21st century*, Brookings Papers on Economic Activity Conference Drafts, March 23–24.

Coe N. and M. Rutledge (2013), *How Does the Composition of Disability Insurance Applicants Change Across Business Cycles?*, Center for Retirement Research at Boston College Working papers, 2013-5.

De Coninck A., F. De Wispelaere, J. Pacolet and M. Lamberts (2017), *Activering uit arbeidsongeschiktheid: hoe de dubbele handicap overwonnen wordt – maatschappelijke doelmatigheid in haar sociale en economische aspecten*, KU Leuven–HIVA.

Duggan M. and S. Imberman (2009), "Why are the Disability Rolls Skyrocketing? The Contribution of Population Characteristics, Economic Conditions, and Program Generosity", in: Cutler D. and D. Wise, eds, *Health at Older Ages: The Causes and Consequences of Declining Disability among the Elderly*, Chicago: University of Chicago Press.

High Council for Employment CSE/HRW (2014), *Report 2014 (Handicap)*, Brussels.

INAMI/RIZIV (2015), *Sick leave during the period of primary disability: analysis and explanatory factors*, Brussels.

INAMI/RIZIV (2016), *Factors explaining the rise in the number of disabled persons: employees and self-employed*, Brussels.

Jousten A., M. Lefebvre and S. Perelman (2012), "Disability in Belgium: There is More than Meets the Eye", in: David A. Wise, ed., *Social Security Programs and Retirement around the World: Historical Trends in Mortality and Health, Employment, and Disability Insurance Participation and Reforms*, Chicago: University of Chicago Press, 251–276.

Koning P. and M. Lindeboom (2015), "The Rise and Fall of Disability Enrolment in the Netherlands", *Journal of Economic Perspectives*, 29:2, 151–172.

Liebman J. (2015), "Understanding the Increase in Disability Insurance Benefit Receipt in the United States", *Journal of Economic Perspectives*, 29:2,123-150.

OECD (2010), *Sickness, Disability and Work: Breaking the Barriers – A Synthesis of Findings across OECD Countries*, Paris.

The cyclical and structural determinants of the low interest rate environment

B. De Backer
J. Wauters(*)

Introduction

In recent years, interest rates have dropped to historically low levels throughout the world. That is largely due to a series of (non-)standard measures adopted by central banks in the context of the great recession. However, if we take a longer-term view, it seems that the current low level of interest rates is perhaps not attributable solely to central bank monetary policy or to other cyclical factors since the crisis. By way of illustration, long-term sovereign bond yields in the advanced economies have displayed a downward trend which clearly began many years before the crisis erupted, and that trend applied in both nominal terms (decline since the early 1980s) and real terms (fall since the early 1990s; see chart 1). From that point of view, the expansionary monetary policy conducted in many countries since the crisis is in line with the downward trend in interest rates which had already been apparent previously.

These findings indicate that, apart from cyclical factors, global structural factors have certainly been contributing to the decline in interest rates for several decades. In theory, those structural factors would have influenced the supply of savings and demand for investment in such a way as to lower the equilibrium level of interest rates. Examples of those structural factors might include socio-economic and financial developments in the broad sense, such as demographic trends (e.g. population ageing) and the slower pace of potential growth. Obviously, monetary policy has very little influence on these structural factors. Nevertheless, they could have significant implications for future interest rate levels in general and hence for monetary policy. In particular, a low interest rate environment could become the "new normal" if structural socio-economic factors continue to depress interest rates.

The article is divided into four sections. Section 1 presents the structural factors which may have contributed to the downward trend in real interest rates over the past 25 years. It focuses on analysing the factors which have had an influence on the supply of savings and on the demand for investment. It also examines more specific factors concerning demand for, and supply of, secure assets (such as certain sovereign bonds).

Section 2 looks at the interest rate picture since the crisis, and highlights some cyclical factors which have encouraged the downward trend in interest rates. In particular, it discusses the role of monetary policy in a low interest rate environment.

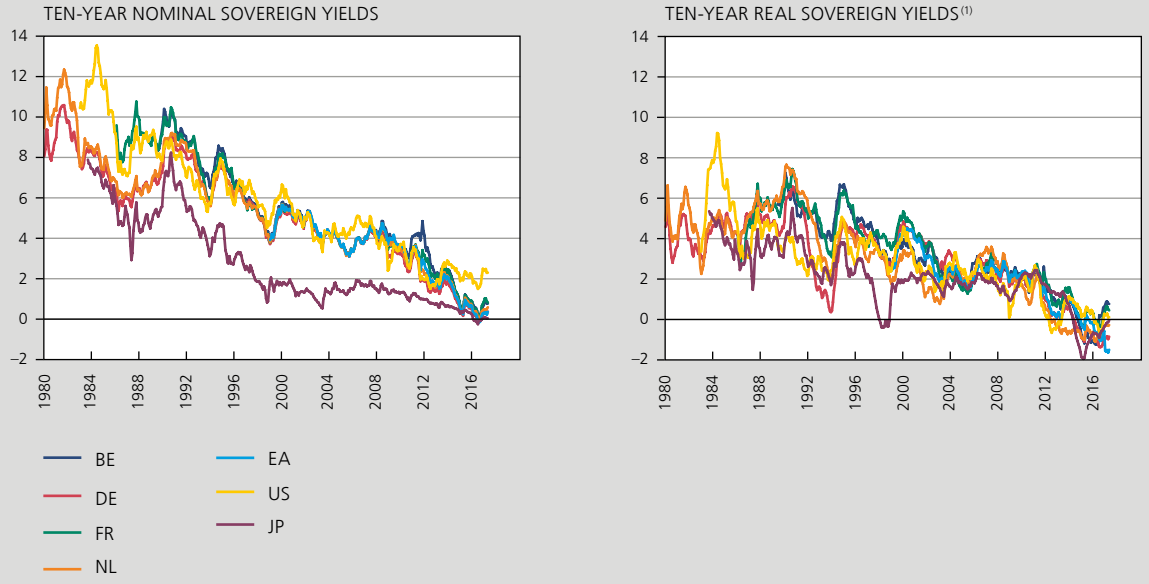
A low interest rate environment poses various challenges which are illustrated in section 3. In regard to monetary policy, this concerns in particular the effective lower bound of nominal interest rates as well as risks to financial stability, and hence the need for (macro)prudential policy.

The fourth and final section puts forward some ideas for addressing the challenges of a new low real equilibrium interest rate. This section examines the advantages and disadvantages of raising the central banks' inflation target, the advisability of price level targeting, and various types of structural reforms that could counteract or offset the impact of the structural factors currently depressing real interest rates.

(*) The authors thank Jef Boeckx, Pelin Ilbas, Christophe Van Nieuwenhuyze and Hans Dewachter for their remarks and suggestions.

CHART 1 GENERAL DECLINE IN LONG-TERM REAL AND NOMINAL INTEREST RATES IN THE ADVANCED ECONOMIES

(in %, monthly averages up to May 2017)



Sources: OECD, Thomson Reuters.

(1) Differences between nominal interest rates and inflation smoothed over one year.

1. Structural developments related to the decline in interest rates

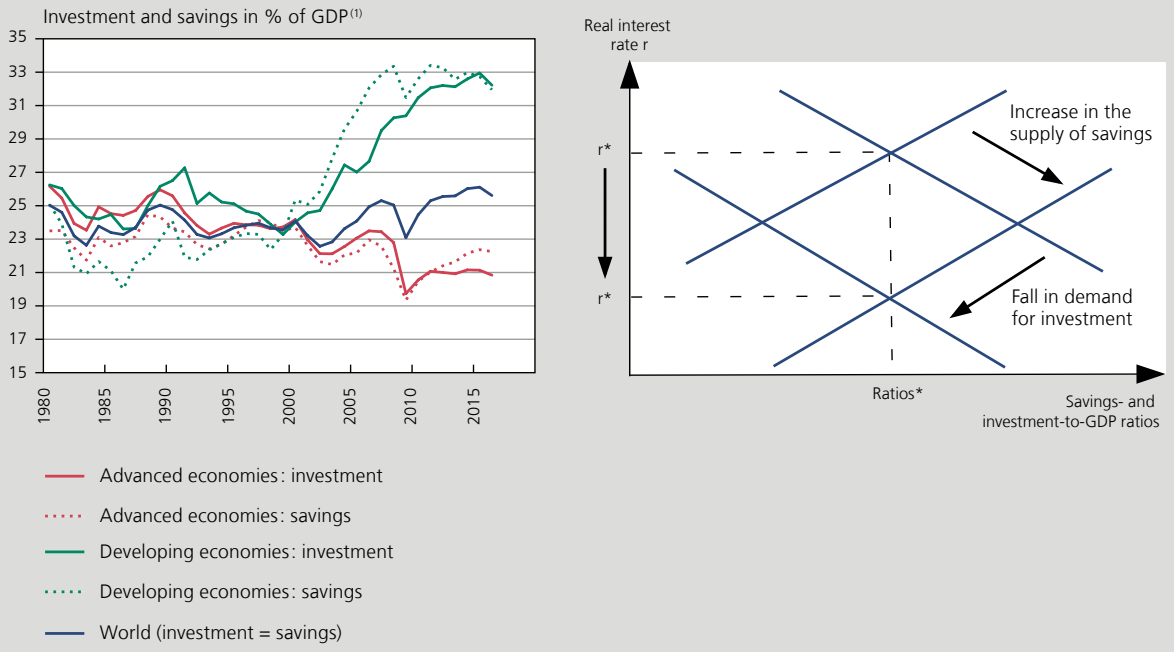
This article examines the causes of the decline in interest rates on the basis of a schematic representation of macroeconomic equilibrium. Conceptually, the point where the savings supply and investment demand curves intersect indicates an equilibrium characterised by an interest rate that creates a balance between the available savings and the level of investment in a closed economy. That interest rate, often called "r", is generally expressed in real terms, i.e. after accounting for inflation. It is assumed that there is a real equilibrium interest rate – or "natural" interest rate – called "r^*", which reflects the long-term equilibrium between the supply of savings and investment demand. If that interest rate applies, the demand for borrowing is in balance with the supply of funds: the economy grows in accordance with its potential and inflation is stable.

This approach is particularly suited to analysis at global level: the world is a closed economy in which savings equal investment. At global level, savings and investment have proved relatively stable in relation to GDP since 1990. Together with the decline in interest rates, that points to a simultaneous movement in the supply of savings and demand for investment (see chart 2). On the one hand, the supply of savings would have increased, which has tended to drive down the natural real interest rate r^* and support the savings/GDP ratio. On the other hand, investment demand would have fallen, causing an even steeper decline in r^* while depressing the investment/GDP ratio. Finally, the simultaneous movement in the two curves would have contributed to the fall in r^* but would not have caused any (major) change in the ratios of saving and investment to GDP.

In the case of the advanced and developing economies, international capital flows complicate the analysis of movements in supply and demand regarding loanable funds. That said, the slight downward trend in savings and investment ratios in the advanced economies suggests that the fall in demand for investment has probably been a bit more pronounced than the movement in the supply of savings. Conversely, in the emerging economies, the increase in the ratios since the late 1990s indicates a relatively sharp rise in the supply of savings.

The rest of this section gives a number of examples of structural factors which may have contributed to the movements in the supply of savings and demand for investment. It outlines the main structural factors without examining the more subtle, possibly secondary, mechanisms and without judging the factors' relative importance (see Rachel and Smith, 2015, for an attempt to quantify the specific

CHART 2 GLOBAL SAVINGS AND INVESTMENT VOLUMES ILLUSTRATE THE INTERSECTION BETWEEN SUPPLY AND DEMAND



Source: IMF.

(1) Investment and gross savings concern both the public sector and the private sector. Averages of investment and savings ratios at the global level (excluding measurement errors).

effects). This section also analyses factors specific to demand for and supply of risk-free assets.

1.1 Various structural determinants have contributed to the fall in the natural real interest rate r^* by increasing the supply of savings

Demographic changes

Longer life expectancy after retirement is a first factor that has certainly contributed to the increased supply of savings (see chart 3). Longer life expectancy is a global phenomenon, seen both in Europe and in the United States, but also in Japan and China (EC, 2015). It is largely due to medical progress, the rise in the standard of living (especially in developing economies), and public health campaigns (e.g. the reduction in the number of smokers).

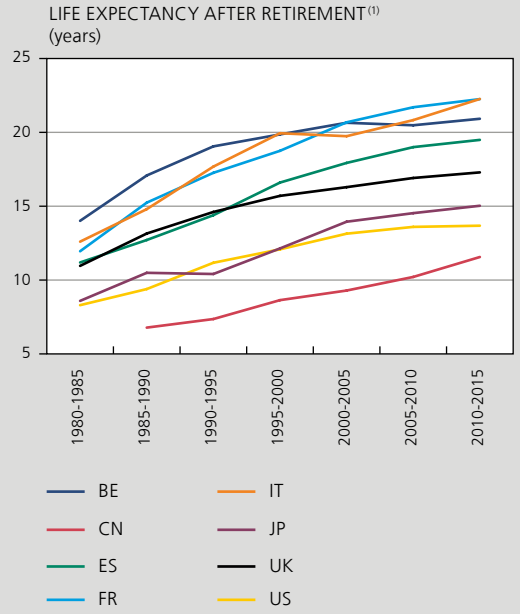
In view of the increasing life expectancy and the relatively stable retirement age, it is reasonable to assume that workers need to set aside more savings for their old age. The Household Finance and Consumption Survey reveals that "provision for retirement" is the second most important motive for saving in the euro area (and notably in Belgium), after "building up a contingency reserve", which could also relate to unexpected events following retirement(1).

Apart from the longer life expectancy, two other factors may have contributed to the increase in the supply of savings, since they have changed the demographic structure of the advanced economies: the post-war baby boom and the subsequent slowing pace of population growth (fall in the fertility ratio) (see Carvalho *et al.*, 2016; Goodhart and Pradhan, 2017). Together, those factors led to an increase in the relative size of the population of working age (the "baby boom" generation) and consequently a rise in the support ratio (expressed, for example, as the size of the 15-64 age group relative to the rest of the population).

According to the life cycle hypothesis, the increase in the support ratio may have boosted the supply of savings. That theory suggests that consumption remains fairly constant throughout the life cycle, whereas incomes follow a hump-shaped curve. This means that persons of working

(1) This survey indicates that roughly 60 % of households polled save in order to build up a contingency reserve, and around 40 % save to provide for their retirement. See Du Caju (2016) for a detailed analysis of the findings of the Household Finance and Consumption Survey.

CHART 3 THE INCREASE IN LIFE EXPECTANCY AND THE STABLE RETIREMENT AGE ENCOURAGE MORE SAVING FOR OLD AGE



Sources: OECD, United Nations.

(1) Difference between life expectancy at birth and actual retirement age (averages for both genders during the periods indicated).

age generally save the most, and that the size of that group influences the supply of savings.

Growing inequality

An increase in inequality expands the supply of savings if the savings ratio of wealthier households exceeds that of people on lower incomes.

Measures of inequality based on the distribution of national income or on the Gini coefficient generally show that inequality is increasing within countries (see Piketty, 2014; Solt, 2016). For example, in the United States, those in the top 10 % of earners accounted for over 50 % of gross national income in 2015, compared to just over 30 % in 1980 (1). Similar increases are seen in Germany, China, the United Kingdom and other countries. The reasons for the growing inequality are the subject of debate. It may be due to technological developments, particularly in the information and communications sector, leading to automation of the tasks of low-skilled workers. The highly-skilled may also have benefited from technological progress, enabling them to increase their productivity (and their wages).

Besides, measures of the savings ratio by income class show that the wealthiest households save proportionately more than the rest of the population; that supports the hypothesis that growing inequality is associated with an increase in the supply of savings. On the basis of the data from the Survey of Consumer Finances in the United States, Dynan *et al.* (2004) show, for example, that between 1983 and 1989, households in the lowest income quintile saved barely more than 1 % of their income, compared to an average of almost 25 % for those in the highest income quintile.

Increased supply of savings from the developing economies

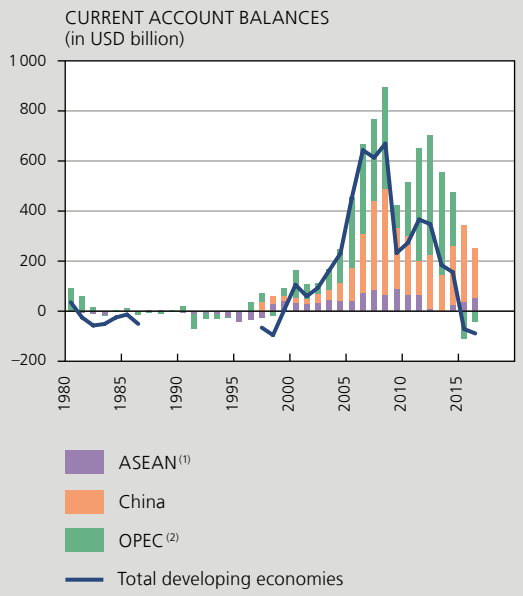
The growth of the supply of savings in the developing economies has been particularly marked since the late 1990s, and has led to a positive current account balance for the developing economies (see chart 4), implying a negative balance for the advanced economies. The increase in the current accounts therefore essentially represents a substantial flow of capital from the emerging economies to the advanced economies. According to Bernanke (2005, 2015), this is the clearest sign of excess saving at global level (global saving glut).

Three key factors may explain the sharp rise in the emerging economies' current account balances. First, the start of that rise in the late 1990s coincided with financial crises in the developing economies. More specifically, the Asian financial crisis of 1997-1998 seems to have prompted South-East Asian countries, in particular, to revise their strategy for managing their foreign exchange reserves. As a result of that crisis, some countries began to build up large stocks of foreign exchange reserves in order to prevent (sometimes sudden) capital outflows and the associated downward pressure on their currencies. Next, some countries such as the members of the Organisation of the Petroleum Exporting Countries (OPEC) gained enormously from the increase in oil prices. Finally, China's current account balance has risen steeply, partly because of the country's integration into the global economy, and demographic factors (such as the one child policy).

Following the latest financial crisis, however, net saving in the developing economies went into reverse in 2015 (the current account balance became negative), largely on account of the fall in oil prices. However, that reversal was offset by the current account surplus which began to appear in the euro area, and which seems to be mainly a reflection of cyclical factors (economic uncertainty in the euro

(1) Data from the World Wealth & Income Database, which are available at http://wid.world/.

CHART 4 INCREASE IN THE SUPPLY OF SAVINGS IN DEVELOPING ECONOMIES



Source: IMF.

(1) Association of South-East Asian Nations (except Singapore), including Hong Kong.

(2) The members of the Organisation of the Petroleum Exporting Countries are Algeria, Angola, Ecuador, Gabon, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates and Venezuela.

area, the tendency towards debt reduction). Overall, the global saving glut still seems to be present, even though the role of the developing economies has diminished.

1.2 Various structural determinants have depressed demand for investment

Slackening pace of innovation

Several economists take the view that potential growth in advanced countries has already been in decline for decades, and that those economies may be experiencing "secular stagnation" (see Summers, 2013; Draghi, 2016a,c; Eggertsson *et al.*, 2016; Praet, 2016). By secular stagnation these economists mean a prolonged period of economic equilibrium accompanied by relatively low growth and interest rates. Generally speaking, the downward trend in potential growth has probably depressed the growth outlook and therefore caused investment to fall owing to the low actual and expected returns on investment.

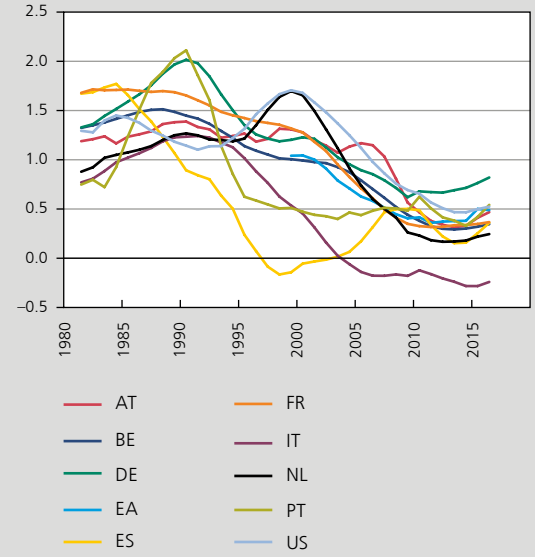
The European Commission estimates that the slowdown in potential growth is due mainly to the fact that, in most euro area countries and in the United States, the contribution of total factor productivity (TFP) has fallen sharply (see chart 5). According to Gordon (2014), the decline in the TFP contribution is attributable partly to a stagnation of the level of education (educational plateau), which can be estimated on the basis of the slower growth in the number of years of education per worker. Rachel and Smith (2015) state that between 1950 and 1990 the number of years of education per worker in the United States increased by 0.8 years per decade, whereas since 1990 it has risen by only 0.3 years per decade; this implies a decline in the contribution of human capital to TFP. Furthermore, Bergeaud *et al.* (2014) detected breaks in the TFP trend in a number of countries. Depending on the case, they were caused by factors such as wars, global financial crises, global supply shocks (e.g. those concerning oil prices) and changes in economic policy.

Decline in the relative price of capital goods

According to the empirical literature, the relative price of capital goods has fallen in recent decades in advanced economies (IMF, 2014; Eichengreen, 2015). And for a given *volume* of investment, a fall in the relative price of capital goods reduces the *nominal* investment expenditure (and therefore the nominal demand for investment). Besides, if capital and labour are not readily

CHART 5 THE SLACKENING PACE OF INNOVATION HAS CONTRIBUTED TO THE DECLINE IN POTENTIAL GROWTH (AND GROWTH PROSPECTS)

(in %, contribution of TFP to annual potential growth)



Source: EC.

interchangeable in the production function, the *volume* of investment will not increase even if capital goods become relatively less expensive. According to the IMF (2014), the volume of investment in the advanced economies has indeed failed to increase since 1990, indicating that the fall in the relative price of capital goods has driven down demand for investment.

Growing importance of services in advanced economies' value added

Services account for an ever-growing share of value added in advanced economies. In 1995, services in the United States and the euro area represented 73 % and 68 % of value added respectively, whereas in 2014 they represented 78 % and 79 % [1]. Assuming that services are less capital-intensive, an increase in the importance of services in advanced economies will tend to depress demand for investment. The OECD (2015) estimates that the growing importance of services has a negative impact on the domestic investment ratio (in % of GDP).

Decline in public investment

The fall in public investment may also have contributed to the decline in interest rates. According to the IMF (2014), public investment has displayed a downward trend as a percentage of GDP in advanced economies since 1970. That decline should be considered partly against the backdrop of pressure on public finances. It could also be due to a certain polarisation of political ideas, hampering public investment in large-scale projects.

1.3 Specific supply and demand factors concerning long-term risk-free assets

Long-term sovereign bond yields were used to illustrate the fall in the real equilibrium interest rate r^* because they often serve as the benchmark for other types of interest rate, and they are available as series of sufficient length and high quality to assess the historical downward trend. Nonetheless, specific factors may have contributed to the fall in sovereign yields, since sovereign bonds are "risk-free" and "long-term". If that is the case, then the sovereign yields will have fallen more sharply than the yields on riskier assets.

Caballero *et al.* (2017) consider, for example, that returns on capital – in contrast to the risk-free long-term interest rates – have been fairly stable since 1980, indicating that the equity risk premium has risen. However, Williams (2017a) comments that the estimated return on equities is based on (theoretical) models. He uses the survey of professional forecasters conducted by the Federal Reserve Bank of Philadelphia to show that the predicted yields on equities (and bonds) have been declining since the early 1990s. He concludes that the reduction in interest rates is not confined to risk-free assets and that it consequently reflects a fall in the natural real equilibrium interest rate r^*.

The estimates of the IMF (2014) and Rachel and Smith (2015) show in a more nuanced way that, on average, returns on capital have fallen throughout the world, albeit less sharply than long-term sovereign bond yields. The reason for this difference could be that the equity market risk premium has generally risen since the early 2000s. These estimates therefore indicate that preferences may have shifted from risky assets to long-term risk-free assets.

In all, various factors may have caused the yields on long-term risk-free sovereign bonds to have fallen more sharply than the real equilibrium interest rate r^* (see also Bernanke, 2013). Those factors include structural developments such as the aforesaid formation of currency reserves in the developing economies, particularly following the Asian financial crisis at the end of the 1990s (those reserves consist mainly of American government paper), certain changes in financial intermediation (such as the growth of insurance companies and pension funds, that generally invest in low-risk long-term assets) and new prudential regulations (risk weighting for the calculation of the capital requirements of financial institutions). Recently, cyclical factors have driven up demand for long-term risk-free assets, such as the purchases of sovereign bonds by central banks implementing quantitative easing programmes. Examples of cyclical factors on the supply side are the trend towards consolidation of public finances since the last financial crisis (contraction of the supply of sovereign bonds) and the loss of "risk-free" status for many structured or government-issued assets (such as certain financial products linked to American mortgage loans).

2. What is the role of monetary policy?

In the light of the foregoing, what is the role of monetary policy in the current low interest rate environment? This section discusses why the real equilibrium interest rate r^* is important for the monetary policy stance. Next, we present estimates showing that r^* is currently at a historically low level, and we establish the link with the low real interest rates actually observed.

(1) Ratios based on European Commission figures (AMECO).

2.1 Estimates of r^* indicate a historical low point

The lower r^* is important for the monetary policy-makers: they endeavour to steer the real interest rate around the equilibrium interest rate which corresponds to an equilibrium between saving and investment with a closed output gap and stable inflation. If inflation is below the target and the output gap is negative, then monetary policy will try to bring the real interest rate below the equilibrium interest rate. The monetary policy stance is then expansionary because it stimulates demand by making saving less attractive and by encouraging investment. In the opposite situation, where inflation exceeds the target and the output gap is positive, restrictive monetary policy will aim to restrain demand by taking the real interest rate above r^* (Draghi, 2016c).

To measure the monetary policy stance, it is not only the level of r but the difference between r and r^* that matters. Lower real interest rates may therefore be seen when monetary policy aims to be neutral in the context of a lower level of r^*. In those circumstances, lower interest rates are necessary to stabilise growth and inflation, because failing to reduce interest rates when r^* falls would cause the economy to drop below its potential and would drive inflation down below its target. That principle is also seen in the Taylor (1993) rule, which prescribes the recommended real interest rate on the basis of the output gap and the inflation rate's deviation from its target. That rule usually adopts an r^* of 2 %, but if account is taken of a lower r^* in recent years, the recommended real interest rate also falls (Yellen, 2017)[1].

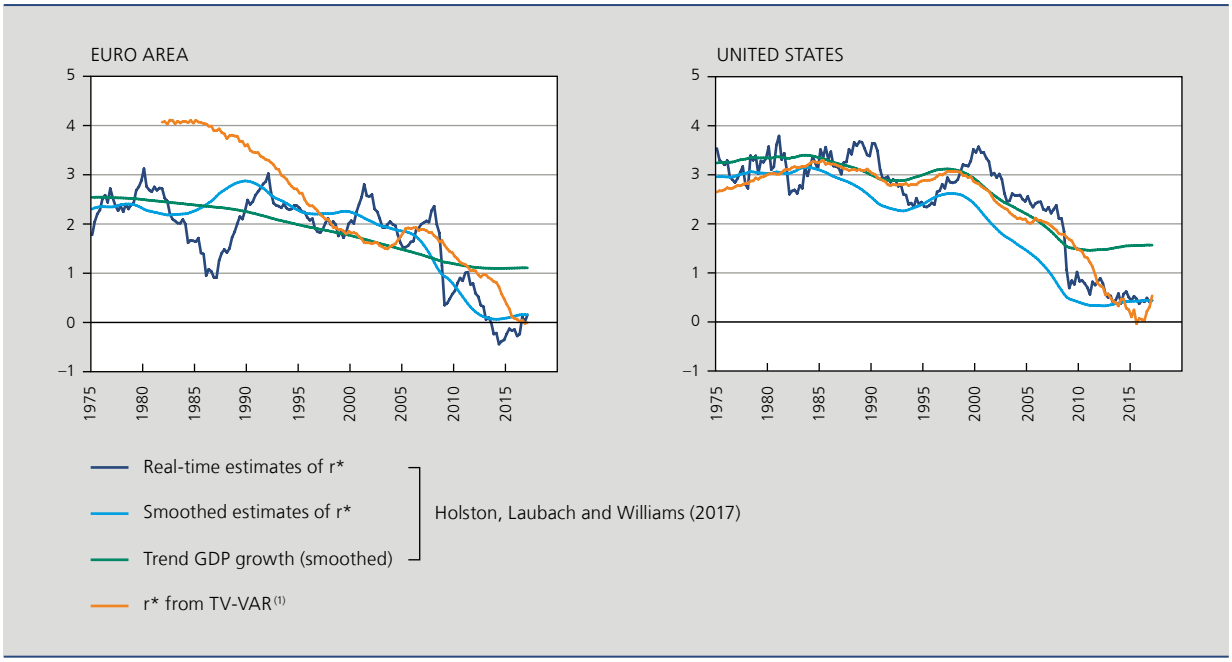
However, the real equilibrium interest rate is a theoretical concept that cannot be observed. Holston *et al.* (2017) use an econometric model to estimate r^* empirically for various regions, such as the United States and the euro area. Their model assumes that r^* is the interest rate corresponding to a closed output gap and stable core inflation once the temporary shocks affecting the economy have dissipated. The intuition of that model is discussed in box 1.

The real-time estimates of r^* according to the model of Holston *et al.* (2017) show two periods of declining r^* values (see chart 6). During the first phase, from 1990 to 2007, r^* displays a moderate fall in both regions.

(1) The original Taylor rule predicts that the nominal policy interest rate i_t depends on inflation (π_t) and the output gap ($\widetilde{y}_t$) : $i_t = \pi_t + r^* + 0{,}5\,(\pi_t - 2\,\%) + 0{,}5\,\widetilde{y}_t$ (Taylor, 1993). In equilibrium, the real interest rate is therefore equal to r^* (which Taylor assumed to be 2 %). It follows from this rule that – for a given inflation rate and output gap – a lower r^* implies a lower recommended policy interest rate.

CHART 6 ESTIMATES OF THE EQUILIBRIUM INTEREST RATE INDICATE A HISTORICAL LOW POINT

(in %, up to 2017Q1)



Source: NBB.

(1) The estimate of the time-varying parameter vector autoregression (TV-VAR) is based on Lubik and Matthes (2015).

During the second phase, which began in 2007 with the financial crisis, the r^* values fall more steeply and reach historical low points. The smoothed r^* estimates from this model and a vector autoregressive model with time-varying parameters show similar tendencies[1]. According to the estimates, r^* in the euro area is currently close to zero and lower than in the United States (where r^* is positive).

According to the model of Holston *et al.* (2017), r^* is equal to the sum of two components: potential growth of real GDP and a variable that represents the time preference of consumers. The estimated potential growth falls systematically in both the euro area and the United States, and the r^* estimates follow that trend. However, in addition to that lower potential growth, there is also a shift in consumers' time preference, as the equilibrium interest rate has fallen more sharply than potential growth. That means that cyclical factors are reinforcing the structural driving forces which are separate from potential growth (see previous section). The propensity to save has increased, e.g. in order to reduce debt levels or as a precaution against the risk of unemployment. And investment demand has fallen further, e.g. in response to a climate of great uncertainty, difficult access to bank credit for businesses, and lower public investment as a result of public expenditure cuts.

(1) The real time estimates indicate for each time period t the estimate based on the data up to that moment. However, the smoothed estimates use data from the complete time series (and therefore also data from after time t), which makes those estimates generally less volatile.

Box 1 – How is r^* defined and estimated?

This box examines in more detail how the real equilibrium interest rate r^* is defined and estimated in the academic literature. It also explains the intuition behind the model of Holston *et al.* (2017) (whose estimation results are discussed in the text).

It was Knut Wicksell who, in 1898, introduced the concept of the natural equilibrium interest rate as the loan interest rate which neither increases nor reduces commodity prices (Wicksell, 1936, translation of the 1898 text, p. 102). That concept is found in several variants in today's academic literature (Beyer and Wieland, 2017). For instance, the new-Keynesian macroeconomic models include a *short-term* equilibrium interest rate which reflects the interest rate in a (hypothetical) economy where prices can always be adjusted flexibly and the economic allocation is therefore not distorted by price rigidities. However, in this article, we follow Laubach and Williams (2003) and define r^* as the interest rate consistent with an equilibrium in which real GDP equals its potential level and inflation is stable. That definition takes a long-term view and indicates the expected real interest rate in, say, five to ten years when demand and supply shocks have dissipated and the economy grows at its potential rate (Williams, 2003).

The figures in the text show estimates of r^* based on the model of Holston *et al.* (2017). This semi-structural model, which is based largely on Laubach and Williams (2003), is explained in more detail here. We estimate several indicators on the basis of data relating to real GDP, core inflation and a measure of the real interest rate r (the 3-month interest rate less the moving average of inflation over four quarters). The model breaks down real GDP into a potential level and an output gap; it derives a measure of trend growth from GDP and also indicates an equilibrium interest rate r^* corresponding to a closed output gap and stable core inflation.

The first component is an "IS equation" for aggregate demand:

$$\tilde{y}_t = a_{y,1}\tilde{y}_{t-1} + a_{y,2}\tilde{y}_{t-2} + \frac{a_r}{2}\sum_{j=1}^{2}(r_{t-j} - r^*_{t-j}) + \varepsilon_{\tilde{y},t}$$

in which the output gap $\tilde{y}_t$ – the percentage difference between real GDP and its potential level – is a function of earlier values for the output gap, deviations between the real interest rate and the equilibrium interest rate r^*, and a residual $\varepsilon_{\tilde{y},t}$.

The second component is a Phillips curve equation that links activity and inflation π_t:

$$\pi_t = b_\pi \pi_{t-1} + (1 - b_\pi) \pi_{t-2,4} + b_y \tilde{y}_{t-1} + \varepsilon_{\pi,t}$$

in which $\pi_{t-2,4}$ represents the average inflation between two and four quarters ago.

Together, these equations display the following dynamics: if the real interest rate is higher than r^*, the output gap is subject to negative pressure (IS equation). A negative output gap will in turn drive down core inflation (Phillips curve equation). Conversely, if $r < r^*$, there will be upward pressure on the output gap and on inflation.

It follows that, in the absence of shocks and if $r = r^*$, the model ultimately converges to an equilibrium with a closed output gap and stable core inflation. This shows that r^* is a long-term concept in this model, and that the sign of $r–r^*$ indicates whether monetary policy is exerting upward or downward pressure on inflation.

Finally, there are some unobserved components. The model uses the Euler equation derived from theoretical models to determine r^* as the sum of two time-varying parameters:

$$r_t^* = g_t + z_t$$

The parameters are the potential growth g_t of real GDP and the time preference z_t of consumers. The latter declines if consumers are more willing to postpone their consumption, implying a higher propensity to save. Finally, g_t indicates the trend growth of potential real GDP y_t^*, and both g_t and z_t are modelled as random walks[1]:

$$y_t^* = y_{t-1}^* + g_{t-1} + \varepsilon_{y^*,t}$$

$$g_t = g_{t-1} + \varepsilon_{g,t}$$

$$z_t = z_{t-1} + \varepsilon_{z,t}$$

The parameters and unobservable variables are estimated on the basis of Kalman filter techniques (Holston *et al.*, 2017). The estimates in the text are based on the *r* code of the original study with updated data.

For comparison, chart 6 also presents estimates of r^* based on a time-varying parameter vector autoregression (TV-VAR), based on Lubik and Matthes (2015). The TV-VAR describes how GDP growth, core inflation and the real interest rate depend on their earlier values and random shocks, and flexibly allows for non-linearities in their underlying equations. In the TV-VAR, the equilibrium interest rate r^* was calculated as the real interest rate prevailing once all temporary shocks have dissipated.

(1) The output gap is defined as $\tilde{y}_t = 100\,(y_t - y_t^*)$, in which y_t and y_t^* respectively represent the natural logarithm of real and potential GDP. Therefore, $y_t^* - y_{t-1}^*$ can be regarded as the growth rate of potential GDP.

2.2 Monetary policy has lowered the real interest rate via (non-)standard policy

During the financial crisis, monetary policy in the euro area tried to encourage demand by means of expansionary measures that reduced r below r^*. Initially this was done via conventional measures, namely by cutting the key interest rates, even taking them into negative territory. However, the effective lower bound to the key interest rate made it difficult to reduce r much below r^*. It was therefore decided to adopt (additional) non-standard measures such as asset purchases, the issuance of long-term loans, and forward guidance on policy intentions. The central bank thus attempted to reduce the real interest rates for various maturities on several markets[1].

(1) See Cordemans *et al.* (2016) for an overview of (non) standard monetary policy in the euro area.

The recommendation on reducing r below r^* – and especially the estimates presented here – should be interpreted in qualitative rather than in strictly quantitative terms. Indeed, model estimates of r^* are generally associated with great statistical uncertainty (Holston *et al.*, 2017; Beyer and Wieland, 2017), which must be taken into account in monetary policy decisions. Nevertheless, the assumption that r^* has fallen is borne out by various models, both for the euro area (Constâncio, 2016) and for other regions of the world (Holston *et al.*, 2017).

In short, the role of monetary policy in the current low interest rate environment was to implement necessary expansionary measures in order to reduce r below r^*, with the latter having decreased since the crisis.

3. Challenges posed by low interest rates

This section discusses some challenges confronting the euro area policy-makers as a result of the low r^*, namely: i) can the real interest rate fall sufficiently? ii) is the low real interest rate appropriate to all countries? and iii) what does the low interest rate imply for macroprudential stability?

3.1 The low r^* and the "effective lower bound" hamper monetary policy

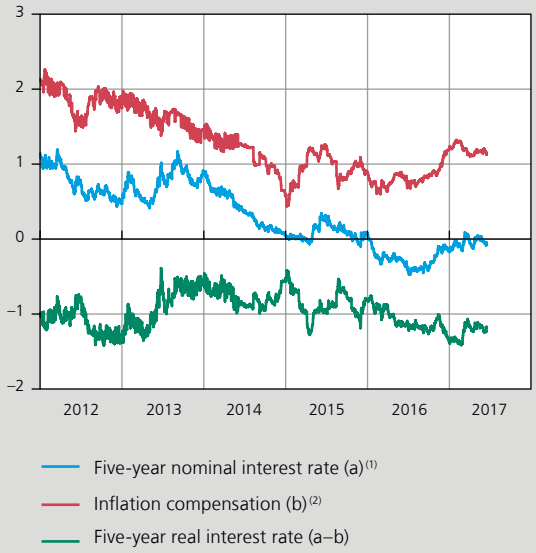
Owing to the low r^* in the euro area, if monetary policy is to be expansionary it has to take the real interest rates to historically low levels. Since the real interest rate is equal to the nominal interest rate minus expected inflation, this means that policymakers have to aim at a low nominal interest rate and/or high inflation.

However, in the current context, there is little scope for the real interest rate to fall. A reduction in the nominal interest rate is impeded by the effective lower bound, because if the nominal interest rate is decidedly negative it is advantageous to convert deposits into cash. The existence of paper money as a non-interest-bearing resource prevents monetary policy from implementing a very negative interest rate.

Chart 7 illustrates developments in the five-year real interest rate in the euro area defined as the difference between the five-year nominal interest rate and the inflation compensation at five years on the financial markets. In principle, the real interest rate could fall to –2 % if the nominal interest rate is zero and inflation expectations are anchored in accordance with the ECB's target. However, in recent years, the real interest rate has been more or less stable at around –1 %. That is due to the downward trend in inflation compensation, which has negated the fall in the nominal interest rate.

CHART 7 THE LOW r^* AND THE "EFFECTIVE LOWER BOUND" HAMPER MONETARY POLICY IN THE EURO AREA

(in %, data up to 16 June 2017)



Source: Thomson Reuters.
(1) Five-year OIS in the euro area
(2) Five-year inflation swap for the euro area.

Monetary policy is therefore approaching its limits, whereas the economic situation still requires stimulus. Although non-standard policy has reduced r, it is also desirable to increase r^* to make the current policy more accommodative. A growth-friendly fiscal stance – in so far as that is possible – could help here, as could (growth-friendly) structural measures aimed at driving r^* back up. We shall return to this in the next section.

3.2 Is the low monetary policy interest rate appropriate to all euro area countries?

While the low r^* makes it difficult to give monetary stimulus for the euro area as a whole, the question is whether the expansionary policy is appropriate to all countries in the currency area. The ECB Governing Council determines the monetary policy for the euro area as a whole and therefore steers a "euro area r" in relation to a "euro area r^*". The unified monetary policy may therefore differ from a policy tailored to the individual Member States.

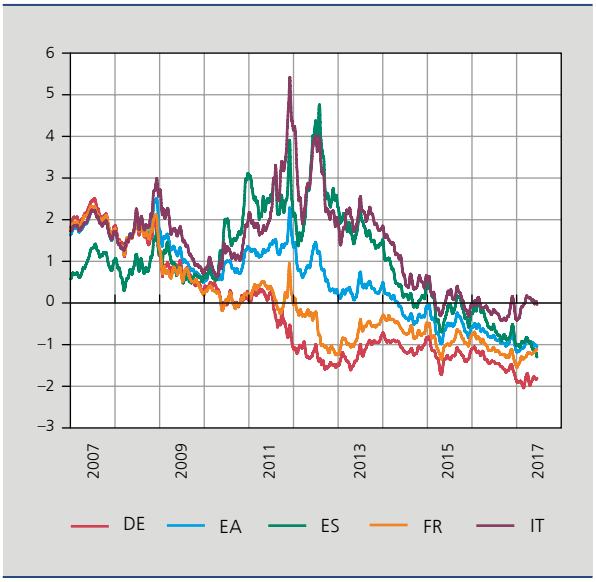
Chart 8 shows the trend in the *ex-ante* real five-year sovereign yield in the euro area, Germany, Spain, France and Italy. At the time of the financial crisis and the sovereign debt crisis, those yields diverged very widely, partly as a result of differences in inflation compensation but mainly because of divergent nominal sovereign yields. When the non-standard policy was actively implemented in recent years, the interest rates converged towards more comparable, negative levels[1].

The real interest rate is lowest in Germany, because that country has both relatively high inflation compensation and the lowest nominal interest rate. That low real interest rate has already been subject to regular criticism and has also been cited as evidence that the ECB's expansionary policy has "expropriated" German savers. But it should be noted here that structural drivers (such as demographic trends and declining investment and productivity growth) create an imbalance between saving and investment in Germany as well, as is evident from the country's large current account surplus. That imbalance is part of the reason for the low interest rate, regardless of the potential role played by the unified monetary policy (Bindseil *et al.* 2015).

Moreover, the imbalances which appeared during the crisis in the euro area require adjustments on the part of both surplus and deficit countries. Countries with a current account surplus can contribute by supporting the target for inflation below but close to 2 %. The relative price distortions between core and peripheral countries are easier to rectify in a context of higher general inflation, without any need for deflation in the peripheral countries (which would increase the real interest rate there) (Coeuré, 2016). In those circumstances, the relatively low real interest rate in the surplus countries – and the impact of that on inflation in those countries – is therefore desirable. Furthermore, the ECB has no option other than to determine the monetary policy for the euro area as a whole : a unified monetary policy can do little to influence inflation in the individual countries.

CHART 8 ***EX-ANTE*** **FIVE-YEAR REAL INTEREST RATE**[1]

(in %, ten-day averages up to 16 June 2017)



Sources : Bloomberg, ECB.

(1) Five-year nominal sovereign yield minus five-year inflation compensation according to inflation swaps for the countries considered.

3.3 Macroprudential policy must ensure financial stability in an interest rate environment hostile to profitability

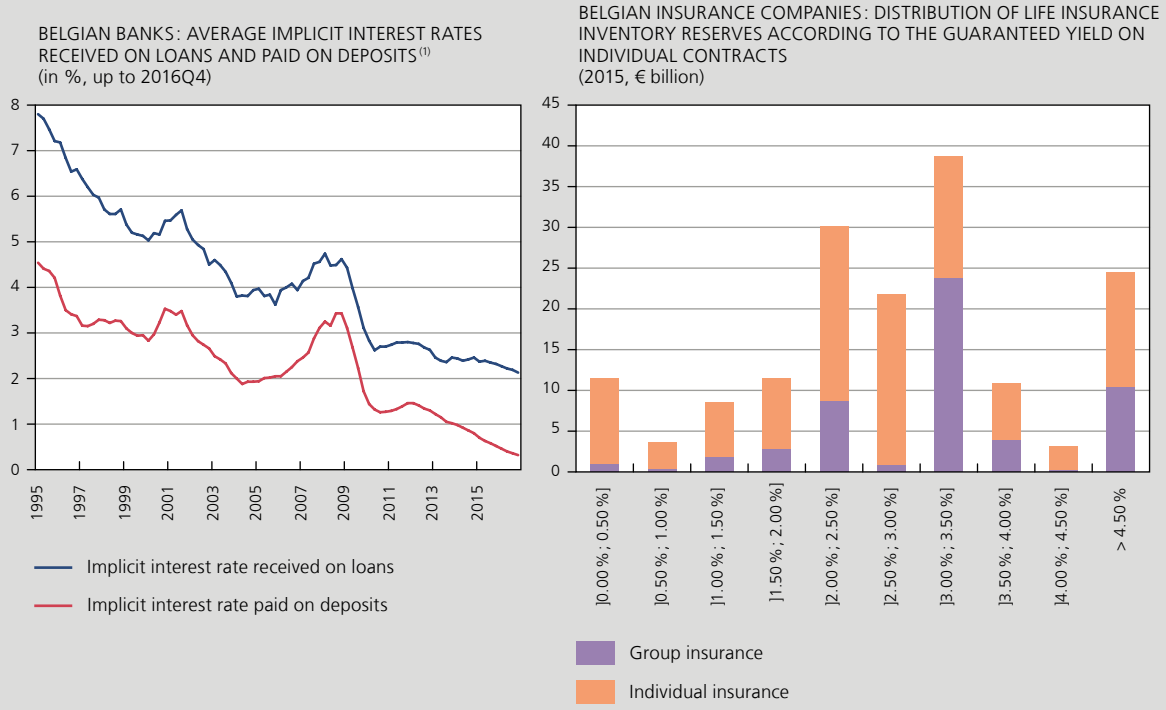
A low interest rate entails challenges for the profitability of banks and insurance companies. In Belgium, for example, the banks' business model is based on maturity transformation. Belgian banks obtain most of their funds from customers' deposits (which can be regarded as equivalent to short-term loans) and use them to grant (longer-term) loans. If there is a general fall in interest rates, banks renew their outstanding loans at lower interest rates and pay a lower rate on deposits. The implicit interest rate received on loans – defined as the ratio of the interest received over one year to the outstanding loans – and the implicit interest rate paid on deposits have been exhibiting a downward trend for several years (see chart 9). As long as the two series can fall in parallel, the pressure on net interest income is limited since banks maintain their margins. However, as implicit interest rates paid on deposits (the short-term interest rates) approach zero, a continuing decline in longer-term interest rates would exert pressure on the banks' intermediation margins[2]. If the current low interest rate environment persists, then it will start to depress banks' profitability, especially if the interest rate curve is flat. For the banks, an alternative scenario would be to refrain from further reducing interest rates on their lending, or actually to increase these rates, which would interfere with the transmission of monetary policy.

In the case of insurance companies, a persistently low interest rate environment could make it harder to honour past contracts offering relatively high guaranteed yields. Insurers have had to offer contracts more in line with market

(1) Fries *et al.* (2016) observe for the four largest euro area economies that individual deviations between r (the one-year interest rate) and r^* have tended towards a neutral position in recent years. They link that convergence to the non-standard measures implemented by the ECB.

(2) In Belgium, the interest rate on regulated savings accounts must not be less than 0.01 % for the basic rate and 0.10 % for the loyalty premium, according to the interpretation of the Royal Decree of 27 August 1993 implementing the Income Tax Code 1992.

CHART 9 MACROPRUDENTIAL POLICY MUST ENSURE FINANCIAL STABILITY IN AN INTEREST RATE ENVIRONMENT HOSTILE TO PROFITABILITY



Source: NBB.

(1) Implicit interest rates are calculated as the ratio between the cumulative flows over twelve months of interest actually received or paid on the corresponding outstanding assets or debts (quarterly average). The range of loans taken into account comprises term loans and mortgage loans. The range of deposits covers sight accounts, savings accounts and term accounts.

conditions (with lower guaranteed yields), and in Belgium regulatory measures were introduced (reduction in the maximum interest rate for long-term life insurance contracts, revision of the guaranteed yield for supplementary pensions). The financial management of the insurance sector's capital gains is also a key point for the attention of prudential policy.

In general, a low interest rate environment implies (macro) financial risks and requires (macro)prudential policy measures to enable the balance sheets and business models of banks and insurers to withstand that low interest rate environment. In particular, the overvaluation of specific financial or real assets, the adoption of excessive positions as a result of a search for yield, and the growth of the shadow banking sector could undermine the stability of the financial sector.

4. How to restore a higher interest rate?

Monetary policy thus tries to bring the real interest rate r below the equilibrium interest rate r^* in order to revive the economy and bring inflation in line with its target. This means that if economic activity recovers, monetary policy can allow r to rise towards r^* as there is less need for monetary stimulus. But if structural factors have driven r^* down in the past decades, the general real interest rate level r will stabilise at a low level.

Although economists do not all agree, most of them seem to assume that structural factors will continue to depress the level of r^*. For example, Draghi (2016a, c), Praet (2016) and Constâncio (2016) consider that the downward trend in the real interest rate is mainly due to declining productivity in the advanced economies, combined with pessimistic potential growth expectations; that has lowered the expected returns on investment and hence investment demand (see also Carvalho *et al.*, 2016; Fischer, 2016; Gordon, 2014; Rachel and Smith, 2015; Summers, 2014 and the Executive Office of the President of the United States, 2015). From that point of view, r^* could remain low in the medium term if potential growth remains weak.

Conversely, Goodhart and Erfurth (2014) and Goodhart and Pradhan (2017) predict that the natural interest rate

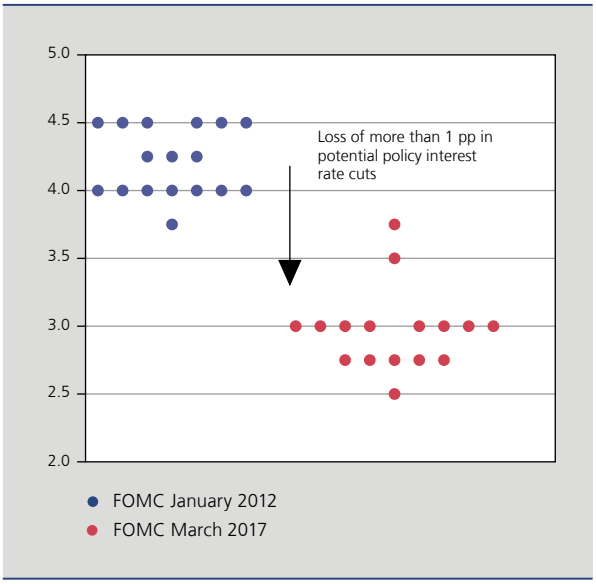
will rise again in the relatively near future. They base their prediction mainly on the gradual retirement of the baby-boom generation (gradual fall in the support ratio) who are likely to begin using their savings. However, Bean *et al.* (2015) consider that the future impact of that structural factor is hard to predict. For instance, its effect may be no greater than that of other structural forces such as the declining growth prospects. In Japan, for example, the support ratio has been falling sharply for more than ten years without any sign of an increase in the natural interest rate. Therefore, despite the sometimes divergent opinions of economists, we can probably expect fundamental forces to continue depressing the level of the natural interest rate.

Apart from challenges implied by low interest rates (see the third section), a low r^* has significant implications for the policy interest rate in the long term. This policy rate is in the long term equal to the sum of r^* and the inflation target (see the Taylor rule). Consequently, a permanently lower real equilibrium interest rate r^* causes a lower nominal equilibrium interest rate, which means that monetary policy will have less scope in future to reduce its key interest rate in the event of an economic recession. That curtails the stabilisation function of monetary policy, because the key interest rate will reach the effective lower bound more frequently.

This is not a purely hypothetical risk. Chart 10 shows the individual long-term expectations for the (nominal) policy interest rate according to members of the Federal Open Market Committee (FOMC) in the United States. That group discusses and determines the monetary policy stance. The blue dots indicate the expectations when those data were first published in January 2012, while the red dots show the expectations in March 2017. It is striking that in the space of five years the distribution of the long-term expectations has largely shifted from "4 % or more" to "3 % or lower"; it is therefore expected that, in the long term, potential interest rate cuts in the United States will have lost a full percentage point.

CHART 10 INDIVIDUAL LONG-TERM EXPECTATIONS FOR THE FEDERAL FUNDS RATE ACCORDING TO FOMC MEMBERS

(in %)



Source: FOMC.

We discuss three possible policy options aimed at remedying the adverse consequences of a low r^*. The first two are linked to monetary policy: an increase in the inflation target and a monetary policy targeting a price level rather than inflation (Williams, 2016). Finally, we discuss how structural reforms could increase r^*.

4.1 A higher inflation target has both advantages and disadvantages

One way of restoring monetary policy's ability to take action against future recessions would be to raise the inflation target to 4 %, for example (Blanchard *et al.*, 2010; Ball, 2014). Since that measure would increase the equilibrium nominal policy interest rate, there would be less risk of the policy rate reaching the effective lower bound. That would also be beneficial for banks and insurers. Since it is hardly possible for banks to cut their funding costs sufficiently at the effective lower bound (because of reluctance to impose negative interest rates on deposits), it avoids occasional downward pressure on their profitability. A higher nominal equilibrium interest rate would also make it easier for insurers to honour their past undertakings concerning nominal guarantees.

However, such a policy adjustment also brings challenges (Blanchard *et al.*, 2010). First, there is the risk that the central bank may lose credibility, e.g. if actual inflation cannot be aligned with the new target. And if today's inflation target of 2 % increases, what guarantee is there that further adjustments will not be made in the future? More uncertainty over the inflation target could cause the economic agents to incorporate higher risk premiums in nominal financial contracts. Finally, an unexpected rise in inflation (on announcement of a new policy) could trigger a redistribution effect to the detriment of savers. Although insurers, for example, benefit from higher nominal interest income, that is not reflected in higher real interest income for their customers, the savers. For that reason, an increase would need

to be phased in gradually so that it can be taken into account in new contracts.

When this article was written, few monetary policy-makers and commentators in the euro area were debating the possibility of raising the inflation target. In the United States, however, a group of eminent economists have advocated a reappraisal of the current inflation target through an open letter to Janet Yellen, Chair of the Fed. At a press conference she in turn stated that this question will be studied in the future (Financial Times, 2017).

4.2 In theory, a price level target could be helpful

Another option is for monetary policy to aim at aligning the price level with a predefined path ("price-level targeting"), e.g. a 2 % annual increase in the price level. The great difference compared to an inflation target is that in the case of a price level target the policy-makers take account of earlier deviations from the target. Imagine that, following a period of low inflation, the price level is lower than its target; a price level target would then aim at *higher-than-average* inflation to restore the price level to its target. In contrast, in the case of an inflation target, the price growth target remains unchanged (Bank of Canada, 2011)[(1)].

In theory, a price level target has some advantages over an inflation target. Although a price level target does not necessarily increase the equilibrium policy interest rate, that measure can still shorten the periods in which the policy rate sits at the effective lower bound. If the policy interest rate has reached the effective lower bound and inflation is persistently low, economic agents know that monetary policy will have to provide an additional stimulus by way of compensation (so that inflation is higher than average). They will therefore increase their inflation expectations, lowering the real interest rate and stimulating economic growth. That enables the central bank to raise the interest rate more rapidly. A price level target can therefore be a useful measure in the context of a low r^* (Williams, 2017b). In addition, consumers have more certainty over the long-term price level because the policy makes adjustments for deviations between the price level and the target. One can therefore expect the nominal risk premiums to be lower.

(1) By way of example, the Bank of Canada (2011) compares a 0 % inflation target with a constant price level target. Assuming the situation in which the price level is on target and inflation rises from 0 % to 1 %, an inflation target will aim at zero growth in the level of prices. However, a price level target will aim at negative inflation so that the price level reverts to its starting value. Conversely, if inflation had fallen to –1 %, a price level target would aim at positive inflation. That reasoning also applies if, for example, the intention is that prices should rise by 2 % per annum and inflation deviates from that average target.

It is important to note that the success of a price level target depends on the credibility of monetary policy and the degree to which consumers maintain rational expectations (Hatcher and Minford, 2016). If these conditions are not met, the theoretical advantages of a price level target vanish, and an inflation target may even be better (Bank of Canada, 2011). Since an increase in the inflation target and a price level target both have their drawbacks, it is advisable to find ways of raising r^* (the real equilibrium rate).

4.3 In the euro area, structural reforms are needed to make r^* great again

Given the decline in the real equilibrium interest rate r^*, possibly followed by stagnation at a relatively low level, potential reforms concerning the price stability objective of the central bank could only treat the symptoms of fundamental economic developments. An increase in the level of r^* therefore necessarily entails reforms other than those concerning monetary policy, namely structural reforms that affect the real economy, either by boosting investment demand or by limiting the supply of savings. Furthermore, an appropriate supply of risk-free assets could help to raise the interest rate on risk-free assets.

Encouraging innovation and reversing the downward trend in potential growth in advanced economies are among the key ways of stimulating investment demand (Draghi, 2015, 2016a, b, c; Praet, 2016). Measures could be implemented in the medium term. On the one hand, generally speaking, those measures could consist in strengthening total factor productivity by diverting resources from the least productive to the most productive businesses, introducing new innovation and management techniques, and promoting entrepreneurship. On the other hand, potential growth could be adjusted upwards by enhancing human capital via high-quality education and lifelong learning. More particularly in regard to the labour market, some countries could consider measures to increase the participation rate and improve the activation of the unemployed.

A favourable investment climate could be promoted by fiscal and regulatory measures. The investment plan for Europe (Juncker plan) and the European Fund for Strategic Investments are practical examples. Furthermore, an appropriate macroprudential policy could stimulate investment demand in the long term, to the extent that financial stability forms the basis for sound, sustainable economic growth and minimises uncertainty over expected future returns. In Europe, in particular, reforms such as the Capital Markets Union could improve the diversification of (and access to) funding sources (and thus

facilitate investment). Finally, public investment could be encouraged in the advanced economies.

Conversely, it seems harder to limit the supply of savings, as that depends partly on demographic factors. If the sustainability (and credibility) of pension systems improves, however, households will have less reason to save for their retirement. Moreover, as the growing inequality may be a factor in the expansion of the savings supply, it also seems important to ensure that growth benefits everyone (inclusive growth).

Finally, an increased supply of risk-free assets would reduce the pressure on the yields on those assets. On that subject, the European Systemic Risk Board and the European Commission (2017) proposed an initiative whereby pools of existing sovereign bonds would be divided into (safe) senior tranches and junior tranches of securities backed by those bonds (sovereign bond-backed securities – SBBS). The creation of SBBS could then expand the supply of risk-free assets thanks to diversification via the pooling of securities, without imposing the mutualisation of sovereign debts.

Conclusion

Since interest rates have fallen substantially worldwide throughout recent decades, it seems that their current low level is due to global structural factors. In general, those factors probably supported the supply of savings and depressed the demand for investment. They could be diverse in character, covering for example sociodemographic trends such as population ageing and increased inequality, and economic changes such as the slackening pace of innovation and the decline in potential growth. As a result of these structural factors, the equilibrium real interest rate, which reflects the macroeconomic equilibrium accompanied by stable inflation, has fallen in the United States and in the euro area, in particular, dropping to historically low levels, as the latest estimates show.

Apart from structural factors, there are also cyclical factors which partly account for the current low level of interest rates. Since the great recession, those cyclical factors have exerted downward pressure on interest rates and thus prolonged the downward trend in rates which had already persisted for years. The central banks, in particular, tried to counter the fall in inflation and economic activity by taking real interest rates below their equilibrium level in order to stimulate demand.

In the medium term, central banks should revise their monetary policy rates upwards once the price stability outlook becomes more favourable, although they cannot guarantee that interest rates could recover to levels comparable to those reached in the past. If central banks no longer aim to encourage demand, they will align real interest rates with the natural interest rate of the economy. However, that rate is still influenced by fundamental structural changes relating to the supply of savings and investment demand. If those structural changes continue to depress the equilibrium interest rate, then interest rates in general will stagnate at relatively low levels.

The persistence of low interest rates would imply monetary and financial risks. The leeway available to central banks for revitalising the economy would be smaller, for example, if they were constrained by an "effective lower bound" when cutting policy interest rates. Moreover, an interest rate environment hostile to the profitability of financial intermediaries could trigger a hunt for yield, among other things. It is therefore necessary to assign a key role to macroprudential policy, which must ensure that the balance sheets and business models of banks and insurance companies remain balanced.

Given these potential risks, an increase in the general level of interest rates seems desirable, preferably via a rise in the natural real interest rate. Such an increase entails economic measures to counter the factors depressing real interest rates. The structural measures would essentially aim to encourage innovation and promote a climate conducive to investment. Measures that would diminish the need for precautionary savings, such as reforms supporting the sustainability of social security, could also increase the real equilibrium interest rate. Alternative strategies modifying the central banks' price stability objective have the major drawback of potentially damaging central bank credibility.

Bibliography

Ball L.M. (2014), *The Case for a Long-Run Inflation Target of Four Percent*, IMF, Working Paper 14/92.

Bank of Canada (2011), *Renewal of the inflation-control target*, Ottawa. Available at http://www.bankofcanada.ca/wp-content/uploads/2011/11/background_nov11.pdf.

Bean C., C. Broda, T. Ito and R. Kroszner (2015), *Low for long? Causes and consequences of persistently low interest rates*, Geneva Report on the World Economy 17.

Bergeaud A., G. Cette and R. Lecat, (2014), *Productivity trends from 1890 to 2012 in advanced economies*, Banque de France, Working Paper 475.

Bernanke B. S. (2005), *The global saving glut and the U.S. current account deficit*, Sandridge Lecture, Virginia Association of Economics, Richmond, Virginia, 10 March.

Bernanke B. S. (2013), *Long-term interest rates*, Speech at the Annual Monetary/Macroeconomic Conference at the Federal Reserve Bank of San Francisco, 1 March.

Bernanke B. S. (2015), *Why are interest rates so low, part 3: the global saving glut*, Brookings. Available at https://www.brookings.edu/blog/ben-bernanke/2015/04/01/why-are-interest-rates-so-low-part-3-the-global-savings-glut/.

Beyer R. and V. Wieland (2017), *Instability, imprecision and inconsistent use of equilibrium real interest rate estimates*, CEPR Discussion Papers 11927.

Bindseil U., C. Domnick and J. Zeuner (2015), *Critique of accommodating central bank policies and the 'expropriation of the saver' – A review*, ECB, Occasional Paper Series 161.

Blanchard O. J., G. Dell'Ariccia and P. Mauro (2010), "Rethinking Macroeconomic Policy", *Journal of Money, Credit and Banking*, Blackwell Publishing, vol. 42(s1), 199-215.

Caballero R. J., E. Farhi and P.-O. Gourinchas (2017), *Rents, technical change, and risk premia: accounting for secular trends in interest rates, returns on capital, earning yields, and factor shares*, NBER, Working Paper 23127.

Carvalho C., A. Ferrero and F. Necchio (2016), "Demographics and real interest rates: inspecting the mechanism", *European Economic Review*, 88, 208-226.

Coeuré B. (2016), *Rebalancing in the euro area: are we nearly there yet?*, Speech at the Danish Economic Society, 15 January.

Constâncio V. (2016), *The challenge of low real interest rates for monetary policy*, Lecture at the Macroeconomics Symposium at Utrecht School of Economics, 15 June.

Cordemans N., M. Deroose, M. Kasongo and A. Stevens (2016), "The ABC of quantitative easing – Or the basics of asset purchases by central banks", NBB, *Economic Review*, June, 33-47.

Draghi M. (2015), *Structural reforms, inflation and monetary policy*, Speech at the ECB Forum on Central Banking, 22 May.

Draghi M. (2016a), *Addressing the causes of low interest rates*, Speech at the Annual Meeting of the Asian Development Bank, 2 May.

Draghi M. (2016b), *On the importance of policy alignment to fulfil our economic potential*, Speech at the fifth annual Tommaso Padoa-Schioppa Lecture, Brussels Economic Forum, 9 June.

Draghi M. (2016c), *Stability, equity and monetary policy*, 2nd DIW Europe Lecture, German Institute for Economic Research, Berlin, 25 October.

Du Caju Ph. (2016), "The distribution of household wealth in Belgium: initial findings of the second wave of the Household Finance and Consumption Survey (HFCS)", NBB, *Economic Review*, September, 29-47.

Dynan K. E., J. Skinner and S. P. Zeldes (2004), "Do the rich save more?", *Journal of Political Economy*, 112(2), 397-444.

EC (2015), *The 2015 ageing report: economic and budgetary projections for the 28 EU Member States* (2013-2060).

EC (2017), *Reflection paper on the deepening of the economic and monetary union.*

Eggertsson G. B., N. R. Mehrotra and L. H. Summers, (2016), *Secular stagnation in the open economy*, NBER, Working Paper 22172.

Eichengreen B. (2015), "Secular stagnation: the long view", *American Economic Review: Papers & Proceedings*, 105(5), 66-70.

Executive Office of the President of the United States (2015), *Long-term interest rates: a survey*.

Financial Times (2017), *Janet Yellen stirs global debate about raising inflation targets*. Available at https://www.ft.com/content/419c6bc2-537b-11e7-9fed-c19e2700005f (consulted on 28 June 2017).

Fischer, S. (2016), *Why are interest rates so low? Causes and implications*, Speech at the Economic Club of New York, 17 October.

Fries S., J.-S. Mésonnier, S. Mouabbi and J.-P. Renne (2016), *National natural rates of interest and the single monetary policy in the euro area*, Banque de France, Working Paper 611.

Goodhart C. and Ph. Erfurth (2014), "Demography and economics: look past the past", *Article published on VOX*, 4 November.

Goodhart C. and M. Pradhan (2017), *Demographics will reverse three multi-decade global trends*, BIS, Working Paper 656.

Gordon R. J. (2014), *The demise of US economic growth: restatement, rebuttal, and reflections*, NBER, Working Paper 19895.

Hatcher M. and P. Minford (2016), "Stabilisation Policy, Rational Expectations And Price-Level Versus Inflation Targeting: A Survey", *Journal of Economic Surveys*, 30(2), 327-355.

Holston K., T. Laubach and J. C. Williams (2017), "Measuring the natural rate of interest: international trends and determinants", *Journal of International Economics (forthcoming)*. Available at http://dx.doi.org/10.1016/j.jinteco.2017.01.004.

IMF (2014), "Perspectives on Global Real Interest rates", *World Economic Outlook*, Chapter 3, April.

Laubach T. and J. C. Williams (2003), "Measuring the natural rate of interest", *The Review of Economics and Statistics*, 85(4), 1063-1070.

Lubik T. A. and C. Matthes (2015), "Calculating the Natural Rate of Interest: A Comparison of Two Alternative Approaches", *Federal Reserve Bank of Richmond*, Economic Brief, October, 1-6.

OECD (2015), "Lifting investment for higher sustainable growth", *OECD Economic Outlook*, 1, Chapter 3.

Piketty T. (2014), *Capital in the 21st century*, Harvard University Press.

Praet P. (2016), *Long-run saving and monetary policy*, Speech at parliamentary evening, Brussels, 14 November.

Rachel L. and T. D. Smith (2015), *Secular drivers of the global real interest rate*, Bank of England, Working Paper 571.

Solt F. (2016), "The Standardized World Income Inequality Database", *Social Science Quarterly*, 97(5), 1267-1281.

Summers L. H. (2013), *IMF fourteenth annual research conference in honor of Stanley Fischer*, 8 November.

Summers L. H. (2014), "US economic prospects: secular stagnation, hysteresis, and the zero lower bound", *Business Economics*, 49(2), 65-73.

Taylor J. B. (1993), "Discretion versus policy rules in practice", *Carnegie-Rochester Conference Series on Public Policy*, 39(1), 195-214, December.

Wicksell K. (1936), *Interest and Prices* (translation of 1898 edition by R.F. Kahn). London: Macmillan.

Williams J.C. (2003), *The natural rate of interest*, Federal Reserve Bank of San Francisco, Economic Letter.

Williams J. C. (2016), *Monetary Policy in a Low R-star World*, Federal Reserve Bank of San Francisco, Economic Letter.

Williams J. C. (2017a), *Three questions on R-star*, Federal Reserve Bank of San Francisco, Economic Letter.

Williams J. C. (2017b), *Preparing for the next storm: reassessing frameworks & strategies in a low r-star world*, Speech to the shadow open market committee, 5 May.

Yellen J. (2017), *The economic outlook and the conduct of monetary policy*, Speech delivered at the Stanford Institute for Economic Policy Research, Stanford University, Stanford, California, 19 January.

The global financial safety net : In need of repair ?

D. Essers
E. Vincent (*)

Introduction : A multi-layered global financial safety net

The global economy has become ever more complex. Notwithstanding recent tendencies towards more protectionist policies, the longer-term trend has been towards more trade and financial integration, especially in emerging market economies. Despite its benefits, globalisation also exposes countries to a great variety of risks, including financial stability risks related to the volatility of capital flows. Deepening financial integration thus underpins the need for an adequate structure to prevent and deal with shocks. As a first line of defence, countries should be encouraged to conduct sound macroeconomic and financial policies. Emerging market economies were more resilient during the global financial crisis than during previous crises precisely because they had better fundamentals and stronger policy frameworks in place (van Doorn *et al.*, 2010). However, sound domestic policies alone may not be sufficient to fend off a crisis and need to be complemented by a well-functioning "global financial safety net" (GFSN), which the ECB (2016, p. 36) defines as *"a set of institutions and mechanisms which provide financial support to prevent a crisis and to countries hit by a crisis, both facilitating adjustment at the country level and preventing the crisis from spreading further"*. This article examines the state of the GFSN and some potential reforms.

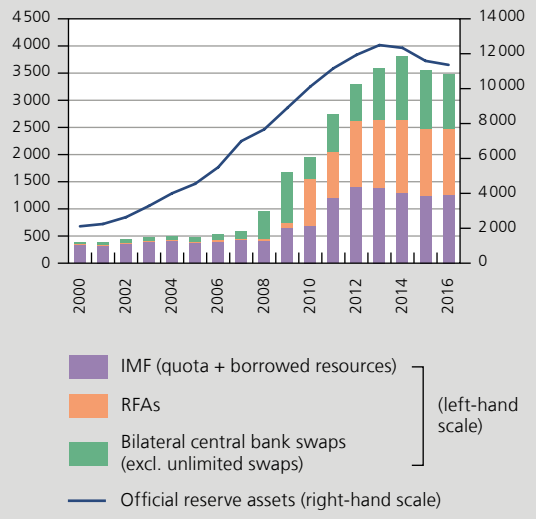
(*) The authors would like to thank Edward Denbee from the Bank of England for providing access to his swap database (see Denbee *et al.*, 2016), as well as Paul Butzen, Caroline Janssens and Luc Stevens from the NBB for their valuable comments and suggestions.

The current GFSN is typically characterised as having four distinct layers, each with its particular strengths and weaknesses (IMF, 2016a ; Denbee *et al.*, 2016) : first, countries' national stock of international reserves ; second, bilateral swap lines between central banks ; third, regional financing arrangements (RFAs) ; and, finally, at the global level, the financing provided by the International Monetary Fund (IMF). The GFSN has evolved significantly, both in terms of size and scope, over the last decades and, especially, last few years (see chart 1). While the Bretton Woods institutions were put at the centre of the GFSN after the Second World War, with the IMF acting as the privileged platform for macroeconomic policy coordination and balance-of-payments crisis resolution (Cheng, 2016), the relative importance of the other layers has increased over time. Reserve accumulation has risen dramatically since the early 2000s, whereas the global financial crisis marked a rapid expansion of swap lines between central banks, as well as the further development of existing and creation of new RFAs.

Although the GFSN has undergone substantial changes, many of them prompted by the global financial crisis, it is still far from optimal. An important reason for this is that the GFSN has not been designed on the basis of an international consensus, but is rather the outcome of an historical accumulation of different forms of financial support, reflecting mostly national and regional concerns (Scheubel and Stracca, 2016 and ECB, 2016). One of the most oft-voiced concerns about the GFSN is its fragmentation. In particular, there appears to be a lack of cooperation between the different layers of the GFSN, which impairs its effectiveness. In addition, the coverage of the GFSN is very uneven ; many countries do not have access to RFAs and

CHART 1 THE GFSN HAS EVOLVED SIGNIFICANTLY OVER THE LAST FEW DECADES [1] [2]

(in $ billion)



Sources: IMF International Financial Statistics (IFS); RFA websites; authors' own update of Denbee *et al.* (2016) swap database using central bank websites and media reports; Datastream.

(1) Estimates of the size of the GFSN exclude (advanced economy) bilateral central bank swap lines with no formal size limit; the value of (limited) reciprocal swap lines is counted twice.

(2) For the RFAs included, see section 3.

while some countries have excess international reserves, others have too little. In the following sections, we describe in more detail the current state of the GFSN and aim to give a balanced overview of some of the reforms that have been proposed to address its remaining flaws.

Sections 1 to 4 take a closer look at each of the four layers of the GFSN and their respective evolution, with focus on the changes since the global financial crisis. The main comparative advantages and disadvantages of each layer are also discussed. Section 5 reviews a number of proposed reforms to the GFSN, more specifically in three areas: the global reserve system, the coordination of bilateral central bank swap lines, and cooperation between the IMF and RFAs. The last section concludes.

1. International reserves ("Going it alone")

1.1 Trend and composition

International reserves, defined as "*external assets that are readily available to and controlled by monetary authorities for meeting balance of payments financing needs, for intervention in exchange markets to affect the currency exchange rate, and for other related purposes*" (IMF, 2009, p. 111), form the first layer of the GFSN. International reserves have built up significantly since the start of the millennium, most notably in China and other fast-growing emerging economies in Asia and elsewhere (see chart 2). With peaks approaching $ 13 trillion in mid-2014, international reserves constitute by far the largest component of the GFSN (see chart 1). Since reserve accumulation only gained traction following a string of severe emerging market financial crises, including in East Asia, Argentina and Brazil, it has traditionally been explained as a way of countries protecting themselves against similar crises and other shocks in the future. Because of the painful and largely unsuccessful structural adjustment programmes that several crisis-hit emerging market economies concluded with the IMF in the late 1990s and early 2000s, one could also see large reserve stocks as insurance against having to turn to the IMF for new support (Wyplosz, 2007). Indeed, the stigma that rests on IMF borrowing is believed to still live on today, especially in Asia and Latin America (Ito, 2012 and IEO, 2013).

As is evident from the above definition for international reserves, it would nevertheless be incorrect to attribute their global surge solely to countries' self-insurance behaviour. Non-precautionary motives have mattered too. Part of the observed reserves accumulation is arguably a by-product of active exchange rate management under a 'mercantilist' growth strategy of export promotion (Dooley *et al.*, 2004) and/or related to intergenerational transfers of natural resource wealth, for example in oil-exporting countries [1]. Nonetheless, in spite of cross-country differences and changes in motives over time, self-insurance is still considered a key driver of reserve accumulation [2].

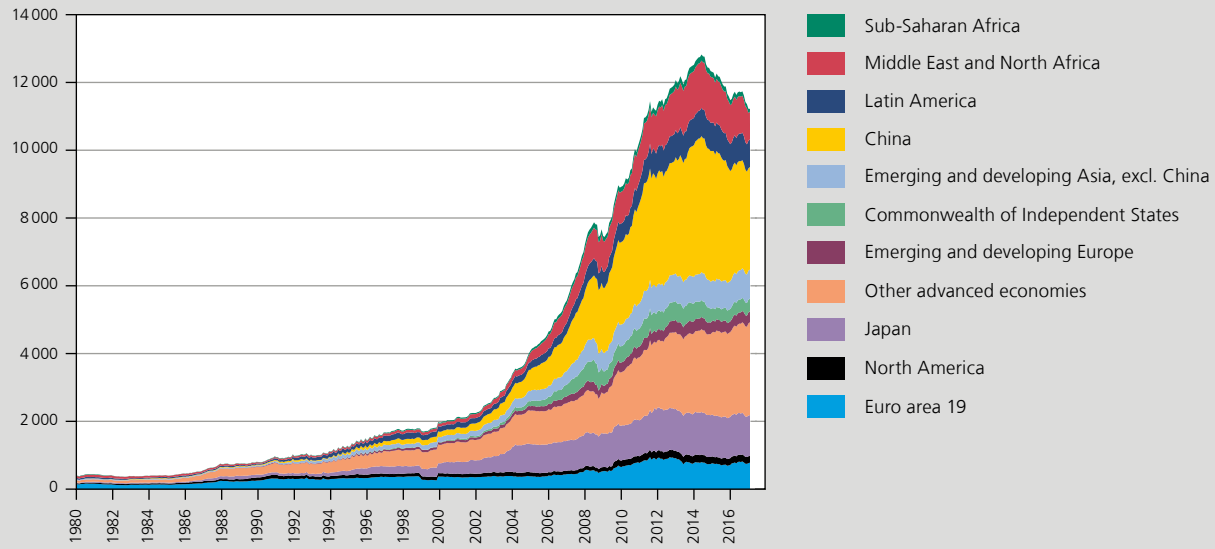
The alleged importance of precautionary demand for reserves is reflected in the rules of thumb traditionally used by policy-makers to assess the adequacy of reserve levels, such as an import cover of three months (as a buffer against current account shocks); 100 % of short-term external debt at remaining maturity (to ensure the rollover of debt); and 20 % of broad money (to counter domestic capital flight). More recently, the IMF (2011) has devised a composite reserve adequacy metric for emerging economies, combining the two latter indicators with potential losses in export earnings and potential outflow of foreign capital from longer-term debt and equity

(1) The assets of sovereign wealth funds typically do not conform to the official (IMF) definition of international reserves, as they tend to be less liquid and are often outside the control of the monetary authorities (Dominguez *et al.*, 2012).

(2) See, for example, Aizenman and Lee (2007) and Ghosh *et al.* (2017) for empirical evidence, and Durdu *et al.* (2009) and Jeanne and Rancière (2011) for theoretical models of precautionary reserves.

CHART 2 OFFICIAL RESERVE ASSETS ARE UNEQUALLY DISTRIBUTED OVER REGIONS [1] [2]

(in $ billion)



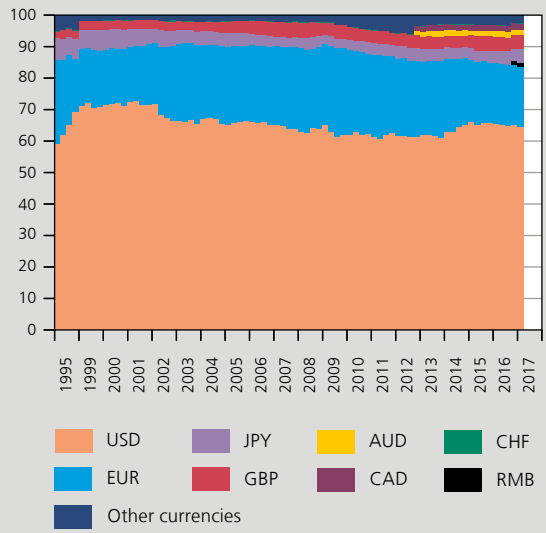
Sources: IMF International Financial Statistics (IFS); ECB Statistical Data Warehouse.
(1) Country groupings based on the classification used by the IMF.
(2) Euro area data includes ECB reserves from December 1999 onwards.
(3) The last observation is for February 2017.

investments, and weighting the different components based on actual outflows/reductions observed during past instances of exchange market pressure. According to this composite measure, some countries, including Ecuador, Egypt, Pakistan and Ukraine, were "under-insured" by their reserves (holding reserves well below 100 % of the IMF-devised metric), whereas others, such as Brazil, Peru, the Philippines, Russia and Thailand, were "over-insured" (holding reserves well in excess of 150 % of the metric) at end-2015 (see IMF, 2017a) [1].

Beyond the volume of international reserves, it is also interesting to look into their composition. In most countries, the bulk of reserves are held in the form of (highly liquid) foreign currency securities and deposits. Other reserve assets include monetary gold, special drawing rights (SDRs) and countries' reserve positions at the IMF (see section 4.2.1 for more on the two latter categories) [2]. Figures on currency composition from the

CHART 3 US DOLLAR DOMINATES COMPOSITION OF FOREIGN EXCHANGE RESERVES [1] [2]

(in % of total)



Source: IMF Currency Composition of Foreign Exchange Reserves (COFER) database.
(1) The chart only shows foreign exchange reserves with known currency denomination. These constitute between 55 % and 80 % of total foreign exchange reserves in each period.
(2) Pre-1999 EUR is the sum of the Deutschmark, French franc, Dutch guilder and ECU.

(1) Judging by the IMF-devised composite metric, China's reserves were excessive over the years 2005-2013, but no longer from 2014 onwards. However, if one adjusts the composite metric for the presence of restrictions on resident outflows (by assigning a lower weight to the broad money component of the metric), China was over-insured by its reserves over the whole 2005-2015 period. See IMF (2016b) for more details on reserve adequacy measures and on further differentiation of such measures along country characteristics.
(2) In advanced economies such as the US, the UK and euro area countries (but not Japan), these other, "non-currency" reserve assets make up much larger shares of total reserves.

IMF's COFER database, only available at the aggregate level, show that foreign exchange reserves are still predominantly denominated in US dollar (about 60-65 %), followed at a clear distance by the euro (about 20 %). Japanese yen, British pound, Canadian dollar and Australian dollar assets make up no more than 2-4 % each of the foreign exchange reserves with known currency denomination (see chart 3). Anecdotal evidence suggests that at least 38 countries, in Asia and beyond, have added the Chinese renminbi to their reserve portfolios (Liao and McDowell, 2016 and Eichengreen and Lombardi, 2017). Nevertheless, again according to COFER, the identified share of the Chinese renminbi in foreign exchange reserves stood at a mere 1 % at the end of the first quarter of 2017. Given the IMF's decision to add the renminbi to the basket of currencies constituting the SDR as from October 2016, widely considered a recognition of its potential as an international currency, a bigger role for the renminbi in countries' reserves can be expected in future.

1.2 Comparative (dis)advantages

Relative to the other layers of the GFSN, self-insurance through reserves has the important advantage of being highly "predictable", as the holder of the reserves can access and use the associated funds at its own discretion, without any conditionality. By definition, reserves can be activated (almost) immediately by the holder, whenever necessary (Denbee *et al.*, 2016 and IMF, 2016a). Empirical studies suggest that during the 2008-2009 global financial crisis, emerging market economies actively drew down part of their reserve stocks, and that has helped them to restore GDP growth (e.g., Dominguez *et al.*, 2012).

At the same time, however, several countries exhibited "fear of losing reserves" during the global financial crisis, i.e. reluctance to deplete reserves beyond certain levels, and preferred to adjust through large exchange rate depreciations (Aizenman and Sun, 2012). Such behaviour may be explained by countries' uncertainty about the duration of the crisis, by the concern that large declines in reserves would trigger speculative attacks, and/or by their attempts to "keep up with the Joneses", i.e. the belief that investors judge the adequacy of countries' reserve positions against those of their regional peers (see Cheung and Qian, 2009). The volume of reserves that is *effectively* available to their holder to meet balance-of-payments needs is therefore (much) smaller than the whole reserve stock. Arguably, reserves are less reliable as a source of insurance against longer-lasting shocks (IMF, 2016a)[1].

The benefits of holding own reserves are partly offset by the fact that it comes at a price to the holder. The cost of reserve accumulation can be expressed in various ways, but ultimately boils down to the wedge between the (typically low) returns earned on (typically low-risk) reserve assets and some (typically higher) borrowing or opportunity cost to the sovereign State (see IMF, 2013). In countries with international capital market access, one can approximate that borrowing cost by the yield on external sovereign bonds. If external market access is limited but a country has relatively developed domestic financial markets, it makes more sense to take the interest paid on domestic bonds, as central banks typically sterilise the extra liquidity created through reserves accumulation by issuing such bonds. And if countries have neither external market access nor developed domestic financial markets, the social opportunity cost of foregone public investment may be used as an alternative proxy (although it is harder to establish empirically). Whichever measure is applied, the general consensus is that the costs of reserve accumulation are significant in most countries (with the exception of reserve currency issuers, which have low borrowing costs)[2]. Exchange rate appreciation may further compound these costs by reducing the value of interest revenue from foreign currency assets and by causing capital losses on the outstanding reserve stock (IMF, 2016a).

Moreover, beyond the individual country level, large-scale reserve accumulation, especially by systemically important emerging market economies, is also intimately linked to "global imbalances", as net reserve asset purchases constitute net capital inflows into reserve currency countries and thereby increase the external indebtedness of the latter[3]. These imbalances may in turn lead to a build-up in systemic risk by stimulating over-borrowing and excessive investment in the reserve currency countries. When the situation unravels, it could lead to (or amplify) a financial crisis that affects both reserve-accumulating and non-accumulating countries (Steiner, 2014). According to some accounts, that is exactly what happened in 2008-2009 (Portes, 2009 and Obstfeld and Rogoff, 2010)[4]. Another, related source

(1) Lately, even China's massive war chest of reserves diminished steadily in the face of sustained capital outflows, from a peak of more than $ 4 trillion in June 2014 to around $ 3 trillion in January 2017, urging the Chinese government to tighten monetary policy and to introduce new restrictions on capital movement (see, e.g. Wildau, 2017).

(2) For example, adopting an approach similar to the first one mentioned above, Rodrik (2006) puts the total annual cost of holding foreign exchange reserves in non-industrial countries at roughly 1 % of their combined GDP. He stresses that, although this is a large number by any standard, it may not be too high an insurance premium against costly financial crises.

(3) Global imbalances generally refer to a situation where large current account surpluses in some countries coincide with large deficits in other countries.

(4) The link between global imbalances and the 2008-2009 global financial crisis sketched here is no consensus view, however, and ignores the importance of gross rather than net capital flows (see Butzen *et al.*, 2014).

of systemic risk comes from the fact that assets supplied by a small set of highly creditworthy advanced economies with deep financial markets, first and foremost US government debt, are almost exclusively sought after as reserves (see chart 3). Given that output grows faster in emerging market economies than in advanced economies while the perceived lower creditworthiness of the first is very slow to change, the ultimate outcome is one where the demand for "safe" assets (say US Treasuries) outstrips what can be supplied without compromising the safety of those assets (Obstfeld, 2014)[1].

Finally, since the accumulation and use of a country's own reserves does not entail any explicit conditionality, it provides little incentive for domestic policy reform. Unlike with the assistance available from RFAs or the IMF, there are no external actors involved that fulfil a monitoring role or that reform-minded country authorities can use as scapegoats to press through politically difficult policy measures.

In view of these drawbacks to large reserve accumulation, both from an individual country and multilateral perspective, policy-makers in various forums have tried to further develop the other layers of the GFSN, a topic to which we turn in the following sections. It is generally assumed, often implicitly, that larger and better-designed central bank swaps, RFAs and/or IMF lending will significantly reduce countries' demand for own reserves. Although plausible, there is in fact little concrete empirical support for this "substitutability" hypothesis. Indeed, because of the unparalleled discretion and flexibility that international reserves provide to their holders, it is likely that they will continue to dominate the GFSN over the foreseeable future.

(1) These tensions resemble a modern-day version of the dilemma formulated by Triffin (1960) in the context of the gold convertibility of the US dollar under the Bretton Woods system (see Obstfeld, 2014).

(2) Charles Coombs, former Vice-President of the Federal Reserve Bank of New York, once stated that such reciprocal swaps create an increase in both central banks' international reserves "out of thin air" (quoted in McDowell, 2012, p. 163).

(3) As noted by Denbee *et al.* (2016), such swaps amount to central banks lending their own foreign exchange reserves to each other. Examples include the unilateral US dollar swaps that were extended by the Bank of Japan and the People's Bank of China to other Asian central banks, the euro swaps by the central banks of Sweden and Denmark to those of Iceland and Latvia, and the swaps extended by the Swiss National Bank to the central banks of Poland and Hungary, which provided Swiss francs in exchange for euros.

(4) Obstfeld *et al.* (2009, p. 483) have praised bilateral swaps as "one of the most notable examples of central bank cooperation in history". Nevertheless, according to Weder di Mauro and Zettelmeyer (2017), the growing influence of central banks within the GFSN has gone relatively unnoticed, especially compared to the mediatised establishment of new RFAs (see section 3).

(5) McDowell (2017a) argues that the Federal Reserve's supply of US dollars to foreign banks through swaps also contributed (together with measures taken by the Federal Reserve to inject liquidity in the US financial system itself) to bringing down the LIBOR, which had spiked following tensions in the interbank lending market. The LIBOR, over which the Federal Reserve has no direct control, was a popular index for adjustable-rate mortgages (ARMs). A continued rise in the LIBOR would bring about increases in monthly payments under such ARMs and hence more defaults by US homeowners (one of the key triggers of the global financial crisis). The logic went that supporting interbank lending with extra US dollar liquidity would lower the spread between the LIBOR and US Treasury rates (over which the Federal Reserve has more sway) and hence improve the transmission of the Federal Reserve's interest rate cuts to the real economy.

2. Bilateral central bank swaps ("With a little help from my friends")

2.1 The changing face and key features of the swap network

In a typical bilateral central bank swap arrangement, one central bank agrees to lend a certain maximum amount of its own (reserve) currency to another central bank in exchange for the latter's domestic currency (which serves as collateral) at the prevailing market exchange rate and for a short period only, usually ranging from overnight to three months. Again typically, the second central bank draws on such a swap line to on-lend/auction off the received liquidity to financial institutions in its own jurisdiction, while itself remaining responsible for returning the currency to the first central bank. At the end of the specified period, the swap of currencies is unwound at the same exchange rate as used in the initial drawing and the second central bank pays a small, market-based amount of interest to the first. Swap arrangements can be either unidirectional or reciprocal, meaning that both central banks can use the swap proceeds at their disposal[2]. There are some variations on this basic swap design, including arrangements where central banks provide and/or obtain third-party currencies in swap operations[3].

The importance of bilateral central bank swaps has grown notably since the global financial crisis (see chart 1), putting central banks firmly on the map as major players in the GFSN[4]. The first impetus to a wider central bank swap line network originated from the US Federal Reserve. During the global financial crisis, banks' various sources of finance all but dried up. US dollar funding markets, on which European banks in particular had become increasingly reliant to finance their purchases of US mortgage-backed securities and other assets, came under significant strain as concerns about the quality of those assets and the wider US financial system escalated (McGuire and von Peter, 2009). Systemically important US banks and money market funds were, in turn, greatly exposed to potential default by dollar-starved European and other non-US banks. In order to protect its domestic financial sector from foreign default, the Federal Reserve took up the role of "international lender of last resort" (McDowell, 2012, 2017a)[5]. From December 2007 onwards, it extended and gradually stepped up temporary bilateral swaps to the central banks of the other main advanced (reserve currency) countries (ECB, Swiss National Bank, Bank of England, Bank of Japan and Bank of Canada) and smaller advanced economies (Sweden, Australia,

Norway, Denmark and New Zealand), with swap volumes ranging from $ 4 billion to $ 240 billion [1] [2]

On 13-14 October 2008, a month after the failure of Lehman Brothers, formal swap limits were abandoned for swaps with the ECB, Swiss National Bank, Bank of England and Bank of Japan, to accommodate the quantity of US dollars demanded by banks in their jurisdictions. In that same month, the Federal Reserve signed temporary swap line arrangements of $ 30 billion each with four emerging market economies : South Korea, Mexico, Brazil and Singapore. Later, in April 2009, the Federal Reserve swap arrangements with the ECB, Swiss National Bank, Bank of England and Bank of Japan were made reciprocal, enabling the Fed (and, ultimately, US banks) to access foreign liquidity too, should the need arise (Goldberg *et al.*, 2011). Meanwhile, the ECB, Swiss National Bank and Bank of Japan also extended swap lines to countries where banks relied heavily on, respectively, euro (Switzerland, Denmark, Sweden), Swiss franc (Hungary, Poland) or yen funding (South Korea) [3].

In February 2010, after the global financial crisis had reached its zenith, the swap arrangements between the Federal Reserve and other advanced and emerging market economy central banks were left to expire. But only a few months later (May 2010), when the euro area sovereign debt crisis started to gain traction, the Federal Reserve swaps with the ECB, Swiss National Bank, Bank of England, Bank of Japan and Bank of Canada were revived, again with no formal size limit specified. On 30 November 2011, these unidirectional Federal Reserve swaps were absorbed into a dense *network* of reciprocal swap lines, where each central bank could lend its own currency to the five others in unlimited amounts, at least in theory. This temporary network of uncapped swaps was transformed into a standing arrangement on 31 October 2013 and remains in place until further notice.

It is not just advanced economies that have taken the initiative to establish bilateral swap arrangements. Even long before the global financial crisis (and actually in response to the Asian financial crisis of 1997-1998), ASEAN+3 central banks in 2000 set up the Chiang Mai Initiative (CMI). The CMI comprised a network of bilateral swap arrangements among the central banks of China, Japan, and South Korea ; between each of these '+3' countries and the original five ASEAN members (Indonesia, Malaysia, Philippines, Singapore and Thailand) ; and among all ASEAN central banks themselves (these five plus Brunei, Cambodia, Laos, Myanmar and Vietnam) (Kawai, 2009). By March 2010, the CMI accounted for about $ 235 billion worth of swap arrangements. On 24 March 2010, the CMI was multilateralised by consolidating the network of bilateral swap lines into a single swap contract. The so-called Chiang Mai Initiative Multilateralisation (CMIM) now operates as a fully-fledged RFA (see section 3).

China in particular has emerged as a key provider of central bank swaps over the past few years. Since December 2008, the People's Bank of China has negotiated reciprocal renminbi-local currency swaps with 37 countries for a total of about $ 485 billion equivalent (at May 2017 exchange rates) [4]. Unlike the swaps signed by the Federal Reserve, the ECB and others, Chinese bilateral swaps have not been designed explicitly to address the liquidity needs of swap-receiving countries' banks, but rather for the purpose of promoting the international use of the renminbi. More specifically, the swaps are meant to promote bilateral trade and direct investment between China and current/potential partner countries, by facilitating cross-border settlement in renminbi [5]. In that sense, they complement efforts by China to support the role of the renminbi in financial markets through offshore hub Hong Kong. Bilateral swap arrangements enable China to (gradually) make renminbi available in partner economies while still maintaining a large degree of control over the currency's use outside its borders, thereby circumventing existing capital account restrictions (Liao and McDowell, 2015). Notwithstanding the mostly small swap amounts, China is seemingly trying to make a broad set of countries comfortable and familiar with renminbi-denominated financial facilities (Prasad, 2017) [6]. Even if, strictly speaking, the RMB is not freely convertible, renminbi-local currency swaps with the People's Bank of China allow central banks to save on their US dollar

(1) The idea of using central bank swaps to address money market dysfunction and financial instability more broadly stood in contrast with the goals of prior US swap arrangements with advanced countries, which since the 1960s had been used, above all, as tools of foreign exchange policy (see Bordo *et al*., 2015 and McDowell, 2017a). In fact, in providing US dollars to banks during the crisis, the Federal Reserve's new swap lines closely resembled an international adjunct of its domestically focused Term Auction Facility (TAF) (Goldberg *et al.*, 2011). The TAF too was available to foreign banks, as long as they had US affiliates. In the end, foreign bank drawings accounted for the majority of the dollars provided through the TAF (McDowell, 2017a).

(2) The ECB, for example, was offered an initial swap line of $ 20 billion by the Federal Reserve on 12 December 2007, which was later expanded to $ 30 billion (11 March 2008), $ 50 billion (2 May 2008), $ 55 billion (30 July 2008), $ 110 billion (18 September 2008), $ 120 billion (26 September 2008) and $ 240 billion (29 September 2008), before the swap limit was removed on 13 October 2008.

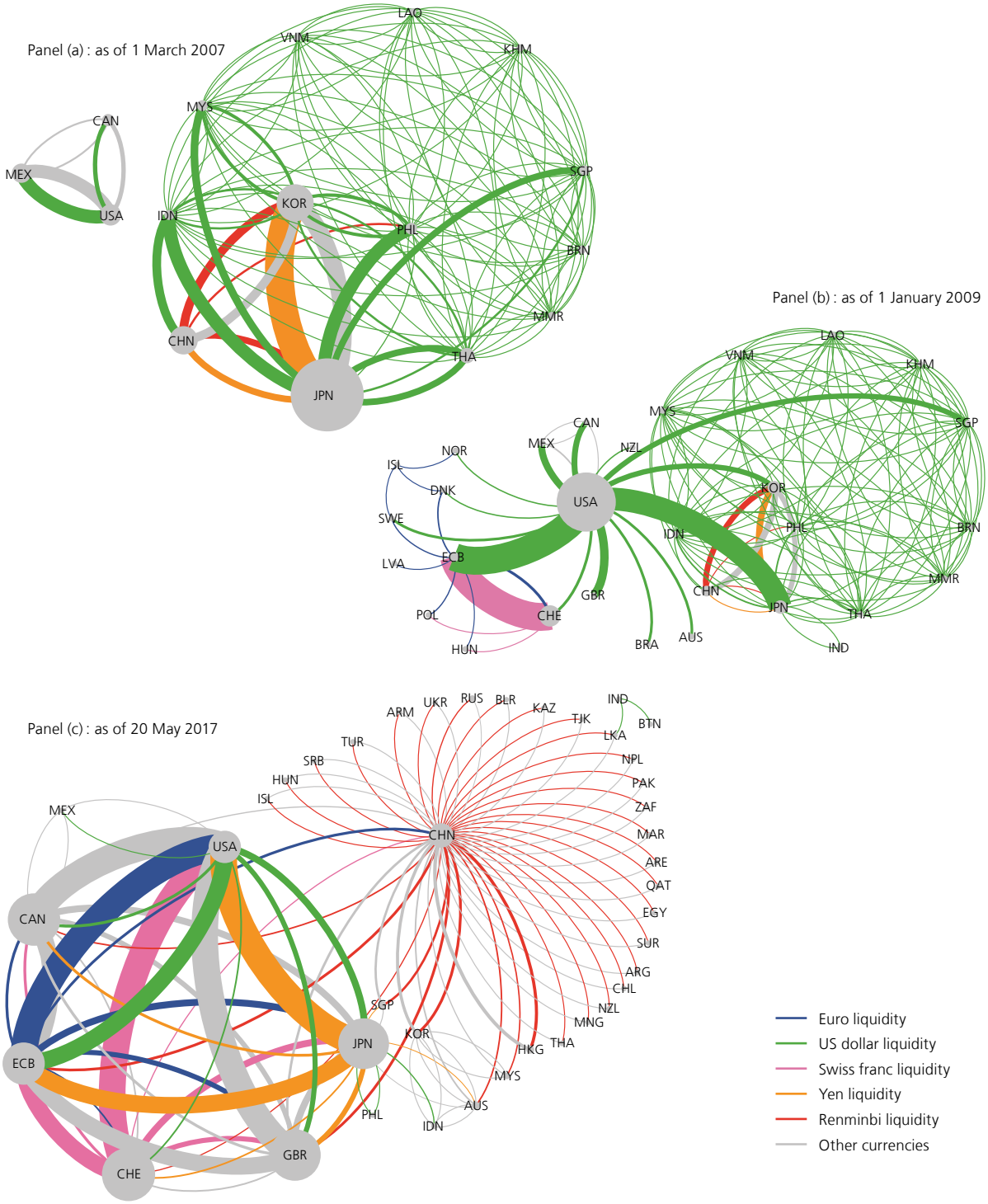
(3) In addition to these swaps, the ECB established repo facilities with the central banks of Hungary, Poland and Latvia in October-November 2008, disbursing euro currency against liquid euro-denominated assets as collateral.

(4) These swaps come on top of its earlier swaps with Japan, South Korea and other CMI countries (the latter being unidirectional US dollar swaps).

(5) For example, the People's Bank of China press release on its November 2014 swap agreement with the central bank of Qatar reads *"The [China-Qatar swap arrangement] represent[s] fresh progress in China-Qatar financial cooperation and [is] expected to bring convenience to companies and financial institutions in the two countries to use RMB in the cross-border transactions and promote the facilitation of bilateral trade and investment for the benefit of regional financial stability"* (see http://www.pbc.gov.cn/english/130721/2878673/index.html). Most press releases on other swaps signed by the People's Bank of China use similar wording.

(6) The median volume of Chinese swaps concluded since December 2008 is below $ 4 billion equivalent. The smallest swaps, with Uzbekistan, Armenia and Suriname, accounted for less than $ 150 million equivalent each. China has signed only a few larger swaps, with Hong Kong, South Korea, the ECB and the UK, above $ 50 billion equivalent each.

CHART 4 CHANGING NATURE OF THE BILATERAL CENTRAL BANK SWAP NETWORK SINCE 2007 (1) (2)



Sources: Authors' own update of Denbee *et al.* (2016) swap database using central bank websites and media reports; Datastream.

(1) The direction of swaps is clockwise. Lines are proportional to the value of the swap and the size of nodes is proportional to the total value of outgoing swaps. Values of unlimited swaps between advanced economies are illustrative and based on maximum drawing from US Federal Reserve swaps in 2008. In cases where a central bank has not drawn on Federal Reserve swaps in the past, the value of the unlimited swap is calculated as the average of past drawings of other central banks relative to their 2008 GDP multiplied by the 2008 GDP of the country of the central bank in question.

(2) Panel (c) does not show CMI swap lines as these were multilateralised into the CMIM, which we classify as an RFA.

reserves because they enable countries to pay for their Chinese imports in local currency rather than the usual dollar (McDowell, 2017b).

The different panels in chart 4 clearly demonstrate the important transformations the global network of bilateral central bank swaps has undergone over the last decade. In March 2007, before the global financial crisis, only swap lines under the Asian CMI and the North American Framework Agreement (NAFA), a set of bilateral reciprocal swaps between the US, Canada and Mexico that has accompanied NAFTA since 1994 (Bordo *et al.*, 2015), were in place. The total value of swap arrangements stood at about $ 98 billion equivalent if the amounts available under reciprocal swaps are double-counted. By January 2009, the total value had risen to $ 513 billion, due to the temporary swap lines directed from the US Federal Reserve, the raising of existing swap lines between various Asian central banks and a new euro liquidity network based around the ECB. As of May 2017, the global swap network had expanded to over $ 1 trillion[1]. The total network comprised no less than 121 bilateral swap arrangements (again double-counting reciprocal swaps) between 41 central banks. One observes the formation of two main clusters : first, the sub-network of advanced economy swaps in the main reserve currencies, which has no formal size limits ; and second, the cluster centred around China, which dominates in terms of the *number* of swap lines signed but exists mostly of small-scale swaps.

2.2. Comparative (dis)advantages

Bilateral central bank swaps arguably provided a useful backstop to the global financial system during the global financial crisis. While the risks of sudden stops and capital flow reversals in emerging market economies were well known, the abrupt drying up of interbank and other funding markets during the crisis was a new phenomenon, to which the existing GFSN had no immediate answer (Weder di Mauro and Zettelmeyer, 2017). Goldberg *et al.* (2011) report how the ECB, Bank of England and Swiss National Bank were the first to draw on their swap lines with the US Federal Reserve through coordinated, fixed-rate auctions of US dollars to European, UK and Swiss banks. The move to full-allotment, non-competitive auctioning from 13 October 2008 onwards led to a boom in Federal Reserve swap use, with an overall peak in the outstanding swap balance of $ 586 billion in December 2008, largely accounted for by drawings by the ECB, Bank of Japan and Bank of England (Denbee *et al.*, 2016). The central banks of Denmark, Sweden, Norway, Australia, South Korea and Mexico also made use of their access to Federal Reserve swaps during the most acute phase of the global financial crisis. Meanwhile, the Federal Reserve itself did not draw on any of its reciprocal swap lines with other advanced country central banks (Goldberg *et al.*, 2011). Unfortunately, data on the actual use of other swap arrangements is not systematically available. Nevertheless, there is anecdotal evidence, among other examples, of the drawing by Poland and Hungary on their swaps with the Swiss National Bank (Andries *et al.*, 2017) ; by Hong Kong, Singapore and South Korea on their swaps with the People's Bank of China in October 2010 (Prasad, 2017) ; and by Pakistan and Argentina on their Chinese swaps during the severe exchange market pressures these countries experienced in 2013 and 2014, respectively (Li, 2015).

On the whole, empirical studies suggest that the Federal Reserve's key swap announcements and actual swap-financed dollar auctions had beneficial effects on country-specific measures of liquidity risk and helped to stem exchange rate volatility and excessive depreciations, especially in countries highly dependent on US dollar liquidity (Baba and Packer, 2009, Aizenman and Pasricha, 2010 and Rose and Spiegel, 2012)[2]. Ultimately, however, the exact effects of swaps remain difficult to quantify at individual country level, because of their typical short-term nature ; spillover effects to other, non-swap countries ; and concurrence with other changes in the GFSN at the time (Goldberg *et al.*, 2011).

One key advantage of bilateral central bank swaps is that, much more so than the IMF and RFAs, central banks have the balance sheet elasticity to quickly mobilise (in fact, create) funds to counter large-scale financial shocks[3]. Some commentators have gone as far as to argue that *only* reserve currency-issuing central banks have sufficiently deep pockets to credibly fulfil the role of international lender of last resort (see, in particular, Truman, 2013).

The relatively fast speed and low cost at which international liquidity can be accessed once a swap arrangement is in place are also beneficial factors. The timing of actual drawings on Federal Reserve swaps suggests that US dollars were made available only a few days after the signing of the respective swap line contracts. However, the speed of activation of a swap may depend on the approval

(1) The amounts mentioned are exclusive of the Federal Reserve's unlimited swap lines with the ECB, the Swiss National Bank, Bank of England and Bank of Japan (January 2009) and the unlimited standing swap agreement between the central banks of the main advanced economies. Denbee *et al.* (2016) estimate the potential capacity of these advanced economy swap arrangements at around $ 1.2 trillion (as of October 2015), based on individual country maximum past drawings and extrapolations following GDP growth.

(2) More granular, bank-level evidence on the effect on bank stock prices of the swap lines the Swiss National Bank extended to Poland and Hungary indicates a positive price response, which was more pronounced for domestically owned, less-capitalised banks with higher foreign currency exposure and greater reliance on short-term funding (Andries *et al.*, 2017).

(3) This was clearly demonstrated during the crisis. The Federal Reserve and other central banks were very quick to set up large and even unlimited swap lines, whereas the IMF could not expand its core resource base, i.e. members' quota, equally fast and had to resort to bilateral borrowing arrangements with willing central banks and governments of its member states (see section 4.2.1).

procedures of the liquidity-providing central bank. And in the case of non-reserve currency swaps, currency conversion operations may be needed, possibly causing further delays (IMF, 2016a)[1]. With respect to borrowing costs, swaps do not entail commitment fees, and Federal Reserve swaps, for example, have been priced at small mark-ups (0-100 basis points) over reference interest rates such as LIBOR or OIS spreads (Goldberg *et al.*, 2011).

Another forte of swaps, at least from the perspective of the receiving central bank, is that these instruments typically do not impose any formal conditionality requirements, as most IMF and RFA programmes do, and hence carry no (or little) stigma. That said, one needs to bear in mind that central bank swaps constitute a rather specific form of liquidity. Unlike self-accumulated reserves, most swap proceeds cannot be spent freely but should be directed towards receiving countries' ailing domestic banking sectors, the purchase of imports from the swap-providing country, or other, narrowly defined purposes (Denbee *et al.*, 2016)[2]. There is typically no scope for general liquidity provision from central banks to governments through swap arrangements (ECB, 2016).

Arguably the biggest limitation to bilateral swap lines is the selectivity with which they are granted, especially to emerging market economies. As explained above and pointed out by McDowell (2017a, p. 140), while foreign banks and economies most probably benefited from the Federal Reserve's dollar liquidity provision during the crisis, *"their interests were not the target of the actions"*. Instead, the Federal Reserve acted in line with its own (unofficial) mandate of fostering domestic financial stability. Econometric analysis by McDowell (2017a) confirms that jurisdictions in which systemically important US banks and money market funds had more foreign claims were more likely to receive a swap line from the Federal Reserve. Likewise, Aizenman and Pasricha (2010) find that the Federal Reserve's choice to extend swap lines to emerging markets Brazil, Mexico, Singapore and South Korea is first and foremost explained by the exposure of US banks to these countries[3]. Empirical studies on the People's Bank of China's renminbi-local currency swap lines show that they are more likely to be concluded with countries whose trade is interdependent with China's and which have previously signed preferential trade agreements and/or bilateral investment treaties with China (Liao and McDowell, 2015 and Garcia-Herrero and Xia, 2015). And the size of both US and Chinese swaps is positively correlated with the importance of swap recipients as export destinations (Aizenman *et al.*, 2011 and Yang and Han, 2013).

Moreover, the Federal Reserve and other swap providers have shown "constructive ambiguity" about their willingness to again extend swap lines to emerging market economies in the event of new crises, out of fear that (quasi-) permanent swap arrangements would contribute to moral hazard on the part of receiving central and private sector banks (Weder di Mauro and Zettelmeyer, 2017).

The foregoing implies that access to swap lines is heavily dependent on the domestic policy considerations of the swap-providing country and highly uncertain, except perhaps for reserve currency issuers[4]. Swap lines are therefore at best a very imperfect substitute for international reserves. Swaps' contractual and typically short-term nature and the non-transparent *ex-ante* qualification process that lies behind them make them arguably less predictable and reliable instruments of liquidity provision than alternative, more institutionalised arrangements, such as the IMF or long-standing RFAs (Destais, 2016 and Denbee *et al.*, 2016)[5].

A final disadvantage of bilateral central bank swaps is that they add little to the GFSN in terms of risk-pooling and diversification. Instead, the typical swap involves "two-tier counterparty risks" (Destais, 2016). The first-tier risk, borne by the swap-receiving central bank, is that commercial banks fail to repay the international currency they obtain through auctions. The second risk, borne by the swap provider, is that the swap-receiving central bank does not settle the swap, i.e. return the international currency, as agreed[6].

(1) For example, both Pakistan and Argentina converted the renminbi amounts they obtained through their swaps with the People's Bank of China into US dollar liquidity through the offshore renminbi market (Li, 2015).

(2) The four Federal Reserve swap arrangements with emerging market economies had additional safeguards (unlike the swap lines concluded with advanced economies). Drawings under the $ 30 billion swap arrangements required the explicit approval of the Federal Reserve's Foreign Currency Subcommittee, to ensure that US dollar credit would be used in line with the swaps' original purposes, i.e., supplying liquidity to illiquid but solvent banks operating in foreign jurisdictions (McDowell, 2017a).

(3) Further evidence can be found in (later released) US Federal Open Market Committee (FOMC) transcripts, in which Dallas Federal Reserve Bank President Richard Fisher is quoted as saying *"Mexico is obvious. It's a national security risk. We're interlinked economically"* (see https://www.federalreserve.gov/monetarypolicy/files/FOMC20081029meeting.pdf). Other factors that are highlighted in these transcripts are the four emerging markets' economic and financial mass, their recent history of prudent policies, their likely reluctance to turn to the IMF, and their expression of interest in a swap line. In the financial press, it was widely reported that Indonesia was turned down by the Federal Reserve and therefore sought (and eventually secured) swap arrangements with China and Japan instead.

(4) On a more positive note, Moessner and Allen (2012) find significant positive correlations between countries' ex-ante currency-specific (dollar, euro, yen and Swiss franc) liquidity shortages and the probability of receiving a swap line in that currency, and between being a large international financial centre and receiving a swap line from any other country. This suggests that swaps are, in part, also allocated in accordance with liquidity needs.

(5) Some argue that, for advanced economy central banks, an extra incentive to sign swap agreements with the People's Bank of China may have been its "symbolic" value of signalling financial ties with China. The signing of such swaps could be interpreted as low-cost bets on the result of a fully convertible and more widely accepted renminbi and could prove helpful in countries' efforts of attracting more renminbi business to their financial centres (Prasad, 2017).

(6) To shield itself against that second risk, the Federal Reserve's October 2008 FOMC meeting considered the possibility of seizing some of the emerging market economies' reserve assets (held at the Federal Reserve Bank of New York) if they failed to honour their swap obligations. Eventually, such measures were not approved. See https://www.federalreserve.gov/monetarypolicy/files/FOMC20081029meeting.pdf.

3. Regional financing arrangements ("Better a good neighbour than a distant friend")

3.1 Definition and key features

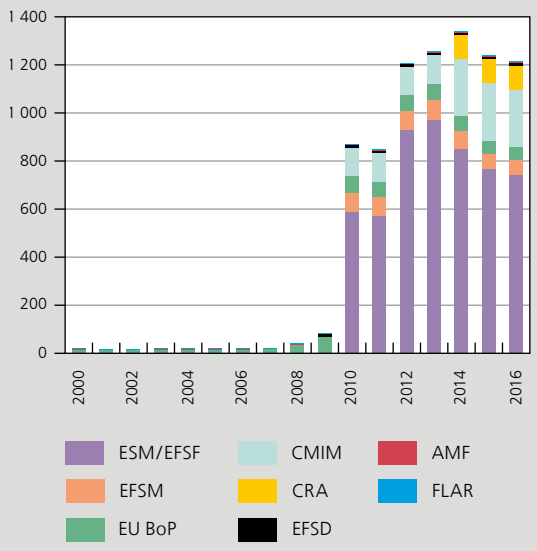
Regional financing arrangements (RFAs) can be broadly defined as financing mechanisms through which a group of countries, usually in the same region, provide liquidity or balance-of-payments support to its members. Accordingly, RFAs represent a middle ground between self-insurance through reserve accumulation and the multilateral assistance provided by the IMF (ECB, 2016). The regional layer of the GFSN has gained in importance over the last decades. More particularly, along with the increase in regional trade and financial interconnectedness, there has been growing awareness of the need for better insurance against shocks at this level. Similar to the large build-up in reserves however, a number of RFAs also have their origins in dissatisfaction with past IMF adjustment programmes or with countries' representation in international financial institutions. The Asian Chiang Mai Initiative Multilateralisation (CMIM), for example, was established in the aftermath of the 1997-1998 Asian financial crisis out of dissatisfaction with the international community's response at the time.

Some RFAs have existed for decades, such as the Arab Monetary Fund (AMF, since 1976) or the Latin American Reserve Fund (FLAR, originally the Andean Reserve Fund, since 1978). Others have been established more recently. Having laid bare the inadequacies of the GFSN, the global financial crisis marked the establishment of a wave of new RFAs, while existing arrangements were strengthened. The CMIM, for example, finds its origin in a network of bilateral swap agreements set up following the Asian financial crisis and consolidated into a single swap contract in 2010. Likewise, the Eurasian Fund for Stabilisation and Development (EFSD, since 2009) and the BRICS Contingent Reserve Arrangement (CRA, since 2014) were set up in response to the global financial crisis. Among the European financing arrangements, finally, the Balance of Payments (BoP) Assistance Facility may have existed since 1972 [1], but all the other European RFAs have been established in the wake of the crisis.

The EU's BoP Assistance Facility is the oldest European financing arrangement. While it has been in use for decades, financing under this facility surged in the aftermath of the global financial crisis, with loans to Hungary, Latvia and Romania, all in combination with IMF programmes. Against that background, the resources available under this facility were increased, from € 12 to 25 billion in December 2008. Shortly thereafter, in April 2009, in view of the intensity of the crisis, this amount was again doubled to € 50 billion. The facility is dedicated to non-euro area EU countries. As the crisis spread to the euro area however, the need arose for a financing mechanism to support euro area countries. In that context, a new mechanism for financial assistance, the European Financial Stabilisation Mechanism (EFSM), was set up in 2010, backed by the EU budget. The EFSM had a lending capacity of € 60 billion and has been used to provide loans, in parallel with an IMF (and EFSF, see below) programme, to Ireland and Portugal (as well as to Greece, under the form of a bridge loan). In addition, a temporary crisis resolution mechanism for euro area countries was established in 2010, the European Financial Stability Facility (EFSF), with a total lending capacity of € 440 billion, guaranteed by euro area Member States. It has been used to support Ireland, Portugal and Greece. While the EFSF remains in place to carry out existing programmes [2], it was ultimately

CHART 5 SINCE THE GLOBAL FINANCIAL CRISIS, RFAs HAVE GROWN IN NUMBER AND SIZE

(in $ billion) [1]



Sources: RFA websites, Datastream.

(1) Since 2012, the size of the European financing arrangements has remained constant when expressed in euro (ESM/EFSF: € 704.8 billion; EFSM: € 60 billion and EU BoP: € 50 billion); the variations seen in the chart are due to changes in the dollar/euro exchange rate.

(1) The EU Balance of Payments Assistance Facility was established in its current form in 2002, replacing an earlier facility providing medium-term financial assistance for members with balance-of-payments problems established in 1988. The latter facility actually merged medium-term financial assistance (set up in 1972) and a Community loan mechanism (set up in 1981) into a single facility.

(2) The EFSM is also no longer used to provide financial assistance, except for providing bridge financing (such as to Greece in 2015). Both the EFSF and EFSM remain in place to deal with the repayments of outstanding loans.

TABLE 1 WIDE VARIETY OF RFAs

RFA	Year of establishment	Members	Size (2016)		Funding	Instruments	IMF involvement	Prior use
			In $ billion	In % of members' GDP				
RFAs in the EU								
– **European Stability Mechanism (ESM) / European Financial Stability Facility (EFSF)**	2012-2010	Euro area Member States	743.4	6.3	Member capital leveraged with capital market borrowing	Loans with a macroeconomic adjustment programme, primary and secondary market purchases, precautionary credit line, (in)direct recapitalisation of financial institutions	"A euro area Member State requesting financial assistance from the ESM is expected to address, wherever possible, a similar request to the IMF"	Loans to Ireland (2010), Portugal (2011), Greece (2012, 2015), Cyprus (2013); bank recapitalisation in Spain (2012)
– **European Financial Stabilisation Mechanism (EFSM)**	2010	EU Member States	63.3	0.4	Member capital leveraged with capital market borrowing	Loan or precautionary credit line	"Its activation will be in the context of a joint EU / International Monetary Fund (IMF) support"	Loans to Ireland (2011), Portugal (2011); bridge loan to Greece (2015)
– **EU BoP Assistance Facility**	1972	Non-euro area EU Member States	52.7	0.3	Member capital leveraged with capital market borrowing	Loan or precautionary financing facility	Not necessary, but post-2008 programmes were jointly with the IMF	Loans to Italy, Ireland, France and Greece in 1970-1990s; loans to Hungary (2008), Latvia (2008), Romania (2009)
Chiang Mai Initiative Multilateralisation (CMIM)	2010	Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam, China, Hong Kong, Japan, South Korea	240	1.2	Foreign exchange reserves	Central bank swap lines (Stability Facility or Precautionary Line)	IMF involvement above 30 % of maximum access	–
BRICS Contingent Reserve Arrangement (CRA)	2014	Brazil, China, India, Russia, South Africa	100	0.6	Foreign exchange reserves	Central bank swap lines (liquidity or precautionary instrument)	IMF involvement above 30 % of maximum access	–
Eurasian Fund for Stabilisation and Development (EFSD)	2009	Armenia, Belarus, Kazakhstan, Kyrgyz Republic, Russia, Tajikistan	8.5	0.6	Member capital	Financial credit, investment loan, subsidies for government programmes in the social sector	No	Different loans to 5 member states between 2010 and 2016
Arab Monetary Fund (AMF)	1976	Algeria, Bahrain, Comoros, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, West Bank and Gaza, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arab Emirates, Yemen	3.6	0.1	Member capital leveraged with capital market borrowing	Automatic loan, ordinary loan, extended loan, compensatory loan, structural adjustment facility, trade reform facility, oil facility and short-term liquidity facility	No	Multitude of loans to 14 member states between 1978 and 2016
Latin American Reserve Fund (FLAR)	1978	Colombia, Bolivia, Costa Rica, Ecuador, Paraguay, Peru, Uruguay, Venezuela	3.9	0.4	Member capital leveraged with capital market borrowing	Balance of payments, central banks' external public debt restructuring, liquidity, contingency and Treasury credit lines	No	Multitude of loans to 6 member states between 1978 and 2016

Sources: RFA websites, IMF World Economic Outlook, Datastream.

superseded by the permanent European crisis fund, i.e., the European Stability Mechanism (ESM) in 2012, with a capital stock of more than € 700 billion. Spain was the first country to receive funds from the ESM to recapitalise its banking sector. Later, Cyprus was to have the first fully-fledged ESM programme. Finally, ESM funds were also used for Greece's third programme; it is currently the only ESM programme that is still active.

One of the most striking features of this layer of the GFSN is its heterogeneity (see table 1). First of all, the various RFAs differ significantly in terms of size (see also chart 5). In this regard, the European RFAs stand out; with a combined size of more than $ 850 billion, they dwarf other RFAs. Even though the CMIM and CRA, with a size of respectively $ 240 and 100 billion are arguably also quite large, they remain small relative to their members' combined GDP. RFAs also differ greatly in terms of their funding and lending frameworks. Some RFAs, such as the CMIM and CRA, take the form of swap arrangements, whereby members commit to provide foreign exchange reserves when a request for assistance is made. Other RFAs provide loans from members' capital, usually leveraged by capital market borrowing. It is also worth noting that a number of RFAs have made (part of) their assistance conditional on members also requesting an IMF programme, even though some of them, especially in emerging and developing economies, have their origins in dissatisfaction with past IMF support. To receive support above 30 % of their access limit, CMIM and CRA members, for example, also have to enter into an IMF programme. Less binding, the ESM Treaty states that *"a euro area Member State requesting financial assistance from the ESM is expected to address, wherever possible, a similar request to the IMF"*. Furthermore, even though EU countries requesting support under the BoP Assistance Facility are not obliged to enter into an IMF arrangement, all programmes under this facility concluded since the global financial crisis have been co-financed by the IMF.

While most RFAs were set up to provide liquidity and balance-of-payments support to their members, some also provide other forms of assistance (such as project financing, for example). The FLAR and AMF have a number of different lending tools at their disposal, depending on the kind of support sought by its members. The FLAR moreover seeks to contribute to the harmonisation of its members' monetary and financial policies, while the AMF and EFSD also pursue economic development and increased integration among their members. The ESM can participate in the recapitalisation of financial institutions, as it has done in Spain for example. Most RFAs also feature precautionary credit lines, for members with potential financing needs.

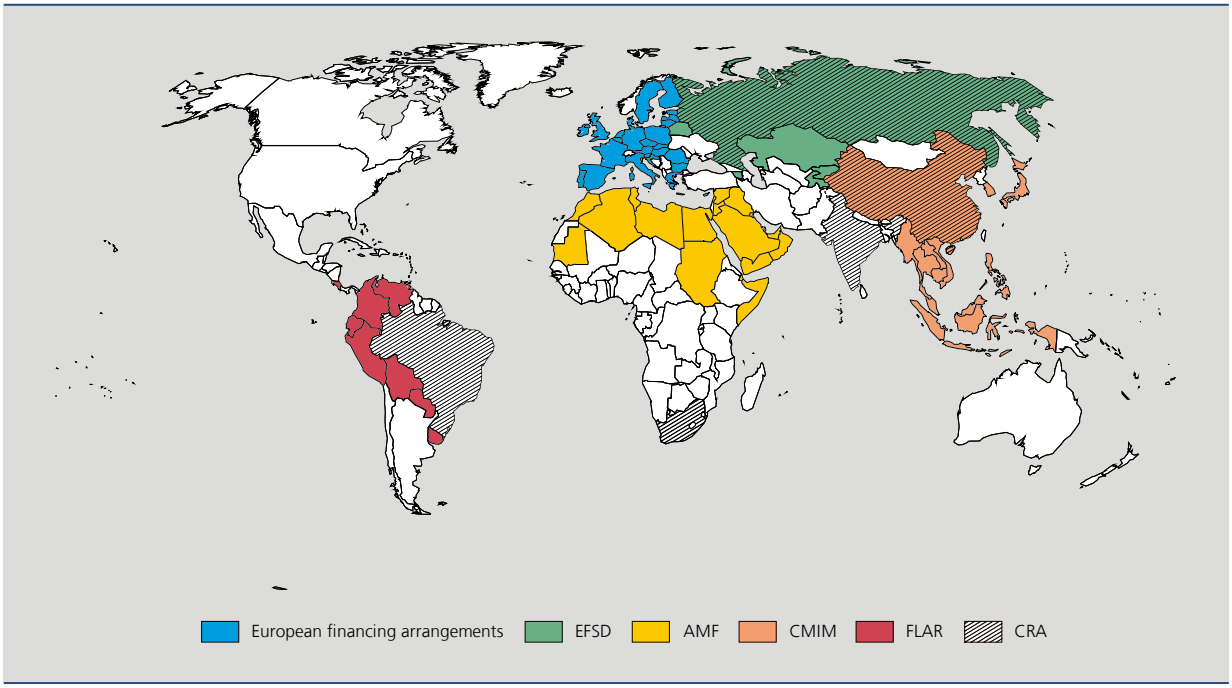
3.2 Comparative (dis)advantages

By pooling resources and, as such, creditworthiness, members of an RFA can access funds at a lower cost than they could individually, especially in times of stress. Moreover, RFA financing may enhance programme ownership and alleviate stigma concerns often associated with IMF assistance, thereby stimulating its members to ask for assistance early on in a crisis. In addition, RFAs are supposed to have a greater knowledge of regional specificities, including quicker access to data, given their proximity to member governments; and may be faster than the IMF in their lending decisions, due to the fewer parties involved and less formalised or rigid lending procedures. On the other hand, the lack of distance between lender and borrower may also create a situation where insufficient pressure is exerted on the borrower to implement needed reforms, thus increasing risks of moral hazard (McKay *et al.*, 2011). The fact that RFAs generally do not have an equally well-developed surveillance capacity and conditionality framework as the IMF adds to these risks. The European arrangements are an obvious exception, though other RFAs have recently been investing in their surveillance capacities too; the CMIM, for example, established its own macroeconomic surveillance unit AMRO (ASEAN+3 Macroeconomic Research Office) in 2011.

RFAs may also be ill-suited to deal with region-wide shocks. More particularly, along with the increasing trade and financial interconnectedness at the regional level, risks of multiple countries simultaneously suffering liquidity shortages or balance-of-payments difficulties have risen. Even larger RFAs might not be able to provide financing to several of its biggest members at the same time.

Finally, even though their number and size has increased significantly since the global financial crisis, coverage by RFAs remains very uneven. Many countries, such as in Sub-Saharan Africa and parts of Latin America, do not belong to any RFA at all, while other countries, such as Russia and China, belong to multiple RFAs (see chart 6). Moreover, resources among RFAs are very unequally distributed. Coverage for euro area countries under the ESM/EFSF amounted to 6.3 % of their combined GDP at end-2016. The corresponding percentage was 1.2 % for the CMIM and did not exceed 1 % of regional GDP for the other RFAs (see table 1).

CHART 6 THE COVERAGE OF RFAs IS VERY UNEVEN



Sources: RFA websites.

4. The International Monetary Fund ("It's a small world after all")

4.1 Role within the GFSN, strengths and weaknesses

The IMF has a unique position within the GFSN, because of its global mandate, near-universal membership, long-term experience in crisis resolution, and pooling of funds. One of the key advantages of the IMF is that its global risk-sharing and long-time experience with surveillance and programme conditionality help to reduce moral hazard and encourage sound policies. On the other hand, in cases where experience with IMF conditionality was troubled, it has also given rise to political stigma. Asian and Latin American countries in particular, disappointed by the IMF's handling of previous crises, have become reluctant to borrow from it, limiting the IMF's effectiveness. Dissatisfaction with IMF governance and, especially, the perceived dominance of the developed countries in the institution's decision-making, has added to the stigma associated with IMF lending. Moreover, the conditionality the IMF attaches to its lending instruments implies that access to funds from the IMF is more uncertain than own reserves or, arguably, (some) RFA resources. While financing is immediately available for qualifying countries under the IMF's precautionary instruments (currently the FCL and PLL, see below), the system of tranched lending involving periodic reviews of programme conditionality under the IMF's standard facility (the Stand-By Arrangement or SBA) and other non-precautionary lending instruments introduces some degree of uncertainty about the availability of financing for the borrower.

4.2 IMF reform since the crisis

4.2.1 Tripling the IMF's resources

Before the global financial crisis, the IMF's lending portfolio had contracted significantly, existing mostly of small loans to low-income countries. From end-2008 onwards however, IMF lending again surged to record highs. Against that background, at the G20 London Summit in April 2009, it was agreed to triple the IMF's lending capacity, from $ 250 to 750 billion. This was put into practice first by *ad hoc* bilateral borrowing from member countries to the IMF (in 2009-2010), which guaranteed the fastest way to boost IMF resources; then by incorporating these additional resources into an expanded New Arrangements to Borrow (NAB) (effective from March 2011); and, finally, by rolling over part of the amended NAB into the

IMF's quota resources[1], which were doubled under the 14th General Quota Review (agreed by the IMF's Board of Governors in December 2010 but effective only from January 2016[2]). Against the backdrop of the deepening of the euro area crisis and the sluggishness of the global recovery more generally, a number of countries committed to increase the IMF's resources further through a second round of bilateral loans in 2012. After several extensions of their initial term of two years, borrowers have now committed to provide these loans until the end of 2019[3]. Consequently, the IMF's resources amounted to almost $ 1.3 trillion in April 2017, compared to just over $ 400 billion in 2008[4]. In addition to that, the IMF also injected liquidity into the global economic system by means of a general allocation of Special Drawing Rights (SDRs) in August 2009, for an amount of SDR 161.2 billion, the equivalent of $ 250 billion[5][6]. This directly added to recipient countries' reserves.

Chart 7 shows the evolution of the size and composition of the IMF's resources. While the size of the Fund has, over the past decades and especially since the global financial crisis, kept growing in absolute amounts, the IMF's resources have shrunk considerably when expressed as a percentage of global external liabilities. The increase in the IMF's resources after the crisis lifted the latter from 0.4 % in 2008 to 0.9 % in April 2017, but this is still significantly lower than the 2.4 % observed at the beginning of the 1980s. In terms of global GDP, the size of the IMF has fluctuated around 1 % in the decades before the crisis, peaked at almost 2 % in 2012 and then fell back again to around 1.5 % currently.

The significant drop in the IMF's funds in terms of global external liabilities has sparked an intense debate on the adequacy of the IMF's resources (and of the GFSN more generally) to deal with global shocks. While there is no unanimity on this, several studies point out that the GFSN would be able to deal with most, except very extreme, shocks. According to Denbee *et al.* (2016, p. 26), *"with the current temporary IMF resources in place, the GFSN appears capable of dealing with most severe, but plausible, crisis scenarios which could pose a threat to the international financial system"*[7]. Furthermore, the IMF (2016a, p. 21) concluded that while *"under a widespread shock and current access levels for the GFSN elements, financing gaps would arise […] GFSN resources, however, would be just sufficient to cover the aggregate financing gap under very strong assumptions of full access to all GFSN elements"*[8].

Apart from their size, the IMF's resources have also changed significantly in terms of their composition. Whereas the IMF has traditionally relied on quotas as its primary source of financing, the share of borrowed resources in its income framework has increased significantly since the crisis. In particular, quotas still accounted for about 80 % of IMF resources in 2008, but this share had fallen to just 50 % in April 2017. Before the entry into force of the 14th General Review of Quotas, which included a roll-over of NAB into quota resources, borrowing even peaked at about three quarters of the IMF's resources. Besides the ongoing debate on the adequacy of the IMF's resources, discussions have also arisen on their optimal composition. Usually, and as also advocated by the IMF itself, it is argued that quotas, as the IMF's permanent resource base, should be large enough to deal with possible shocks in normal times, whereas the NAB and bilateral loans, as the IMF's second and third lines of defence, are meant to cover tail risks. Against that background, one could conclude that the IMF's borrowed resources should be maintained at their current size at least as long as the uncertainty in the global economy has not abated. It should be noted that, in the context of the 15th General Review of Quotas (see below), the IMF is currently working on an assessment of the appropriate size and composition of its resources.

(1) The IMF's resources come in two forms: quota and bilateral contributions. Quotas are the Fund's main and permanent resource base; when a country joins the IMF, it is assigned a quota, broadly based on its relative position in the world economy. A member country's quota determines its required financial contribution, voting power and access to IMF financing. To supplement its quota resources, the Fund can also borrow from its members; contributions through these arrangements do not affect members' voting rights. Borrowing has occurred mainly through bilateral loans with individual member countries and through the NAB, a set of credit arrangements between the IMF and 38 member countries. The General Arrangements to Borrow (GAB) is another multilateral borrowing arrangement between the IMF and a more limited number of countries (11). Private sector borrowing, finally, is not precluded by the IMF's Articles of Agreement, but this option has never been used.

(2) Any changes in quotas must be approved by an 85 % majority of members' total voting power and quotas change as members consent to and pay their quota increases. Entry into force of the 14th General Review of Quotas was delayed pending ratification of the proposal by the US, which has, with a 16.5 % voting share, a de facto veto power.

(3) The 2012 bilateral loans had an initial term of two years, but have been extended several times. Most recently, in 2016, the bilateral loans have been renewed, with borrowers committing to provide their loans until the end of 2019 (with a possible extension by one year). The renewal of the bilateral loans is part of a broader arrangement on IMF resources to maintain IMF borrowed resources (bilateral loans and the NAB) at least until agreement has been reached on the 15th Quota Review (scheduled to be completed by 2019).

(4) Only part of the IMF's resources is effectively loanable. In particular, the IMF sets aside 20 % of its funds as a prudential balance. Moreover, only resources from members with a sufficiently strong balance of payments and reserve position are used for financing of IMF programmes.

(5) The SDR, an international reserve asset created by the IMF, is a potential claim on the freely usable currencies of IMF members. Its value is determined by a basket of selected currencies that satisfy two criteria: first, being issued by the world's largest exporters; and second, being "freely usable", i.e., widely used for international payments and widely traded in the principal exchange markets (see IMF, 2015 for more details). Currently the SDR basket consists of the US dollar, the euro, the Japanese yen, the British pound and the Chinese renminbi. The inclusion of the renminbi dates from 1 October 2016, after the IMF's Executive Board labelled the renminbi as freely usable.

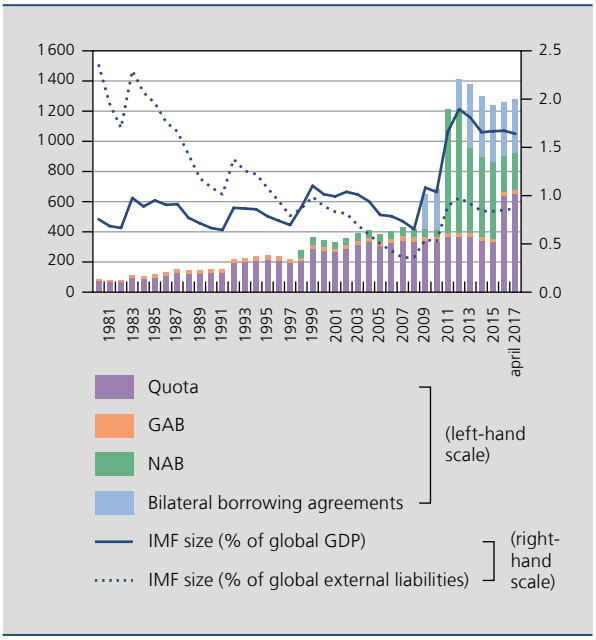
(6) Under a general SDR allocation, SDRs are allocated to IMF members in proportion to their quotas. At their April 2009 Summit, G20 leaders also urged rapid ratification of the special one-time allocation of SDRs, for an amount of SDR 21.5 billion, approved by the IMF's Board of Governors in 1997. The intent of this allocation was to enable all members of the IMF to participate in the SDR system on an equitable basis and correct for the fact that countries that joined the Fund after 1981 had never received an SDR allocation. The proposal finally became effective in September 2009 when the Fund certified that at least three-fifths of the IMF membership with 85 % of the total voting power had accepted it.

(7) Based on simulations of a balance of payments shock in emerging market economies and banking sector foreign currency liquidity and sovereign debt shocks in advanced economies.

(8) Including that: (i) resources are unlimited under the ESM, and used all the way up to the maximum access limits for the other RFAs; (ii) all active swap lines can be tapped, and all historical lines, especially those extended during the global financial crisis but discontinued after, can be renewed with the same amounts; and (iii) the entire lending capacity of the Fund is deployed (IMF, 2016a).

CHART 7 THE IMF'S RESOURCES WERE INCREASED AFTER THE GLOBAL FINANCIAL CRISIS[1][2][3]

(in $ billion, unless otherwise indicated)



Sources: IMF Financial Data, IMF World Economic Outlook (WEO); Lane and Milesi-Ferretti (2017) External Wealth of Nations Mark II (EWN) database; Datastream.

(1) GAB includes a SDR 1.5 billion credit arrangement with Saudi Arabia from 1983 onwards; bilateral borrowings include notes purchase agreements.

(2) The dollar/SDR exchange rate is evaluated at end of year, except for April 2017; April 2017 world GDP is WEO forecast for end-2017.

(3) Global external liabilities are assumed constant after 2015, which is the latest available data point in the EWN.

4.2.2 Overhauling the IMF's lending toolkit

Ever since the IMF's inception, there have been debates on the main objectives of the Fund's financing. Some argue that IMF lending should focus on crisis *prevention*; i.e. the IMF should act as an "international lender of last resort", making large amounts of financing available, with no or minimal conditionality. Others believe the focus should be on crisis *resolution*, lending smaller amounts on a discretionary basis subject to policy conditionality (Reichmann and de Resende, 2014). While the "crisis resolution" view has generally prevailed – with IMF financing usually provided through its standard crisis resolution tool, the SBA –, recent years have seen more efforts to include precautionary instruments too. More particularly, the global financial crisis demonstrated for many that the IMF, and the GFSN more generally, lacked adequate crisis prevention tools.

In response to the crisis, the IMF therefore overhauled its lending toolkit, with arguably the most remarkable innovation the introduction of the Flexible Credit Line (FCL) in 2009, the IMF's first genuine precautionary lending instrument that allocates large amounts of resources to countries with very strong fundamentals and solid policy track records (strict ex-ante conditionality) without requiring an adjustment programme (no ex-post conditionality). Further, a Precautionary Credit Line (PCL), combining FCL-like ex-ante qualification criteria with targeted *ex post* conditionality, was created in 2010 for countries with sound policies but remaining vulnerabilities, disqualifying them from the FCL. In 2011, the PCL was broadened in scope and re-baptised Precautionary and Liquidity Line (PLL).

Despite its seemingly attractive nature, only three countries have so far entered into FCL arrangements (Mexico, Colombia and Poland), and only two countries have used the PLL (Macedonia and Morocco). This notwithstanding, as of April 2017, the three FCL arrangements together accounted for about two-thirds of total committed IMF resources. Moreover, the first FCL with Mexico constituted the largest ever individual commitment of IMF resources in absolute terms[1]. The limited use of the IMF's existing precautionary instruments is most probably due to constraints on both the demand and supply side. With regard to the latter, reluctance of the IMF to extend large credit lines with no or limited conditionality has probably played a role. On the demand side – even though the FCL had specifically been created to alleviate stigma concerns, stimulating countries to apply for IMF financing early on – such concerns have probably held some potential candidates back from applying for it. Research however has shown that, as far as *economic* stigma is concerned, there seems to be no evidence of negative market reactions to countries accessing the FCL, at least not in terms of bond spreads or capital inflows (Essers and Ide, 2017). This notwithstanding, the authors also find that a higher share in US economic and political interests is associated with a greater likelihood of obtaining an FCL arrangement – an observation that is not conducive to overcoming *political* stigma concerns.

Against that background, the IMF is currently reviewing its precautionary instruments and looking into the possibility of a new short-term liquidity facility. As part of these discussions, it was decided in July 2017 to introduce a new non-financial instrument to provide monitoring of interested member states' policies and under which the country in question commits itself to a reform agenda. One of the objectives of this monitoring instrument is to unlock financing from other official creditors and/or private investors, including from RFAs,

(1) Mexico's first FCL arrangement (approved in April 2009) amounted to SDR 31.5 billion, or about $ 47 billion. Access was subsequently raised in January 2011, to SDR 47.3 billion ($ 72 billion) and then to SDR 62.4 billion (about $ 88 billion) in May 2016. Poland currently has an FCL arrangement of SDR 6.5 billion (€ 8 billion); Colombia's FCL provides access to a potential amount of SDR 8.2 billion ($ 11 billion). None of the three countries has ever drawn on its credit lines.

and to contribute to a better collaboration between the various layers of the GFSN (see above).

4.2.3 IMF governance reform

Emerging market and developing economies have staged impressive growth rates over the past decades, raising their share in world GDP from less than 40 % at the beginning of the 1990s to almost 60 % today[1]. However, their representation at international financial institutions, such as the IMF, has generally not kept pace with this trend. Currently (i.e. since the 14th General Quota Review became effective) the quota shares of emerging market and developing economies in the IMF amount to 42.4 % of total quota shares.

While the global financial crisis created the momentum for boosting the IMF's resources and revamping its lending framework, governance reforms have somewhat lagged behind. Admittedly, the 2010 quota and governance reforms have contributed to shifting quota shares within the institution from advanced to emerging market and developing economies. More particularly, about 6 % of quota shares were shifted towards dynamic emerging market and developing countries and from over-represented to under-represented IMF members. Furthermore, the IMF's Executive Board became an all-elected Board[2] and advanced European countries committed to reduce their combined Board representation by two chairs. Nevertheless, it took five years for the 2010 quota and governance reforms to become effective (in January 2016), as the Board proposal had to be approved by 85 % of the Fund's membership, depending, as such, on the ratification by the US, which holds veto power over important decisions (see footnote 2 on p. 100). Moreover, while European members have effectively reduced their Board representation – including as a result of the agreement between the Netherlands and Belgium, which each initially had one seat in the Executive Board, to designate their Executive Directors on an alternating basis – the shift still falls short of the committed two seats. Further governance reforms are being debated in the framework of the 15th General Review of Quotas, which also includes discussions on a new quota formula. In the context of this review, the International Monetary and Financial Committee (IMFC)[3] is committed to agreeing on *"a realignment of quota shares to result in increased shares for dynamic economies in line with their relative positions in the world economy and hence likely in the share of emerging market and developing countries as a whole, while protecting the voice and representation of the poorest members"*[4]. The initial schedule for concluding the discussions has already been significantly delayed however; currently, the IMF's intention is to complete the review by its Spring Meetings (and no later than its Annual Meetings) of 2019.

5. Proposed reforms to the GFSN

5.1 Towards a more balanced global reserve system

5.1.1 A wider role for the SDR

Many policy-makers and commentators have taken issue with the dominance of the US dollar in international reserves (see chart 3) and, more broadly, the international monetary system (IMS)[5], often by invoking the systemic risks this poses (see section 1.2). In a now famous speech from March 2009, People's Bank of China Governor Zhou Xiaochuan argued for the creation of *"an international reserve currency that is disconnected from individual nations and is able to remain stable in the long run, thus removing the inherent deficiencies caused by using credit-based national currencies"* (Zhou, 2009, p. 2). In his plea for a "super-sovereign" reserve currency, he referred to Keynes's "bancor" proposal, an international currency unit based on the value of 30 representative commodities, and pointed to the potential of the SDR to fulfil a similar role[6]. What Zhou (2009) advocated was a (partial) centralisation of international reserves by the IMF, which would set up an open-ended SDR-denominated fund permitting voluntary subscription and redemption in the existing reserve currencies.

In fact, similar discussions about the exchange of US dollar assets for a reserve unit issued by the IMF already took place under the Bretton Woods system and led to the creation of the SDR in 1969. As explained by McCauley and Schenk (2015), the original set-up of the SDR marked a triumph of ambiguity and compromise over clarity of purpose, undermining its later role in the IMS. The SDR

(1) Based on Purchasing Power Parity GDP data from the IMF World Economic Outlook database.

(2) Before the entry into force of the 2010 quota and governance reforms, IMF members with the five largest quota shares appointed an Executive Director.

(3) The IMFC advises and reports to the IMF Board of Governors on the supervision and management of the international monetary and financial system.

(4) See i.a. the communiqué of the Thirty-Fifth Meeting of the International Monetary and Financial Committee (IMFC), April 22, 2017.

(5) The IMS, of which the GFSN is only a part, can broadly be described as the *"set of arrangements and institutions that facilitate international trade and the allocation of investment capital across nations"* (Bush *et al.*, 2011, p. 4; see also IMF, 2016c).

(6) It is worth stressing again that the SDR is not a currency, but rather a potential claim on the holdings of freely usable national currencies of IMF members (i.e., currencies that are widely used and traded in practice). SDRs can be exchanged by their holders for such currencies through voluntary trading arrangements between countries or, if voluntary exchange does not suffice, by the IMF designating countries with strong external positions to purchase SDRs from countries with weak external positions. A key difference with other international reserve assets is that SDRs are "allocated", according to IMF quotas, rather than accumulated by running balance of payment surpluses (IMF, 2016d).

was designed not as a vehicle to transform existing reserve asset *stocks* but rather to coordinate multilaterally the *flow* of future reserve creation. Ultimately, official SDR creation has remained limited; since 1969 there have been only three general allocations and one special allocation of SDRs by the IMF, with a cumulative amount of SDR 204 billion or about $ 285 billion (see section 4.2.1. and footnote 6 on p. 100). The SDR has therefore not contributed significantly in supplementing global reserves, let alone in reducing the role of the US dollar therein[1]. More ambitious proposals for an IMF-housed "substitution account", enabling central banks to replace a sizeable portion of their US dollar reserves by SDRs, were floated in the 1970s and 1980s but ran against technical, financial and political obstacles (McCauley and Schenk, 2015). In the wake of the global financial crisis, the concept of a substitution account was revived by, among others, Zhou (2009), Ocampo (2010, 2015) and the IMF (2011b) itself, although without practical consequences so far[2]. The IMF (2016d) is looking to further explore whether any specific reform options to increase the clout of the SDR as an official reserve asset should and could be pursued[3].

The foregoing proposals, however, do not directly address a second important concern with global reserves, i.e., their very unequal distribution over countries (see chart 2). Indeed, some countries appear to be holding too much reserves, while others hold too little. Such problem could be tackled, to some extent, by changing the way SDRs are allocated. The current practice of allocating SDRs in accordance with countries' IMF quota implies that large advanced economies, including reserve currency issuers, receive the majority of allocated SDRs. One could attempt to better match the supply of SDRs with countries' actual need for reserves. Williamson (2010), for example, proposes to divide the SDRs to be allocated over two groups, advanced economies and emerging and developing economies, proportionally to the observed increase in reserves in each group over a certain reference period prior to the SDR allocation. Williamson (2010) argues that this increase can be taken as a crude proxy for reserve demand, and finds that it has been much larger in the group of emerging and developing countries. Within both groups, SDR allocations would still be made according to individual countries' quota. While such an SDR allocation rule would shift reserves away from advanced towards emerging and developing countries, it would not ameliorate the unbalanced distribution of reserves *within* the latter group. A direct way to do so would be to suspend countries' right to receive SDR allocations if they already hold excessive reserves (Ocampo, 2010), where 'excessive' could be defined with reference to the IMF's reserve adequacy measures (see section 1.1). To be sure, in order for any changes to SDR allocations to have a noticeable impact, such allocations would need to be made more regularly than is currently the case (IMF, 2011b).

5.1.2 A multi-currency global reserve system

Of course, one could argue that, even under a *laissez-faire* approach and without an enhanced role for the SDR, the state of global reserves will gradually evolve towards a multi-currency system. Features of such a system are of course already present, although the US dollar's status in the IMS, and more so in global reserves, remains unrivalled[4]. Whereas an increased role for the euro, renminbi and/or other currencies would not address the tensions inherent in a global reserve system based on national currencies, it would at least facilitate the diversification of foreign exchange reserves by their holders and mitigate the risk of large valuation losses (Ocampo, 2010; see section 1.2).

Although it is virtually impossible to predict how the current constellation of reserve currencies will evolve over the years and decades to come, currently there seem to be no indications that the US dollar will relinquish its leading position any time soon[5]. On the contrary, when US financial markets nearly collapsed in 2008, foreign investors, including reserve managers, paradoxically sought the "safe haven" of the US dollar, buying large amounts of US Treasuries and contributing to the appreciation of the dollar. Part of the explanation for the US dollar's safe-haven status lies in the fact that the US still boasts the world's deepest and most liquid financial markets, implying that US Treasuries can easily be sold on when desired. Other trumps are the US political system's checks and balances and the sizeable share of US federal debt that is held by US retirees, pension and insurance funds, financial institutions and other domestic investors, whose political weight provides some

(1) In other words, the SDR currently falls far short of its objective of becoming *"the principle reserve asset in the international monetary system"*, included in the IMF's Articles of Agreement (Article VIII, section 7).

(2) Part of the IMF's 2009/2010 round of ad hoc bilateral borrowing (see section 4.2.1) was fulfilled by the issuance of SDR-denominated notes. More specifically, China, India and Brazil signed note purchase agreements with the IMF, in which they committed to buy notes up to a pre-defined amount in case the IMF would need supplementary resources (in a similar fashion as the direct bilateral loans provided by other member countries to the IMF in 2009/2010). Since these note purchase agreements, once activated, result in countries exchanging a portion of their (dollar) reserves for SDR-based assets, Ocampo (2010) sees this as a (small) step in the direction of a genuine substitution account. Also in its 2012 and 2016 rounds of bilateral borrowing the IMF concluded note purchase agreements with large emerging economies.

(3) A more indirect, "bottom-up" approach to expanding the role of the SDR in the IMS is through increased engagement of the private sector with SDRs. Private market participants have experimented with SDR-denominated financial instruments (so-called M-SDRs, as opposed to official SDRs or O-SDRs), but after some initial momentum in the 1970s and early 1980s, issuance has been dormant. Besides the availability of other instruments offering similar hedging/diversification qualities, also the lack of market infrastructure, such as clearing and settlement systems and a liquid yield curve, is holding back the development of markets for M-SDRs (IMF, 2016d).

(4) According to data assembled by the ECB (2017), at end-2016, the US dollar represented around 64% of global foreign exchange reserves, 63% and 59% of outstanding international debt securities and loans, respectively, 44% of foreign exchange turnover, and 42% of global international payments.

(5) For alternative perspectives, see e.g. Eichengreen (2011) and Subramanian (2011).

assurance to foreigners that their US investments will be protected from high inflation and outright default (Prasad, 2014)[1]. And there may be an incumbency advantage for the dollar in future too.

Whereas China has taken several measures to promote the international use of its currency, including bilateral swap arrangements, and a growing number of countries are indeed diversifying some of their reserve holdings into renminbi (see section 1.1)[2], the renminbi's ascendance to becoming an important global reserve currency is stymied by the country's stop-and-go approach to financial sector and capital account liberalisation. *A fortiori*, it is unlikely that the renminbi will enjoy dollar-like safe-haven status as long as the Chinese authorities retain a heavy hand in steering the currency's exchange rate (Prasad, 2017).

The euro, on the other hand, has quickly occupied and confirmed a clear second place in the IMS, including in global reserves (see chart 3)[3]. Using the IMF's COFER data and econometric forecasting techniques, Chinn and Frankel (2008) projected that the euro could overtake the US dollar as the world's leading reserve currency by as early as 2015. The fact that such predictions did not materialise (not even nearly) may have been due, in part, to the severe financial difficulties the euro area has experienced in recent years and the institutional weaknesses it exposed. In fact, the euro's share of foreign exchange reserves identified in COFER declined from above 27 % in the first quarter of 2010, just before concerns about a European sovereign debt crisis intensified, to below 20 % at end-2016. Other candidate-constraining factors include the absence of a single euro area-wide safe asset and imperfect financial market integration between euro Member States, which reduces market size and liquidity. Although euro internationalisation is not among its policy objectives, the ECB (2017) contends that a completion of the EU banking union and move towards an EU capital market union could boost financial market depth and liquidity in the euro area and thereby, indirectly, the international role of the euro.

5.2 Coordination of bilateral swap lines

Recent years have seen several proposals to better coordinate bilateral central bank swaps (beyond the current standing swap agreement between reserve currency central banks), with options ranging from a loose common framework within which bilateral swaps would continue to be negotiated independently, to a multilateral model that involves collective decision-making, risk-sharing and/or maintains a link with IMF financing. Proponents of a common framework for central bank swaps argue that, especially if such a framework were to be made public, it would lead to reduce ex-ante uncertainty about swap availability, one of the main drawbacks to swaps for potential beneficiaries (see section 2.2), and would send a strong signal to financial markets that central banks stand ready to cooperate. Critics, however, point to the increase in moral hazard of swap recipients and banks a (public) common swap framework could bring; the potential for greater credit risk exposures for central banks; and a clash with central banks' independence and domestic mandates (which played a key role in the allocation of bilateral swaps). They also claim that during the global financial crisis and thereafter, and without any coordinating framework, central banks have already shown to be able to step in and provide swap liquidity at very short notice.

Arguably the loudest voice in this debate is Truman (2011, 2013), which puts forward an institutionalised swap network in which the IMF would come to play an important, double role (see also Henning, 2015 and Weder di Mauro and Zettelmeyer, 2017). First, the IMF would call a general need for global liquidity, based on objective criteria, and would recommend central banks to provide that liquidity. Second, the IMF would assist key swap-providing central banks in selecting potential swap recipients by subjecting its membership to prequalification tests. For example, the presumption could be that countries satisfying the IMF's FCL criteria would qualify for central bank swaps as well. Central banks would come under pressure to follow up on the IMF's recommendations, but would retain ultimate decision-making authority. They would also keep the possibility to enter into swap arrangements outside of the coordination framework. According to Truman (2011, 2013), Henning (2015) and Weder di Mauro and Zettelmeyer (2017), such an approach would have various benefits. For deserving swap recipients, it would mean lower "constructive ambiguity" (see section 2.2) and access to more liquidity than under either a stand-alone FCL or central bank swap. This in turn could help the IMF to leverage its resources and lower the stigma associated with approaching the IMF. Swap-providing central banks would be able to free-ride on the IMF's surveillance and analytical capacity and could be shielded from credit risk if short-term swap lines would be backstopped by a medium-term FCL.

(1) The high credibility of the Federal Reserve's price stability mandate also helps to stem inflation fears.

(2) This process may be bolstered by the renminbi's recent inclusion in the SDR basket of currencies. See section 1.1 and footnote 5 on p. 100.

(3) Again according to the ECB (2017), at end-2016 the euro accounted for about 20 % of global foreign exchange reserves, 22 % and 21 % of outstanding international debt securities and loans, 16 % of foreign exchange turnover, and 31 % of global payments. In all these domains, the euro outperforms, by a wide margin, the yen and the renminbi.

Truman's proposal does not seem to address, in a sufficient manner, central banks' rightful concerns about their independence and domestic mandates. Perhaps a more realistic approach would be to come up with a minimum common framework, agreed among central banks and preferably supported by the IMF, BIS, G20 and/or other multilateral bodies. Destais (2016) suggests this could include the creation of an inventory of central bank swaps, say at the IMF or BIS, and provisions aimed at guaranteeing a minimum degree of stability over time, preventing "unfair" exclusion of swap recipients, and incentivising swap beneficiaries to adhere to international financial standards. To this, one could add the sharing of information, best practices and swap assessments between central banks.

5.3 IMF-RFA cooperation

5.3.1 The case for enhanced collaboration

Some commentators have argued that the current GFSN has become too fragmented and that, consequently, there is a need for better cooperation between the different layers. One of the main arguments for closer engagement is that it enables the resources of the different layers of the GFSN to be used more efficiently, thus lowering the required size of each of its individual components[1]. A specific case in point is IMF-RFA cooperation, an issue which has attracted increased attention with the rise in the number of RFAs since the global financial crisis. An important argument in favour of enhanced cooperation between these two layers of the safety net is to prevent the possibility of arbitrage or "facility-shopping", where a country would seek for assistance with the weakest conditionality but which would not offer the most sustainable solution to its problems. At the same time, sharing regional and global surveillance and expertise among RFAs and the IMF might contribute to better crisis prevention. Also, introducing a more structured approach to collaboration between the IMF and RFAs would enhance the predictability of IMF-RFA co-financing and, as such, increase the effectiveness of crisis fighting. Thus, while there certainly seems to be a case for strengthening cooperation between the IMF and RFAs, collaboration might not be so straightforward, as both are guided by their own mandates, policies and procedures. Moreover, it is not clear which form such collaboration should take given the large heterogeneity among RFAs (see table 1).

(1) It can be observed that countries often rely on different layers of the GFSN simultaneously. For concrete examples, see e.g. Villard Duran (2015).
(2) See http://www.g20.utoronto.ca/2011/2011-finance-principles-111015-en.pdf.

5.3.2 Possible avenues for more formal cooperation

Attempts have already been made to formalise cooperation between the IMF and RFAs; in 2011, the G20 endorsed a set of non-binding guiding principles[2]. In short, these principles state that cooperation should be tailored to each RFA in a flexible manner, based on the comparative advantages of each institution, while respecting each institution's role, independence and decision-making process. Moreover, collaboration should be sought early on and lending conditions should be as consistent as possible to prevent arbitrage and facility shopping. Finally, the principles require that RFAs respect the preferred creditor status of the IMF.

However, these principles are arguably too general to be useful. Nevertheless, a one-size-fits-all approach towards IMF-RFA cooperation may neither be feasible nor desirable, in view of the diverse geometries of RFAs. One could therefore envisage structuring collaboration along different possible models of engagement, from which an RFA could choose, depending on the degree of cooperation desired or needed. These are also the lines along which the IMF is currently working; depending on each institution's mandate and capacity, the proposed arrangements for cooperation would range from collaboration in the areas of capacity development or surveillance, to actual joint lending.

At very least, one could argue that regular *information-sharing* between the IMF and RFAs, outside crisis times, would be useful, as also acknowledged by the G20 principles. Such regular dialogue and exchange of information would enable leveraging of both institutions' surveillance capabilities; RFAs could benefit from the IMF's global expertise while Fund surveillance would be enriched by RFAs' regional knowledge. By contributing to a timely detection of risks and spillovers, this form of cooperation could considerably enhance global crisis prevention capacities. All in all, strengthening collaboration outside crisis times would already significantly benefit the chances of an adequate and rapid response when a shock eventually hits.

In addition, depending on the level of involvement sought by the RFA, cooperation could be extended to the IMF offering *technical assistance or policy monitoring*, but without providing financial assistance. IMF policy monitoring has been used in the context of ESM support to Spain's banking sector. There have also been cases with the IMF providing technical assistance to RFAs; in the context of the Arab Debt Market Development Initiative for example, launched in 2009, to strengthen the public and corporate debt market in AMF countries.

Another example is the participation of EU and FLAR delegates in IMF training programmes.

IMF-RFA *co-financing* is the most contentious issue. With different mandates, policies and procedures, co-operation in crisis times entails an intense coordination process and not all RFAs may be able or willing to take collaboration to this level. In a joint programme, the terms of the financial assistance programme (maturity, timing of programme reviews, charges, etc.) would need to be aligned as much as possible. Moreover, the conditionality applied by the two institutions needs to be consistent and would ideally be based on each institution's areas of comparative advantage. In cases where the RFA has its own surveillance capacity, overlaps between institutions' areas of expertise can give rise to coordination problems.

Given that collaboration between the IMF and the European RFAs is already well developed, this experience could be used as an input for developing operational guidance on IMF-RFA cooperation. While engagement between the IMF and the European institutions has been positive overall, is has been a learning-by-doing process and, as the IMF (2013b) itself recognises, will continue to be challenging, given the differences of view that arise from fundamentally different institutional mandates and priorities.

Collaboration between the IMF and the European financing arrangements has evolved over time from an ad-hoc, less structured engagement in the earlier cases, towards a more structured cooperation process, with programme negotiations based on the Troika framework, consisting of IMF, European Commission and ECB staff in the case of financing arrangements for euro area countries (IMF, 2013b). While conditionality is set jointly by the three institutions and disbursements are coordinated, borrowing countries enter into separate financing arrangements with the IMF and the ESM (or EFSF before it), each with their different terms (maturity, repayment schedule, charges, etc.). In cases of co-financing of non-euro area EU Member States, programme discussions are conducted on a trilateral basis between the national authorities, the EC, and the IMF. Burden-sharing has differed greatly between the various cases, with the IMF providing only 10 % of the financing for Cyprus, whereas the IMF was responsible for more than 60 % of the funds under the Hungarian and Romanian programmes.

Apart from the IMF's engagement with European institutions, co-lending between the IMF and RFAs has been much more limited. The other larger RFAs, the CMIM and CRA, have never been activated to date. In both cases, co-financing with the IMF is envisaged whenever access exceeds 30 % of a member's maximum access. It has often been argued (e.g. Kawai and Lombardi, 2012) that the IMF's involvement above that threshold – and the associated stigma concerns – is exactly the reason why these RFAs have never been activated to date. While financing from smaller RFAs has often occurred in parallel with drawings from the IMF, this has not always happened in the context of an actual co-financed programme.

Nevertheless, there are signs that cooperation between the IMF and other RFAs is strengthening too. In 2016 for example, the IMF and CMIM participated in a "test run" of a hypothetical co-financed IMF-CMIM programme. The test revealed some key differences between the Fund and CMIM with respect to policies and procedures that would need to be addressed in order to ensure efficient coordination in a real-life case (IMF, 2017b). Furthermore, representatives of AMRO, the ESM and FLAR met in October 2016 to discuss the role of RFAs in the GFSN and, more specifically, cooperation with the IMF. They agreed that there is great potential for further cooperation in the areas of economic surveillance, crisis management, research, capacity-building and technical assistance and decided to convene annually from then on[1]. The IMF Executive Board also decided, as part of a debate on IMF-RFA cooperation in July 2017, that the Fund should maintain a permanent dialogue with the RFAs.

Concluding remarks

This article has discussed recent evolutions in and the current state of the GFSN, i.e. the set of institutions and financing mechanisms aimed at preventing and resolving crises, which, ideally, should facilitate necessary adjustments and encourage sound policies at the country level and multilaterally. We have shown how the GFSN has grown significantly in size and, especially since the global financial crisis, in scope too. While international reserves remain the first and principal layer of the GFSN and the IMF still functions as an important final backstop, bilateral currency swaps between central banks and RFAs have gained in relative importance.

The multi-layered character of the GFSN can be seen as an asset rather than a source of fragmentation *per se*. Although there is ample room for more and better cooperation between the different layers, we believe full integration of the GFSN is neither feasible nor desirable. Different elements of the safety net have their own strengths and weaknesses and often serve distinct objectives and groups

(1) See http://www.flar.net/files/large/cb0bf656ae3258b.

of countries. Hence, they are not necessarily good substitutes but, more often, complements.

Self-insurance through international reserves enables quick and flexible access to liquidity, but comes at a relatively high cost to the holder and, on an aggregate level, may increase systemic risk for the world economy. Self-accumulated reserves are also less suited to deal with prolonged crises. Bilateral central bank swaps are a powerful instrument to make available large funds at short notice and bear limited financial and political costs for the beneficiary. However, swaps have been granted very selectively, above all to serve the domestic policy considerations of the providing central bank, and for narrowly defined purposes and short periods only. Their contractual nature makes future access to swaps highly uncertain for all but a few (reserve currency) countries. Although RFAs are very heterogeneous, they all engage in some sort of pooling of resources to lower the cost of crisis financing and, compared to the IMF, tend to have higher ownership and greater region-specific knowledge. On the downside, RFAs typically have less-developed surveillance and monitoring capacities than the IMF, are ill-suited to dealing with regional crises and, by definition, cater to members' needs only. Finally, the IMF is the only GFSN mechanism that engages in truly global risk-sharing. Its global mandate, near-universal membership and long-time experience with surveillance and programme conditionality imply that the IMF is well-placed to rein in moral hazard and encourage good and multilaterally consistent policies. At the same time, dissatisfaction with the IMF's handling of previous crises, its governance and conditional lending procedures has tainted the institution with stigma and is believed to have been an important force in the development of the other layers of the safety net.

This article has also reviewed a number of reforms that have been proposed to address the GFSN's remaining flaws. First, we have looked at the prospects for the SDR and multi-currency arrangements in moving towards a more balanced global reserve system. Arguably, only more ambitious reforms to SDR allocations and/or SDR exchange mechanisms can be expected to have a real impact on the state of global reserves. Such reforms might be worth pursuing, but more in-depth research on the feasibility of their implementation is needed. Predictions about the emergence of a truly multi-currency global reserve system are hard to make, but we expect the US dollar to continue its role as the world's prime reserve and safe haven currency over the near future. The euro is already an important runner-up to the US dollar in the IMS, and the renminbi may become one too, under the condition that the Chinese financial sector and capital account are further liberalised in due time.

Second, we have assessed proposals to improve coordination of bilateral central bank swaps. While it could be useful to establish a loose, mutually agreed common framework between central banks to facilitate the sharing of information and harmonisation of swap terms, we have major reservations about reforms that would bring together central bank swaps under the umbrella of the IMF, or any other multilateral organisation. In particular, the IMF cannot and should not try to replace or dictate the liquidity provided by reserve currency and other central banks, something which seems very difficult to reconcile with the latter's independence and domestic mandates.

A third area of reforms we have considered is the collaboration between the IMF and RFAs, the enhancement of which would allow for better use and leverage of the available resources, streamlining of conditionality, and the prevention of facility-shopping by prospective borrowers. A promising approach that goes beyond the G20's overly general guiding principles but still acknowledges RFA heterogeneity is that of structuring IMF-RFA collaboration along different models of engagement, ranging from information-sharing, over technical assistance and/or policy monitoring, to co-financing. The idea would be to let each RFA decide on the desired areas and degrees of cooperation with the IMF and then take this as a starting point to work out a more detailed bilateral agreement on the practical implementation of IMF-RFA collaboration.

On the whole, it seems that important steps have already been taken in making the GFSN more effective. Today's safety net is a much different and clearly improved version of the GFSN before the global financial crisis. Recent achievements should be no reason for complacency, however. Much more remains to be done to improve cooperation between the GFSN's different layers and fully exploit its current potential. We expect the reforms we have highlighted in this article and other proposals to be further discussed and researched in the years to come.

Bibliography

Aizenman J., Y. Jinjarak and D. Park (2011), "International reserves and swap lines: substitutes or complements?", *International Review of Economics and Finance* 20(1), 5-18.

Aizenman J. and J. Lee (2007), "International reserves: Precautionary versus mercantilist views, theory and evidence", *Open Economies Review* 18(2), 191-214.

Aizenman J. and G. K. Pasricha (2010), "Selective swap arrangements and the global financial crisis: Analysis and interpretation", *International Review of Economics and Finance* 19(3), 353-365.

Aizenman J. and Y. Sun (2012), "The financial crisis and sizable international reserves depletion: From 'fear of floating' to 'fear of losing international reserves'?", *International Review of Economics and Finance* 24, October, 250-269.

Andries A. M., A. M. Fischer and P. Yesin (2017), "The asymmetric effect of international swap lines on banks in emerging markets", *Journal of Banking and Finance* 75, February, 215-234.

Baba N. and F. Packer (2009), "Interpreting deviations from covered interest parity during the financial market turmoil of 2007-08", *Journal of Banking and Finance* 33(11), 1953-1962.

Bordo M. D., O. F. Humpage and A. J. Schwartz (2015), "The evolution of the Federal Reserve swap lines since 1962", *IMF Economic Review* 63(2), 353-372.

Bush O., K. Farrant and M. Wright (2011), *Reform of the international monetary and financial system*, Bank of England Financial Stability Paper 13.

Butzen P., M. Deroose and S. Ide (2014), "Global imbalances and gross capital flows", NBB, *Economic Review* September, 41-60.

Cheng G. (2016), *The global financial safety net through the prism of G20 summits*, ESM Working Paper Series 13.

Cheung Y.-W. and X. Qian (2009), "Hoarding of international reserves: Mrs Machlup's wardrobe and the Joneses", *Review of International Economics* 17(4), 824-843.

Chinn M. and J. Frankel (2008), "Why the euro will rival the dollar", *International Finance* 11(1), 49-73.

Denbee E., C. Jung and F. Paternò (2016), *Stitching together the global financial safety net*, Bank of England Financial Stability Paper 36.

Destais C. (2016), "Central bank currency swaps and the international monetary system", *Emerging Markets Finance and Trade* 52(10), 2253-2266.

Dominguez K. M. E., Y. Hashimoto and T. Ito (2012), "International reserves and the global financial crisis", *Journal of International Economics* 88(2), 388-406.

Dooley M. P., D. Folkerts-Landau and P. M. Garber (2004), "The revived Bretton Woods system", *International Journal of Finance and Economics* 9(4), 307-313.

Durdu C. B., E G. Mendoza and M. E. Terrones (2009), "Precautionary demand for foreign assets in sudden stop economies: An assessment of the new mercantilism", *Journal of Development Economics* 89(2), 194-209.

ECB (2016), "The layers of the global financial safety net: Taking stock", *Economic Bulletin* 2016(5), Article 1, 36-52.

ECB (2017), *The international role of the euro*, ECB, Report, July.

Eichengreen B. (2011), *Exorbitant privilege : The rise and fall of the dollar and the future of the international monetary system*, Oxford, Oxford University Press.

Eichengreen B. and D. Lombardi (2017), "RMBI or RMBR ? Is the renminbi destined to become a global or regional currency ?", *Asian Economic Papers* 16(1), 35-59.

Essers D. and S. Ide (2017), *The IMF and precautionary lending : an empirical evaluation of the selectivity and effectiveness of the flexible credit line*, National Bank of Belgium Working Paper Series 323, June.

Garcia-Herrero A. and Xia, L. (2015), "RMB bilateral swap agreements : How China chooses its partners ?", *Asia-Pacific Journal of Accounting and Economics* 22(4), 368-383.

Ghosh A. R., J. D. Ostry and C. G. Tsangarides (2017), "Shifting motives : Explaining the buildup in official reserves in emerging markets since the 1980s", *IMF Economic Review* 65(2), 308-364.

Goldberg L. S., C. Kennedy and J. Miu (2011), "Central bank dollar swap lines and overseas dollar funding costs", *FRBNY Economic Policy Review* 17(1), 3-20.

Henning R. (2015), *The global liquidity safety net : Institutional cooperation on precautionary facilities and central bank swaps*, CIGI New Thinking and the New G20 Paper Series 5, March.

IEO (2013), *The role of the IMF as trusted advisor*, Independent Evaluation Office, Evaluation Report.

IEO (2016), *The IMF and the crises in Greece, Ireland and Portugal : An evaluation by the Independent Evaluation Office*, July.

IMF (2009), *Balance of payments and international investment position manual*, Sixth edition (BPM6).

IMF (2011a), *Assessing reserve adequacy*, IMF Policy Paper, February.

IMF (2011b), *Enhancing international monetary stability – A role for the SDR ?*, IMF Policy Paper, January.

IMF (2013a), *Assessing reserve adequacy : Further considerations*, IMF Policy Paper, November.

IMF (2013b), *Stocktaking the Fund's engagement with regional financing arrangements*, IMF Policy Paper, April.

IMF (2015), *Review of the method of valuation of the SDR*, IMF Policy Paper, November.

IMF (2016a), *Adequacy of the global financial safety net*, IMF Policy Paper, March.

IMF (2016b), *Guidance note on the assessment of reserve adequacy and related considerations*, Staff Report, June.

IMF (2016c), *Strengthening the international monetary system – A stocktaking*, IMF Policy Paper, March.

IMF (2016d), *The role of the SDR – Initial considerations*, Staff Note for the G20, July.

IMF (2017a), *Assessing reserve adequacy template*. Available from :
http : //www.imf.org/external/datamapper/ARA/aradata.xlsx (Last updated : 18 April 2017).

IMF (2017b), *Collaboration between regional financing arrangements and the IMF*, IMF Policy Paper, July.

Ito T. (2012), "Can Asia overcome the IMF stigma ?", *American Economic review : Papers & Proceedings* 102(3), 198-202.

Jeanne O. and R. Rancière (2011), "The optimal level of international reserves for emerging market countries : A new formula and some applications", *Economic Journal* 121(555), 905-930.

Kawai M. (2009), *Reform of the international financial architecture : An Asian perspective*, Asian Development Bank Institute Working Paper Series 167.

Kawai M. and D. Lombardi (2012), "Financial regionalism", *Finance & Development* 49(3), 23-25.

Lane P. R. and G. M. Milesi-Ferretti (2017), *International financial integration in the aftermath of the global financial crisis*, IMF Working Paper 17/115.

Li C. (2015), *Banking on China through currency swap agreements*, Federal Reserve Bank of San Francisco Pacific Exchange blog, 23 October. Available from : http ://www.frbsf.org/banking/asia-program/pacific-exchange-blog/banking-on-china-renminbi-currency-swap-agreements.

Liao S. and D. McDowell (2015), "Redback rising : China's bilateral swap agreements and renminbi internationalization", *International Studies Quarterly* 59(3), 401-422.

Liao S. and D. McDowell (2016), "No reservations : International order and demand for the renminbi as a reserve currency", *International Studies Quarterly* 60(2), 272-293.

McCauley R. N. and C. R. Schenk (2015), "Reforming the international monetary system in the 1970s and 2000s : Would a special drawing right substitution account have worked ?", *International Finance* 18(2), 187-206.

McDowell D. (2012), "The US as 'sovereign international last-resort lender' : The Fed's currency swap programme during the Great Panic of 2007-09", *New Political Economy* 17(2), 157-178.

McDowell D. (2017a), *Brother, can you spare a billion ? The United States, the IMF, and the international lender of the last resort*, New York, Oxford University Press.

McDowell D. (2017b), "Emergent international liquidity agreements : Central bank cooperation after the global financial crisis", *Journal of International Relations and Development*, forthcoming.

McGuire P. and G. von Peter (2009), "The US dollar shortage in global banking", *BIS Quarterly Review*, March, 47-63.

McKay J., U. Volz and R. Wölfinger (2011), "Regional financing arrangements and the stability of the international monetary system", *Journal of Globalization and Development* 2(1), Article 5.

Moessner R. and W. A. Allen (2012), "International liquidity provision and currency-specific liquidity shortages", *Journal of Financial Transformation* 34, 31-41.

Obstfeld M., J. C. Shambaugh and A. M. Taylor (2009), "Financial instability, reserves, and central bank swap lines in the panic of 2008", *American Economic Review : Papers & Proceedings* 99(2), 480-486.

Obstfeld M. and K. Rogoff (2010), "Global imbalances and the financial crisis : Products of common causes", *Asia Economic Policy Conference Volume : Asia and the global financial crisis*, San Francisco, Federal Reserve Bank of San Francisco, 131-172.

Obstfeld M. (2014), "International monetary system : Living with asymmetry", In : Feenstra, R. C. and A. M. Taylor (Eds.), *Globalization in an age of crisis : Multilateral economic cooperation in the twenty-first century*, Chicago, University of Chicago Press, 301-336.

Ocampo J. A. (2010), "Building an SDR-based global reserve system", *Journal of Globalization and Development* 1(2), Article 14.

Ocampo J. A. (2015), *Reforming the global monetary non-system*, WIDER Working Paper 2015/146, Helsinki, UNU-WIDER.

Pisani-Ferry J., A. Sapir and G. B. Wolff (2013), *EU-IMF assistance to euro-area countries: An early assessment*, Bruegel Blueprint Series, Vol. XIX.

Prasad E. S. (2014), *The dollar trap: How the U.S. dollar tightened its grip on global finance*, Princeton, Princeton University Press.

Prasad E. S. (2017), *Gaining currency: The rise of the renminbi*, New York, Oxford University Press.

Portes R. (2009), "Global imbalances", In: Dewatripont M., X. Freixas and R. Portes (Eds.), *Macroeconomic stability and financial regulation: Key issues for the G20*, London, CEPR, 19-26.

Reichmann T. and C. de Resende (2014), *The IMF's lending toolkit and the global financial crisis*, IEO Background Paper 14/11, October.

Rodrik D. (2006), "The social cost of foreign exchange reserves", *International Economic Journal* 20(3), 253-266.

Rose A. K. and M. M. Spiegel (2012), "Dollar illiquidity and central bank swap arrangements during the global financial crisis", *Journal of International Economics* 88(2), 326-340.

Scheubel B. and L. Stracca, (2016), *What do we know about the global financial safety net? Rationale, data and possible evolution*, ECB Occasional Paper Series 177, September.

Steiner A. (2014), "Reserve accumulation and financial crises: From individual protection to systemic risk", *European Economic Review* 70, August, 126-144.

Subramanian A. (2011), *Eclipse: Living in the shadow of China's economic dominance*, Washington, DC, Peterson Institute of International Economics.

Triffin R. (1960), *Gold and the dollar crisis: The future of convertibility*, New Haven, Yale University Press.

Truman E. M. (2011), *Three evolutionary proposals for reform of the international monetary system*, Extension of prepared remarks delivered at the Bank of Italy's Conference in Memory of Tommaso Padoa-Schioppa, 16 December. Available from: https://piie.com/sites/default/files/publications/papers/truman12162011.PDF.

Truman E. M. (2013), *Enhancing the global financial safety net through central bank cooperation*, VoxEU.org, 10 September. Available from: http://voxeu.org/article/enhancing-global-financial-safety-net-through-central-bank-cooperation.

van Doorn R., V. Suri and S. Gooptu (2010), *Do middle-income countries continue to have the ability to deal with the global financial crisis?*, World Bank Policy Research Working Paper 5381.

Villard Duran C. (2015), *The international lender of last resort for emerging countries: A bilateral currency swap?*, University of Oxford Global Economic Governance Working Paper 108.

Weder di Mauro B. and J. Zettelmeyer (2017), *The new global financial safety net: Struggling for coherent governance in a multipolar system*, CIGI Essays on International Finance, Vol. 4, January.

Wildau G. (2017), *China forex reserves dip under $ 3tn to touch 5-year low*, Financial Times, 7 February. Available from: https://www.ft.com/content/39b97f86-ed18-11e6-930f-061b01e23655.

Williamson J. (2010), "The future of the reserve system", *Journal of Globalization and Development* 1(2), Article 15.

Wyplosz C. (2007), *The fuss about foreign exchange reserves accumulation*, VoxEU.org, 28 May. Available from : http : //voxeu.org/article/forex-reserves-weapons-or-insurance.

Yang J. and L. Han (2013), "Optimal size of currency swap between central banks : evidence from China", *Applied Economics Letters* 20(3), 203-207.

Zhou X. (2009), *Reform the international monetary system*, Speech, 23 March. Available from : http : //www.bis.org/review/r090402c.pdf.

Websites

AMF website : http : //www.amf.org.ae.

AMRO website : http : //www.amro-asia.org.

EFSD website : http : //efsd.eabr.org.

ESM website : http : //www.esm.europa.eu.

European Commission website : http : //ec.europa.eu.

FLAR website : http : //www.flar.net.

IMF website : http : //www.imf.org.

Treaty for the Establishment of a BRICS CRA : http: //www.brics.utoronto.ca/docs/140715-treaty.html.

Abstracts from the Working Papers series

321. Economic importance of the Belgian ports : Flemish maritime ports, Liège port complex and the port of Brussels – Report 2015, by C. Mathys, June 2017

The paper provides an extensive overview of the economic importance and development of the Flemish maritime ports, the Liège port complex and the port of Brussels for the period 2010 - 2015, with emphasis on 2015. Focusing on the three major variables of value added, employment and investment, the report also provides some information based on the social balance sheet and an overview of the financial situation in these ports as a whole. These observations are linked to a more general context, along with a few cargo statistics.

In 2015, the growth of shipping traffic in the Flemish maritime ports was due to developments in the port of Antwerp and the port of Ghent. Direct value added increased in all Flemish maritime ports in 2015. However, direct employment is continuing to decline. Investment was down everywhere except in the port of Zeebrugge. Cargo traffic in the Liège port complex declined in 2015, whereas it slowed down only slightly in the port of Brussels. At the same time, direct value added in Liège shrank while it rose sharply in the port of Brussels. By contrast, direct employment was down in both ports.

322. Foreign banks as shock absorbers in the financial crisis ?, by G. Barboni, June 2017

The paper finds that foreign banks can act as a buffer against negative credit supply shocks, in contexts where thedomestic credit market is heavily hit by a country-specific adverse shock. A new dataset is constructed, which combines Belgian Credit Register data with firms' and banks' balance sheets. After 2008, Belgian firms borrowing from domestic banks experienced a stronger credit contraction (minus 1.8 percentage points) than firms borrowing from foreign banks. Also, foreign banks "cherry-picked" new relationships with more profitable firms to a higher extent during the crisis, and turned down existing relationships more frequently than domestic banks. Results suggest that foreign banks can mitigate negative financial shocks in countries where domestic financial intermediaries unexpectedly suffered the consequences of the financial crisis to a higher extent.

323. The IMF and precautionary lending : An empirical evaluation of the selectivity and effectiveness of the flexible credit line, by D. Essers, S. Ide, June 2017

The paper provides an empirical evaluation of the Flexible Credit Line (FCL), the IMF's prime precautionary lending instrument since 2009 to which so far only three emerging market economies have subscribed : Mexico, Colombia and Poland. The authors consider both questions of selectivity and effectiveness : first, which factors explain the three FCL countries' participation in such arrangements ? And second, to what extent have the FCL arrangements delivered on their promise of boosting market confidence in their respective users ? Based on a probit analysis, they show that FCL selectivity can be explained by both demand- and supply-side factors. The probability of participation in the FCL was

greater in countries that experienced larger exchange market pressures prior to the creation of the instrument, that had lower bond spreads and inflation, that accounted for higher shares in US exports, and that exhibited a higher propensity of making political concessions to the US. Their estimation of the effects of the FCL uses the "synthetic control" methodology, a novel counterfactual approach. They find evidence for some but not spectacular beneficial effects on sovereign bond spreads and gross capital inflows in FCL countries. Overall, their results suggest that any economic stigma eligible countries still attach to entry into an FCL arrangement is unwarranted. Conversely, the apparent link of FCL participation with US interests may not be conducive to overcoming political stigma.

324. Economic importance of air transport and airport activities in Belgium – Report 2015, by S. Vennix, July 2017

The study assesses the economic importance of air transport and airport activities in Belgium in terms of value added, employment and investment over the 2013-2015 period. In 2015, air transport and airport activities generated € 6 billion in direct and indirect value added (i.e. 1.5 % of Belgian GDP) and employed around 62 500 people in full-time equivalents (FTEs) either directly or indirectly (1.5 % of domestic employment including the self-employed).

Brussels and Liège Airport remain the country's biggest airports, respectively in terms of passenger and cargo traffic. In he aftermath of the terrorist attacks in March 2016, the regional airports received part of Brussels' passenger traffic. All in all, Brussels recovered fairly quickly, especially freight traffic, but also passenger traffic resumed gradually to tie in with growth again since November 2016. Brussels and Liège were the fastest growing airports during the 2013-2015 period, respectively in terms of value added and employment. At Ostend Airport, these economic variables slumped in line with the trend in freight traffic volumes. Antwerp's growth rates went into the red as well, mainly under the influence of the difficulties faced by VLM Airlines. At Charleroi and Liège, the value added trend is downward, while that is not the case for employment. The smallest changes are recorded in Kortrijk.

325. Economic importance of the logistics sector in Belgium, by H. De Doncker, July 2017

The paper assesses the economic importance of the logistics sector in Belgium for the period 2010-2015 on the basis of data from the annual accounts submitted to the NBB's Central Balance Sheet Office.

In 2015, the logistics sector directly generated € 11.9 billion in value added and employed 134 000 full-time equivalents contributing 2.9 % of GDP and 3.3 % of domestic employment (expressed in full-time equivalents). The total economic importance of the logistics sector – i.e. including the indirect effects generated by the sector – came to 4.6 % of GDP and 5.4 % of domestic employment. If the definition of the sector is extended to include logistics activities outside the defined sector, the estimates for both percentages increase by more than half, to roughly 7.6 % of GDP and 8.0 % of domestic employment.

The analysis of the sector's economic importance is supplemented by an analysis from the social and financial point of view, presenting the findings relating to the social balance sheet, financial ratios, the NBB's financial health indicator, and credit risk based on the NBB's In-house Credit Assessment System.

326. Identifying the provisioning policies of Belgian banks, by E. Arbak, August 2017

Loan loss reserves make up an essential part of a bank's soundness and more generally its viability. An under-provisioned reserve account implies that capital ratios may overstate a bank's ability to absorb future losses. For this reason, both supervisory authorities and investors regularly assess the adequacy of the loan loss provisions alongside the more popular capital ratios. The aim of the paper is to identify what motivates the loss provisioning policies employed by Belgian banks, especially whether banks use provisioning to inter-temporally smooth their earnings or capital positions. Owing to the relatively long data series, the paper also investigates whether the introduction of the IAS 39 "incurred loss" accounting standard or the onset of the financial crisis in 2008/9 had any impact on the provisioning decisions. The results show that provisioning practices of Belgian banks have been rather tightly linked to future losses, although the relationship

weakened considerably after the introduction of the IAS 39 standard and, to a lesser extent, after the financial crisis. There is also evidence that Belgian banks might have used provisioning decisions to manage their current earnings and to some extent to signal future profitability, although the latter motive also appears to have weakened after the introduction of the IAS 39 standard.

327. The impact of the mortgage interest and capital deduction scheme on the Belgian mortgage market, by A. Hoebeeck, K. Inghelbrecht, September 2017

In 2005, mortgage interest, capital deductions and insurance premiums (MICPD) were assembled into one single tax deduction package to further stimulate home ownership in Belgium. Former research has shown that the MICPD did not raise the probability of becoming a home owner, due to its capitalisation into higher house prices. The objective of the paper is to investigate how the transmission of the capitalisation takes place. The analysis is based on data extracted from the Household Finance and Consumption Survey. The mortgage amount, the mortgage maturity, the interest rate and the house price are estimated simultaneously using a 3-SLS approach. The results suggest that the mortgage deduction does not result in more affordable housing by shortening the mortgage maturity. Most likely, the mortgage deduction results in larger amounts being borrowed, which in turn may indirectly push up house prices, the mortgage maturity and the interest rate as well. Although the estimation sample is rather small, these results suggest that the MICPD might be more beneficial for sellers and mortgage-granting institutions than for home owners.

Conventional signs

AUD	Australian dollar
CAD	Canadian dollar
CHF	Swiss franc
EUR	Euro
JPY	Japanese yen
GBP	British pound
RMB	Renminbi
USD	United States dollar
%	per cent
°C	degree Celcius
e.g.	*exempli gratia* (for example)
etc.	*et cetera*
f.i.	for instance
i.e.	*id est* (that is)
p.m.	*pro memoria*

List of abbreviations

Countries or regions

BE	Belgium
DE	Germany
IE	Ireland
EL	Greece
ES	Spain
FR	France
IT	Italy
LU	Luxembourg
NL	Netherlands
AT	Austria
PT	Portugal
FI	Finland
EA	Euro area
BG	Bulgaria
CZ	Czech Republic
DK-DNK	Denmark
HR	Croatia
HU-HUN	Hungary
LT	Lithuania
LVA	Latvia
PL-POL	Poland
RO	Romania
SE-SWE	Sweden
UK-GBR	United Kingdom
EU	European Union
AE-ARE	United Arab Emirates
AR-ARG	Argentina
ARM	Armenia
AUS	Australia
BLR	Belarus
BR-BRA	Brazil
BRN	Brunei

BTN	Bhutan
CA-CAN	Canada
CHE	Switzerland
CL-CHL	Chile
CN-CHN	China
CO	Colombia
EGY	Egypt
HKG	Hong Kong
ID-IDN	Indonesia
IN-IND	India
ISL	Iceland
JP-JPN	Japan
KHM	Cambodia
KAZ	Kazakhstan
KR-KOR	South Korea
LAO	Laos
LKA	Sri Lanka
MAR	Morocco
MMR	Myanmar
MNG	Mongolia
MX-MEX	Mexico
MY-MYS	Malaysia
PE	Peru
NZL	New Zealand
NOR	Norway
NPL	Nepal
PAK	Pakistan
PH-PHL	Philippines
QAT	Qatar
RU-RUS	Russia
SGP	Singapore
SRB	Serbia
SUR	Suriname
TH-THA	Thailand
TJK	Tajikistan
TR-TUR	Turkey
UA-UKR	Ukraine
US-USA	United States
UY	Uruguay
VNM	Vietnam
ZA-ZAF	South Africa

Other abbreviations

ABS	Asset-backed securities
AMECO	Annual macro-economic database of the European Commission
AMF	Arab Monetary Fund
AMRO	ASEAN+3 Macroeconomic Research Office
ARM	Adjustable-rate mortgage
ASEAN(+3)	Association of Southeast Asian Nations (plus China, Japan and South Korea)
BEAMA	Belgian Asset Managers Association
BIS	Bank for International Settlements

BRICS	Brazil, Russia, India, China, South Africa
CBI	Climate Bonds Initiative
CCyB	Countercyclical capital buffer
CMI(M)	Chiang Mai Initiative (Multilateralisation)
CO_2	Carbon dioxide
COFER	Currency Composition of Foreign Exchange Reserves
COP21	21th Conference of the Parties (Paris Climate Conference in 2015)
CRA	Contingent Reserve Arrangement
DGS	Directorate General Statistics
DNB	De Nederlandsche Bank
EC	European Commission
ECB	European Central Bank
ECU	European currency unit
EDF	Électricité de France
EFSD	Eurasian Fund for Stabilisation and Development
EIB	European Investment Bank
EME	Emerging Market Economies
ESG	Environmental, Social and Governance Criteria
ESM	European Stability Mechanism
ESRB	European Systemic Risk Board
ETS	Emissions Trading System
EU BoP	EU Balance of Payments Assistance Facility
EWN	External Wealth of Nations Mark II
FCL	Flexible Credit Line
FEBEG	Fédération Belge des Entreprises Electriques et Gazières (Belgian federation of electricity and gas companies)
Febelfin	Belgian Financial Sector Federation
FED	Federal Reserve of the United States
FLAR	Latin American Reserve Fund
FOMC	Federal Open Market Committee
FPB	Federal Planning Bureau
FSB	Financial Stability Board
GAB	General Arrangements to Borrow
GB	Green Bond
GBP	Green Bond Principles
GDP	Gross domestic product
GFSN	Global financial safety net
GSIA	Global Sustainable Investment Alliance
GVC	Global value chains
G20	Group of Twenty
HP	Hodrick-Prescott
HSBC	Hongkong and Shanghai Banking Corporation Limited
ICMA	International Capital Market Association
ICT	Information and communications technology
IEA	International Energy Agency
IEO	Independent Evaluation Office
IFC	International Finance Corporation

IFS	International Financial Statistics
IMF	International Monetary Fund
IMFC	International Monetary and Financial Committee
IMS	International monetary system
IORP	New Directive on Institutions for Occupational Retirement Provision
IRENA	International Renewable Energy Agency
ISR	Investissement Socialement Responsable (Socially Responsible Investing)
ITER	International Thermonuclear Experimental Reactor
LFS	Labour force survey
LIBOR	London Interbank Offered Rate
MIP	Macroeconomic imbalance procedure
MSCI	Morgan Stanley Capital International
Mtoe	Million Tonnes of Oil Equivalent
MTOs	Medium-Term Budgetary Objectives
NAB	New Arrangements to Borrow
NACE	Nomenclature of economic activities in the European Community
NAFA	North American Framework Agreement
NAFTA	North American Free Trade Agreement
NAI	National Accounts Institute
NAIRU	Non-accelerating inflation rate of unemployment
NAWRU	Non-accelerating wage rate of unemployment
NBB	National Bank of Belgium
NBER	National Bureau of Economic Research
OECD	Organisation for Economic Cooperation and Development
OIS	Overnight index swap
OPEC	Organisation of the Petroleum Exporting Countries
PCL	Precautionary Credit Line
PCT	Patent Cooperation Treaty
PISA	Programme for International Student Assessment
PLL	Precautionary and Liquidity Line
r	Real interest rate
r*	Real natural (or equilibrium) interest rate
R&D	Research and Development
RFA	Regional financing arrangement
SBA	Stand-by Arrangement
SBBS	Sovereign bond-backed securities
SDR	Special Drawing Right
UCI	Undertaking for Collective Investment
TAF	Term Auction Facility
TFCD	Task Force on Climate-related Financial Disclosures
TFP	Total factor productivity
TV-VAR	Time-varying parameter vector autoregression
VAT	Value added tax

WAO	Wet op de arbeidsongeschiktheidsverzekering
WEO	World Economic Outlook
WIA	Wet Werk en Inkomen naar Arbeidsvermogen
WIV-ISP	Scientific Institute of Public Health

National Bank of Belgium
Limited liability company
RLP Brussels – Company number: 0203.201.340
Registered office: boulevard de Berlaimont 14 – BE-1000 Brussels
www.nbb.be

Publisher

Jan Smets
Governor

National Bank of Belgium
Boulevard de Berlaimont 14 – BE-1000 Brussels

Contact for the publication

Pierre Crevits
Head of General Secretariat and Communication

Tel. +32 2 221 30 29
pierre.crevits@nbb.be

Cover and layout: NBB AG – Prepress & Image

Published in October 2017