



EUROPEAN CENTRAL BANK

EUROSYSTEM

**ECB FORUM**   
**ON CENTRAL BANKING**  
17-19 June 2019 · Sintra Portugal

# 20 years of European Economic and Monetary Union

Conference proceedings



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Monday, 17 June 2019

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18:00 **Opening reception and dinner**

Opening remarks

**Mario Draghi**, President, European Central Bank

Dinner hosted by the Executive Board of the European Central Bank

**Dinner speech**

**Olivier Blanchard**, Senior Fellow, Peterson Institute for International Economics

Tuesday, 18 June 2019

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9:00 **Introductory speech**

**Mario Draghi**, President, European Central Bank

9:30 **Session 1: The first 20 years of EMU**

Chair: **Luis De Guindos**, Vice-President, European Central Bank

**Paper 1: Real convergence in the EMU**

**Jean Imbs**, Professor, Paris School of Economics and New York University, Abu Dhabi (with **Laurent Pauwels**, Senior Lecturer, University of Sydney)

Discussant: **Şebnem Kalemli-Özcan**, Professor, University of Maryland

10:30 **Coffee break and young economists' poster session**

11:00 **Presentation: The single monetary policy: 20 years of experience**

**Peter Praet**, Former Member of the Executive Board, European Central Bank

11:30 **Panel: The first 20 years of EMU**

Chair: **Philip R. Lane**, Member of the Executive Board, European Central Bank

**Laurence Boone**, Chief Economist, Organisation for Economic Co-operation and Development

**Markus Brunnermeier**, Professor, Princeton University

**Peter Praet**, Member of the Executive Board, European Central Bank

**Ricardo Reis**, Professor, London School of Economics

13:00 **Lunch**

15:00 **Policy panel**

Moderator: **Claire Jones**, Frankfurt Bureau Chief, Financial Times

**Mark Carney**, Governor, Bank of England

**Mario Draghi**, President, European Central Bank

**Stanley Fischer**, Former Vice Chair, Board of Governors of the Federal Reserve System

Group photo

18:30 **Reception and dinner**

Wednesday, 19 June 2019

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9:30 **Speech**

**Jean-Claude Juncker**, President, European Commission

10:00 **Session 2: The future of EMU**

Chair: **Sabine Lautenschläger**, Member of the Executive Board, European Central Bank

**Paper 2: Superstar firms and spatial agglomeration: An exploration of effects in Europe**

**Laura Alfaro**, Professor, Harvard University

(with **Maggie X. Chen**, Professor, George Washington University; Harald Fadinger, Professor, University of Mannheim)

Discussant: **Gianmarco Ottaviano**, Professor, Bocconi University

11:00 **Coffee break and young economists' poster session**

11:30 **Paper 3: Demographic changes, migration and economic growth in the euro area**

**Axel Börsch-Supan**, Director, Munich Center for the Economics of Aging at the Max Planck Institute for Social Law and Social Policy

(with **Duarte Nuno Leite** and **Johannes Rausch**, Munich Center for the Economics of Aging at the Max Planck Institute for Social Law and Social Policy).

Discussant: **Anna Maria Mayda**, Associate Professor, Georgetown University

12:30 **Lunch**

13:30 **Panel: The future of EMU**

Chair: **Benoît Cœuré**, Member of the Executive Board, European Central Bank

**Marcel Fratzscher**, President, German Institute for Economic Research (DIW)

**Gita Gopinath**, Economic Counsellor and Director of the Research Department, International Monetary Fund

**Martin Hellwig**, Director (em.), Max Planck Institute for Research on Collective Goods

**Hélène Rey**, Lord Bagri Professor of Economics, London Business School

**Award ceremony – young economists' competition**

**Closing remarks**

15:00 **Mario Draghi**, President, European Central Bank

19:30 **Reception and dinner**

# 20 Years of European Economic and Monetary Union: takeaways from the ECB's Sintra Forum

By Philipp Hartmann and Glenn Schepens<sup>1</sup>

## Abstract

On the occasion of the 20<sup>th</sup> anniversary of the euro, the experiences with EMU so far and crucial factors for its success going forward were at the core of the European Central Bank's 2019 Sintra Forum on Central Banking. In this article two of the organisers highlight some of the main points from the discussions, including the diverse progress with economic convergence and how it may relate to the geographic agglomeration of industries, the role of fiscal policies relative to monetary policy for macroeconomic stabilisation in the still incomplete monetary union, selected key determinants of future growth in the euro area (such as demographic forces), and the increasing importance of internationalising the euro.

## 1 Introduction

January 2019 marked the 20th anniversary of the euro. Therefore, policy makers, academics and market economists at the ECB's 2019 Sintra Forum looked back at the founding ideas of EMU, debated the experiences gained over two decades, and discussed key factors and policies that will determine EMU's success in the future. In this chapter we summarise some of the main issues debated and group them in four themes: different perspectives on the experience with convergence among euro area countries, the evolution and roles of macroeconomic stabilisation policies and how they may be supported by completing EMU, the implications of demographic changes for growth and inflation, and the international role of the euro. The papers, presentations and video recordings of all sessions can be found at the [ECB website](#).<sup>2</sup>

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<sup>1</sup> Both European Central Bank. We are grateful to Luis de Guindos, Benoît Coeuré and Philip Lane for comments. All views expressed are summarised to the best of the authors' understanding from the various Sintra participants' Forum contributions and should not be interpreted as the views of the ECB or the Eurosystem. Any errors are our own.

<sup>2</sup> A shorter version of this chapter is available on [VoxEU](#).

## 2 Convergence, agglomeration and growth in the euro area

A widely debated issue relating to the proper functioning of currency unions in general and EMU in particular is the degree of economic convergence among its member countries. For example, the literature on optimum currency areas (see Mongelli 2002 or Dellas and Tavlas 2009 for surveys) highlights the fact that asymmetric shocks make macroeconomic adjustment challenging when monetary policy is unified and can smooth business cycles only at the area-wide level. Building on the growth and economic development literature (see e.g. Barro and Sala-i-Martin 1992 and, for a survey, de la Fuente 1997), convergence of per-capita GDP towards high levels is tantamount to spread the benefits of a monetary union evenly.

Jean Imbs (in Imbs and Pauwels 2019) adopted the conjectural perspective, which is particularly relevant for monetary policy. Over the first 20 years he finds significant sigma-convergence – i.e. cross-country synchronisation treating upturns and downturns equally – in GDP (see also Draghi 2019) and, in particular after 2013, consumption growth between the twelve early EMU member countries. A major contribution of the paper – based on a novel analysis of supply chains as captured in input-output tables – is that the overall “export intensity” of euro area countries is as important as, or even more important than, direct trade in explaining the observed convergence in GDP growth (Table 1, first two rows). “Export intensity” measures the proportion of value chains that is directed towards exports. The measure in the first row of Table 1 ( $BII_{ij,t}^{r,s}$ ) focuses on upstream sectors that provide inputs to export-oriented sectors in the same country but do not trade much across borders themselves (and on cross-border trade of intermediate goods). For example, services – such as transportation, hotels or business services – play an important role in these input sectors. Therefore, euro area real GDP synchronisation reflects a deep form of integration that is not observed in other regions of the world without a monetary union.



**Table 1**

Determinants of real GDP growth synchronisation (sigma-convergence) among euro area countries

	(1)	(2)	(3)	(4)	(5)	(6)
$BII_{ijt}^{rs}$	4.15*** (0.11)	4.08*** (0.11)	2.10*** (0.11)	2.15*** (0.10)	2.32*** (0.11)	2.18*** (0.12)
$Trade_{ijt}^{rs}$		3.81*** (0.74)	3.32*** (0.72)	2.53*** (0.26)	4.15*** (0.31)	3.82*** (0.31)
Country-Pair-Sector Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Effects			Yes			
Year-Country-Sector Effects				Yes		
Year-Country Effects					Yes	
Year-Country-Pair Effects						Yes
N	325,600	325,600	325,600	325,600	325,600	325,600
$R^2$	0.0089	0.0091	0.054	0.33	0.013	0.03

Notes: The table shows the estimation results of different specifications of the following equation:  $q_{ijt}^{rs} = \alpha_{ij}^{rs} + \beta BII_{ijt}^{rs} + \gamma Trade_{ijt}^{rs} + \eta_{ijt}^{rs}$ . The sample period is 2000-2014.  $q_{ijt}^{rs}$  is a quasi-correlation coefficient capturing the synchronisation of GDP growth between sector  $r$  in country  $i$  and sector  $s$  in country  $j$ .  $BII_{ijt}^{rs}$  is a bilateral index of export intensity, excluding final goods trade. It measures in a symmetric way the degree to which intermediate goods of sectors  $r$  and  $s$  in countries  $i$  and  $j$  serve as inputs to each other or to sectors that trade directly between  $i$  and  $j$ .  $Trade_{ijt}^{rs}$  captures the direct exports between countries and sectors.  $\alpha_{ij}^{rs}$  represents the set of fixed effects listed in the left column of the table and  $\eta_{ijt}^{rs}$  is the error term.

Source: Reproduced from Imbs and Pauwels (2019), Table 9.

Sebnem Kalemli-Özcan (2019) added in her Sintra discussion the structural perspective on GDP per-capita levels, the so-called beta-convergence that focuses on countries catching up and moving from low to high levels. It recently received a lot of attention, because many of the newer Member States that joined the euro after 2007 exhibit significant convergence towards the euro area average, whereas some initial member countries from southern Europe exhibit protracted diverging tendencies (e.g. Sondermann et al. 2019, Chart 2). Diaz del Hoyo et al. (2017) argue that the main reason for the lack of convergence in the latter countries is a gradual reduction in total factor productivity growth, which began long before they introduced the euro.

As the different trends in different groups of countries offset each other, Kalemli-Özcan finds neither catch-up nor divergence in real per-capita GDP levels across euro area countries once she controls for standard growth determinants such as demographic variables or education. Interestingly, however, the picture changes when countries are broken down in regions. Running the same regressions at the regional level she finds clear evidence that – on average – poorer regions in the euro area catch up with richer regions (Table 2). One caveat remains, however, as a Bruegel paper that was presented to the April 2019 ECOFIN meeting emphasises: regional convergence is quite uneven, with many regions in France, Greece, Italy, Portugal and Spain underperforming (see Demertzis et al. 2019, Figure 4).

**Table 2**

Catch-up (beta-convergence) of euro area regions with low real per-capita GDP levels

	(1)	(2)	(3)	(4)	(5)
	2000-2014		2000-2007		2007-2014
$\beta$	0.0057** (0.0025)	-0.0080*** (0.0030)	-0.0096*** (0.0025)	-0.0087*** (0.0031)	-0.0096*** (0.0034)
<b>Controls</b>	Yes		Yes	Yes	Yes
<b>Export intensity</b>		Yes			
<b>Country Effects</b>			Yes	Yes	Yes
<b>N</b>	113	113	113	108	124
<b>R-squared</b>	0.239	0.372	0.789	0.646	0.883

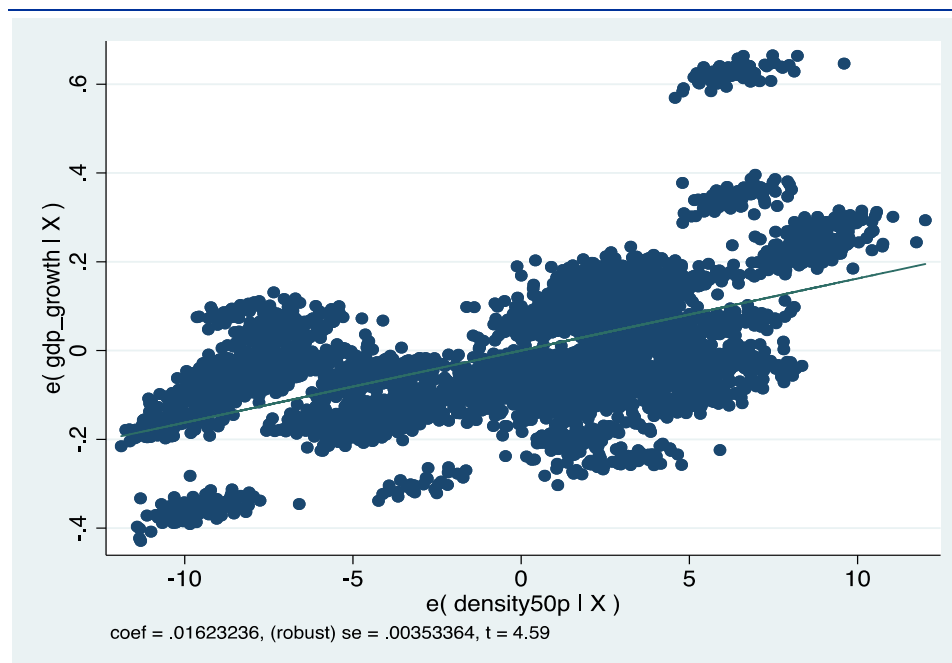
Notes: The table shows the estimation results of different specifications of the following equation for regional beta-convergence and for different periods:  $\frac{1}{T} \log \left( \frac{y_{it}}{y_{it-T}} \right) = a - [\log(y_{it-T})] \left[ \frac{1-e^{\beta T}}{T} \right] + \gamma X$ .  $y_{it}$  is real per-capita GDP in region  $i$  at time  $t$  and  $X$  represents a group of country-level control variables (1/life expectancy (years), log of fertility rate (%), and the share of the population with more than a secondary education (%)), which may be extended by export intensity – taken from Imbs and Pauwels (2019) – or country fixed effects.

Source: Reproduced from Kalemli-Özcan (2019), Table 1.

Looking forward, one important factor influencing future (regional) economic convergence and growth in the euro area is how industrial structures agglomerate geographically. Think, for example, of Silicon Valley in the United States and the start-up and “superstar firms” that determine its productive potential. In joint work with Maggie Chen and Harald Fadinger, Laura Alfaro applied a new continuous index of agglomeration (that measures agglomeration as distinct from market concentration) to a huge plant-level data set (Alfaro et al. 2019). Looking at the manufacturing sector in 2004, they find a hub-and-spoke structure in the geographic distribution of plants, with larger, more productive plants (which are often parts of multinational companies) being the centre towards which other plants gravitate. Importantly, Chart 1 suggests that, in euro area regions, greater manufacturing agglomeration in 2004 was associated with higher average real GDP growth between 2005 and 2017. Quantitatively, an approximately 50% increase in the probability that plants are within 50 km of each other is associated with an increase of the average annual regional growth rate from 1.1 to 1.5 percent (although causality cannot be claimed).

**Chart 1**

Average real regional GDP growth rates (2005-2017) and industrial agglomeration (2004) in the euro area



Notes: The vertical axis shows the average annual real GDP growth rate for the euro area NUTS2 regions between 2005 and 2017. The horizontal axis shows an industry-region level agglomeration index. The agglomeration index for plant  $i$  captures the relative probability that other plants (from the same industry) agglomerate around plant  $i$  (within a certain distance, in this case 50 km) rather than around other plants in the same country and industry. This plant-level index is then averaged at the industry-region level. A higher agglomeration index implies more agglomeration. The grey line shows the expected (conditional) regional growth for different levels of industry-region agglomeration, based on the following estimation:  $growth_r = \beta * density_{k,r} + \gamma'X_r + \delta_k + \varepsilon_{k,r}$  where  $r$  denotes regions and  $k$  industry sectors,  $density_{k,r}$  is the industry-region level agglomeration index,  $X_r$  represents a group of regional control variables (the level of per-capita GDP, population density, the fraction of the population with more than a secondary education and R&D expenditures, all measured in 2004) and  $\delta_k$  is an industry fixed effect. Source: Reproduced from Alfaro, Chen and Fadinger (2019), Chart 3.

While the discussant, Gianmarco Ottaviano (2019), endorsed the efficiency and growth effects of such agglomeration, he highlighted two related side effects. First, increasingly de-industrialised (“peripheral”) regions are being left behind, with unemployment and declining living standards. Second, voters in the most negatively affected regions turn to populist and right-wing parties that question the current economic and political system. For example, Colantone and Stanig (2018a,b) show causality in this regard for the UK Brexit vote and elections in western European countries, respectively. Overall, these facts are consistent with both Baldwin’s (2016) Great Convergence at the global level (some major emerging market economies catching up with the leading advanced countries) and Moretti’s (2012) Great Divergence at the regional level.

### 3 Macroeconomic stabilisation policy and the completion of EMU

Given the degree of convergence achieved in the euro area, the next question is the suitability of area-wide and national macroeconomic stabilisation policies. Many speakers mentioned the overall success of the ECB’s monetary policy during its first

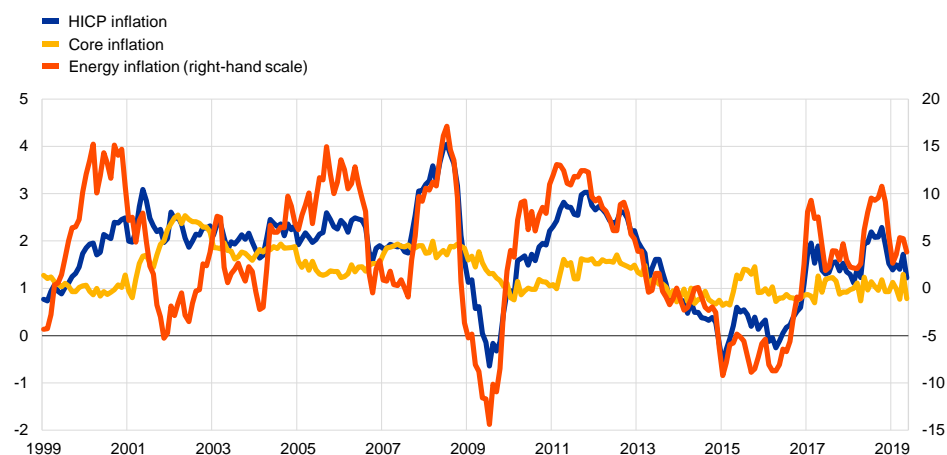
20 years (in line with research by Hartmann and Smets 2018), which provided a stable inflation anchor (e.g. Brunnermeier 2019 or Reis 2019) and showed the ECB's ability to act even in difficult circumstances and be innovative when necessary (e.g. Boone 2019 or Praet 2019), including President Draghi's leadership in ensuring the ECB's readiness to do "whatever it takes to preserve the euro" during the European sovereign debt crisis (e.g. Blanchard 2019 or Juncker 2019).

More specifically, Ricardo Reis (2019) and Peter Praet (2019) showed that between 1999 and 2013 the ECB's preferred headline inflation gauge, based on the Harmonised Index of Consumer Prices in the euro area, moved relatively closely to the ECB's aim of below but close to two percent (see Chart 2). Thereafter, however, protracted downward deviations set in, as part of a low-inflation recovery following the sovereign debt crisis. Drawing on Rostagno et al. (2019), Mario Draghi (2019) and Peter Praet (2019) also highlighted that core inflation (HICP inflation stripped of volatile components such as energy and food prices) evolved along a lower trend than headline since well before the financial crisis (Chart 2). The stabilisation of headline inflation in the presence of large upward oil price shocks (see the dashed red line in panel a) of Chart 2) would necessarily imply a lower path for core inflation. In addition to the scars from the sovereign debt crisis later, Draghi and Praet argued that this may have contributed to the subsequent low inflation environment. Moreover, in order to further underline the ECB's symmetric pursuance of its inflation aim Peter Praet suggested revisiting the formulation of below but close to two percent going forward and Mario Draghi (2019) highlighted that after a long spell below the aim inflation would have to be above the aim for some time in the future.

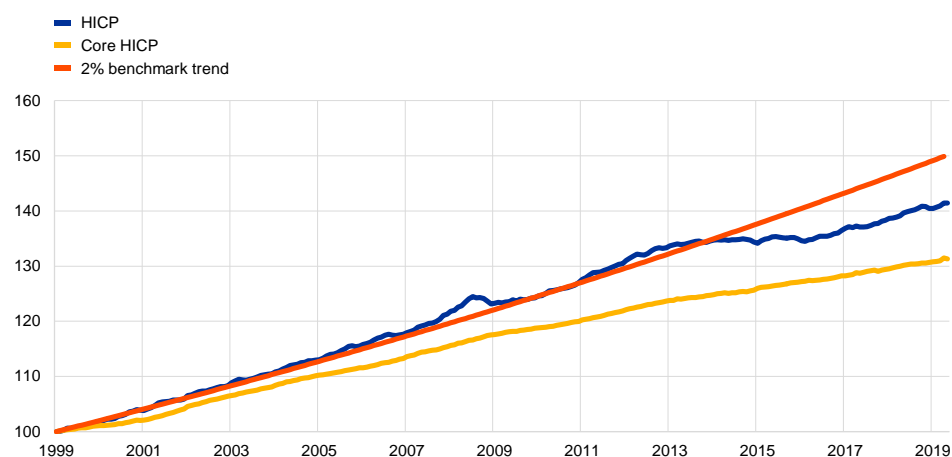
## Chart 2

### Headline inflation, core inflation and energy price shocks in the euro area

a) Changes (year-on-year %)



b) Levels (index, January 1999=100)



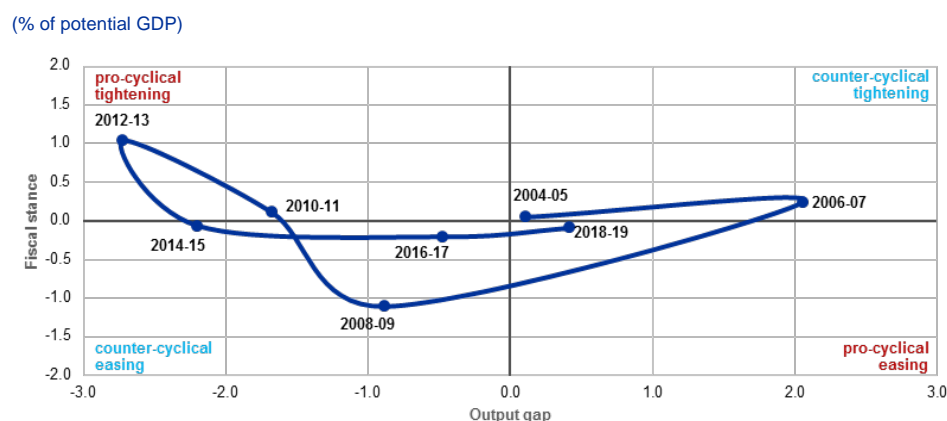
Notes: Core inflation is HICP inflation excluding food and energy. Panel a) shows monthly HICP and core inflation on the left y-axis and energy inflation on the right y-axis. Panel b) compares a 2% trend line with the actual HICP and core HICP levels.  
Source: Reproduced from Praet, Guilhem and Vidal (2019), Charts 3 and 4.

Critical points about ECB monetary policy were made more rarely. Olivier Blanchard (2019) did not find some features of the (initial) ECB monetary policy strategy promising, Laurence Boone (2019) suggested that the ECB should have used quantitative easing earlier (like the US Federal Reserve did) or Martin Hellwig (2019) referenced research suggesting that the ECB Very Long Term Refinancing Operations induced less private lending by healthy banks than government bond purchases of weaker banks. But overall Sintra speakers and participants seem to agree that – within its mandate – the ECB had adequately adapted its strategy and conduct of monetary policy to what evolving circumstances and challenges required (see also Draghi 2019 and Hartmann and Smets 2018).

At the same time, many participants seemed to share the view that macroeconomic stabilisation in the euro area can only function properly when other EMU features and institutions are also designed adequately. This particularly applies to the fiscal arena, which remains a national responsibility in EMU – with some common rules

applicable to individual countries – and whose imperfect functioning placed an over-proportional share of the stabilisation burden on ECB monetary policy, notably since the aggravation of the sovereign debt crisis (Draghi 2019, Praet 2019 and Rey 2019). Chart 3 shows an extreme example, among others, when in 2012-2013 a strongly pro-cyclical fiscal tightening occurred, precisely at a time when macroeconomic stimulus was essential (Praet 2019).

**Chart 3**  
Cyclicality of the aggregate of euro area countries' fiscal policies



Notes: The euro area fiscal stance is calculated as the combination of member countries' changes in their primary balances in % of potential GDP. (For data availability, cyclically adjusted primary balances are used before 2010 and structural primary balances thereafter.) Observations in the upper-left (upper-right) area indicate a period of pro-cyclical (counter-cyclical) fiscal tightening, while observations in the lower-left (lower-right) area imply a period of counter-cyclical (pro-cyclical) fiscal easing.  
Source: Reproduced from Praet, Guilhem and Vidal (2019), Chart 16.

More generally, Laurence Boone (2019), H el ene Rey (2019) and Gita Gopinath (2019) expressed strong support for some central fiscal stabilisation capacity. For example, decentralised fiscal policies imply a focus on domestic situations and a negligence of positive cross-border spillovers (Blanchard 2019 and Boone 2019). Moreover, when countries that lack fiscal space are hit by a negative economic shock, rules focusing on the situations of individual countries may result in insufficient support for the area as a whole. Volker Wieland, however, observed a disconnect between these calls for fiscal centralisation and what citizens in euro area countries seem to vote for. The budgetary instrument for convergence and competitiveness (BICC) that the Eurogroup (2019) agreed in June 2019 does not contain a stabilisation function.

Blanchard (2019), Reis (2019) and Rey (2019) also raised the issue of current account and relative price adjustments when shocks are not uniform across euro area countries. If member countries with stronger growth maintain low inflation and run current account surpluses, it becomes even more difficult for the countries with weaker growth to recover. In their view, macroeconomic stabilisation in the euro area would function better if there was greater fiscal stimulus in the surplus countries with more fiscal space and more flexibility towards higher inflation.

Given that macroeconomic stabilisation to asymmetric shocks does not seem to function optimally in the euro area at present, Brunnermeier (2019) and Rey (2019) suggested that macroprudential policy could be used as an additional tool. In particular, if countries built up a counter-cyclical capital buffer in upturns, they could

induce stimulus by releasing the buffer when the cycle turns. While this may complement potentially sub-optimal national fiscal policies, it also raises the issue whether the original financial stability purpose of such macroprudential tools can still be ensured.

In order to improve the financial and prudential features of EMU, Laurence Boone (2019) and Gita Gopinath (2019) called for further progress with the European capital markets and banking union projects. In what concerns the capital markets union, Gopinath reported about IMF work that suggests that greater comparability of firm disclosures, a minimum standard for insolvency regimes and a single supervisor for non-bank financial intermediaries would be important steps forward. Boone argued that the banking union would remain incomplete and the sovereign-bank nexus intact as long as there is no common deposit insurance and not a large enough fiscal backstop for the single resolution fund (SRF). There is a political agreement about and terms of reference for the SRF backstop to be provided by the European Stability Mechanism (General Secretariat of the European Council 2018) but not yet about the European Deposit Insurance Scheme.

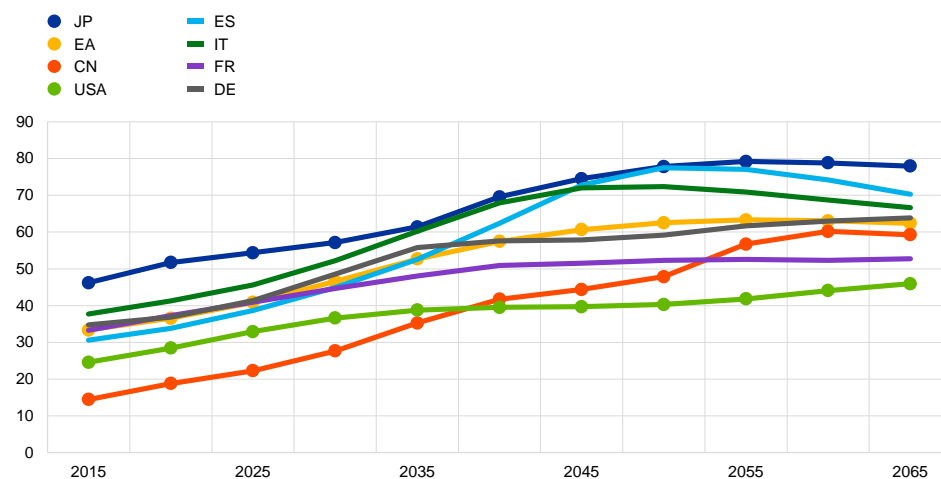
Martin Hellwig (2019), however, challenged parts of the traditional view on banking union. The bank resolution cases that have happened since 2014 show for him that the new European resolution regime does not work well enough. Improving this is in Hellwig's view more important than introducing a common deposit insurance, given for example that the long-standing lack of bank restructuring in Europe is a key obstacle to the transmission of the ECB's monetary policy. The existing European banking union project cannot solve this, because it lacks political legitimacy in member countries. Banking in most countries is still regarded as an inherent part of the local, regional or national political sphere and the long-winded "procrastination" with banking problems in Europe can only be overcome if executive and legislative political powers are created at the area-wide level that induce public discussions that cut across national borders.

## 4 Demographic change, growth and inflation

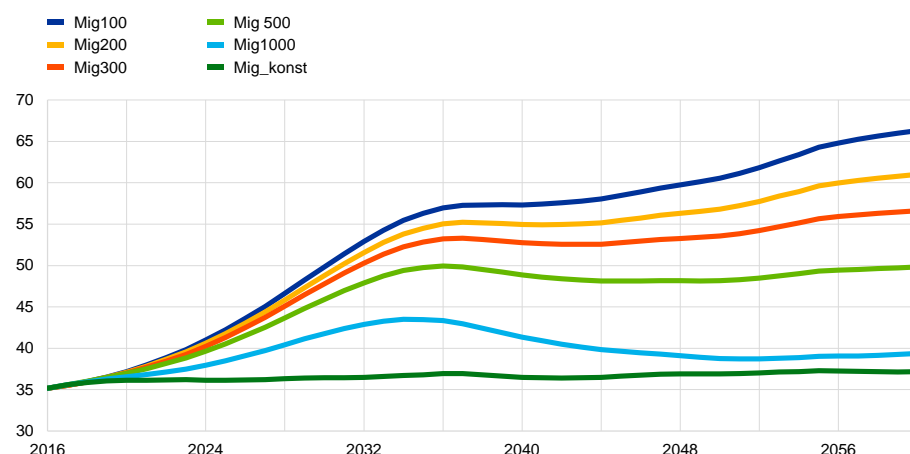
Ultimately, EMU can only be successful if member countries experience strong enough growth and employment. Axel Börsch-Supan addressed one particularly important factor, which is demographic change (Börsch-Supan et al. 2019). Panel a) of Chart 4 shows that there will be significant population ageing in the euro area over the next 30 to 40 years. Importantly, this process will be very diverse across countries. Italy and Spain are predicted to age significantly more than France, for example.

**Chart 4**  
Ageing and migration

a) International comparison of the expected evolution of old-age dependency ratios (%)



b) Simulated effects of immigration on the old-age dependency ratio in Germany (%)



*Note:* The old-age dependency ratio is defined as the number of people aged 65 or above divided by the number of people aged 20-64 (people deemed to be of working age). Abbreviations in panel a): JP=Japan; EA=euro area; CN=China; USA=United States; ES=Spain; IT=Italy; FR=France and DE=Germany. The upper coloured lines in panel b) show the simulated evolution of the German dependency ratio for different annual net immigration figures between 2016 and 2060: Mig100=100,000 immigrants and so on. The bottom line (Mig\_konst) represents the scenario in which net immigration would keep the old-age dependency ratio roughly constant (e.g. about 1.5 million immigrants per annum between 2016 and 2025).  
*Source:* Reproduced from Börsch-Supan, Leite and Rausch (2019), Charts 1 and 4.

Börsch-Supan et al. (2019) use a general equilibrium overlapping generations (OLG) model to simulate that this ageing process could reduce euro area per-capita GDP (approximated by the aggregate of its three largest economies, France, Germany and Italy) by a cumulative 8.7 percent between 2015 and 2030. However, labour market reforms, pension reforms and international flows of capital, labour and goods and services would moderate this negative effect. For example, implementing reforms that gradually increase the retirement age by two years, decrease the job entry age by two years, increase female labour force participation to 90 percent of the rate for men, and reduce unemployment rates to the non-accelerating inflation rate of unemployment (NAIRU) would almost completely undo the drop in per-capita GDP. Börsch-Supan called on European governments to actively use the necessary pension, labour market and education reforms in a forward-looking manner and to



facilitate the capital deepening associated with a reduction in the working age population through adequate investments in digitisation.

In contrast, Börsch-Supan reckoned that the direct impact of plausible streams of (typically relatively young) immigrants is unlikely to offset the ageing of the domestic population. The upper lines in panel b) of Chart 4 show simulations of the effects of net immigration into Germany of between 100,000 and 1,000,000 people on the old-age dependency ratio (roughly the share of retired people relative to the working age population). Only the dark green line (Mig\_konst), which corresponds (on average) to about 1.5 million immigrants per annum over the next 15 years (with a peak of 2.1 million in 2021), would neutralise population ageing. Such numbers are clearly not feasible in the light of the reversal of attitudes in the German population which followed the 2015 peak of 950,000 immigrants during the refugee crisis.

Anna Maria Mayda (2019) added in her discussion, however, that the impact of migration on ageing and its growth implications would be more forceful when indirect effects were also taken into account. First, migrants tend to have higher fertility rates than natives. Second, low-skilled immigration can increase the labour force participation of high-skilled native women, as low-skilled immigrants often take over services in households (e.g. Cortes and Tessada 2011). Third, skilled immigrants have a positive impact on innovation and – as a consequence – on productivity (e.g. Hunt and Gauthier-Loiselle 2010).

Importantly for central banks, population ageing also affects inflation; even though the literature is inconclusive about whether the relationship is generally negative or positive. Some papers find that a higher share of dis-savers (young retirees) boosts inflation (e.g. Lindh and Malmberg 1998), while others find that a smaller base of working-age people lowers inflation (e.g. Gajewski 2015). Härtl and Leite (2018) reconcile these results by identifying two effects in a computational general equilibrium OLG model, a size and a structure effect. The former refers to the lack of population growth leading to disinflationary pressures through the related reduction in consumption growth. The demographic structure effect has, however, an ambiguous sign. If the aging process leads the largest age group to be in high-spending years (such as the years before retirement), then it fosters consumption and inflation. If it leads the largest age group to be in low-spending years, then it is disinflationary like the size effect. Simulations with the Härtl and Leite model suggest that both effects combine to disinflationary pressures in both France and Germany since the 1990s (see Chart 23 in Börsch-Supan et al. 2019). Since the aging process is advancing faster in Germany than in France (see Chart 4, panel a)), however, the disinflationary tendency is more pronounced in Germany, including for the next decade. In line with these results, ECB staff recently estimated a positive long-run relationship between the growth rate of the working-age population and inflation in the euro area (Bobeica, Lis, Nickel and Sun 2017).

## 5 The international role of the euro

Finally, several Sintra speakers discussed the role that the euro plays internationally. Marcel Fratzscher (2019) pointed out that in an increasingly “hostile” economic order a strong global role of the euro is a crucial and widely underestimated instrument for Europe to defend its economic and political interests. But the incompleteness of EMU is also weighing on this role, for example in terms of the absence of a strongly integrated euro area capital market, an imperfectly functioning fiscal framework and the absence of a common safe asset (see also Reis 2019). Changing this falls under the responsibilities of euro area member countries’ governments, Fratzscher said, whereas Reis also saw a role for the ECB in terms of providing international swap lines in euro for crises.

While the euro became the second most widely used international currency from its start (Hartmann 1998), Gita Gopinath (2019) and Ricardo Reis (2019) observed that over the last decade it has lost ground relative to the leading role of the US dollar. While signs of a reversal of this trend are emerging (ECB 2019) and while the European Commission launched an initiative to strengthen the international role of the euro in December last year (European Commission 2018), Gopinath referred to new research suggesting that the complementarity between the unit of account and the store of value functions of money strengthens the tendency towards a single dominant international currency and makes it exceedingly difficult for competing currencies to overtake it (Gopinath and Stein 2018). Previous literature has, however, argued that diversification benefits of using multiple stores of value also imply forces towards multiple international investment currencies (e.g. Detken and Hartmann 2000) and, thus, the further development and integration of European capital markets – as envisaged under the European Capital Markets Union project, for example – may become a key factor promoting the euro’s international role.

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# How to strengthen the euro macro-policy architecture?

## Dinner speech by Olivier Blanchard<sup>1</sup>

It is truly a great honor to have been invited to give this talk. It is also an immense personal pleasure to be the dinner speaker for Mario's last Sintra event, at least in this official role.

Put simply, I am simply in awe of what Mario has achieved over the last 8 years.

He will probably be mostly remembered for 3 words, which, on their own, and without having to take any action, saved Europe from tragedy.

But behind the 3 words, there was a lot of preparation, and Mario's contribution is much deeper. He has done it through the combination of pragmatism and creativity on the one hand, and an exceptional political sense on the other.

As Larry Summers said last year in his dinner speech, one meets policy makers with intellectual creativity, and one meets policy makers with an exceptional political sense. One very rarely meets policy makers with both traits. Mario belongs to this rarefied set. I suspect he will put in the same pantheon as the fathers of Europe, not for creating it, but for saving it, which is equally important.

Moving from the man to the institution: Through Mario's influence, and that of his predecessors, the ECB has achieved an incredible transformation. It is fair to say that the initial incarnation did not look promising, at least to most of us on the other side of the ocean. The strange two-pillar strategy, the asymmetric inflation target, the prohibition on buying sovereign bonds, the lack of euro level banking regulation and supervision, all looked like a recipe for failure.

And it came close. But, as it was tested, the ECB transformed itself, from the provision of liquidity, to the purchase of a large set of assets, to negative interest rates, while keeping and indeed reinforcing its credibility. It is hardly recognizable today.

There is little question that it deserves most of the credit for the long recovery from the crisis. (I cannot resist a zinger here. Given how it was able to change so much and keep its credibility, one wonders why it is so reluctant to move, at least for a while, say until neutral real interest rates have increased sufficiently, to a higher inflation target, which would help solve many of the problems it is facing today. Just an idea...).

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<sup>1</sup> Peterson Institute for International Economics. I thank Mario Draghi, Stanley Fischer, Francesco Giavazzi, Philipp Hartmann, Jean Pisani Ferry, Larry Summers, Angel Ubide, and Jeromin Zettelmeyer.

But monetary policy cannot do everything. And the euro macro-policy architecture suffers from two serious weaknesses, which have largely shaped the history of the last 20 years and are likely to also shape the years to come. (I shall leave aside the euro macro-financial policy architecture, which should be the topic of another talk)

The first of the two weaknesses is an old and well documented one, namely the lack of adjustment of relative prices. It was at the source of the large current account deficits in the South early on, and now shows up as the large current account surpluses of Germany and the Netherlands. It is not solved today.

The second is newer, and it is the inadequacy of the fiscal policy framework in the light of the very low interest rates which prevail today and are expected to prevail far into the future. In that context, fiscal policy has a much more active role to play, and it is not yet equipped to do so.

I shall start by briefly going over the first one. It is familiar but it should not be ignored. But I shall focus mostly on the second one. Admittedly, what I shall say is, in the euro geopolitical context, 30,000 feet, thinking. But it is useful to start there.

Let me take a step back and start with the “ideal” macro policy architecture, and the allocation of tasks between fiscal and monetary policy, in a common currency area such as the euro.

Monetary policy should be in charge of maintaining euro output at potential, or equivalently (in my view), of maintaining euro inflation at target.

In each country, national fiscal policy should follow what I would call pure public finance principles, focusing on aging, intergenerational redistribution, tax smoothing. In other words, there should be a nice separation of tasks.

And, if as is likely, this leaves specific countries with output gaps, positive or negative, relative prices should adjust so as to maintain output in each country at potential. Whatever current account balances come out will then be the right, desirable, ones, and everything will be fine.

Why doesn't this happen? The main reason is that relative prices do not adjust, or at least do not adjust fast enough. The result, as we saw in the past, is that some countries end up with large current account deficits, or long and painful slumps, or the combination of both. And, now, we see it with large current account surpluses, not quite as bad, but still a major issue.

There was some hope, at the start of the euro, that the fixed nominal exchange rate, would lead to faster price and wage adjustment. It has not happened. And, indeed, because of low inflation, downward wage rigidity has become, if anything, stronger.

Can it be solved? Not easily, and I think this will remain an issue in the future. We may not get the same large shocks as we got at the start of the euro, but there will be country specific shocks. To solve the problem, or at least reduce it, would require a number of conditions:

First, that there is agreement as to what needs to be done, what the right configuration of current accounts should be, and how each country should adjust. And then, implementation, through wage and price adjustments at the country level, up as well as down. Neither condition is satisfied.

For the first, an anecdote. In 2015, the 5 Presidents' report advocated the creation of a euro area system of competitiveness authorities, and the creation of national competitiveness councils. After opposition from Germany, the councils are now called "National Productivity Councils".

Even if there was agreement about what the right configuration of current account balances should be, achieving it is far from easy. It is better to achieve it through inflation in the current account surplus countries than through deflation in the current account deficit countries. The reason is that deflation comes with higher real interest rates, making the adjustment much more difficult for current account deficit countries. Thinking in those terms would be quite a change for euro members, as well as require a more flexible inflation target for the ECB. We are not there.

Finally, at the country level, even if a parallel adjustment of nominal wages and domestically produced goods prices could decrease the pain, it is also likely to be difficult to achieve. The trust needed between social partners to achieve such a coordinated adjustment is not there. I have advocated for institutional arrangements where such agreements or at least such discussions could take place, but, again, we are not there.

Bottom line: Problem is not solved, and it will be difficult to solve.

Let me move to the second challenge, that posed by the very low neutral rates.

What I am going to say will be greeted by some the same way Ronald Reagan reacted to the notion of a larger role for the government: "The most terrifying nine words in the English language are: I'm from the government, and I'm here to help". Nevertheless, I shall proceed.

As I have argued in a recent contribution, low neutral rates have two general implications:

They imply a lower cost of debt, both fiscal and economic. I focused on "r-g" being negative—which it is in most countries---but the general point is the low cost of debt.

And, related but conceptually separate, because low rates make the effective lower bound more likely to bind, and thus reduce the space for monetary policy, they imply a more important role for fiscal policy.

Is this the situation the euro is in? My answer is yes.

Clearly markets are betting that rates will remain very low for a long time. (According to option prices, the probability that the 3-month Euribor rate exceeds 3% in 5 years is less than 2%). The hypothesis that this was due to the financial crisis and would fade away has proven false. Larry Summers' secular stagnation seems increasingly likely.



Is there a euro output gap? As we know, this is a controversial issue, but I continue to go by the behavior of inflation. To me, the fact that inflation is below target is an indication that there is indeed an output gap. And going country by country, I see a negative output gap in many of them. Remember how Germany has been able to achieve a much lower unemployment rate (without excessive wage pressure) than anybody had projected.

Has monetary policy lost its room of manoeuvre? It is clearly much reduced. Surely, it can purchase a lot more assets. But the effects on rates are likely to be limited. And surely there is not enough room to respond to even a run-of-the-mill recession.

This has implications for fiscal policy in general, and for fiscal policy in a common currency area in particular. Start with the general implications, which I see as three-fold:

The first, and rather obvious one, is that whatever urgency there was in reducing debt, debt reduction is less urgent than it was. The costs are lower. The risks are also lower. While debt is high, debt service is not, by historical standards. There is no debt crisis.

The second is that, to the extent that demand is too low to deliver output at potential, deficits are needed to sustain it. Surely, structural reforms, delivering higher growth and leading to more optimism and higher demand today can help, but the evidence suggests it would be unwise to rely only on them.

The third, which complements the second, is that to the extent that deficits are needed, they should be used, as much as possible, to invest in the future, either through public investment, understood in a large sense, or through the costs of financing structural reforms.

Let me now turn to the implications for the euro area fiscal architecture (down from 30,000 feet, but not quite to ground level, where the political constraints dominate). Let me again focus on four implications:

The first is that the various rules defining debt targets, speeds of adjustment to these targets, flexibility to respond to possibly persistently low demand, must be revisited. Even if they were the right ones earlier, they cannot be right today. Whether this is done through a formal change in the rules, or a more liberal interpretation, is not for me to recommend.

The second is that, to the extent that deficits are needed to sustain demand, they should be put to good use. Since 2007, the ratio of public investment to GDP in the euro zone has decreased by 0.8%, with numbers like -2.3% for Greece, -2.7% for Spain, -1.3% for Portugal, -0.9% for Italy. This strongly suggests revisiting the so called fiscal golden rule, i.e. the separation between a current and a capital account for governments, with the possibility of financing capital account spending through debt. I am aware of the dangers of classifying nearly anything as an investment. Recently, I was told, in one euro country, that reducing the age of retirement should be thought as an investment in the future, as it liberated jobs that could go to the

young, and the young are the future. Thus, clearly, there is a need for some euro level institution, with the mandate to decide what can and cannot go below the line.

The third and the fourth reflect the specificity of a common currency area.

The third has to do with coordination of monetary and fiscal policy. In this environment, coordination between monetary and fiscal policy becomes much more important. This is more difficult when there are 19 countries involved. The case for some form of Minister of finance at the euro level is clearly stronger.

Finally, the fourth arises from the externalities specific to a common currency area. If expansionary fiscal policy is needed at the euro level, it is likely to be under supplied. The reason is spillovers, i.e. the externalities arising in a group of highly integrated countries. The increase in domestic demand from the fiscal expansion partly falls on imports rather than on an increase demand for domestic output. As a result, countries are likely to do too little and the euro output gap is likely to remain.

How can this be solved? Conceptually, in one of two ways. First, through a coordinated fiscal expansion, the way it was done by the G20 in 2009, with each country issuing debt. This would however have to be limited to the coalitions of the able, although I suspect that markets would look more kindly to an increase in deficits in Italy if it were part of a coordinated expansion. Second, through a common budget, financed through euro bonds. But this implies risk sharing, and we know the political difficulties of doing so (the new embryonic budget is a start, hopefully not an end).

Let me conclude. I realize that what I have offered is blue sky thinking, ignoring the complex euro geo-politics which will determine the outcome in the end. But it is the right place to start. Anniversaries are good times to assess both progress and setbacks, and when needed, to make bold moves. Monetary policy has transformed itself. Now is the time to do the same for the rest of the macro policy architecture.

# Twenty years of the ECB's monetary policy

Introductory speech by Mario Draghi<sup>1</sup>

## 1 Introduction

Central banks were often established in the past with the aim of bringing stability in the aftermath of historic episodes. The Bank of England was established during the sovereign debt crisis of 1690, when the government was unable to obtain funding in the market. The Federal Reserve was created after a series of panics that had rocked the US banking system in the late 19th and early 20th century.

The euro was introduced 20 years ago in response to repeated episodes of exchange-rate instability and the need to secure the Single Market against competitive devaluations. The ECB was established as the keystone of the new Economic and Monetary Union (EMU).

The first decade of the Monetary Union was characterised by calm macroeconomic conditions, with limited volatility and steady economic growth. The second decade, however, has seen profound shifts in the prevailing environment – including both financial and sovereign debt crises – and our monetary policy strategy has had to adapt with it.

I would like to discuss this morning why this evolution came about and how it was achieved – and what the past twenty years can tell us about the ECB's monetary policy in the future.

## 2 Monetary policy before the crisis

The ECB's mandate is given by the Treaty as price stability. In 1998, the Governing Council defined price stability as inflation within a range of 0-2% over the medium term, which constitutes the ECB's objective. Then, in 2003, the Governing Council clarified that, within this range, it would aim at a focal point of below, but close to, 2%, which remains our medium-term aim to this day. This was a formulation that differed from the standard inflation-targeting framework of the time, which was typically based around a point target for inflation. But there were sound reasons why this definition was put in place.

In common with central banks across the world, the ECB faced a macroeconomic environment before the crisis that was predominantly defined by low volatility and

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<sup>1</sup> President of the European Central Bank

moderate shocks, with the distribution of shocks to inflation almost exclusively to the upside. In the euro area, HICP energy prices rose by 80% between January 1999 and September 2008. Under these conditions, establishing a strong reaction function against high inflation was seen as crucial to anchor inflation expectations. Emphasising an aim of “below, but close to, 2%” was seen to imply a stronger commitment than a standard inflation-targeting regime.

But monetary policy in the euro area also faced a special challenge. The ECB was a new central bank operating in a very heterogeneous monetary union, which created a particular imperative to establish inflation credibility. Establishing a commitment to controlling inflation was seen as critical to cement lower inflation expectations across the euro area – especially as moderate inflation was a relatively new phenomenon in several Member States.

Over the two decades up to 1999, inflation had averaged above 3% in 10 of the 12 original members. The decline in inflation in many countries in the run-up to EMU was in large part due to expectations of joining, as well as to a number of extraordinary actions taken by national authorities to meet the convergence criteria. From 1989-99, long-term inflation expectations had fallen from a range of between 2.5-4.5% in the four largest euro area economies to below 2% across the board. It was now the task of the new central bank to lock in this moderate-inflation environment – and it did so successfully. Over the next decade, inflation expectations internalised the ECB’s commitment to keep inflation down and remained below 2%.

But this process of building inflation credibility had implications for the ECB’s reaction function. As a matter of accounting, stabilising headline inflation largely caused by its volatile components must mean that core inflation adjusts downwards. Rolling cross-correlations between energy inflation and core inflation show that an episode of high energy inflation between 1999 and 2007 was accompanied by a period of rapidly softening core inflation.<sup>2</sup> As a result, between January 1999 and September 2008 headline inflation in the euro area averaged 2.35%, while core inflation averaged 1.7% and exceeded 2% less than 15% of the time.

Central banks in other advanced economies faced similar challenges and adopted similar strategies. But differences in mandates – and length of track records in fighting inflation – led to differences in how much energy price pass-through to headline inflation others were comfortable accommodating. For example, energy prices in the US CPI rose by 160% over the same period<sup>3</sup> and headline inflation averaged 2.9%. The Federal Reserve reacted less to headline inflation, and core CPI inflation averaged 2.2%.<sup>4</sup>

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<sup>2</sup> Rostagno et al. (2019), forthcoming.

<sup>3</sup> The difference in growth in energy prices between the euro area and the United States can in large part be attributed to differences in tax rates, which are typically higher in the euro area. As such, the share of the final price paid by consumers accounted for by oil is much smaller in the euro area, and CPI energy prices are less affected in aggregate by movements in oil prices. That being said, the energy component has a higher weight in euro area HICP, so a 1 percentage point increase in CPI energy prices has a greater impact on headline inflation in the euro area than in the United States.

<sup>4</sup> The equivalent figure for core PCE inflation was 1.9%.

The upshot was that the euro area entered the crisis having succeeded in establishing its anti-inflation credentials, but with underlying inflation dynamics that were perhaps relatively weaker. This was not immediately apparent, as inflation stayed at fairly elevated levels for more than four years after the Lehman crash. Monetary policy responded decisively to the global financial crisis and disinflationary threats seemed to pass quickly.

But in hindsight it seems reasonable to conclude that the inflation process was vulnerable to a shift in the environment – which is what transpired from around mid-2012 onwards.

### 3 New challenges for monetary policy

At this point, headline inflation in the euro area began what was, in retrospect, a prolonged downward drift, and core inflation fell by almost a percentage point from mid-2012 to early 2014. There are two factors that help explain the switch to a disinflationary trend.

First, the distribution of shocks to inflation moved strongly to the downside and the amplitude of the shocks increased. Supply-side shocks gradually dissipated over the years following the Lehman crash and the sovereign debt crisis. Negative demand shocks, driven at different times by domestic demand and external demand, instead became the dominant source of macroeconomic fluctuations in the euro area. ECB analysis shows that negative demand shocks have weighed on euro-area inflation by more than 1 percentage point on average since the start of the crisis. In the previous ten years, their effect was neutral overall, with periods of both upward and downward pressure.<sup>5</sup>

The second factor was a change in the macroeconomic policy mix. While in the first phase of the crisis fiscal and monetary policy had eased in tandem – with fiscal policy loosening by a total of about 3% of potential GDP between 2008 and 2010<sup>6</sup> – thereafter the stance of monetary and fiscal policy decoupled. The euro area fiscal stance turned contractionary in response to the sovereign debt crisis, tightening by around 4 percentage points of potential GDP until 2013 – years the euro area was mostly in recession.

This stands in contrast to the United States, where fiscal policy eased more in the initial phase of the crisis, by about 6.5% of potential GDP in total over 2008-09, and then tightened by about 5.5% of potential GDP from 2011 to 2013 when the economic recovery was underway. The euro area was forced onto a different path by the need in some countries to re-establish fiscal credibility. But on aggregate the euro area did not have less fiscal space than the United States: public debt levels were similar in the two jurisdictions. The key difference was that fiscal stabilisation in

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<sup>5</sup> Rostagno et al. (2019), op.cit.

<sup>6</sup> Measured as the change in the cyclically adjusted primary balance.

the United States took place at the federal level, while the euro area lacked a central fiscal instrument to act counter-cyclically.

The policy mix is also relevant when it comes to financial sector policies. After the crisis, it was inevitable that banking sectors in advanced economies would have to deleverage, both to cover losses and to re-focus their business models. The United States ensured that this process happened quickly and early. Around 500 failing banks were resolved by the Federal Deposit Insurance Corporation, while struggling banks were stress-tested and recapitalised through the Troubled Assets Relief Program. Between 2008 and 2011, US banks improved their leverage ratio<sup>7</sup> by 1.6 percentage points from 7.2 to 8.8%.

The response in the euro area was more sluggish. Despite being more levered than their US peers before the crisis, euro area banks improved their leverage ratio by just 0.9 percentage points, from 3.7 to 4.6%, and this was achieved more through shedding assets and less through raising capital.<sup>8</sup> This in part reflected the fact that, due to the fiscal rules, public support for banks was concentrated in countries with fiscal space. Moreover, without a common resolution framework only around 50 banks were resolved in the euro area in this period.<sup>9</sup> So a weak banking sector continued to drag on the euro area economy, which was especially pernicious given the importance of the banking lending channel for financing.

In sum, the ECB faced an environment where there was both an increasing need to counter demand shocks, and an increasing burden on monetary policy to do so. Our strategy therefore had to adapt to these new circumstances in order to continue delivering our aim.

Monetary policy responded first in the summer of 2012 by acting to defuse the sovereign debt crisis, which had evolved from a tail risk for inflation into a material threat to price stability. Announcing Outright Monetary Transactions (OMT) established our commitment to counter unwarranted redenomination risks in sovereign debt markets and acted as a powerful circuit breaker.

While OMT was never activated, the effect of its announcement was equivalent to that of a large-scale asset purchase programme: spreads in vulnerable countries fell on average by more than 400 basis points over the next two years. The macroeconomic impact of OMT was also analogous to other purchase programmes: ECB research finds that the GDP and price effects of OMT were broadly in line with those estimated for the QE that took place in the United States and the United Kingdom.<sup>10</sup>

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<sup>7</sup> Leverage ratio calculated as Tier 1 capital/Total assets. Source: Consolidated Banking Data for euro area banks and FDIC data for US banks.

<sup>8</sup> It should be noted that deleveraging was also more challenging in Europe than in the US, given the larger size of bank balance sheets relative to GDP and less developed market-based finance.

<sup>9</sup> Sapir, A. and Wolff, G. (2013), "[The neglected side of banking union: reshaping Europe's financial system](#)", note presented at the informal ECOFIN on 14 September 2013, Vilnius.

<sup>10</sup> Altavilla, C., Giannone, D. and Lenza, M. (2016), "The Financial and Macroeconomic Effects of the OMT Announcements", *International Journal of Central Banking*, 12(3): 29-57.

But the lingering effects of the sovereign debt crisis dented the capacity of this stimulus to counter the new disinflationary trend. The delayed bank deleveraging process in the euro area began to accelerate, with banks further shrinking their balance sheets and paying back central bank loans. Bank balance sheets declined by around 20 percentage points of GDP in 2013 alone and, at the end of 2013, credit growth to the private sector was contracting at a rate of 2.4% relative to a year earlier. On the demand side, risk appetite in the private sector collapsed, with investment subtracting 1.6 percentage points from GDP growth in 2012.

The ECB therefore reacted again in 2013 by cutting its main refinancing rate twice, from 0.75% to 0.25%, and by seizing the opportunity of the launch of European banking supervision. We carried out a comprehensive assessment of bank balance sheets, with the aim of steering the process of balance sheet repair towards a positive macroeconomic outcome. Banks strengthened their balance sheets by over €200 billion in advance of the outcome.<sup>11</sup> That put the banking sector in a much stronger position to transmit our policy.

But at this point, the euro area economy was hit by a further downward shock to inflation in the form of a 60% collapse in oil prices in mid-2014, which pushed inflation into negative territory. With underlying inflation already weakening, inflation expectations began to be affected. As the scope for further interest rate cuts was now limited, it became increasingly clear that our reaction function needed to evolve to address these new challenges.

Indeed, since our policy framework had never been systematically tested by persistent disinflationary risks, the ECB had not yet had a chance to demonstrate its intolerance for inflation remaining below its aim for protracted periods of time.

At the same time, there appeared to be some uncertainty about which tools we would be able to deploy if the effective lower bound were reached. Unlike in other major economies, the ECB had not resorted to large-scale asset purchases during the global financial crisis and its aftermath. Some even questioned the legality of asset purchases in Europe and their effectiveness in our bank-based economy.

If these uncertainties were not removed, there was a material risk that falling inflation could become self-fulfilling: the public could begin expecting a smaller monetary policy response to future inflation undershoots, and revise their inflation expectations further downwards.

In other words, credibility now relied not just on perceptions of the ECB's commitment to our aim, but also on perceptions of our capability to fight low inflation. We responded to the situation in three main ways.

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<sup>11</sup> See [ECB's in-depth review show banks need to take further action](#).

## 4 The ECB's policy response

The first was by clarifying the symmetry of our aim. While the quantitative definition of price stability was instrumental in establishing credibility in the first decade, its asymmetric formulation may have led to misperceptions in a low-inflation environment. Thus we made clear that our policy aim was fully symmetric,<sup>12</sup> and it was symmetric around the level that we had established in 2003: below, but close to, 2%. It is achieving this aim over the medium term that steers our policy decisions.

In addition, we clarified that symmetry meant not only that we would not accept persistently low inflation, but also that there was no cap on inflation at 2%. As I emphasised on a number of occasions,<sup>13</sup> our medium-term orientation implies that inflation can deviate from our aim in both directions, so long as the path of inflation converges back towards that focal point over the medium-term policy horizon.

The second part of our response was to lay out the tools we would use to counteract downside inflation risks, which began with a speech I gave in Amsterdam in April 2014 that described three contingencies and the instruments we would use to react to them. This established unambiguously that we had no taboos about resorting to unconventional measures.<sup>14</sup> There was nothing institutionally or legally special about the euro area that prohibited monetary policy from adding accommodation once the lower bound was approached.

Third, as these various contingencies played out, we operationalised our reaction function by launching a series of new instruments. We broke through the zero bound by lowering our deposit rate into negative territory, launched our targeted longer-term refinancing operations (TLTROs) to provide incentives for banks to lend, and implemented a large-scale asset purchase programme (APP) of public and private securities. These measures were deliberately designed to work as a package and ease the stance through complementary channels, working both through banks and the wider matrix of capital markets.

The negative rate policy challenged market expectations that when rates reached zero they could only go up and not down, which helped skew the distribution of rate expectations and depress the short end of the risk-free curve – a key benchmark for the pricing of bank loans. Asset purchases in tandem compressed yields at the longer end of the curve, pushing down mortgage rates and, at the same time, making bank lending to firms more attractive in risk-adjusted terms. And bank-based

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<sup>12</sup> For example, in the February 2014 press conference, the ECB President responded to a question about the symmetry of the inflation objective on the downside by recalling that the central bank did not *"have a cool attitude at all with respect to the present level of inflation rates [...] these levels of inflation for a protracted period of time, are a risk on their own [...] so, we [still] have a symmetric attitude."*

<sup>13</sup> For example, <sup>at</sup> the press conference in March 2016, the ECB President noted that *"our mandate is defined as reaching an inflation rate which is close to 2% but below 2% in the medium term, which means that we'll have to define the medium term in a way that, if the inflation rate was for a long time below 2%, it will be above 2% for some time. The key point is that the Governing Council is symmetric in the definition of the objective of price stability over the medium term."*

<sup>14</sup> Draghi, M. (2014), "Monetary policy communication in turbulent times", Speech at the Conference De Nederlandsche Bank 200 years: Central banking in the next two decades, Amsterdam, 24 April.



transmission was amplified by the TLTROs, which lowered funding costs and increased competition among banks.

Over time, we also enhanced this framework with state- and date-based forward guidance<sup>15</sup>, allowing us to rotate the marginal tool for determining the policy stance from asset purchases to forward guidance as the economic outlook improved. Today, this forward guidance links our expectations on the path of future rates to the path of inflation towards our aim, leading to automatic easing if the convergence path towards 2% is delayed.

There is mounting evidence that these instruments have been effective.<sup>16</sup> Negative rates have proven to be a very important tool in the euro area – and more so than they would have been in an economy like the United States. Indeed, the Federal Reserve eschewed negative rates in part due to concerns about their effects on the money market industry, which are key intermediaries in the US financial system. But this factor is less relevant in the euro area, since many money market funds have been operating as Variable Net Asset Value funds, and therefore are more flexible to extend duration to seek additional returns.

Furthermore, the euro area is a relatively open economy for its size, with total trade making up 51% of GDP,<sup>17</sup> compared with 27% in the United States. This means that the impact of negative rates on inflation and financing conditions via the exchange rate is more powerful.

In short, faced with a new environment of downside risks and limited conventional policy space, the ECB showed that it had no shortage of tools available to respond. Unconventional measures proved suitable substitutes for conventional ones: using market prices to construct a so-called “shadow short rate”,<sup>18</sup> the stimulus provided appears broadly in line with the recommendation of monetary policy rules as suggested by recent academic research.<sup>19</sup>

Our capacity to react in this way was made possible by the flexibility embedded in our mandate – a flexibility that was confirmed by the recent ruling of the European Court of Justice. This not only affirmed that asset purchases are a legal instrument of monetary policy in the euro area, but emphasised the broad discretion of the ECB in using all our tools in a necessary and proportionate way to achieve our objective.

However, although we have seen the successful transmission of monetary policy to financing conditions, and from financing conditions to GDP and employment, the final legs of the transmission process to wages and inflation have been slower than

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<sup>15</sup> Forward guidance on interest rates had first been introduced in 2013 but was enhanced in this period.

<sup>16</sup> For a review of the evidence see Hammermann, F., Leonard, K., Nardelli, S. von Landesberger, J. (2019), “Taking stock of the Eurosystem’s asset purchase programme after the end of net asset purchases”, *ECB Economic Bulletin*, Issue 2 / 2019.

<sup>17</sup> Measured as total extra-euro area trade in goods and services as a share of GDP.

<sup>18</sup> See Krippner, L. (2015), *Term Structure Modeling at the Zero Lower Bound: A Practitioner’s Guide*, Palgrave-Macmillan.

<sup>19</sup> Hartmann, P. and Smets, F. (2018), “The first twenty years of the European Central Bank: monetary policy,” *Working Paper Series*, No. 2219, European Central Bank, forthcoming in the *Brookings Papers on Economic Activity*.

we expected. Wage growth is now strengthening as slack in the labour market diminishes. But the pass-through from wages to prices remains weak. This may reflect structural changes, such as globalisation and digitalisation, which mostly have an impact at this point in the pricing chain. Lingering cyclical weakness can also delay wage-price pass-through as firms elect to squeeze margins rather than raise prices and risk losing market share.<sup>20</sup>

## 5 Current challenges for monetary policy

In this environment, what matters is that monetary policy remains committed to its objective and does not resign itself to too-low inflation. And, as I emphasised at our last monetary policy meeting, we are committed, and are not resigned to having a low rate of inflation forever or even for now.

We have described the overall orientation of our monetary policy as being “patient, persistent and prudent”. Patient, because faced with repeated negative shocks we have had to extend the policy horizon. Persistent, because monetary policy will remain sufficiently accommodative to ensure the sustained convergence of inflation to our aim. And prudent, because we will pay close attention to underlying inflation dynamics and to risks and will adjust policy appropriately.

This orientation is expressed in our current policy framework, which allows us to adapt our forward guidance and react flexibly as the macroeconomic situation evolves. That was illustrated by the monetary policy decisions taken at our meeting earlier in June.

Looking forward, the risk outlook remains tilted to the downside, and indicators for the coming quarters point to lingering softness. The risks that have been prominent throughout the past year, in particular geopolitical factors, the rising threat of protectionism and vulnerabilities in emerging markets have not dissipated. The prolongation of risks has weighed on exports and in particular on manufacturing.

In the absence of improvement, such that the sustained return of inflation to our aim is threatened, additional stimulus will be required.

In our recent deliberations, the members of the Governing Council expressed their conviction in pursuing our aim of inflation close to 2% in a symmetric fashion. Just as our policy framework has evolved in the past to counter new challenges, so it can again. In the coming weeks, the Governing Council will deliberate how our instruments can be adapted commensurate to the severity of the risk to price stability.

We remain able to enhance our forward guidance by adjusting its bias and its conditionality to account for variations in the adjustment path of inflation.

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<sup>20</sup> Bobeica, E., Ciccarelli, M. and Vansteenkiste, I. (2019), “The link between labor cost and price inflation in the euro area,” *Working Paper Series*, No. 2235, European Central Bank.

This applies to all instruments of our monetary policy stance.

Further cuts in policy interest rates and mitigating measures to contain any side effects remain part of our tools.

And the APP still has considerable headroom. Moreover, the Treaty requires that our actions are both necessary and proportionate to fulfil our mandate and achieve our objective, which implies that the limits we establish on our tools are specific to the contingencies we face. If the crisis has shown anything, it is that we will use all the flexibility within our mandate to fulfil our mandate – and we will do so again to answer any challenges to price stability in the future.

All these options were raised and discussed at our last meeting.

What matters for our policy calibration is our medium-term policy aim: an inflation rate below, but close to, 2%. That aim is symmetric, which means that, if we are to deliver that value of inflation in the medium term, inflation has to be above that level at some time in the future.

But fiscal policy should play its role. Over the last 10 years, the burden of macroeconomic adjustment has fallen disproportionately on monetary policy. We have even seen instances where fiscal policy has been pro-cyclical and countered the monetary stimulus.

If the unbalanced macroeconomic policy-mix in the euro area in part explains the slide into disinflation, so a better policy mix can help bring it to a close. Monetary policy can always achieve its objective alone, but especially in Europe where public sectors are large, it can do so faster and with fewer side effects if fiscal policies are aligned with it.

Recreating fiscal space by raising potential output through reforms and public investment, and respecting the European fiscal framework will maintain investor confidence in countries with high public debt, low growth and low fiscal space. But as fiscal expansion in the other countries may have limited spillovers, national fiscal policies remain constrained. So work on a common fiscal stabilisation instrument of adequate size and design should proceed with broader scope and renewed determination.

## 6 Conclusion

Let me conclude.

The euro was introduced twenty years ago in order to insulate the Single Market from exchange-rate crises and competitive devaluations that would threaten the sustainability of open markets. It was also a political project that, relying on the success of the Single Market, would lead to the greater integration of its Member States.

On both counts, the vision of our forefathers has scored relatively well. Imagine where the Single Market would be today, after the global financial crisis and rising protectionism, had all countries in Europe been free to adjust their exchange rates. Instead, our economies integrated, converged and coped with the most severe challenge since the Great Depression. That leads me to four observations.

First, the integration of our economies and with it the convergence of our Member States has also greatly increased. Misalignments of real effective exchange rates between euro area countries are about a half those between advanced economies with flexible exchange-rates or countries linked by pegged exchange rates and they have fallen by around 20% in the second decade of EMU relative to the first.<sup>21</sup>

Second, the dispersion of growth rates across euro area countries, having fallen considerably since 1999, is since 2014 comparable to the dispersion across US states. Third, this has been driven in large part by the deepening of European value chains, with EMU countries now significantly more integrated with each other than the United States or China are with the rest of the world.<sup>22</sup> Most EMU countries export more with each other than with the US, China or Russia. Fourth, employment in the euro area has reached record highs and in all euro area countries but one stands above its 1999 level.

But the remaining institutional weaknesses of our monetary union cannot be ignored at the cost of seriously damaging what has been achieved. Logic would suggest that the more integrated our economies become, the faster should be the completion of banking union and capital markets union, and the faster the transition from a rules-based system for fiscal policies to an institution-based fiscal capacity.

The journey towards greater integration that our citizens and firms started twenty years ago has been long, far from finished, and with broad but uneven success. But overall, it has strengthened the conviction of our peoples that it is only through more Europe that the implications of this integration can be managed. For some, that trust may lie in a genuine faith in our common destiny, for others it comes from the appreciation of the greater prosperity so far achieved, for yet others that trust may be forced by the increased and unavoidable closeness of our countries. Be that as it may, that trust it is now the bedrock upon which our leaders can and will build the next steps of our EMU.

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<sup>21</sup> Fidora, M., Giordano, C. and Schmitz, M. (2017), "Real exchange rate misalignments in the euro area", *Working Paper Series*, No. 2108, ECB.

<sup>22</sup> Imbs, J. and L. Pauwels (2019), "Twenty Years of Convergence", paper presented at ECB Forum on Central Banking, 17-19 June 2019.

# Twenty years of convergence

By Jean Imbs and Laurent Pauwels<sup>1</sup>

## Abstract

Real synchronization in the Economic and Monetary Union is manifest over the past 20 years: the absolute differences in GDP and consumption growth rates have narrowed significantly, reaching by some measures higher levels of similarity than US States. To explain this convergence, we use a measure of bilateral export intensity introduced in Imbs and Pauwels (2019a) based on input-output linkages at sector level. The measure is distinct from directly observed trade and is available for 50 sectors, including services. It takes exceptionally high values in EMU member countries, much higher than the US or China. Within EMU, pairs of sectors with high export intensity are significantly more correlated, which explains the aggregate synchronization in GDP. Convergence in consumption, in turn, is by some measure more complete in the EMU than between US States. We show this can be ascribed to financial integration in the monetary union.

## 1 Introduction

The European project is about economic integration. More than 30 years ago, the Cecchini report evaluated the expected benefits of the Single Market of 1992 to a minimum of 5 percent of European GDP, as barriers were removed between member countries. With added monetary and financial integration, the Single Currency was expected to reinforce and multiply these gains, with expected permanent, far-ranging benefits to real growth, consumption, and welfare.<sup>2</sup>

Of particular interest are the consequences of EMU on real convergence between member countries, and especially synchronization in GDP and consumption. Synchronization in GDP implies a homogeneous monetary union, which alleviates one of the main costs of a single currency, i.e. the inability to use monetary policy in response to country-specific shocks. Whether EMU created synchronization in GDP is therefore a key reason why EMU can become an optimal currency *ex post*, even though it may not have been one *ex ante*. Synchronization in GDP is customarily ascribed to economic integration, especially in goods markets.

Synchronization in consumption can follow simply from synchronization in GDP. But it can also happen over and above GDP, with correlated consumption across countries despite uncorrelated income. This requires agents in each member country

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<sup>1</sup> Imbs: NYU Abu Dhabi, PSE (CNRS), CEPR, CEPII. Pauwels: University of Sydney Business School. Andrea Mencarelli provided stellar research assistance. All errors are our own.

<sup>2</sup> Cecchini, 1988, *European Economy*, 1990.

to hold similarly diversified portfolio of financial assets. And this happens if international frictions in financial markets are kept to a minimum. Synchronization in consumption is therefore customarily ascribed to financial integration.

Twenty years into EMU, this paper takes stock on both questions. We start with some stylized facts obtained from a measure of synchronization based on absolute differences in growth rates. For the 12 original EMU member countries, we compute the  $n(n-1)/2$  distinct bilateral differences in GDP and consumption growth rates.<sup>3</sup> We describe how both distributions evolved since the introduction of the Euro, between 1999 and 2018. We compare them with equivalent estimates obtained for US States. The punchline is that GDP growth rates in EMU countries have converged sizeably since 1999, up to a level comparable to the US. But the EMU continues to be characterized by substantial cross-sectional heterogeneity, much larger than in the US (for example Greece in 2011 or Ireland in 2015). Consumption growth rates converged as well, although not at a rate obviously outpacing convergence in GDP.

We then turn to the question of what explains such fast convergence. We use a measure of market integration based on input-output data introduced in Imbs and Pauwels (2019a). The measure evaluates the proportion of a sector's value chain that is directed towards exports, which we label "Export Intensity". It tells us how close across the border two sectors are, in the sense that both tend to serve downstream activities that eventually trade with each other. Over a decades-long process of deepening economic integration, one would expect it to be increasingly likely that two sectors serve downstream activities that trade across borders, even though they themselves do not trade with each other internationally. The measure is distinct from actually observed bilateral trade; it captures a mechanism that is likely relevant to EMU, and it is available for all sectors, including services.

We compute export intensity across all 12 core EMU member countries and compare values with the US, China, and the rest of the European Union. We show the EMU is much more export intensive than the US, more than the EU (outside of EMU), and comparable with China, both in 2000 and again at the end of the sample in 2014. We show these patterns pervade all sectors in the economies: manufacturing as well as services.

We evaluate how much export intensity can explain of the bilateral synchronization in sector-level growth rates in value added. This is not a small effort. We consider all bilateral differences between 50 sectors in 12 countries and 15 years: This constitutes a very large dataset, with almost 2.5 million observations.<sup>4</sup> We investigate whether the export orientation of input-output linkages can account for the similarity in sector-level growth rates.

We find that *bilateral* sector-level export intensity is much higher between EMU member countries than between the US, or even China, and the rest of the world.

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<sup>3</sup> Austria, Belgium, Germany, Spain, Finland, France, Greece, Ireland, Italy, Luxembourg, the Netherlands, and Portugal. We focus on the 12 member countries with as close to 20 years of available data as possible.

<sup>4</sup>  $50 \times 50 \times 12 \times 11 / 2 \times 15$ . The measure of export intensity is not symmetric at sector level.

The EMU is highly integrated, much more so than the US or China are with the world economy. This fact would be entirely missed with a measure based on actually observed direct bilateral trade. We also find that export intensity is highly significant and robust in accounting for synchronization in sector-level growth rates. Interestingly, while export intensity matters for conventionally traded sectors, such as manufacturing, it is in services that we find the largest effects, both economically and statistically. These results survive large batteries of fixed effects, afforded by the large dimensionality of our panel data (sector-pair in country-pair over time).

How much does export intensity matter in the aggregate? We follow Imbs and Pauwels (2019a) and use a property of quasi-correlation coefficients to decompose the aggregate quasi-correlation between two countries' GDP growth rates into a weighted sum of sector-level bilateral quasi-correlations. We use our model to predict values for bilateral sector quasi-correlations and aggregate them up to country level. Thus we can evaluate how much of GDP correlation can be explained by export intensity. We find that export intensity explains a sizable share of the increase in GDP correlation – up to 20 percent.

Absolute differences in consumption growth rates also display a significant downward trend in the EMU, consistent with international risk sharing. Conventional tests of risk sharing are typically performed in time series, checking whether changes in income are reflected by changes in consumption, and whether that can be ascribed to financial integration. Here we extend the test to a cross-sectional environment and estimate the extent of risk sharing year by year. We find the relation between consumption and GDP is eroding over time and has been insignificant since 2015 in the EMU. In the US, the same methodology yields estimates that are significantly different from zero, and stationary over time. In other words, by this measure, risk sharing in the EMU has been on an upward trend since 1999 and has recently achieved levels that appear to be more complete than between US states. We show at least part of this finding can be related with the trend of financial harmonization in the European Union.

The measure of synchronization used here is typically found in the recent literature about international business cycle synchronization (Giannone, Lenza, and Reichlin, 2010, Kalemli-Ozcan, Papaianou, and Perri, 2013). This literature is ripe with candidate explanations to business cycle synchronization: The most robust appears to be bilateral trade (Baxter and Kouparitsas, 2005, Rose, 2008). Given the boom in trade between EMU members, the emergence of an EMU business cycle should be uncontroversial. And yet the literature is inconclusive: Aguiar-Conraria and Soares (2011), Artis and Zhang (2008), Gachter and Ridell (2014), Goncalves, Rodrigues and Soares (2009) all document an increase in synchronization between EMU member countries. But Caporale, De Santis and Girardi (2015), Christodoulopoulou (2014), Crespo-Cuaresma and Fernandez-Amador (2013), and Lehwald (2012) all document the opposite. One explanation is measurement: the correlation coefficients typically used in this literature are estimated with error. Another one is the existence of confounding factors within the EMU.

A potential such factor is financial integration, one of the inherent elements of the single currency. If financial integration results in asymmetric cycles, as argued in



Kalemli-Ozcan, Papaianou, and Peydro (2013), then EMU could have ambiguous effects on cycle synchronization. It is therefore important to allow for financial flows to affect cycle synchronization. It is of course also of direct interest to investigate the effect of financial integration on consumption convergence, since financial integration is expected to allow consumption risk sharing (Cochrane, 1991, Lewis, 1996). The test we introduce builds from Fratzscher and Imbs (2009) and augments it with the instrument variables proposed by Kalemli-Ozcan, Papaianou, and Peydro (2013), updated to recent years. It is also possible for financial integration to facilitate specialization in production, and thus result both in divergence in GDP and convergence in consumption (Kalemli-Ozcan, Sorensen and Yosha, 2004).

Our measure of export intensity builds on input-output linkages. It is introduced in Imbs and Pauwels (2019a), and is directly adapted from the measures of upstreamness and downstreamness introduced in Antras and Chor (2018), modified to capture export intensity rather than the length of the value chain.

The rest of the paper is organized as follows. The next section introduces data sources, the definition of key variables, and offers a first look at some stylized facts. Section 2 briefly describes the measure of export intensity, illustrates the exceptional proximity of EMU sectors to export markets as compared with other economies, and investigates how much this position can explain the convergence of GDP in the EMU. Section 3 introduces a cross-sectional test of consumption risk sharing, applies it to EMU and US data, and draws comparison between the two regions. Section 4 concludes.

## 2 A first look at the data

### 2.1 Data sources

Data on quarterly real (chain-linked) GDP, consumption, population, and productivity growth come from the Quarterly National Accounts compiled by Eurostat for EMU member countries. Total employment (from 15 to 64 years of age) comes from Eurostat's Population and Social Conditions data. Absolute bilateral differences in growth rates are computed as  $ABSy_{ijt} = -|gy_{it} - gy_{jt}|$ ,  $ABSc_{ijt} = -|gc_{it} - gc_{jt}|$ ,  $ABSprod_{ijt} = -|gprod_{it} - gprod_{jt}|$ , and  $ABSn_{ijt} = -|gn_{it} - gn_{jt}|$ , with self-explanatory notation. The difference is computed quarter by quarter and averaged by year. All values are negative so that convergence means the differences increase towards zero.

Our measure of export intensity is computed from the World Input-Output Tables (WIOT). WIOT covers 40 developed and developing countries and provides annual data from 1995 to 2014. The covered countries account for approximately 85% of world GDP. The data is in millions of U.S. dollars at current prices. We use the 2016 release of WIOT, which contains 43 countries and 50 industries (ISIC Rev. 4)



spanning from 2000 -- 2014.<sup>5</sup> This is also the source for sector-level measures of value added. Throughout the paper we focus on EU and EMU countries, and, for comparison purposes the US, and China.

As a measure of sector-level trade, we compute direct bilateral intermediate exports as implied by the WIOT. Exports are measured free on board, in dollars at sector level. We include intermediate goods exports between all pairs of sectors in the WIOT. Define:

$$Trade_{ij,t}^{rs} = \frac{Z_{ij,t}^{rs} + Z_{ji,t}^{rs}}{VA_{i,t}^r + VA_{j,t}^s}$$

where  $VA_{i,t}^r$  denotes value added in sector  $r$  of country  $i$ , and  $Z_{ij,t}^{rs}$  is intermediate input use of sector  $r$ 's output in country  $i$  by sector  $s$  in country  $j$ . This measure focuses on *direct* trade between all pairs of sectors and countries. It is a constituent part of our measure of export intensity but does not necessarily correlate much with it.

The measure of financial harmonization in Europe is taken from Kalemli-Ozcan et al. (2013). They focus on the directives part of the Financial Services Action Plan (FSAP), issued by Brussels and implemented by member countries at different dates. The variable considers the number of directives implemented by each EU member country. In a bilateral context, we compute the number of common directives adopted in a given year by two countries. This implies a time-varying measure of bilateral financial integration. Importantly, Kalemli-Ozcan et al. (2013) describe an adoption mechanism for these directives that suggests they can be taken as exogenous to the economic conditions in each adopting countries at the time of implementation. The directives are available from 1999; we update the original data and compute the index until 2014.

Annual real and nominal Gross State Product (GSP) and state-level Personal Consumption Expenditures (PCE) come from the Bureau of Economic Analysis. PCE is a relatively recent development at the BEA, with series beginning from 1997, and is focused on households' consumption. State population comes from the State Intercensal datasets put together by the US Census Bureau. A variable capturing whether States are contiguous is constructed in Merryman (2005), using the USSWM Stata module. And bilateral geodetic distance between US States was calculated from LatLong.net, using latitude and longitude for each State's centroid. Shipment values between States is collected from the Commodity Flow Survey and is available in 2002 and 2007.

## 2.2 Some stylized facts

The analysis is focused on the panel formed by bilateral (absolute) differences in growth rates and their change over time. In Table 1, we start with the simplest

<sup>5</sup> We removed sectors 51 to 56, which include public administration, defence, social security, education, human health, social work activities, households as employers, household activities for own use, and extraterritorial organizations and bodies.

possible check for any convergence: we estimate whether absolute differences display a trend in the EMU.<sup>6</sup> This is done for differences in the growth rates of GDP, consumption, employment, and labor productivity. The results are mixed: while consumption displays significant trend convergence over the 20 years since 1999, the same is not true of GDP, employment, or productivity. GDP growth in particular appears to have converged only in the earlier period, before the great recession of 2007.

The right panel of Table 1 shows this apparent heterogeneity is an artefact of extreme outliers in the distribution of GDP growth in recent years. In 2011, Greece contracted by 9.1%, and in 2015, Ireland grew at 25.6%. Excluding these two observations gives stable results: an upward trend in convergence is now apparent in both GDP and consumption, over the whole sample period and in each sub-period. Interestingly, convergence in GDP outpaces consumption until 2006, but the opposite occurs after 2007. This is an interesting result, for it is consistent with consumption in member countries becoming increasingly unrelated with local income. We note the convergence in employment and labor productivity is less evident in the data, and so focus the rest of the paper on the behaviour of GDP and consumption.

**Table 1**  
Trends in convergence in EMU

Convergence in	Full Sample			Excluding GRC 2011 & IRL 2015		
	1999-2018	1999-2006	2007-2018	1999-2018	1999-2006	2007-2018
<b>GDP growth</b>	-0.026** (0.012)	0.114*** (0.030)	-0.013 (0.036)	0.018*** (0.006)	0.114*** (0.030)	0.058*** (0.015)
<b>Consumption growth</b>	0.043*** (0.008)	0.092*** (0.025)	0.116*** (0.014)	0.048*** (0.008)	0.092*** (0.025)	0.106*** (0.012)
<b>Employment growth</b>	-0.010 (0.013)	0.043** (0.019)	0.096*** (0.015)	-0.006 (0.012)	0.043** (0.019)	0.085*** (0.015)
<b>Labor Productivity Growth</b>	-0.033** (0.015)	-0.001 (0.024)	0.011 (0.002)	0.002 (0.007)	-0.001 (0.024)	0.077*** (0.010)

Sources: Eurostat, Author's computations

Notes: The Table reports coefficients on time trends, with robust standard errors. \*(\*\*)(\*\*\*) denote significance at 10(5)(1) percent confidence level. All estimations include country-pair fixed effects.

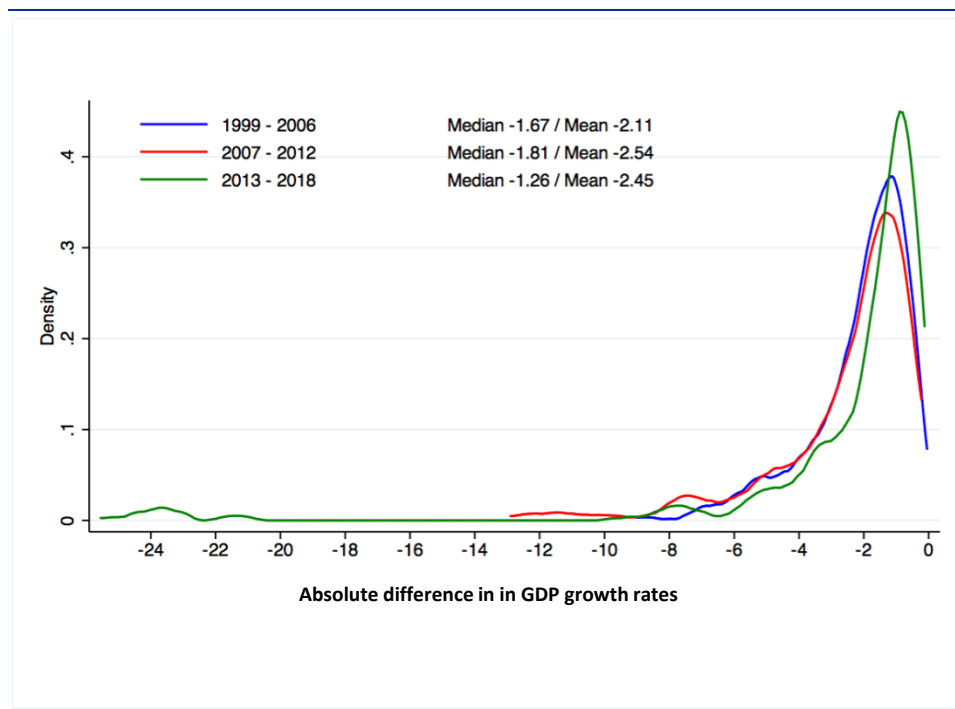
Table 1 illustrates the importance of outliers, as bilateral differences can take large values. In Charts 1 and 2 we plot the distribution of  $ABSy_{ijt}$  for three sub-periods of similar length. Chart 1 shows that the distribution has shifted observably to the right since 2013, but not much between 1999 and 2012. But as the distribution's mode shifted to the right, the lower tail grew with large outliers. As a result the mean (absolute) growth difference actually increases over time, whereas the median does fall, from 1.67 to 1.26. Chart 2 performs the same exercise but abstracting from Ireland 2015 and Greece 2011. The Chart illustrates clearly the convergence in GDP has accelerated in the past 5 years in the EMU: neither mean nor median change much between 1999 and 2013, but between 2013 and 2018, the median GDP absolute difference falls to 1.22 (against 1.77 in the previous period) and the mean

<sup>6</sup> The paper uses "convergence" and "synchronization" interchangeably.

falls to 1.76 (against 2.33). The whole distribution for 2013-2018 is also almost systematically to the right of the estimates for the two earlier periods. Convergence in GDP is manifest in the EMU, but it is a relatively recent phenomenon.

### Chart 1

Absolute difference in GDP growth – EMU



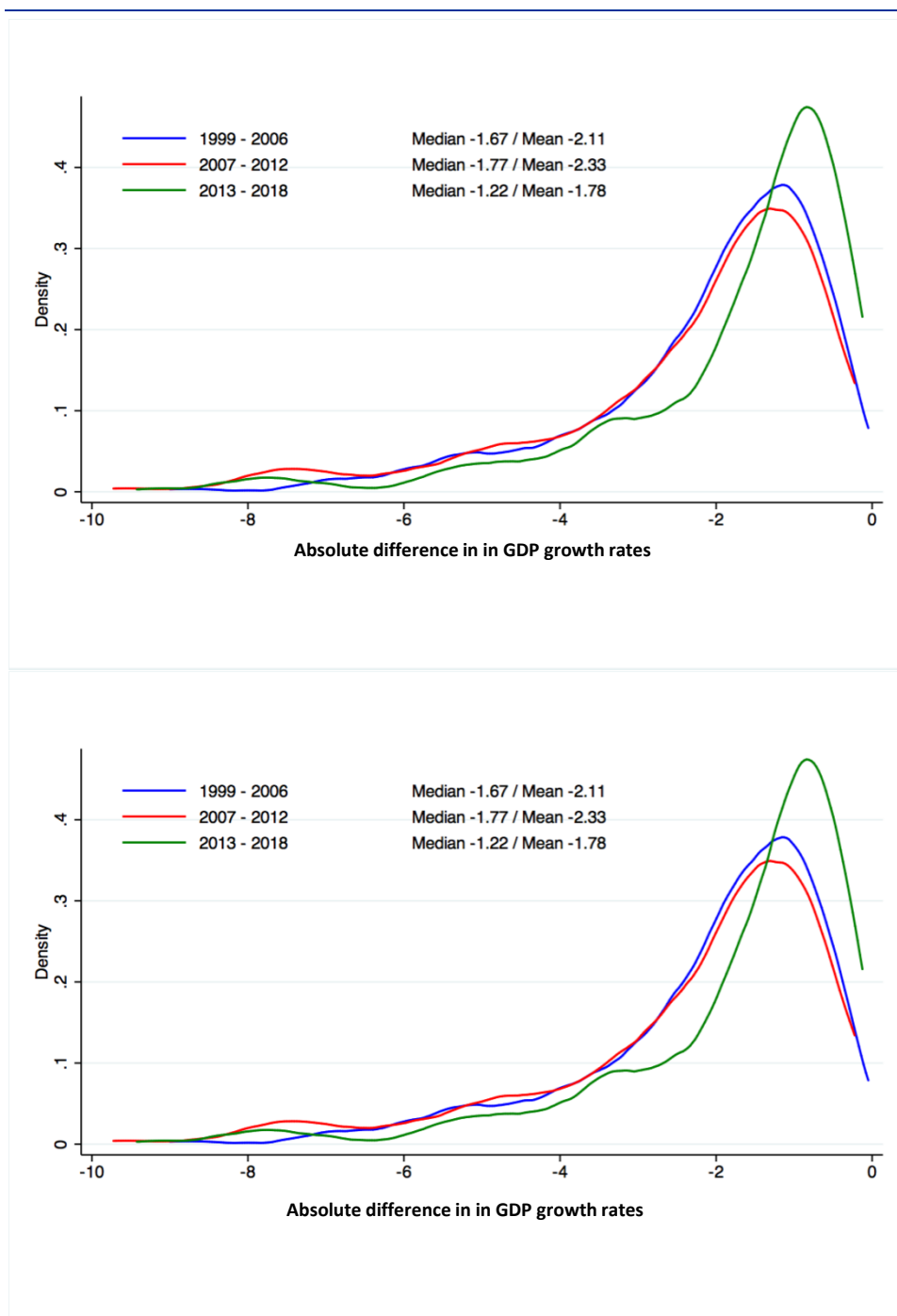
Sources: Eurostat.

Notes: Density plots of annual difference in GDP growth in pairs of EMU countries.

It is frequent to compare EMU member countries with US States. The idea is that the US provides a laboratory of what economic regions should look like when they have reached a maximum level of deep economic integration, i.e. where the only remaining frictions have to do with distances and/or imperfect information. Charts 3, 4, and 5 replicate the exercise in Charts 1 and 2 for US States and plot the absolute differences in growth rates for real Gross State Products. For comparison purposes, each chart plots the estimated distributions for both US States and EMU member countries, obtained over three sub-periods since 1999.

## Chart 2

### Absolute difference in GDP growth - EMU



Sources: Eurostat.

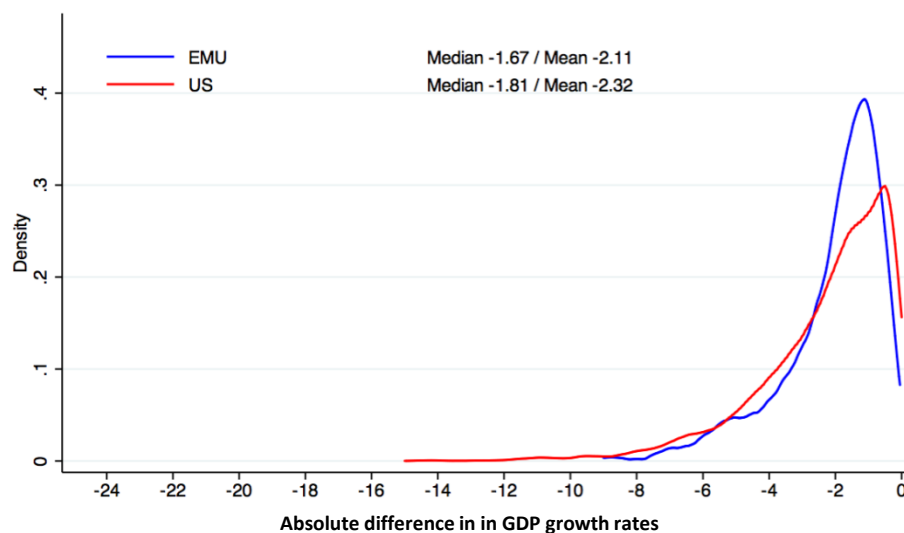
Notes: Density plots of annual difference in GDP growth in pairs of EMU countries without Greece in 2011 and Ireland in 2015. Excluding Greece (2011) and Ireland (2015)

The three graphs suggest that convergence between EMU members is of comparable magnitude to convergence between US States. Both the means and the medians of both distributions are very close to each other across the three periods, although both moments tend to be slightly closer to zero in the EMU. This comes from two features of the data: the mode of the absolute difference is closer to zero in

the US in all three graphs, but there is more extreme heterogeneity across US States than there is across EMU members: The left tail of the distribution is systematically longer in US data.

### Chart 3

Absolute difference in GDP growth from 1999 to 2006 – EMU and US

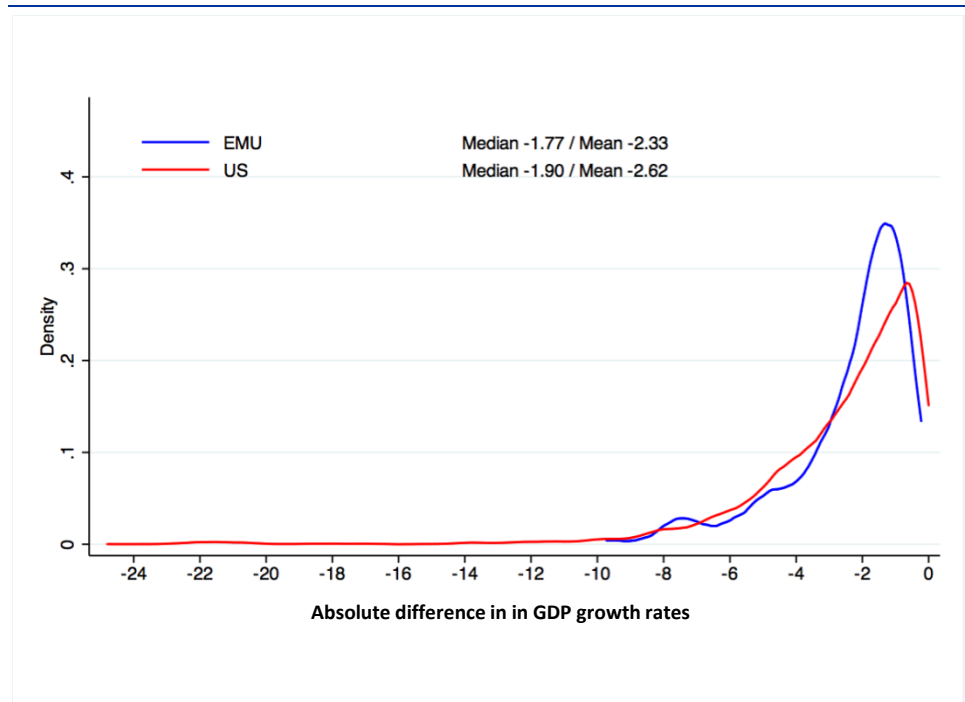


Sources: Eurostat.

Notes: Density plots of annual difference in GDP growth in pairs of EMU countries and pairs of US states.

### Chart 4

Absolute difference in GDP growth from 2007 to 2012 – EMU and US

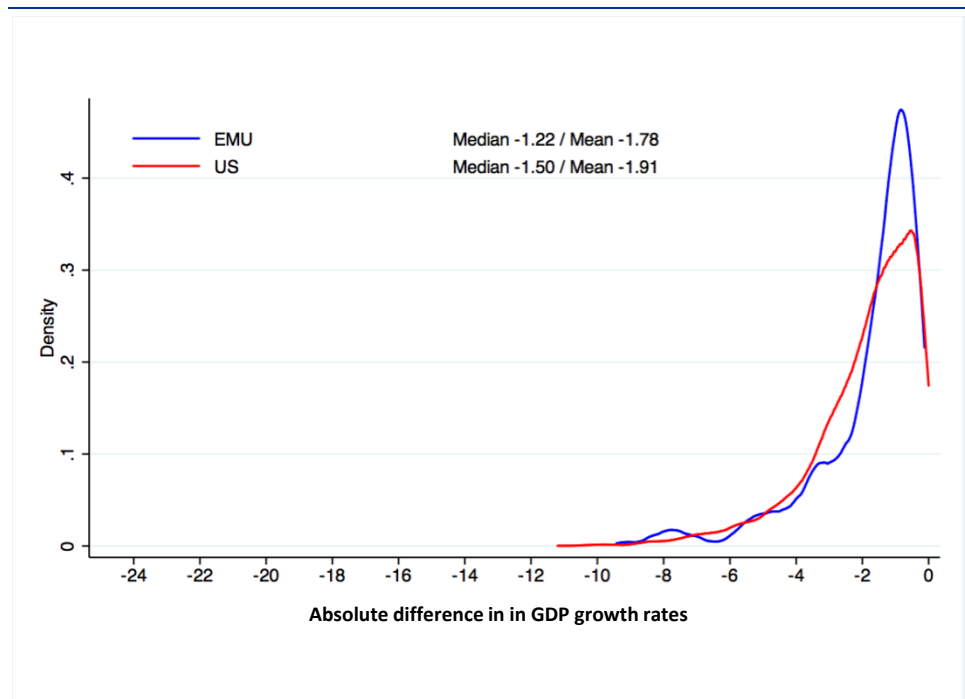


Sources: Eurostat.

Notes: Density plots of annual difference in GDP growth in pairs of EMU countries and pairs of US states.

### Chart 5

Absolute difference in GDP growth from 2013 to 2018 – EMU and US



Sources: Eurostat.

Notes: Density plots of annual difference in GDP growth in pairs of EMU countries and pairs of US states.

### 3 Synchronization in GDP

In this Section, we compute the measure of export intensity between sectors introduced in Imbs and Pauwels (2019a). It is possible that sectors are closely related across a border even if there is no direct trade between them: This will happen if each sector trades with downstream sectors in their own country, and it is the downstream sectors whose output crosses the border. In that case, the two sectors are close to each other in the sense that they tend to cater for traded activities, but that fact is completely absent from trade data. They are also close to each other in the sense that shocks propagate via downstream linkages, and so export proximity ought to explain synchronization.<sup>7</sup>

One definition of deep integration is precisely that a rising fraction of sectors are catering for exporting ones, i.e. that the value chain becomes increasingly integrated internationally, at second, third, or higher orders. This phenomenon is completely missed by actual trade data, which focus on first order effects, a potentially tiny fraction of what deep integration implies. A salient example are services: most are probably traded little (data availability notwithstanding), and yet in integrating economies it is likely that services are catering for large exporting sectors. Shocks to service sectors then diffuse internationally, even though they do not appear to trade with each other in the data.

#### 3.1 Measuring export intensity

This section briefly summarizes the workings of the export intensity measure introduced in Imbs and Pauwels (2019a). We start from a simple identity. Gross output in each country-sector can be either used as an intermediate input in another sector (in the same country or not), or as a final good (in the same country or not). This identity can be formalized as:

$$Y_i^r = \sum_s \sum_j Z_{ij}^{rs} + \sum_j F_{ij}^r$$

where  $Y_i^r$  denotes gross output in country  $i$  and sector  $r$ ,  $Z_{ij}^{rs}$  is intermediate input use in country  $j$  and sector  $s$ , and  $F_{ij}^r$  is final use in country  $j$ . The identity can readily extend to a decomposition into traded and domestic components:

$$Y_i^r = \left[ \sum_s \sum_{j \neq i} Z_{ij}^{rs} + \sum_{j \neq i} F_{ij}^r \right] + \left[ \sum_s Z_{ii}^{rs} + F_{ii}^r \right]$$

where the first term in brackets denotes international uses of domestic gross output in sector  $r$ , and the second term captures purely domestic linkages.

Following Antras and Chor (2013), define  $a_{ij}^{rs} = \frac{Z_{ij}^{rs}}{Y_j^s}$ , the dollar amount of sector  $r$ 's output from country  $i$  needed to produce one dollar worth of industry  $s$ 's output in

<sup>7</sup> See for instance Acemoglu, Akcigit, and Kerr (2015).

country j. By definition,  $a_{ij}^{rs}$  is the entry in a direct requirement input-output matrix.

The identity becomes:

$$Y_i^r = \left[ \sum_s \sum_{j \neq i} a_{ij}^{rs} Y_j^s + \sum_{j \neq i} F_{ij}^r \right] + \left[ \sum_s a_{ii}^{rs} Y_i^s + F_{ii}^r \right]$$

In words, the output of sector r can be exported in country j as an intermediate input or as a final good, or it can stay in country i as an intermediate input into sector s or as a final good. Iterating:

$$\begin{aligned} Y_i^r = & \left[ \sum_{j \neq i} F_{ij}^r + \sum_s \sum_{j \neq i} (a_{ij}^{rs} F_j^s + a_{ii}^{rs} F_{ij}^s) \right. \\ & \left. + \sum_t \sum_s \sum_{j \neq i} \left( a_{ij}^{rs} a_{jj}^{st} F_j^t + a_{ii}^{rs} a_{ij}^{st} F_j^t + a_{ij}^{rs} \sum_k a_{jk}^{st} F_k^t \right) + \dots \right] \\ & + \left[ F_{ii}^r + \sum_s a_{ii}^{rs} F_{ii}^s + \sum_s a_{ii}^{rs} a_{ii}^{st} F_i^t + \dots \right] \end{aligned}$$

where  $F_i^t = \sum_j F_{ij}^t$  is the total final demand for good t produced in country i. The first bracket in the expression captures all the orders at which a good can cross the border: as an exported final good (order 1), as an intermediate good used either in the production of a final good abroad or used as an input for a domestic exporting sector (order 2), and so on. The second bracket captures similarly all the manners in which a good reaches final demand, but focusing on domestic linkages. Since it is an identity, the decomposition traces exactly the orders at which the production of sector r crosses a border until it meets final demand: For example, it is entirely possible that good r crosses the border once as an intermediate export into sector s in country j, and then crosses the border back into its original country i as a final re-import into sector t. This would constitute a highly integrated international value chain, with border crossings at various orders, and would by definition be incorporated in the first bracket of the decomposition above. The second bracket would include strictly domestic input-output linkages only.

It is therefore important to keep track of the orders separating production from final demand: We want to draw a difference between a sector whose production crosses the border immediately as a final good, from a sector whose production crosses the border at higher orders. The former would simply be an exporting sector; the latter would not appear to be actually exporting but could still be proximate to exports via vertical linkages. Antras and Chor (2013) introduce a scheme with rising weights associated with distance from final demand to define a measure of upstreamness  $U_i^r$  given by:

$$\begin{aligned} U_i^r = & \left[ \sum_{j \neq i} F_{ij}^r + 2 \times \sum_s \sum_{j \neq i} (a_{ij}^{rs} F_j^s + a_{ii}^{rs} F_{ij}^s) + 3 \right. \\ & \left. \times \sum_t \sum_s \sum_{j \neq i} \left( a_{ij}^{rs} a_{jj}^{st} F_j^t + a_{ii}^{rs} a_{ij}^{st} F_j^t + a_{ij}^{rs} \sum_k a_{jk}^{st} F_k^t \right) + \dots \right] \end{aligned}$$



$$+ \left[ F_{ii}^r + 2 \times \sum_s a_{ii}^{rs} F_{ii}^s + 3 \times \sum_s a_{ii}^{rs} a_{ii}^{st} F_i^t + \dots \right]$$

They do not differentiate between domestic and final demand, but show that in general  $U_i^r$  is given by the typical element in  $[\mathbf{I} - \mathbf{A}]^{-2} \mathbf{F}$ , where  $\mathbf{A}$  is the direct requirement matrix whose typical element is  $a_{ij}^{rs}$ , and  $\mathbf{F}$  is the vector of final demand.

By analogy, it follows that  $F_{ii}^r + 2 \times \sum_s a_{ii}^{rs} F_{ii}^s + 3 \times \sum_s a_{ii}^{rs} a_{ii}^{st} F_i^t + \dots$  is given by the typical element in  $[\mathbf{I} - \mathbf{A}^{DOM}]^{-2} \mathbf{F}^{DOM}$ , where  $\mathbf{A}^{DOM}$  is the purely domestic direct requirement matrix whose typical element is  $a_{ii}^{rs}$ , and  $\mathbf{F}^{DOM}$  is the vector of domestic final demand. Note that  $\mathbf{A}$  and  $\mathbf{A}^{DOM}$  have the same dimension, as  $\mathbf{A}^{DOM}$  is constituted of a sub-set of  $\mathbf{A}$  focused on its block diagonal elements, i.e., its purely domestic input-output linkages.

We can therefore define a vector of export proximities in country  $i$ , given by  $\mathbf{EP} = [\mathbf{I} - \mathbf{A}]^{-2} \mathbf{F} - [\mathbf{I} - \mathbf{A}^{DOM}]^{-2} \mathbf{F}^{DOM}$ . Finally we can define the export intensity of a given sector  $r$  in country  $i$ , given by the ratio of  $EP_i^r$ , the typical element of  $\mathbf{EP}$ , to the total length of the value chain  $U_i^r$ . The index of export intensity measures the extent to which the sectors of country  $i$  serve downstream sectors that are across a border, holding constant the length of the value chain (the upstreamness index of Antras and Chor). The typical element of export intensity  $\mathbf{EI}$  is given by  $EI_i^r = EP_i^r / U_i^r$ .

Computing  $\mathbf{EI}$  is straightforward with the information from the World Input-Output tables (WIOT), which contain direct requirement matrices  $\mathbf{A}$  and  $\mathbf{A}^{DOM}$  as well as vectors of final demand  $\mathbf{F}$  and  $\mathbf{F}^{DOM}$ . It is in fact straightforward to exclude first-order final goods' trade from the measure of export intensity, focusing it instead on higher order intermediate trade only. The idea is that such an amended measure is abstracting from the more conventional approach to measuring openness, based on observed direct trade between countries or sectors. We define a measure of export intensity in intermediates:

$$EII_i^r = \frac{EP_i^r - \sum_{j \neq i} F_{ij}^r}{U_i^r}$$

$EII_i^r$  measures the export intensity of sector  $r$  in country  $i$  abstracting from any exports in final goods arising from sector  $r$ . It captures the export intensity of sector  $r$  in terms of indirectly serving other domestic sectors that eventually exports final goods, or directly trading intermediates with other countries.

As their definitions suggest, both  $EI_i^r$  and  $EII_i^r$  capture the export intensity of a sector  $r$  in country  $i$ . Neither variable have any bilateral dimension: They tell us how much of the value chain in sector  $r$  and country  $i$  is in fact exported to the rest of the world. They do not tell us where.

Consider now a version of the two variables computed on the basis of a subset of WIOT focused on two countries  $i$  and  $j$ ,  $A_{ij}$ . By definition,  $A_{ij}$  embeds all the input-output linkages between countries  $i$  and  $j$ : it tells us how much of output in sector  $r$  of country  $i$  is necessary to produce one dollar of output in country  $j$ 's sector  $s$ . By analogy with earlier notation, denote with  $A_{ij}^{DOM}$  the direct requirement matrix for countries  $i$  and  $j$  focused on strictly domestic linkages. It is straightforward to define a

bilateral version of export proximity, denoted with  $EP_{ij} = [I - A_{ij}]^{-2} F_{ij} - [I - A_{ij}^{DOM}]^{-2} F_{ij}^{DOM}$ , where  $F_{ij}$  is the vector of final demands emerging from both countries, and  $F_{ij}^{DOM}$  is the vector of domestic final demand in both countries i and j. Then the measure of export intensity between sector r in country i and country j is given by  $EI_{ij}^r = EP_{ij}^r / U_{ij}^r$ , where  $U_{ij}^r$  is the typical element of  $[I - A_{ij}]^{-2} F_{ij}$ . By analogy export intensity in intermediates is given by  $EII_{ij}^r = (EP_{ij}^r - F_{ij}^r) / U_{ij}^r$ .

We introduce measures of bilateral export intensities  $BI_{ij}^{rs} = EI_{ij}^r \times EI_{ji}^s$  and bilateral export intensity in intermediates  $BII_{ij}^{rs} = EII_{ij}^r \times EII_{ji}^s$ . The measures combine the intensity of exports from country-sector (i,r) to country j, with the intensity of exports from country sector (j,s) to country i. It is bilateral in the sense that sectors (r,s) in countries (i,j) tend to be close to each other if sector r in country i has high export intensity with country j, and sector s in country j has high export intensity with country i. Both measures are uni-directional in the sense that  $BI_{ij}^{rs} \neq BI_{ij}^{sr}$  and  $BII_{ij}^{rs} \neq BII_{ij}^{sr}$ .

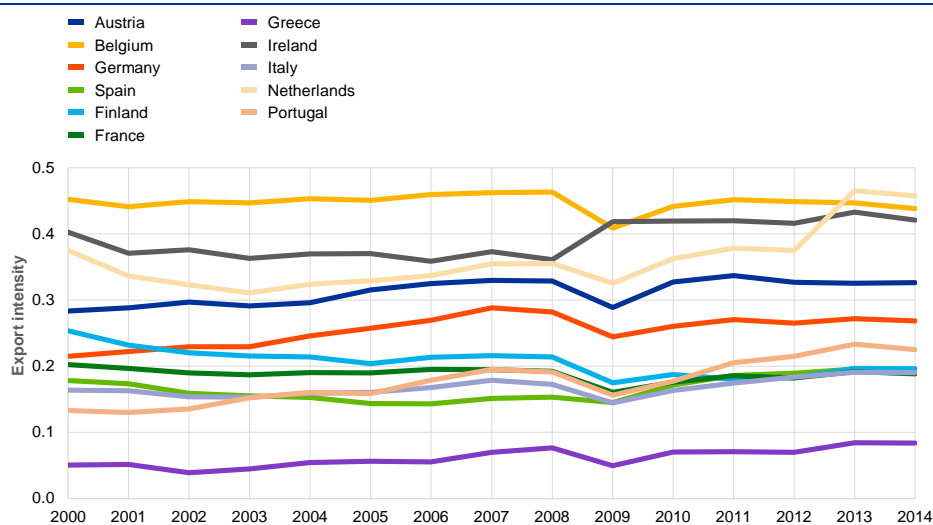
### 3.2 Export intensity in EMU

We now characterize economic integration within the EMU with computations of  $EI_i^r$ , and  $EII_i^r$  for individual EMU member countries and for the EMU as a whole. We also draw comparisons with the main players in the world economy.

We first isolate the EMU from world input-output tables. We do this focusing on input-output linkages between all 12 core EMU member countries in the WIOT. We compute an EMU-wide direct requirement matrix normalizing the entries in the I/O table that pertain to core EMU countries by sector gross output in the core EMU countries. This gives us the values for  $a_{ij}^{rs}$  in the EMU. We proceed similarly with sector-level final demand. Finally, we isolate the domestic I/O matrices for each of the 12 EMU core member country, along with the corresponding (domestic) final demands. This makes it possible to compute  $EI_i^r$  for all 56 sectors in the core of the EMU. Chart 6 reports average measures of export intensity at country-level, averaging  $EI_i^r$  up to country level using sector gross output shares as weights.

**Chart 6**

Export intensities for EMU member countries (without Luxembourg)



Sources: World Input Output Database.

Several results are worth mentioning. First, small countries like Luxembourg, Belgium, or Ireland are exceptionally intensive in exports. In fact, Luxembourg is omitted from Chart 6, for its export intensity index dwarves that of other EMU members, culminating to 74% on average. It is followed by Belgium, Ireland, the Netherlands and Austria, all with averages between 30 and 50%. This is not surprising and is the mirror image of what raw exports (imports) data imply: these economies are geared towards foreign trade. The chart confirms this fact, with allowances for export intensity even in sectors that do not effectively trade internationally. The large economies in the Union – Germany, France, Italy, Spain – come immediately next, with value between 20 and 25%, with highest values in Germany. Finally, Greece is the least open country in the Union.

Second, EMU member countries experience very similar trends, slightly upwards, with an increase until 2007, a slight dip around 2008, and a mild recovery post-2008. The dispersion between countries is much larger than the changes over time.

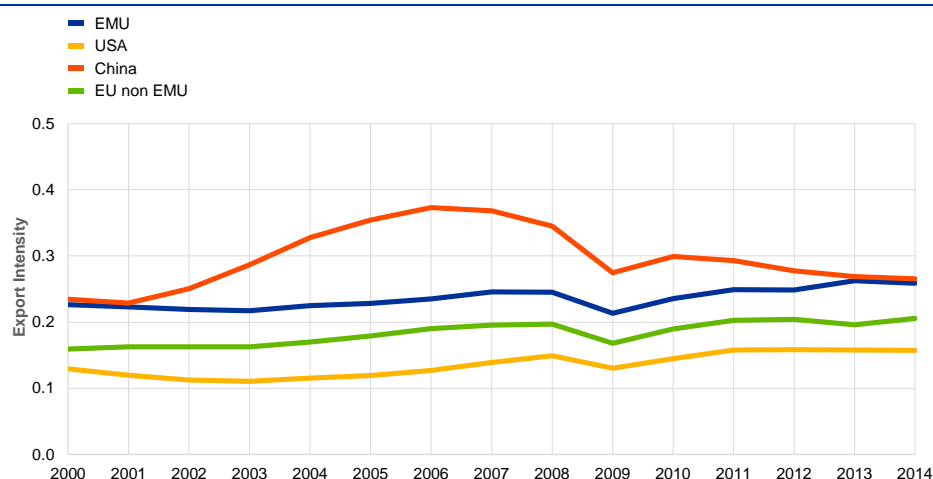
How do EMU members countries compare with other large economies in the world? In Chart 7, we compare the average export intensity of EMU countries (with the rest of the Union) with the average export intensity in the European Union (outside of EMU), in China and in the US.<sup>8</sup> Several results stand out. First, the US and Europe display the same, slightly upward trend, whereas China's export intensity booms from 30 to 42% until 2006, but then plateaus (before the crisis) and falls back after 2008. In fact, by 2014 China's intensity index falls to 27%, barely above that in the EMU, 26%. This appears to be consistent with the re-orientation of the Chinese

<sup>8</sup> For the EMU, we consider the I/O linkages within the Union only, aggregate the entries across the 12 countries, and compute the direct requirement matrix accordingly. For the US and China, we consider I/O linkages from each country with the rest of the world. The comparison is between the average within-EMU export intensity and the average export intensities of China and the US with the rest of the world.

economy towards domestic demand. The US, in contrast, is a much less export oriented economy, with a maximum value of 15%. The recent upward trend in the EMU, combined with the fall in export intensity in China, imply EMU countries that are as open to each other as China is to the rest of the world. EMU countries are also substantially more connected with each other than they are with the rest of the EU.

### Chart 7

Export intensities for the three main areas in the world economy



Sources: World Input Output Database.

An obvious question is the role of individual sectors in driving these results. Tables 2 and 3 report a selected sample of values for  $EI_i^t$  in the EMU, the US, and China. Rather than reporting all 56 sectors, we report the three sectors with top values in each region, and a subset of sectors representative of primary, secondary, and tertiary activities. One of the great advantages of our measure of export intensity is that it can be computed just on the basis of input-output linkages. So it is straightforward to compute for services, even those that are customarily deemed to be “non traded”. In fact, since the index is not built from actual trade data, it is blind to traded or non-traded-ness (see Imbs and Pauwels, 2019a).

Table 2 reports the three sectors with highest export intensity values in the EMU, the US, and China, in 2000, 2007, and 2014. Across all three regions the most export intensive sectors are in manufacturing. In the EMU and the US, heavy manufacturing takes the top spots, with Chemicals, Metals, Transport manufacturing, and Mining. In China, light manufacturing is somewhat more prominent, with Textile, Computers, and Other manufactures. Top values for export intensities in the EMU have increased from around 60% in the 2000’s to around 70% in 2014. These are in fact higher than the top industry in China, Computers, which has become much less export intensive since 2007, down to 66% from 85%. In fact, on the basis of its most intensive sectors, the EMU is more export intensive than China. It is clearly much more export intensive than the US, whose most intensive sector – Metals – reached 58% in 2014.

**Table 2**

Export intensities: top 3 sectors in EMU, China and USA

	EMU			China			USA		
	2000	2007	2014	2000	2007	2014	2000	2007	2014
<b>Chemicals</b>	0.63	0.69	0.76	0.53	0.76	0.61	0.64	0.57	0.52
<b>Metals</b>	0.61	0.66	0.74	0.44	0.66	0.51	0.49	0.49	0.44
<b>Computers</b>	0.58	0.61	0.68	0.42	0.64	0.46	0.46	0.45	0.44

Source: Authors' calculations from World Input-Output Tables.

Table 3 focuses on nine sectors chosen to be representative of agriculture, manufactures, and services. The patterns in agriculture and manufacturing are quite systematic: EMU countries display a manifest trend upwards, while China's trend turns downwards from 2007. As a result, EMU sectors are more export intensive than China's by the end of the sample. This is true of Agriculture, Mining, Textile, Machinery, and Pharmacy. These are also much more intensive in exports in the EMU than in the US, where the trend is essentially flat.

For services, the pattern is different. China's services are substantially more export oriented than the EMU's, and, by a long margin, than the US. While export intensity continues to be hump-shaped in China with a peak in 2007, the levels in China by the end of the sample tend to remain slightly above EMU's, and far above the US's. The most intensive services in the EMU are wholesale and business (legal and accounting) services: Their level in 2014 is roughly on par with China's, while they were far below earlier in the 2000's. China is by far the most export intensive in Retail and Finance.

**Table 3**

Export intensities: selected sectors in EMU, China and USA

	EMU			China			USA		
	2000	2007	2014	2000	2007	2014	2000	2007	2014
<b>Agriculture</b>	0.24	0.28	0.35	0.15	0.29	0.21	0.18	0.23	0.26
<b>Mining</b>	0.50	0.60	0.74	0.30	0.41	0.30	0.18	0.22	0.32
<b>Textile</b>	0.45	0.51	0.65	0.44	0.64	0.46	0.24	0.31	0.27
<b>Pharmacy</b>	0.39	0.54	0.61	0.11	0.24	0.14	0.28	0.33	0.36
<b>Machinery</b>	0.44	0.51	0.57	0.24	0.45	0.35	0.36	0.43	0.42
<b>Wholesale</b>	0.28	0.30	0.36	0.29	0.42	0.34	0.23	0.25	0.27
<b>Retail</b>	0.18	0.21	0.14	0.29	0.41	0.34	0.02	0.02	0.03
<b>Finance</b>	0.19	0.25	0.24	0.23	0.37	0.27	0.12	0.15	0.21
<b>Legal &amp; Acct</b>	0.25	0.27	0.36	0.40	0.49	0.35	0.17	0.18	0.21

Sources: Authors' calculations from World Input-Output Tables.

Table 4 repeats the exercise with a breakdown into the same nine sectors for individual EMU countries. The upper panel focuses on three large EMU economies (Germany, France, and Italy); the lower panel presents results for three small

economies (Austria, Greece, and the Netherlands). The same broad conclusions emerge in the large European economies: export intensity is increasing, sometimes fast, across agriculture and most manufacturing sectors. No such trend is apparent for services. Greece is by far the most inward-looking country in the sample, with lower export intensities across the board. Austria and the Netherlands have services that are quite outward-oriented, especially Finance and Business Services.

**Table 4**  
Export intensities: selected sectors in selected EMU countries

	Germany			France			Italy		
	2000	2007	2014	2000	2007	2014	2000	2007	2014
Agriculture	0.17	0.24	0.34	0.24	0.25	0.29	0.11	0.13	0.20
Mining	0.32	0.53	0.69	0.31	0.46	0.47	0.18	0.25	0.20
Textile	0.61	0.88	0.85	0.51	0.66	NA	0.33	0.35	0.52
Pharmacy	0.29	0.64	0.58	0.31	0.42	0.62	0.25	0.31	0.57
Machinery	0.42	0.53	0.56	0.55	0.70	0.73	0.35	0.38	0.49
Wholesale	0.29	0.38	0.35	0.24	0.23	0.33	0.18	0.20	0.22
Retail	0.08	0.11	0.13	0.23	0.23	0.07	0.16	0.18	0.11
Finance	0.15	0.21	0.19	0.15	0.15	0.16	0.13	0.16	0.16
Legal & Acct	0.22	0.28	0.28	0.21	0.20	0.23	0.17	0.19	0.18
	Austria			Greece			Netherlands		
	2000	2007	2014	2000	2007	2014	2000	2007	2014
Agriculture	0.26	0.36	0.46	0.04	0.06	0.09	0.64	0.75	0.69
Mining	0.38	0.67	0.57	0.13	0.19	0.31	NA	NA	NA
Textile	0.77	0.90	0.87	0.16	0.12	0.06	0.89	0.93	0.87
Pharmacy	0.46	0.65	0.62	0.04	0.17	0.22	0.74	0.86	0.83
Machinery	0.67	0.73	0.71	0.04	0.08	0.14	0.54	0.88	0.79
Wholesale	0.35	0.40	0.45	0.07	0.10	0.14	0.53	0.45	0.66
Retail	0.08	0.09	0.10	0.03	0.03	0.05	0.41	0.41	0.15
Finance	0.26	0.29	0.28	0.04	0.06	0.08	0.32	0.33	0.40
Legal & Acct	0.32	0.36	0.35	0.06	0.09	0.12	0.43	0.40	0.82

Sources: Authors' calculations from World Input-Output Tables.

### 3.3 Export intensity and synchronization

We now compute bilateral indices of export intensity,  $BI_{ij}^{r,s}$  and  $BII_{ij}^{r,s}$ . Each index can be computed in each year, and we seek to establish whether bilateral export intensity can explain the synchronization in sector-level growth rates, and ultimately in GDP. Our approach is from the bottom up, in the sense that we seek to explain the synchronization in aggregate GDP growth on the basis of the sector level. The conjecture is that sectors that co-move between countries are ones with strong bilateral export intensity. This in turn reflects deep integration in terms of input-output

linkages, rather than large volumes of exports, and it increases aggregate co-movements.

We start with a simple description of the values of  $BII_{ij}^{rs}$  obtained for EMU countries, as compared with China and the US. In the EMU we consider all country pairs between the core 12 member countries, i.e. a total of 66 country pairs. We construct  $A_{ij}$ ,  $F_{ij}$ , and their domestic constituents for each one of these pairs. We also apply Leontief's inverse to compute value added and gross output corresponding to each country pair. We proceed similarly for the US and China, focusing on all bilateral pairs involving one or the other.

**Table 5**  
Bilateral export intensities in sectors

	AGR	Light MFG	Heavy MFG	Utilities	Retail/Whole	Transp.	Hotels	Bus. Serv.
<b>AGR</b>	6.906	6.195	7.550	4.471	3.481	6.052	3.570	3.944
	2.172	2.009	2.371	1.366	1.455	1.706	1.269	1.486
	0.927	0.945	1.384	0.879	0.923	1.297	0.709	0.816
<b>Light MFG</b>	7.037	6.387	7.980	4.516	3.562	6.144	3.570	3.968
	1.725	1.585	1.948	1.093	1.173	1.338	0.997	1.198
	1.031	1.036	1.529	0.947	1.004	1.424	0.770	0.877
<b>Heavy MFG</b>	7.950	7.335	9.132	5.232	4.100	7.091	4.116	4.580
	2.473	2.272	2.790	1.568	1.677	1.921	1.426	1.711
	1.157	1.182	1.728	1.106	1.153	1.618	0.890	1.028
<b>Utilities</b>	4.040	3.709	4.639	2.687	2.064	3.603	2.092	2.312
	1.282	1.200	1.493	0.837	0.870	1.012	0.758	0.912
	0.841	0.860	1.254	0.806	0.843	1.182	0.648	0.751
<b>Retail/Whole</b>	3.733	3.393	4.228	2.411	1.896	3.301	1.944	2.154
	0.718	0.668	0.831	0.460	0.491	0.570	0.426	0.519
	1.005	1.023	1.501	0.950	0.994	1.401	0.766	0.883
<b>Transp.</b>	5.548	5.044	6.316	3.643	2.845	4.905	2.890	3.207
	1.587	1.490	1.930	1.068	1.105	1.326	0.964	1.163
	1.136	1.133	1.670	1.043	1.086	1.549	0.848	0.955
<b>Hotels</b>	3.798	3.488	4.284	2.531	2.074	3.488	2.226	2.431
	0.804	0.767	0.984	0.537	0.555	0.663	0.494	0.609
	0.877	0.897	1.321	0.834	0.870	1.228	0.671	0.775
<b>Bus. Serv.</b>	4.219	3.942	4.864	2.846	2.358	3.942	2.542	2.792
	0.993	0.937	1.192	0.651	0.688	0.814	0.612	0.760
	0.950	0.968	1.428	0.898	0.937	1.326	0.724	0.836

Sources: World Input Output Database. Averages of  $BII_{ij}^{rs}$ .  
Notes: EMU in blue, USA in red and China in black. All numbers are multiplied by 1,000.

We find the average value for  $BII_{ij}^{rs}$  is about four times larger in EMU than in China or the US: it is equal to 4.21 in EMU, 1.19 in the US, and 1.05 in China. Are these differences homogeneous across sector pairs? We partition the 50 sectors in WIOT

into 8 categories – Agriculture, Light Manufacturing, Heavy Manufacturing, Utilities, Retail/Wholesale, Transport, Hotels, and Business Services. We compute the average values for  $BII_{ij}^{rs}$  in each of the 64 bilateral cells defined by this partition. Table 5 reports these average values for  $BII_{ij}^{rs}$  for the EMU as compared with the US and China. The table illustrates considerable heterogeneity across sector-pairs. In the EMU,  $BII_{ij}^{rs}$  takes highest value within heavy manufactures, where it is equal to 6.19 on average, followed by light manufacturing and agriculture. The lowest value is in retail / wholesale, where it is 2.88. The highest bilateral value is within heavy manufacturing, with 9.13. Interestingly, the dispersion in the values of  $BII_{ij}^{rs}$  is quite similar across countries. The most integrated sectors in China and the US are also in heavy manufactures, followed by light manufactures. But they are considerably smaller, 1.98 and 1.23, respectively. The pair with highest value is also within heavy manufactures both in the US (2.79) and in China (1.73). The lowest value in the Table for the US is in services, like in the EMU: within retail / wholesale (0.49), and between retail / wholesale and hotels (0.42). And the lower value in the Table for China is also in services: 0.67 within hotels, and 0.64 between utilities and hotels.

The cross-sectional distribution of  $BII_{ij}^{rs}$  across sector-pairs is in fact quite stable across regions, with high values within manufacturing, and relatively low values within services. The key difference apparent in the Table is that numbers in the EMU are considerably larger than in the US and in China. EMU member countries are considerably more integrated bilaterally with each other than the US or China are integrated with individual countries in the world economy. This is a fact that raw trade data would miss completely.

We then turn to the question whether export intensity can explain convergence in GDP. We seek to establish if  $\beta$  is significant in the estimation of

$$-|gy_{it}^r - gy_{jt}^s| = \alpha_{ij}^{rs} + \beta BII_{ij,t}^{rs} + \gamma Trade_{ij,t}^{rs} + \eta_{ij,t}^{rs}$$

The estimation is performed within country-sector pair, and positive estimates of  $\beta$  are interpreted as suggestive that bilateral export intensity (as opposed to observed trade intensity) does contribute to convergence.

Table 6 reports the estimates of  $\beta$  for all country-sector pairs  $i,j,r,s$  in the EMU. The different specifications include additional intercepts, with a view to ensuring the robustness of the estimates. All specifications include  $\alpha_{ij}^{rs}$  and are performed within-country-sector pair.

The first specification includes export intensity  $BII_{ij}^{rs}$  only. Specification (2) is augmented with controls for bilateral direct trade. Specification (3) includes year effects in order to absorb any EMU-wide aggregate shocks. Specification (4) includes country-sector-year effects to allow for country-specific sector shock. Specification (5) includes country-year effects only, meant to control for any macroeconomic shock, most prominently the global financial crisis of 2008. Finally, specification (6) introduces country-pair year effects, allowing for changes in the patterns of aggregate country-level correlations. These fixed effects are important, as estimates of beta in  $\beta$  guarantee that any mechanism at country-pair level is controlled for, even if it is time varying. This is important, because it ensures that the



typical measure for financial integration is held constant. In particular, cross-country financial integration, manifested for example by capital account openness, or financial harmonization, is in fact purged from the estimates of  $\beta$  in the last specification of Table 6, both in the upper and the lower panels.

**Table 6**  
Export intensities and convergence in EMU countries

	(1)	(2)	(3)	(4)	(5)	(6)
$BII_{ij}^{r,s}$	0.20*** (0.01)	0.20*** (0.01)	0.10*** (0.01)	0.12*** (0.01)	0.16*** (0.02)	0.15*** (0.02)
$Trade_{ij}^{r,s}$		0.23*** (0.08)	0.24*** (0.07)	-0.0048 (0.03)	0.0073 (0.04)	0.012 (0.04)
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Effects			Yes			
Year-Country-Sector				Yes		
Year-Country					Yes	
Year-Country-Pair						Yes
N	2292400	2292391	2292391	2128492	2128492	2128492
$R^2$	0.00018	0.00018	0.053	0.34	0.035	0.051
	(7)	(8)	(9)	(10)	(11)	(12)
$BII_{ij}^{r,s}$	0.14*** (0.01)	0.14*** (0.01)	0.07*** (0.01)	0.10*** (0.01)	0.10*** (0.01)	0.10*** (0.01)
$Trade_{ij}^{r,s}$		0.25*** (0.08)	0.25*** (0.07)	-0.005 (0.03)	0.009 (0.04)	0.013 (0.04)
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Effects			Yes			
Year-Country-Sector				Yes		
Year-Country					Yes	
Year-Country-Pair						Yes
N	2292391	2292391	2292391	2128492	2128492	2128492
$R^2$	0.0002	0.0002	0.05	0.34	0.04	0.05

Sources: World Input Output Database.

Notes: The dependent variable is  $-|gy_{it}^r - gy_{jt}^s|$  and the standard errors are in brackets. \*\*\*, \*\*, \* denote the 1%, 5% and 10% level of significance respectively.

The first six specifications use  $BII_{ij,t}^{r,s}$  as a regressor; the last six use  $BII_{ij,t}^s$  instead, with similar permutations of fixed effects. In all cases the value of  $\beta$  is estimated to be strongly positive and significant, with point estimates that are quite robust between 0.10 and 0.20. The same cannot be said of actually observed bilateral trade, which does not survive the inclusion of country-sector-year, country-year, or country-pair-year effects. Focusing on specification (3), we find that increasing in  $BII_{ij,t}^s$  by one standard deviation increases  $-|gy_{it}^r - gy_{jt}^s|$  by 0.16, whereas increasing trade by one standard deviation only increases synchronization by 0.06. The consequence of export intensity is therefore a robust effect, obtained in a broad bilateral dataset at sector-level, and it is significant both statistically and economically. Importantly, this significant effect is distinct from one caused by international financial integration. The natural next question is: what are the sectors that drive the effects of export intensity.

**Table 7**

Export intensities and convergence in EMU for primary/secondary/tertiary sectors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	AGR-AGR	AGR-MFG	AGR-SER	MFG-AGR	MFG-MFG	MFG-SER	SER-AGR	SER-MFG	SER-SER
$BII_{ij}^{rs}$	0.04 (0.06)	-0.01 (0.04)	0.18*** (0.05)	0.02 (0.03)	0.13*** (0.02)	0.26*** (0.02)	0.23*** (0.04)	0.41*** (0.03)	0.57*** (0.03)
$Trade_{ij}^{rs}$	-1.86 (2.05)	0.34*** (0.11)	-8.48 (5.72)	-3.05 (2.76)	0.26* (0.14)	-1.87*** (0.45)	7.28 (6.63)	2.08*** (0.49)	-1.42*** (0.32)
N	14168	80183	84220	78428	443828	466108	82078	464470	487784
$R^2$	0.0001	0.0001	0.0002	0.00003	0.0001	0.0003	0.00047	0.0004	0.0007

Sources: World Input Output Database.

Notes: The dependent variable is  $-|gy_{it}^r - gy_{jt}^s|$  and the standard errors are in brackets. \*\*\*, \*\*, \* denote the 1%, 5% and 10% level of significance respectively. AGR is Agriculture, MFG is Manufacturing and SER are Services.

Tables 7 and 8 break the estimation down to the sector level. Table 7 partitions all sectors into primary, secondary, and tertiary activities, and reports estimates of  $\beta$  for all nine bilateral combinations of these three categories. Two results stand out. First, manufacturing sectors that are intensive in exports tend to correlate bilaterally. This is not too surprising, as these are highly traded merchandises. Much more surprising is the systematically high and significant estimates of  $\beta$  for pairs involving service sectors. These are quintessentially non-traded sectors, and yet their bilateral export intensity is significantly associated with converging growth rates: These are in fact the activities where estimates of  $\beta$  take their largest values. These are also the pairs of sectors where a standard measure of direct trade would be unable to explain the convergence in sector growth rates: the estimates of the effects of trade on  $-|gy_{it}^r - gy_{jt}^s|$  are unstable, sometimes insignificant, sometimes negative and significant. Focusing on specification (5) (MFG-MFG), increasing  $BII_{ij,t}^{rs}$  by one standard deviation increases synchronization by 0.29, whereas increasing trade by one standard deviation only results in an increase of 0.11. For specification (8) (SER-MFG), the numbers are 0.50 and 0.12, respectively.

**Table 8**

Export intensities and convergence in EMU for 8 categories

	Variables	AGR	Light MFG	Heavy MFG	Utilities	Retail/Whole	Transp.	Hotels	Bus. Serv.
AGR	$BII_{ij}^{TS}$	0.04 (0.06)	-0.10 (0.08)	-0.02 (0.06)	0.20** (0.10)	0.14 (0.16)	0.22*** (0.08)	0.12 (0.13)	0.16* (0.09)
	$Trade_{ij}^{TS}$	-1.86 (2.05)	-0.93 (0.75)	0.36*** (0.13)	0.44 (0.55)	7.12 (15.60)	-9.7 (23.20)	-11.0* (5.85)	29.1 (27.50)
Light MFG	$BII_{ij}^{TS}$	0.09* (0.05)	0.07 (0.07)	0.16*** (0.05)	0.21** (0.09)	0.39*** (0.14)	0.29*** (0.07)	0.36*** (0.12)	0.44*** (0.08)
	$Trade_{ij}^{TS}$	1.72 (5.41)	0.44 (0.65)	9.00** (3.96)	-5.43 (7.15)	4.07 (6.19)	-2.66 (7.35)	0.47 (2.22)	4.27 (3.30)
Heavy MFG	$BII_{ij}^{TS}$	-0.01 (0.04)	0.11** (0.05)	0.12*** (0.03)	0.20*** (0.06)	0.11 (0.10)	0.22*** (0.04)	0.24*** (0.08)	0.33*** (0.05)
	$Trade_{ij}^{TS}$	-4.27 (3.48)	-0.92 (3.01)	0.12 (0.16)	-2.03 (1.36)	-0.91 (3.80)	-1.67*** (0.55)	-15.9*** (4.60)	-38.6*** (5.30)
Utilities	$BII_{ij}^{TS}$	0.11 (0.11)	0.24 (0.16)	0.05 (0.14)	-0.29 (0.24)	-0.58 (0.40)	0.16 (0.14)	0.24 (0.32)	0.44** (0.22)
	$Trade_{ij}^{TS}$	-5.96 (8.70)	7.30 (4.73)	3.95*** (0.70)	2.43*** (0.93)	13.0 (12.40)	-3.59 (12.60)	-27.9*** (7.94)	-23.0*** (8.50)
Retail/Whole	$BII_{ij}^{TS}$	0.057 (0.11)	0.29 (0.20)	0.29 (0.20)	-0.13 (0.29)	-0.35 (0.45)	0.39** (0.17)	0.16 (0.36)	0.41* (0.25)
	$Trade_{ij}^{TS}$	16.9 (14.20)	6.12 (4.29)	6.12 (4.29)	2.09 (6.81)	18 (15.50)	5.89 (19.20)	-3.14 (4.43)	9.13 (6.41)
Transp.	$BII_{ij}^{TS}$	0.33*** (0.08)	0.79*** (0.11)	0.79*** (0.11)	0.73*** (0.11)	0.88*** (0.22)	0.60*** (0.10)	1.51*** (0.18)	1.06*** (0.11)
	$Trade_{ij}^{TS}$	-88.9*** (29.70)	-36.7*** (9.53)	-36.7*** (9.53)	-15.8 (11.70)	5.34 (5.42)	-2.01* (1.21)	-31.4*** (6.62)	-5.33* (2.94)
Hotels	$BII_{ij}^{TS}$	0.17* (0.10)	0.14 (0.16)	0.14 (0.16)	0.065 (0.19)	-0.34 (0.24)	0.24* (0.14)	0.36* (0.19)	0.42*** (0.13)
	$Trade_{ij}^{TS}$	18.1* (9.49)	3.77 (6.20)	3.77 (6.20)	-72.5*** (14.20)	7.22** (3.29)	2.34 (8.70)	-1.94* (0.99)	-0.73 (0.74)
Bus. Serv.	$BII_{ij}^{TS}$	0.15** (0.06)	0.26*** (0.10)	0.26*** (0.10)	0.08 (0.13)	-0.19 (0.17)	0.46*** (0.09)	0.34*** (0.12)	0.46*** (0.08)
	$Trade_{ij}^{TS}$	17.8** (7.46)	8.61* (4.55)	8.61* (4.55)	0.60 (2.04)	7.32*** (2.24)	-10.8** (5.18)	-0.37 (0.60)	-1.47*** (0.38)

Sources: World Input Output Database.

Notes: The dependent variable is  $-|gy_i^r - gy_i^s|$  and the standard errors are in brackets. \*\*\*, \*\*, \* denote the 1%, 5% and 10% level of significance respectively.

Table 8 now partitions all 50 WIOT sectors in eight categories, following the same classification as in Table 5, and reports estimates of  $\beta$  in each of the thus defined 64 cells. The coefficient is typically significant and positive whenever sector r belongs to manufactures (light and heavy) and transport, but these point estimates are largest when sector s belongs to services, especially transport, hotels, and business services. In fact, the most consistently positive and large estimates of  $\beta$  obtain for

pairs of sectors involving business services. This is intuitive as business services constitute presumably a key input for activities that export: even though there is very little direct trade in those sectors, they contribute to convergence between sectors.

How much do these results contribute to aggregate convergence? Absolute differences in growth rates cannot answer this important question, since they do not have palatable aggregation properties. To answer this crucial question, we turn to an alternative measure of co-movements, the quasi-correlation coefficient

$$q_{ij,t}^{rs} = \frac{(g_{it}^r - \bar{g}_i^r)(g_{jt}^s - \bar{g}_j^s)}{\sigma_i^r \sigma_j^s}$$

where  $g_{it}^r$  denotes value added growth in sector  $r$  of country  $i$  at time  $t$ ,  $\bar{g}_i^r$  is its average over time, and  $\sigma_i^r$  is its standard deviation.

The main appeal of the quasi-correlation coefficient is its simple aggregation properties. Define the aggregate quasi correlation

$$q_{ij,t} = \frac{(g_{it} - \bar{g}_i^*)(g_{jt} - \bar{g}_j^*)}{\sigma_i \sigma_j}$$

where  $g_{it}$  denotes the GDP growth rate in country  $i$  at time  $t$ ,  $\bar{g}_i^*$  is its average over the period, and  $\sigma_i$  is its standard deviation. It is straightforward that

$$q_{ij,t} = \frac{\sum_r \sum_s \omega_i^r \omega_j^s (g_{it}^r - \bar{g}_i^r) (g_{jt}^s - \bar{g}_j^s)}{\sigma_i \sigma_j}$$

where we assumed constant sector shares, and  $E g_{it}^r g_{it}^s = 0$  for all  $r, s, i, t$ , i.e., the meaningful correlation between sectors is international. Simple algebra implies

$$q_{ij,t} = \sum_r \sum_s \frac{\omega_i^r \omega_j^s \sigma_i^r \sigma_j^s}{\sigma_i \sigma_j} q_{ij,t}^{rs}$$

Aggregate co-movements are given by a weighted average of all bilateral quasi-correlations at sector level, with weights given by relative standard deviations.

Table 9 presents the results of estimating

$$q_{ij,t}^{rs} = \alpha_{ij}^{rs} + \beta BII_{ij,t}^{rs} + \gamma Trade_{ij,t}^{rs} + \eta_{ij,t}^{rs}$$

including a battery of fixed effects akin to what we did previously, with and without controls for bilateral trade. The table confirms the results obtained with absolute differences carry through with quasi-correlation coefficients, with positive and significant estimates of  $\beta$  everywhere.<sup>9</sup> Note that once again these estimates are controlling for any country-pair specific development, even if it varies over time, which includes financial integration between countries.

<sup>9</sup> An issue with the quasi-correlation coefficient  $q_{ij,t}^{rs}$  is that it is measured with considerable error: both moments  $\bar{g}_i^r$  and  $\sigma_i^r$  are estimated over the whole period, which includes the global financial crisis of 2007-2008. As a result,  $q_{ij,t}^{rs}$  displays (very) large volatility over time. This is a serious problem for an estimation that is performed within country-sector pairs, which is known to exacerbate measurement error. To alleviate this issue, the estimation is performed using average values of all variables over two periods: 2000-2007, and 2008-2014.

**Table 9**

## Export intensities and quasi correlation in EMU countries

	(1)	(2)	(3)	(4)	(5)	(6)
$BI_{ijt}^{rs}$	4.15*** (0.11)	4.08*** (0.11)	2.10*** (0.11)	2.15*** (0.10)	2.32*** (0.11)	2.18*** (0.12)
$Trade_{ijt}^{rs}$		3.81*** (0.74)	3.32*** (0.72)	2.53*** (0.26)	4.15*** (0.31)	3.82*** (0.31)
<b>Fixed Effects</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Year Effects</b>			Yes			
<b>Year-Country-Sector</b>				Yes		
<b>Year-Country</b>					Yes	
<b>Year-Country-Pair</b>						Yes
<b>N</b>	325600	325600	325600	325600	325600	325600
<b>R<sup>2</sup></b>	0.0089	0.0091	0.054	0.33	0.013	0.03

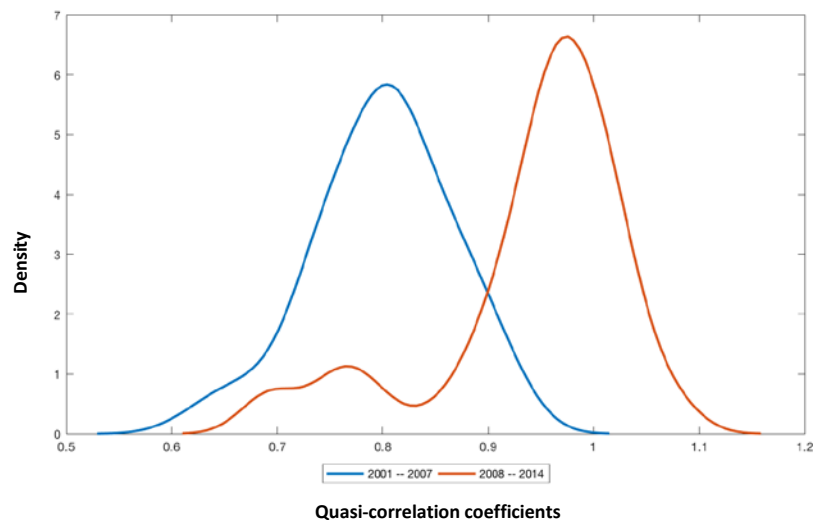
Sources: World Input Output Database.

Notes: The dependent variable  $q_{ij,t}^{rs}$  and the standard errors are in brackets. \*\*\*, \*\*, \* denote the 1%, 5% and 10% level of significance respectively.

We finally investigate the ability of export intensity to explain the convergence in GDP, i.e., the change in quasi-correlation between GDP growth rates in the EMU. Since we have so far focused on a measure of convergence based on absolute differences, we first verify that the quasi correlation between aggregate GDP growth did indeed shift upwards over the past 20 years. Chart 8 plots density estimates for the value of  $q_{ij,t}$  averaged over 2000-2007 and over 2008-2014. The chart illustrates unambiguously the increase in average bilateral correlations over that period.

**Chart 8**

Distribution estimates for quasi-correlations between GDP growth rates – 2001-2007 and 2008-2014



Sources: World Input Output Database.

Notes: Density plots of observed  $q_{ij,t}$ . Density of  $q_{ij,t}$  over two periods: 2001 – 2007 and 2008 – 2014

This is also the period during which an increase in  $BII_{ij,t}^{rs}$  was associated with a rise in sector-level correlations  $q_{ij,t}^{rs}$ , as per Table 9. We now ask how much of the aggregate convergence can be explained by sector-level developments. To do so, we fit values for  $\hat{q}_{ij}^{rs}$  using the model in Table 9. First, we fit  $\hat{q}_{ij}^{rs}(BII)$ , the value for bilateral correlations at sector level implied by export intensity only (along with the fixed effects) in specification (1). For comparison purposes, we fit  $\hat{q}_{ij}^{rs}(Trade)$ , the value for bilateral correlations at sector level implied by bilateral trade only (again, along with the fixed effects) in specification (1). We fit these values over the two periods 2000-2007 and 2008-2014. We then use the aggregation formula and obtain fitted values of aggregate correlations,  $\hat{q}_{ij}(BII)$ , and  $\hat{q}_{ij}(Trade)$ , measured again over the same two periods. Both fitted values are only allowed to change over time because of changes in export intensity and changes in trade: Thus, we focus the analysis on the ability of bilateral intensity to explain aggregate synchronization. We compare it with the well-known fact that bilateral trade explains bilateral cycle correlations.

We collect aggregate GDP growth rates from WIOT and compute quasi-correlation coefficients over the same two periods. Finally, we estimate  $q_{ij,t} = \alpha_{ij} + \beta \hat{q}_{ij}(BII) + \varepsilon_{ij,t}$  and  $q_{ij,t} = \alpha_{ij} + \beta \hat{q}_{ij}(Trade) + \varepsilon_{ij,t}$  with  $t = 2000-2007, 2008-2014$ . The estimates of  $\beta$  will tell us how much the model, estimated at sector-level, is able to explain aggregate synchronization abstracting from any aggregate shocks. The lynchpin of the analysis will be significance, of course, but also values for the R squared.

Table 10 presents the results: estimates of  $\beta$  are positive and significant in both specifications when the fitted values  $\hat{q}_{ij}(BII)$  and  $\hat{q}_{ij}(Trade)$  are included in isolation. The within R squared are in the same ballpark in either case: 20.6% for bilateral export intensity, and 16.9% for bilateral trade. In other words, bilateral intensity at sector level can explain 20% of aggregate GDP synchronization, as against 17% for bilateral trade. When both fitted values are included simultaneously  $\hat{q}_{ij}(Trade)$  stops being significant, and it is only  $\hat{q}_{ij}(BII)$  that displays any explanatory power. The R squared is virtually unchanged, at 20.9%. We conclude that export intensity is at least as relevant as trade in explaining GDP convergence in the aggregate.

**Table 10**  
Estimates of  $q_{ij,t} = \alpha_{ij} + \beta \hat{q}_{ij}(BII) + \varepsilon_{ij,t}$  and  $q_{ij,t} = \alpha_{ij} + \beta \hat{q}_{ij}(Trade) + \varepsilon_{ij,t}$

	(i)	(ii)	(iii)
<b>Export Intensity</b>	2.722*** (0.675)		2.221* (1.240)
<b>Trade</b>		48.753*** (13.375)	12.756 (24.020)
<b>N. Obs</b>	132	132	132
<b>Within R2</b>	0.206	0.169	0.209
<b>Pair fixed effects</b>	Yes	Yes	Yes

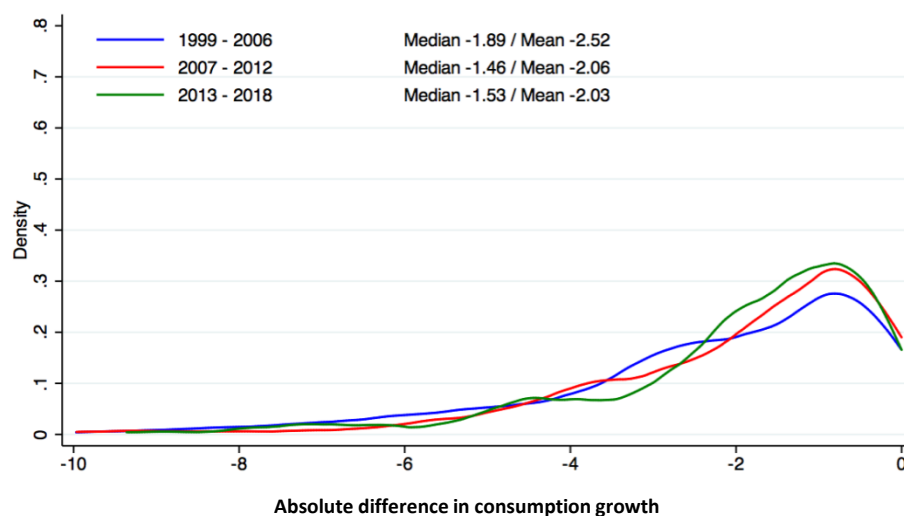
Sources: World Input Output Database.  
Notes: The dependent variable is  $q_{ij,t}$  and standard errors are in brackets. \*\*\*, \*\*, \* denote the 1%, 5% and 10% level of significance respectively.  
Estimates of  $q_{ij,t} = \alpha_{ij} + \beta \hat{q}_{ij}(BII) + \varepsilon_{ij,t}$  and  $q_{ij,t} = \alpha_{ij} + \beta \hat{q}_{ij}(Trade) + \varepsilon_{ij,t}$

## 4 Convergence in consumption

We start with an illustration of the convergence in per capita consumption between EMU member countries, and then compare it with US states. Chart 8 plots the estimated distribution for the absolute differences in per capita consumption growth rates across the 12 core EMU members. Once again, the trend is one of increased convergence, and it is between 1999-2006 and 2007-2012 that the increase is most pronounced. Both mean and median absolute differences fall observably between the two periods, from -2.52 to -2.06, and -1.89 to -1.45, respectively. The latest period 2013-2018 does not witness much of a shift in the distribution. Interestingly, this is very different from convergence in GDP, which mostly occurred after 2013. It suggests the evidence in the intermediate period could be due to financial integration (since this is when consumption converge without much of a change in GDP differences). And it suggests the opposite for the most recent period, since GDP converged while consumption did not.

### Chart 9

#### Absolute difference in consumption growth – EMU



Sources: Eurostat.

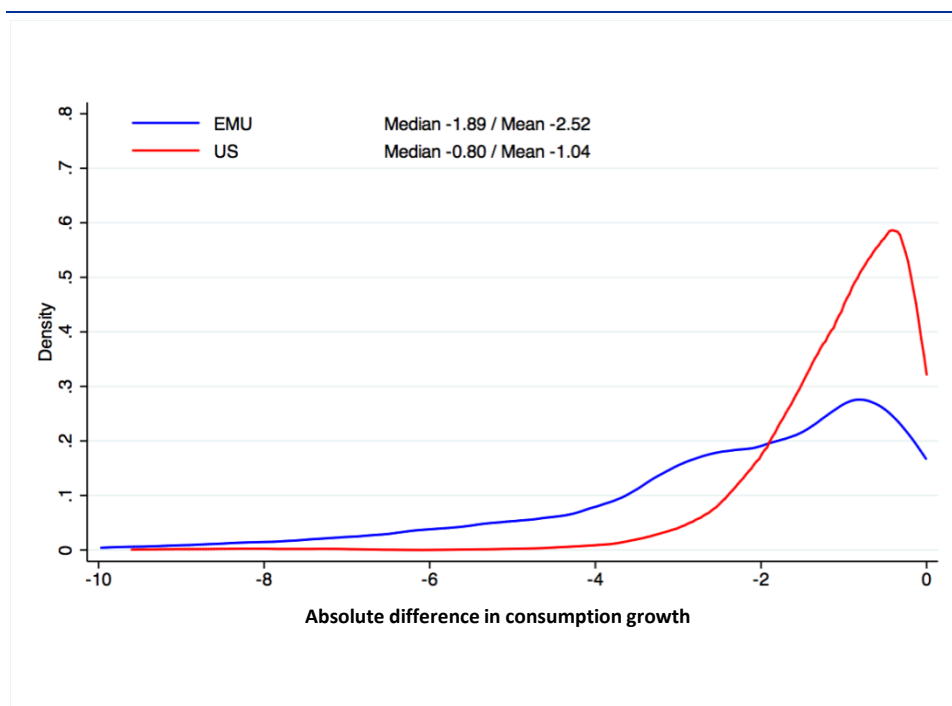
Notes: Density plots of annual difference in Consumption growth in pairs of EMU countries.

How does absolute difference in consumption compare between the EMU and the US? Charts 9, 10, and 11 begin to answer the question, comparing distributions in the two regions over the three periods considered. The evidence is unambiguous: per capita consumption growth is substantially more homogeneous across US states than it is between EMU member countries. The mean, median, and mode of the estimated distribution for absolute differences are substantially closer to zero in the US, with values often less than half what they are in the EMU. For example, the mean absolute difference is -1.04 between 1999 and 2006 in the US, against -2.52 in

the EMU. The same pattern emerges in all three periods. Increased convergence is also apparent in the US, especially in the last period after 2013. While mean and median are virtually unchanged in the US between 1999-2006 and 2007-2012, they fall sizeably after 2013, going from -0.80 to -0.60, and from -1.06 to -0.75, respectively. Of course, in the US this is also the period during which GDP converge, which suggests this recent convergence in consumption growth does not necessarily originate in improved financial integration. Next Section investigates rigorously how disconnected from local income consumption has become over time, both in the EMU and in the US.

### Chart 10

Absolute difference in GDP growth from 1999 to 2006 – EMU and US



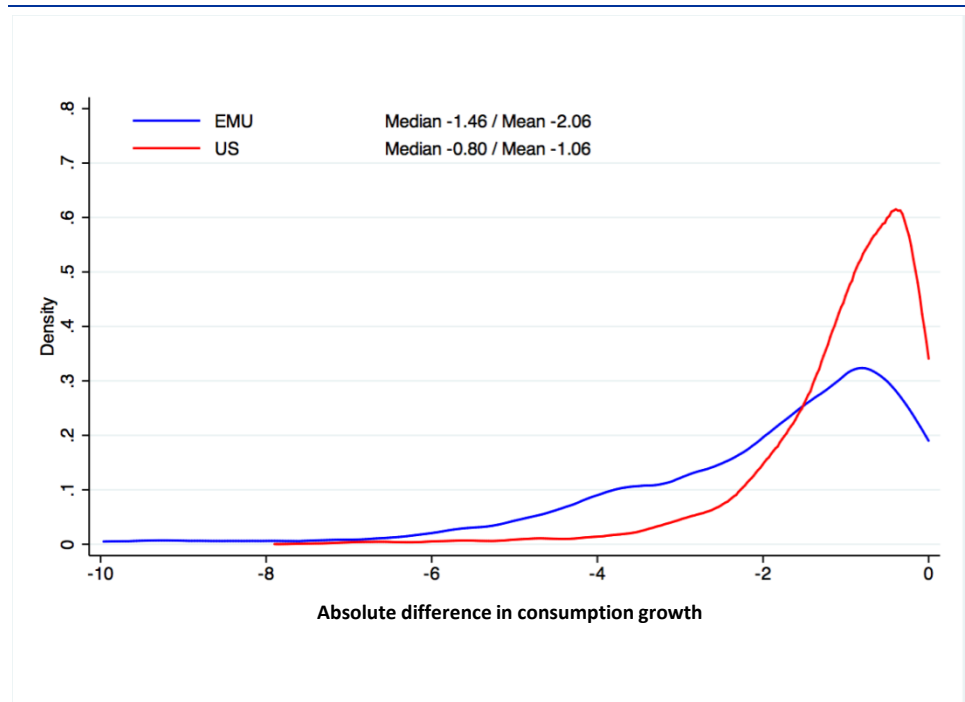
Sources: Eurostat.

Notes: Density plots of annual difference in Consumption growth in pairs of EMU countries and pairs of US states.



### Chart 11

Absolute difference in Consumption growth from 2007 to 2012 – EMU and US

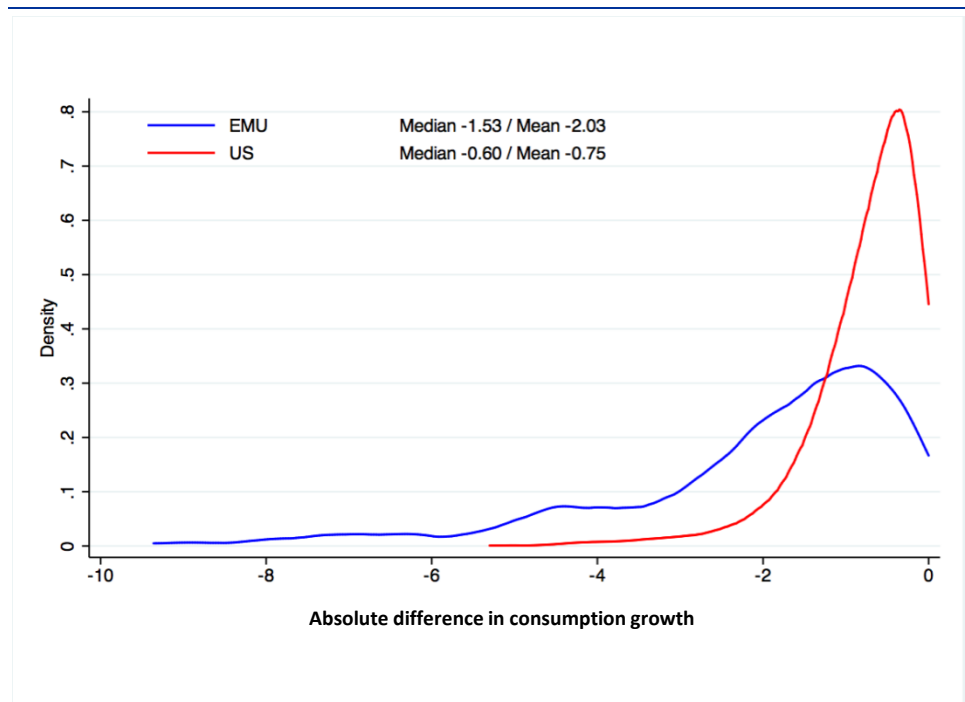


Sources: Eurostat.

Notes: Density plots of annual difference in Consumption growth in pairs of EMU countries and pairs of US states.

### Chart 12

Absolute difference in Consumption growth from 2013 to 2018 – EMU and US



Sources: Eurostat.

Notes: Density plots of annual difference in Consumption growth in pairs of EMU countries and pairs of US states.

## 4.1 Two tests of consumption risk sharing

The conventional test for consumption risk sharing investigates how changes in consumption (per capita) are related with changes in GDP (per capita). Lewis (1996) estimates

$$gc_{i,t} = \gamma_t + \beta gy_{i,t} + \epsilon_{i,t}$$

where  $gc_{i,t}$  ( $gy_{i,t}$ ) denote the growth rate of per capita consumption (per capita GDP).  $\gamma_t$  is a time effect that controls for changes in income that are common in the cross-section of  $i$ . In a panel of countries,  $\gamma_t$  controls for common shocks across countries.  $\beta$  tests whether country-level consumption responds to idiosyncratic, country-specific income shocks: under perfect risk sharing,  $\beta$  should be indistinguishable from zero. Lewis (1996) augments this regression with interaction terms meant to reflect whether restrictions to free capital flows can explain large estimates for  $\beta$ .

A natural extension to the bilateral setting in this paper is to estimate

$$|gc_{i,t} - gc_{j,t}| = \delta |gy_{i,t} - gy_{j,t}| + \epsilon_{ij,t}$$

where it is now the pairwise convergence in consumption that is explained by convergence in income per capita. Since the estimation is performed in international differences, it filters automatically any common shocks without the necessity for time effects. As such the estimation can be estimated in cross-section. But using international differences also creates a novel problem: consumption between countries  $i$  and  $j$  could be identical because they are both financially integrated with the same third country,  $k$ .

For example, consider the country pair  $(i,j)$ , and suppose per capita GDP is perfectly correlated between the two countries. In other words, there is no incentive for risk sharing between  $i$  and  $j$ . Now suppose a third country  $k$  experiences income fluctuations that are perfectly negatively correlated with  $i$ , and with  $j$ . Then optimally both countries  $i$  and  $j$  will integrate financially with country  $k$ , and  $\delta$  will be estimated to be zero between  $i$  and  $j$ , even though the two countries have no financial integration (because they choose not to).

What is missing in the estimation is a measure of the potential for risk sharing from the standpoint of a country  $i$ : a measure that captures the potential for risk sharing with country  $j$ , relative to the same potential vis à vis third party countries,  $k$ . That measure should capture the cross-section of correlations in per capita GDP between country  $i$  and all potential counterparts in the sample. Conceptually this is akin to the multilateral resistance term introduced by Anderson and Van Wincoop (2003), that controls for openness vis à vis all third-party countries. Multilateral resistance is well captured by a country-pair specific fixed effect, provided the cross-section in bilateral GDP correlations is time-invariant. Under this assumption, a bilateral test for risk sharing becomes:

$$|gc_{i,t} - gc_{j,t}| = \alpha_{ij} + \delta |gy_{i,t} - gy_{j,t}| + \epsilon_{ij,t}$$

where  $\alpha_{ij}$  hold constant the cross-section of GDP correlations from the standpoint of country  $i$ . Then  $\delta$  estimates the effect of risk sharing between countries  $i$  and  $j$ , controlling for how desirable it is to share risk between countries  $i$  and  $j$ . Obviously the magnitude of  $\delta$  is different from  $\beta$ , even though perfect risk sharing implies both point estimates are zero.

In what follows, we present results of estimating both approaches on EMU and on US data. In each case we split the sample into three periods. Then we bring some measures of financial integration in the EMU and investigate how much financial integration can contribute to the estimated extent of risk sharing.

## 4.2 US vs. EMU

Table 11 presents the estimates for risk sharing obtained from the conventional time series approach. The upper panel reports the estimates for  $\beta$  across US states, compared in the middle panel with the same parameter across EMU member countries. The lower panel focuses on the EMU, where financial harmonization is measured by the number of FSAP directives implemented in each country at each point in time.

**Table 11**  
Estimates of  $\beta$  in  $gc_{i,t} = \gamma_t + \beta gy_{i,t} + \epsilon_{i,t}$

	1999-2017	1999-2006	2007-2012	2013-2017		
<b>US States</b>						
Growth in per capita GDP	0.281*** (0.014)	0.296*** (0.024)	0.247*** (0.020)	0.336*** (0.031)		
<b>EMU Member Countries</b>						
Growth in per capita GDP	0.449*** (0.023)	0.728*** (0.044)	0.718** (0.048)	0.171*** (0.023)		
<b>EMU Member Countries with financial harmonization</b>						
Growth in per capita GDP	0.716*** (0.031)	0.710*** (0.054)	0.728*** (0.044)	0.821*** (0.055)	0.707*** (0.044)	-0.531* (0.82)
Interaction with FSAP Directives		0.000 (0.002)		-0.017*** (0.006)		0.034*** (0.008)
FSAP Directives		0.065 (0.045)		0.106** (0.054)		0.113 (0.078)

Source: Authors' calculations.

Notes: The Table reports the estimates of  $\beta$  in the conventional time series test for consumption risk sharing. \*(\*\*)(\*\*\*) denote significance at 10(5)(1) percent confidence level. All estimations include time effects. Data on FSAP directives stop in 2014

Three key results emerge from the upper two panels in the table. First, risk sharing between US states is stable over time, with estimates of  $\beta$  largely unchanged across periods. This suggests the increase in consumption correlations apparent in the US since 2013 is in fact not a manifestation of improved risk sharing, but due to an

increase in the correlation in GDP. Second, risk sharing between US states is on average more complete than between EMU member countries. This result was already in Asdrubali et al (1996), but it is interesting that it is confirmed in much more recent data, inclusive of personal consumption expenditures at State level. Third, interestingly since 2013 consumption risk sharing is estimated to be more complete in the EMU than in the US, with a lower value for  $\beta$ .

The lower panel of Table 11 augments the test for risk sharing with a measure of financial harmonization. The idea is to investigate whether the measured effect of local idiosyncratic income on local consumption is affected by the degree of financial integration. In particular we estimate

$$gc_{i,t} = \gamma_t + \beta_1 gy_{i,t} + \beta_2 gy_{i,t} \times FSAP_{i,t} + \beta_3 FSAP_{i,t} + \epsilon_{i,t}$$

where  $\beta_1$  and  $\beta_2$  measure whether financial harmonization affect the relationship between consumption and income. Over the full period, financial harmonization does not affect any estimate. We then split the sample over which financial harmonization is observed into two periods of equal length, before and after the global financial crisis of 2007. Interestingly,  $\beta_2$  is negative and significant between 1999 and 2006, suggesting that financial harmonization did help smooth country-specific shocks over that period. We also estimate  $\beta_3 > 0$  over that period, suggesting financial integration has a direct effect on consumption, akin to a diversification effect that increases consumption correlation unconditionally.

In contrast, the post-crisis period displays opposite patterns. Between 2007 and 2013, we estimate  $\beta_2 > 0$ , which means that financial integration results in more dependence on local income. A natural interpretation is that financial integration created contagion in the sense of diffusing bank balance sheets shocks across the Union, rather than fostering portfolio diversification. Interestingly, conditional estimates of  $\beta_1$  are not significant in that period, suggesting that imperfect risk sharing is in fact due to financial integration then. Unfortunately, we do not have data on the FSAP directives are 2014, which is the period during which the EMU seems to have been able to smooth consumption the most.

How robust are these conclusions? In Table 12 we present the results obtained from an alternative specification, based on the cross-section of bilateral differences in growth rates. The table is organized similarly to Table 11. The two upper panels of Table 11 confirm that consumption smoothing is more complete in the US than in EMU, with estimates of  $\delta$  that are systematically higher in Europe, across all periods. Over time, risk sharing remains stable, although estimates of  $\delta$  increase somewhat in the latest period since 2013 in both regions.

The lowest panel introduces the measure of financial integration in the EMU. The augmented estimation is specified in the same spirit as Table 11. We estimate

$$|gc_{i,t} - gc_{j,t}| = \alpha_{ij} + \delta_1 |gy_{i,t} - gy_{j,t}| + \delta_2 |gy_{i,t} - gy_{j,t}| \times FSAP_{ijt} + \delta_3 FSAP_{ijt} + \epsilon_{ij,t}$$

We confirm the earlier result that financial directives help smooth consumption in the period pre-GFC, in fact quite sizably. Between 1999 and 2006, we estimate  $\delta_2$  to be negative and significant, with large effect on the estimate of  $\delta_1$ , which goes from

0.193 in the unconditional regression in column (3) to 0.824 in the conditional regression in column (4). In other words, financial integration does affect consumption risk sharing sizably over this period. As in Table 11, the result is reversed in the more recent period:  $\delta_2$  becomes positive and significant after the GFC. In fact financial harmonization appears to be the main reason for imperfect risk sharing after 2007, since conditional estimates of  $\delta_1$  are in fact not different from zero then.

The results are therefore robust to two alternative estimations approaches for consumption risk sharing. While financial integration improved risk sharing in the EMU between 1999 and 2006, albeit not to the level observed in the US, it worsened it after the global financial crisis.

**Table 12**  
Estimates of  $\delta$  in  $|gc_{i,t} - gc_{j,t}| = \alpha_{ij} + \delta|gy_{i,t} - gy_{j,t}| + \varepsilon_{ij,t}$

	1999-2017	1999-2006		2007-2012		2013-2017
<b>US States</b>						
Difference in per capita GDP	0.062*** (0.003)	0.048*** (0.005)		0.035*** (0.005)		0.127*** (0.004)
<b>EMU Member Countries</b>						
Difference in per capita GDP	0.157*** (0.024)	0.193*** (0.043)		0.086*** (0.038)		0.226*** (0.045)
	1999-2014	1999-2014	1999-2006	1999-2006	2007-2014	2007-2014
<b>EMU Member Countries with financial harmonization</b>						
Difference in per capita GDP	0.135*** (0.027)	0.362*** (0.069)	0.193*** (0.043)	0.824*** (0.105)	0.078** (0.035)	-0.169 (0.161)
Interaction with FSAP Directives		-0.010*** (0.003)		-0.043*** (0.007)		0.009* (0.005)
FSAP Directives		-0.009 (0.008)		-0.012 (0.022)		0.047** (0.024)

Source: Authors' calculations.

Notes: The Table reports the estimates of  $\delta$  in cross-sectional tests for consumption risk sharing. \*(\*\*)(\*\*\*) denote significance at 10(5)(1) percent confidence level. All estimations include time effects. Data on FSAP directives stop in 2014

## 5 Conclusion

We document significant increases in the synchronization of GDP and consumption between twelve core EMU member countries over EMU's twenty years of existence. To explain synchronization in GDP growth rates, we use a measure of export intensity introduced in Imbs and Pauwels (2019a), which captures how much of a value chain is exported. The measure is fundamentally distinct from actually observed direct trade, in the sense that export intensity can be high without any direct trade, via downstream linkages. Export intensity is exceptionally high between EMU member countries, much higher than between the US or China and the rest of the world. It is a large and robust predictor of bilateral correlation between sector-

level growth rates, especially between services. In fact, the export orientation of EMU countries can explain a sizable fraction of convergence in GDP, more than what directly observed bilateral trade can explain. Finally, to explain convergence in consumption growth, we invoke financial harmonization in the EMU.

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# Discussion of “Twenty years of convergence”

By Şebnem Kalemli-Özcan<sup>1</sup>

## Abstract

I document key findings from Imbs and Pauwels (2019) and discuss a few points that would complement our understanding of the authors' results. The authors' paper is a significant contribution to both academic and policy-making bodies by providing a new view of integration. Their measure of export intensity poses a novel perspective. The goal of this discussion is to help interpret the authors' results and relate them to other works in the literature to deepen the knowledge about EMU integration.

## 1 Introduction

Imbs and Pauwels (2019) ask important questions as the EMU walks into the twentieth year of its integration. Using a rich canvas of data, they show that the EMU member countries have converged substantially in both GDP and consumption. As a force behind the convergence in GDP, they suggest a measure of bilateral export intensity, which measures the proportion of a sector's value chain that is directed towards exports. In other words, it provides information on how much each sector (in each country) is integrated in EMU market. By using the bilateral export intensity measure, which is the product of the export intensities of two sectors -- the paper explores its role in explaining GDP convergence among the member states. They measure the GDP convergence by the similarity of GDP growth rates among sectors. They find that export intensity is highly significant in explaining the sector-level growth rates while the traditional measure of trade intensity is not, which is a novel finding. The authors further explore whether export intensity matters for the aggregate economy by analysing its role in explaining the bilateral aggregate-level quasi-output-correlations. Their results again show that export intensity is more relevant than bilateral trade for aggregate correlations as well.

The authors also show an increasing trend of consumption convergence in the EMU and show that the consumption convergence in the region has been better than the one between the US states. They further augment the conventional risk-sharing test by adding financial integration to study whether financial integration helped the observed consumption convergence. By using the number of Financial Services Action Plan (FSAP) directives employed in each country for the measure of financial

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<sup>1</sup> University of Maryland, NBER and CEPR.



integration, the authors find that financial integration helped smoothing out consumption before the crisis.

Below, I include a few comments and exercises that would help interpreting the results and relating them to other works in the literature.

## 2 Measuring GDP convergence

The literature has looked into the matter of real convergence through a few measures. The main measure of convergence is so-called “beta convergence” measure from the growth literature (Barro and Sala-i-Martin, 1992). This measure investigates the relationship between GDP level and GDP growth rate. It tests whether poor countries and regions grow faster than rich ones. In other words, it seeks to see if there are forces that lead to convergence in the level of per capita GDP over time.

The measure used by the authors is not a convergence measure but rather a measure of GDP synchronization that comes from the international business cycle literature. GDP synchronization has been a key measure to understand economic integration and co-movement of countries' GDPs and has been a central concept in the study of currency areas. Mundell (1961) lays out that the desirability of economic integration depends on the degree of synchronization of GDP fluctuations across countries. Frankel-Rose (1998) present that similarity or divergence of GDP fluctuations depends on the degree of economic integration. The measure employed in this paper is exactly this measure used in the international business cycle literature---that is the absolute bilateral differences in GDP per capita growth rates.

### 2.1 Correlation between GDP and growth: beta convergence

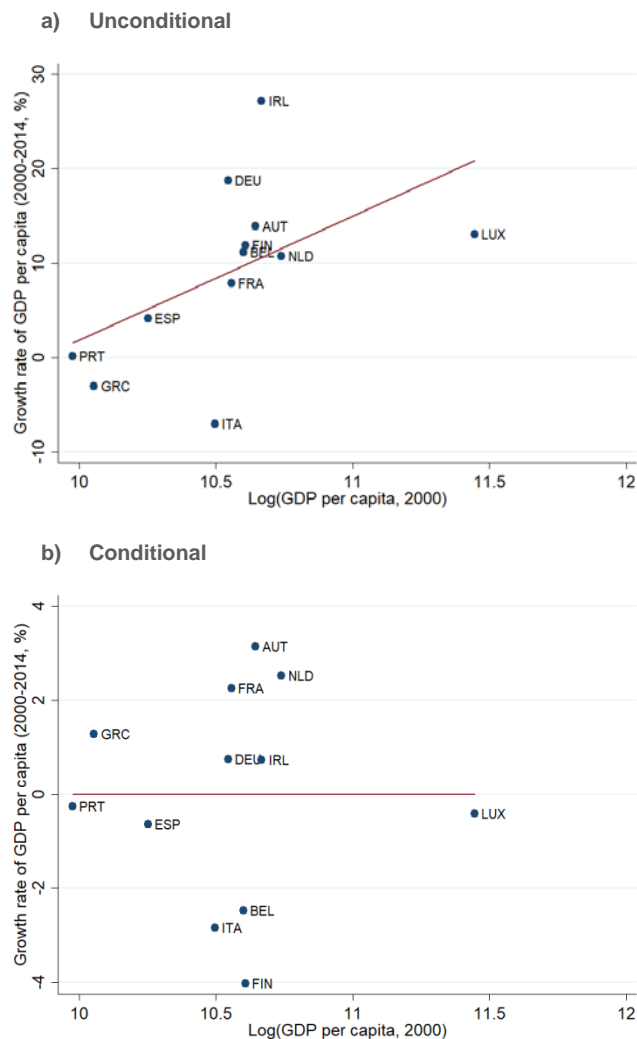
In order to understand whether there is GDP convergence or not, I have calculated beta convergence of the EMU member countries, both at the country level and at the regional level. Below, I present the scatter plots that show the relationship between GDP per capita level and its growth rate.

Chart 1, panel (a) plots the growth rate of GDP per capita during 2000-2014 against the log of GDP per capita in the year 2000 for 12 EMU countries. The unconditional correlation plotted shows that the countries in EMU have diverged during the period of 2000-2014. In other words, the richer countries have grown at faster rates than the poorer ones. Upon the concern that this may be the result of omitting country-specific characteristics, I also plot the conditional correlation in panel (b). It features the partial relationship of the GDP level and GDP growth rate after controlling for structural variables, including life expectancy, fertility rate, education, investment ratio, inflation rate, export intensity, openness, and the interaction between openness and terms of trade.<sup>2</sup> Even after controlling for these country-specific features, the

<sup>2</sup> Structural variables are obtained from World Bank WDI.

correlation between the GDP level and growth does not become negative, which would have implied the countries that were poorer in 2000, grew faster in the subsequent 15 years. As panel (b) shows, the correlation is close to zero, meaning there was not any GDP convergence among EMU countries.

**Chart 1**  
Divergence in GDP for EMU 12



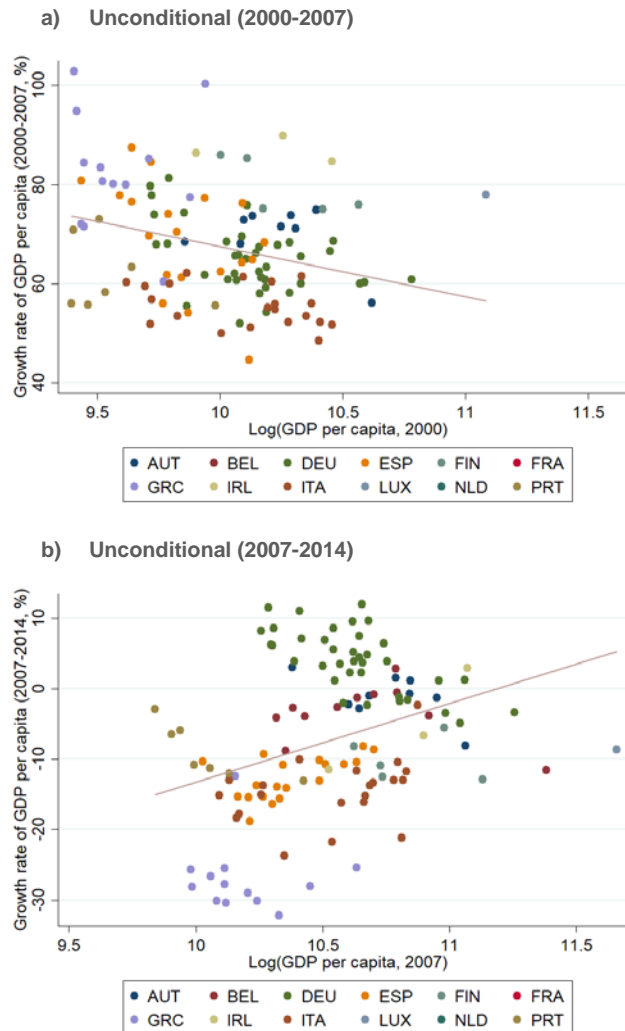
Sources: Data from Imbs and Pauwels (2019), World Bank WDI  
Notes: The sample includes 12 original EMU member countries: Austria (AUT), Belgium (BEL), Germany (DEU), Spain (ESP), Finland (FIN), France (FRA), Greece (GRC), Ireland (IRL), Italy (ITA), Luxembourg (LUX), the Netherlands (NLD), and Portugal (PRT). Conditional scatter-plot is drawn as the partial relationship after controlling for structural variables, including life expectancy, fertility rate, education, investment ratio, inflation rate, openness, openness X ToT, and export intensity.

Next, I repeat the same exercise using data from regions at NUTS2 regio-level. Looking at more disaggregated level, I find suggestive evidence that the EMU regions have experienced convergence. Chart 2, panel (a) plots the growth rate of GDP per capita of each region during 2000-2007 against the log of GDP per capita level of each region in year 2000. Panel (b) plots the same relation for the growth during 2007-2014 using initial level of GDP in year 2007. I do this, mimicking authors' methodology, to minimize the disrupting effects of the crisis period. As Chart 2(a)

shows, the poorer regions grew faster than the richer ones during pre-crisis period. This means that there is beta-convergence for the EMU regions before the crisis.

### Chart 2

Convergence in regional GDP before crisis



Sources: Eurostat

Notes: The sample includes the NUTS 2 regions of 12 original EMU member countries. They are Austria (AUT), Belgium (BEL), Germany (DEU), Spain (ESP), Finland (FIN), France (FRA), Greece (GRC), Ireland (IRL), Italy (ITA), Luxembourg (LUX), the Netherlands (NLD), and Portugal (PRT).

However, as shown in panel (b), the negative unconditional correlation turns to positive during the crisis and post-crisis period.

## 2.2 Conditional beta convergence regressions for regions

In order to further confirm the negative correlation between GDP level and growth, I run a beta convergence regression at NUTS 2 regional level. The specification is as follows.

$$\frac{1}{T} \log \left( \frac{y_{it}}{y_{it-T}} \right) = a - [\log(y_{it-T})] \left[ \frac{1 - e^{\beta T}}{T} \right] + \gamma X$$

where T is the number of years between the initial year and the end year. t is the end year, which is either 2007 or 2014 in this case. X is a set of regional control variables, which include 1/life expectancy, log(fertility), and education rate, obtained from Eurostat. If  $\beta$  is negative, it means the regions converged during the period.

Table 1 shows the results. The first three columns present the beta coefficient produced from the regression of entire period of 2000-2014. Column 1 shows that 113 NUTS 2 regions show divergence during 2000-2014. Note that this is after taking account of the control variables, so conditional beta convergence. Column 2, however, shows that once the export intensity -- authors' measure -- of each region is controlled the beta coefficient becomes negative. In other words, export intensity was an important omitted variable that is related to both GDP level and growth rate. Column 3 presents the result obtained after controlling for both regional level control variables and country fixed effects. If I compare column 2 and column 3, it is noteworthy to find that controlling for regional trade intensity alone already corrects much of the bias coming from omitting regional and country level characteristics. Column 4 and 5 present the same specification with column 3 into two sub-periods and find the similar results indicating regional level convergence.

Next section discusses the mechanism behind such convergence.

**Table 1**  
Conditional Beta convergence in regional GDP

	(1)	(2)	(3)	(4)	(5)
	2000-2014		2000-2007		2007-2014
$\beta$	0.0057** (0.0025)	-0.0080*** (0.0030)	-0.0096*** (0.0025)	-0.0087*** (0.0031)	-0.0096*** (0.0034)
<b>Controls</b>	Y		Y	Y	Y
<b>Export intensity</b>		Y			
<b>Country-FE</b>			Y	Y	Y
<b>N</b>	113	113	113	108	124
<b>R-squared</b>	0.239	0.372	0.789	0.646	0.883

Sources: Eurostat

Notes: Control variables are 1/life expectancy, log(fertility), and education rate.

\* Significant at 10 percent

\*\* Significant at 5 percent

\*\*\* Significant at 1 percent

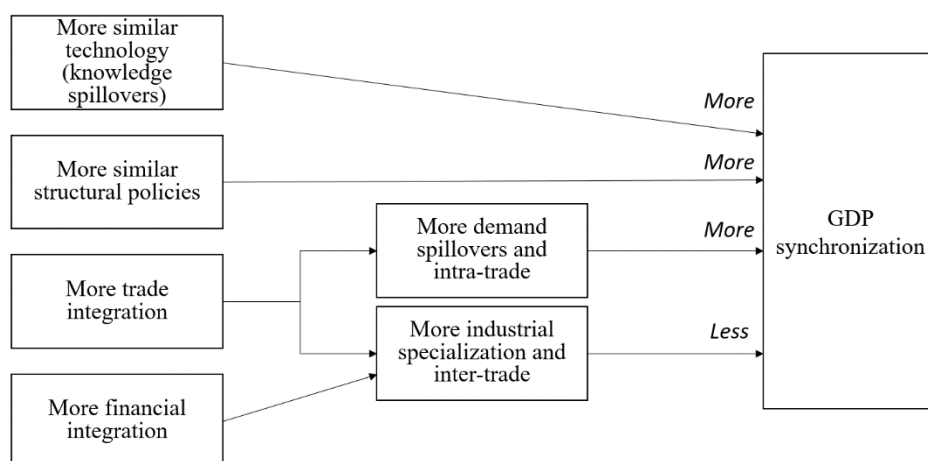
### 3 Role of integration

The authors argue that the links to export sector increase GDP synchronization of those 'linked' sectors and this synchronization is transmitted to other (upstream and downstream) sectors, leading to GDP convergence in the aggregate economy. Their regression results presented in their Table 6 show that their measure of bilateral

export intensity explains most of GDP synchronization while the actually observed trade intensity does not.

While they show robust results that bilateral export intensity matters while trade intensity does not through multiple different specifications, there is not sufficient discussion on how other types of integration have played role. In particular, the authors' measure of GDP synchronization is endogenous not only to trade integration (observed trade intensity) but also to financial integration. Chart 3 is a diagram that shows the effect of integration on GDP synchronization, reproduced based on the one presented in Kalemli-Özcan et al. (2001). It shows how different sources of integration, including technology, policy, trade, and finance, influence the degree of GDP synchronization. Trade integration, for example, leads to synchronization through demand spill-overs and intra-trade. But more industrial specialization and inter-trade offsets some of the synchronizing force arising from trade integration. Financial integration facilitates the latter channel, thus leading to less synchronized economies.

**Chart 3**  
Effect of integration on GDP synchronization



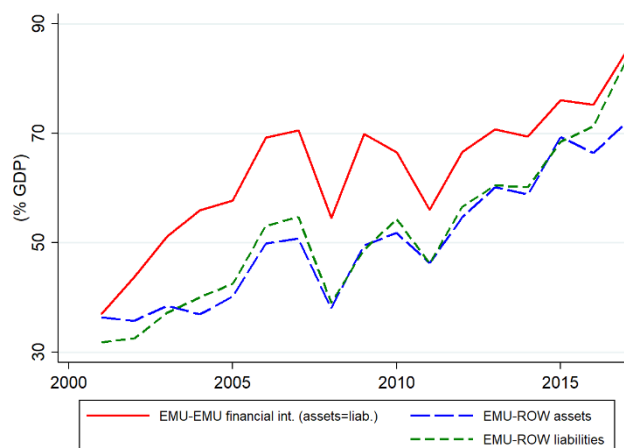
Sources: Reproduced from Kalemli-Özcan et al., 2001, JIE.

### 3.1 Integration among EMU

Chart 4 shows the trend of financial integration both among EMU members and between EMU members and the rest of the world since 2001. Total foreign assets (equivalently, liabilities) made within 12 EMU countries, which is presented in red line. The dash blue line presents the total assets of 12 EMU countries owned from the rest of the world, and the dotted green line shows the total liabilities of 12 EMU countries owed to the rest of the world. All values are normalized by the total GDP of 12 EMU countries. It is noteworthy that the measure shows a deep financial integration -- starting from less than 40% in 2001 to over 80% in 2017. Moreover, the degree of financial integration among member states has been always higher than their integration with the rest of the world.

**Chart 4**  
Financial integration

Financial integration of EMU



Sources: IMF

Notes: EMU includes 12 original EMU members including Austria (AUT), Belgium (BEL), Germany (DEU), Spain (ESP), Finland (FIN), France (FRA), Greece (GRC), Ireland (IRL), Italy (ITA), Luxembourg (LUX), the Netherland (NLD), and Portugal (PRT). ROW is the rest of the world.

### 3.2 Augmented estimation

The substantial increase in financial integration in the EMU highlights the need and importance of controlling for it for authors' synchronization estimation. In this section, I run a set of sector-level synchronization regressions by using the authors' export intensity measure as well as both trade and financial integration measures.

First, I use the authors' benchmark measure of GDP convergence, which is a negative absolute difference of GDP growth, as a dependent variable, following authors' methodology. The explanatory variables include export intensity, trade intensity, and financial integration as well as the interaction terms between them and a crisis indicator. Crisis indicator is a dummy variable, which takes the value of 1 in year 2007 and 2008. Financial integration is measured as the number of FSAP directives implemented in each country, following the authors' method.

Table 2 shows the results. I first present sector-level analyses in the first three columns and an aggregate country-level result in the last column. Among the sector-level results, the first two columns are full-panel regression results, and the third column presents the result where the sample period is divided into three sub-periods: pre-crisis (2001-2006), crisis (2007-2008), and post-crisis (2009-2014), again following the authors' method. The country-level result is a full-panel.

Column 1 and 2 show that export intensity leads to higher GDP synchronization financial integration leads to divergence making growth rates more dissimilar. The effect of trade intensity is positive in column 2, but it disappears when I control for country-sector-time fixed effects, so observed trade intensity would have been correlated with unobserved changes that occurred at sector level and influenced

GDP synchronization. The positive effect of export intensity, however, disappears in the other two specifications in column 3 and 4. Financial integration shows a robust negative effect in all specifications.

**Table 2**  
Synchronization: author's benchmark measure

Dependent variable: Negative absolute difference of GDP growth				
	(1)	(2)	(3)	(4)
	SECTOR			AGGREGATE
	Full-panel		T=3	
<b>Crisis</b>		0.65*** (0.02)		
<b>Export intensity</b>	0.2631*** (0.0692)	0.2668*** (0.0125)	-0.3231 (0.1997)	0.0326 (0.0615)
<b>Crisis X Export intensity</b>			0.1251 (0.1005)	-0.1182*** (0.0294)
<b>Trade intensity</b>	0.2733 (0.2251)	0.2760** (0.153)	-0.3775 (0.2885)	0.5487** (0.2241)
<b>Crisis X Trade intensity</b>			0.1876* (0.1042)	-0.0079 (0.0832)
<b>Financial integration</b>	-0.03*** (0.01)	-0.03*** (0.01)	-0.08*** (0.01)	-0.02** (0.01)
<b>Crisis X Financial integration</b>			0.03*** (0.01)	0.05*** (0.01)
<b>Observations</b>	2292391	2292391	491700	924
<b>R-squared</b>	0.250	0.250	0.629	0.327
<b>Country-sector-pair FEs (ijrs)</b>	Yes	Yes	Yes	
<b>Country-sector-time FEs (irt, jst)</b>	Yes		Yes	
<b>Country-pair FEs (ij)</b>				Yes
<b>Country-time FEs (it, jt)</b>				Yes

Sources: Data from Imbs and Pauwels (2019)  
Notes: Regression specification is from IMF WEO 2013, Kalemli-Ozcan et al., 2013a,b, JF, JIE. Sample includes 12 original EMU countries. The dependent variable is negative absolute difference in GDP growth  
\* Significant at 10 percent  
\*\* Significant at 5 percent  
\*\*\* Significant at 1 percent

The authors link the results on the absolute difference of growth rate to aggregate-level by using quasi-correlations. They show that aggregate co-movements can be expressed as a weighted average of bilateral quasi-correlations at sector level, so they turn to running a similar regression with quasi-correlation as the dependent variable.

I follow their method and augment their version of quasi-correlation regression in their Table 9 by adding financial integration in the set of explanatory variables. Following their specification, I also run this quasi-correlation synchronization regression by calculating quasi-correlation separately for 2001-2007 and 2008-2014.

The definition of export intensity, trade intensity, and financial integration is the same as in the previous estimation.

Table 3 presents the results. The first two columns present the results for sector-level analyses. The last two columns are aggregate-level results. Column 1 presents the same result in authors' Table 9 column 2. Both export intensity and trade intensity have significant positive effects on quasi-correlation. Column 2, however, shows that once country-sector-time fixed effects are added, trade intensity loses explanatory power, which is consistent with the previous findings.

The aggregate-level results produce different implications. Column 3 confirms the explanatory power of export intensity which is not found in trade intensity. But as financial integration is added, export intensity stops being significant, and trade intensity and financial integration help explaining the quasi-correlation of GDP growth rate. Once country-time fixed effects are added, all explanatory variables become insignificant.<sup>3</sup>

**Table 3**  
Synchronization: Author's alternative measure

Dependent variable: Quasi-correlation of GDP growth					
T=2 ('01-'07 & '08-'14)	(1)	(2)	(3)	(4)	(5)
	SECTOR		AGGREGATE		
<b>Export intensity</b>	4.0830*** (0.1310)	0.7171*** (0.0892)	6.3740*** (0.8148)	1.6959 (1.1449)	-0.0386 (1.0350)
<b>Trade intensity</b>	3.8132* (1.9797)	0.7182 (0.6990)	4.0985 (3.6851)	4.7745* (2.8155)	0.2424 (1.0526)
<b>Financial integration</b>				0.51*** (0.11)	0.72 (0.68)
<b>Observations</b>	325600	325600	132	132	128
<b>R-squared</b>	0.583	0.867	0.435	0.613	0.979
<b>Country-sector-pair FEs (ijrs)</b>	Yes	Yes			
<b>Country-sector-time FEs (irt, jst)</b>					
<b>Country-pair FEs (ij)</b>			Yes	Yes	Yes
<b>Country-time FEs (it, jt)</b>					Yes

Sources: Data from Imbs and Pauwels (2019)  
Notes: Sample includes 12 original EMU countries.  
\* Significant at 10 percent  
\*\* Significant at 5 percent  
\*\*\* Significant at 1 percent

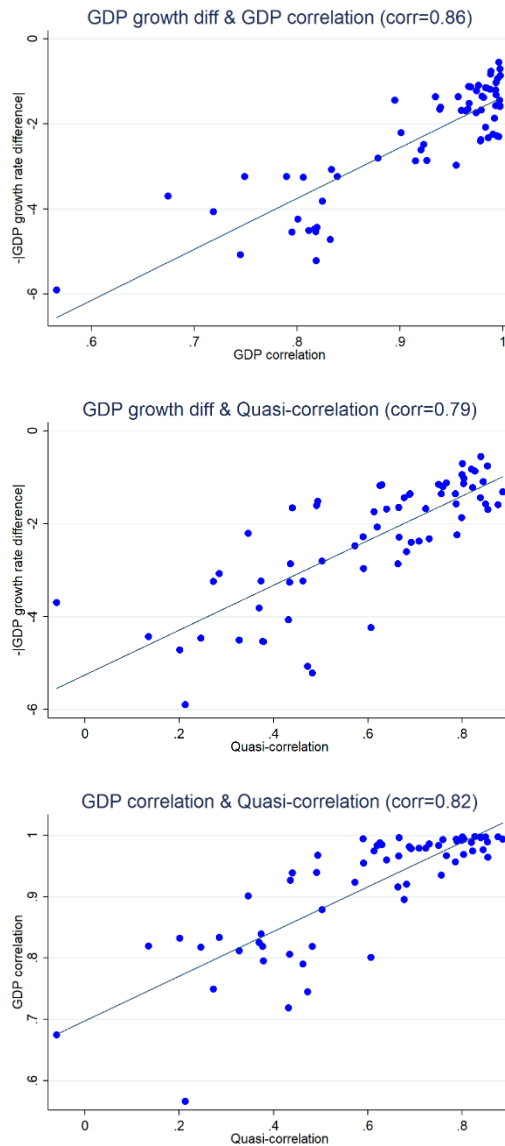
I compare three measures of pairwise synchronization to make it clear that regardless of what measure is used, the result will be the same since these measures of synchronization are highly correlated. The three measures are the

<sup>3</sup> Note that the aggregate-level results presented in Table 3 in this discussion are different from authors' Table 10, which runs a regression on GDP growth quasi-correlation with respect to the fitted value of quasi-correlation produced from their Table 9. This paper's Table 3, in contrast, presents the estimates produced from running a regression of quasi-correlation with respect to integration measures.



negative absolute value of GDP growth rate, quasi-correlation of GDP growth, and a simple pairwise GDP correlation, where the first two are the authors' benchmark measures. GDP is real GDP per capita, and each measure for each country pair is averaged over 2000-2017.<sup>4</sup> Chart 5 shows that three measures are highly correlated.

**Chart 5**  
Comparing country-pair synchronization/convergence measures



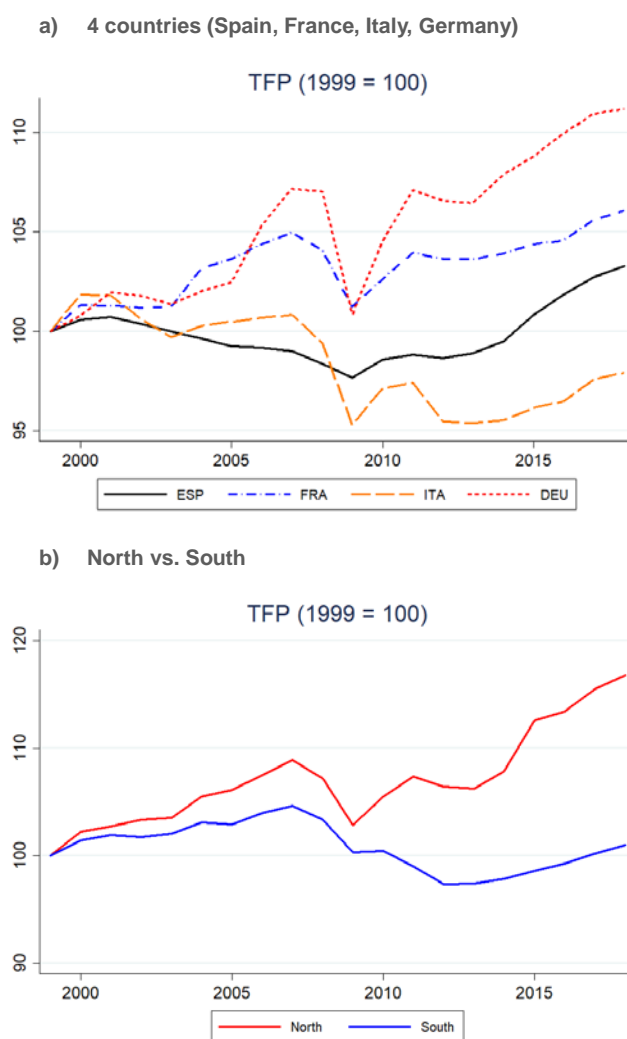
Sources: Data from Imbs and Pauwels (2019), World Bank WDI  
Notes: The sample includes the country pairs within 12 original EMU member countries: Austria (AUT), Belgium (BEL), Germany (DEU), Spain (ESP), Finland (FIN), France (FRA), Greece (GRC), Ireland (IRL), Italy (ITA), Luxembourg (LUX), the Netherland (NLD), and Portugal (PRT). The measures are averaged over 2000-2017.

<sup>4</sup> I use the GDP per capita data from World Bank WDI since the authors' data provided do not include country-level real GDP per capita.

### 3.3 TFP divergence

One important related question is to ask what does GDP synchronization imply for total factor productivity (TFP) convergence. If technology, for example, is shared across sectors that do not trade (based on authors' export intensity measures), then TFP would converge as well. TFP can also diverge if there is resource misallocation within sectors due to financial frictions as a result of less than full financial integration (Gopinath et al. 2017).

**Chart 6**  
Divergence in Aggregate TFP



Sources: European Commission AMECO  
Notes: The sample includes 12 original EMU member countries: Austria (AUT), Belgium (BEL), Germany (DEU), Spain (ESP), Finland (FIN), France (FRA), Greece (GRC), Ireland (IRL), Italy (ITA), Luxembourg (LUX), the Netherlands (NLD), and Portugal (PRT). North countries are Belgium, Germany, Finland, France, Ireland, Luxembourg, and Netherlands. South countries are Greece, Italy, Portugal, and Spain.

Chart 6 plots the trend of aggregate TFP of European countries based on the data from European Commission AMECO. The TFP level is normalized in the year of 1999. The first chart features the increasing divergence of TFP among Spain, France, Italy, and Germany. The divergence is also present when 12 EMU countries

are divided into North and South countries.<sup>5</sup> The gap between North and South has been increasing, and the divergence has been accelerating especially during the last decade.

## 4 Consumption convergence

The authors explore how consumption convergence has evolved through the course of integration. In the end, we care about consumption convergence for welfare. EMU countries might face different shocks, but if financial integration is able to smooth out these shocks then EMU citizens have smooth consumption, by having “consumption convergence”. Thus, the key question that the authors ask is how much of the shocks to GDP are smoothed out so that consumption does not co-move with GDP.

They measure convergence in consumption via standard risk sharing regressions, in both aggregate-level and bilateral-level specifications. To explore the role of financial integration in smoothing-out GDP shocks, they use the number of FSAP directives that each countries implemented as a proxy for financial integration. This measure has been used in many studies and introduced by Kalemli-Özcan et al. (2008, 2013a, 2013b). It is an ideal measure as it is exogenous to individual countries. It also disentangles the impact of the single currency and harmonization policies on financial integration, which is of major interest for the further integration, thereby making it a policy relevant measure.

The authors find that consumption is smoothed out more in the countries that passed the FSAP directives before the crisis. This is similar to the findings from the existing literature. They also find that, during crisis, financial integration did not help smoothing country-specific shocks. While their results on the role of financial integration are robust for both aggregate and bilateral estimations, I am cautious to conclude that financial integration served as a channel for the contagion in consumption. Financial integration might very well be behind contagion in GDP but harder to conclude the same for consumption. Kalemli-Özcan et al. (2008) finds that financial integration helped consumption smoothing tremendously both before and during crisis, but there is a different role for cross-border liabilities and assets, where liabilities can hurt and assets can help smoothing.

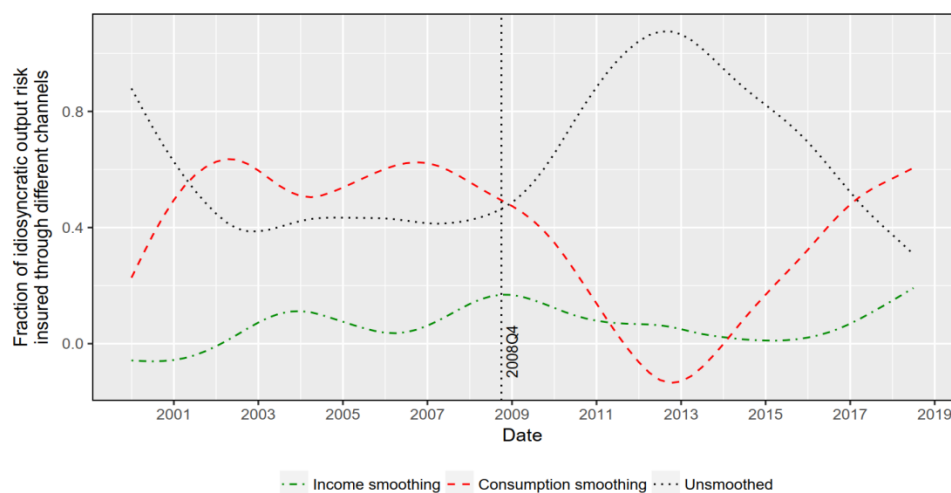
Lastly, it is worthwhile to compare the authors' results with Hoffman et al. (IMF Economic Review forthcoming). As in Chart 7, they document that consumption smoothing in the EMU fell substantially during the crisis periods, as the authors find, while (capital) income smoothing remained stable. Both consumption smoothing and income smoothing are products of financial integration so it will not be plausible to say financial integration causes one and not the other. Hoffman et al. show that interbank integration is associated with consumption smoothing, and the fact that interbank integration is unstable during the periods of financial stress is one factor behind the decline of consumption smoothing. These results are consistent with the different roles of liabilities and assets as shown by Kalemli-Özcan et al. (2008).

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<sup>5</sup> TFP for North and South are calculated as simple average of TFP for each group.

**Chart 7**

Consumption and income smoothing EMU12



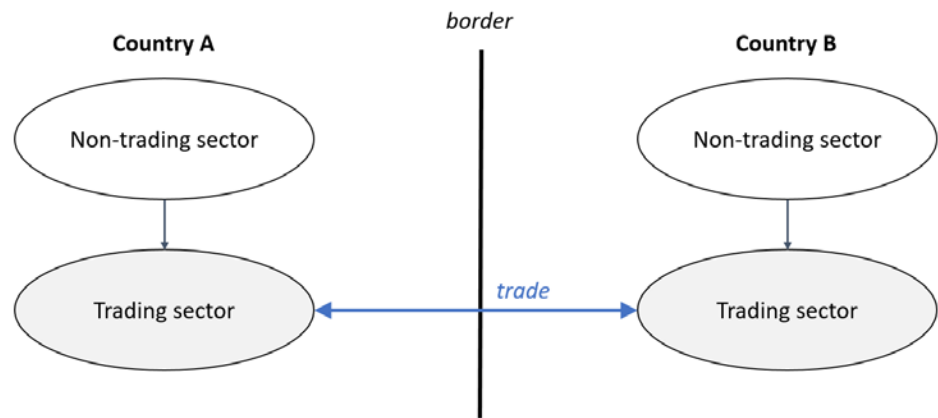
Sources: Hoffman et al., IMF Economic Review (forthcoming).

## 5 Importance of a framework

The authors employ the link via trading sectors and their connection with the rest of the economy to explain the aggregate convergence -- as illustrated in Chart 8. While their findings provide us a robust relation between the sectors that trade and do not trade, the exact mechanism behind the link from this relation between sectors to the aggregate economy is not clear. In particular, as the Chart 6 in their paper shows, the country-level export intensity does not vary significantly over time. How these relatively stable measures may explain convergence for the aggregate economy than? The authors do comparisons to US and China but it is also not clear if these are the most appropriate countries to compare with the EMU. If EMU countries' GDPs are more synchronized than US and China, does this mean that US and China are subject to different temporary and persistent shocks? Or does this mean they have different degrees of trade and financial integration? Or are EMU members are actually more integrated than them? A proper theoretical framework is important to answer these questions.

### Chart 8

Framework: how to link sector to aggregate convergence?



Source: Own exposition.

## 6 Conclusion

The authors' paper is a significant contribution to both academic and policy-making bodies by providing a new view in understanding integration and its role in convergence. Moreover, their measure of export intensity poses a novel perspective different than standard trade integration measures.

While the paper deepens our knowledge on EMU integration, it also leaves a few questions open. For example, if non-trading sectors converge due to their links to exporting sectors, why did aggregate GDPs fail to converge in terms of standard beta convergence measures? Also, are there enough sectors that are linked to exporting sectors in the aggregate? There is room for future research to answer these questions, building on the methods and findings from this paper.

## Appendix

Table A1 presents the country-level beta convergence regression. The specification is as follows. The sample period is 2000-2014, so  $T$  is 14 and  $t$  is 2014. To use real GDP per capita, I use the data obtained from World Bank WDI.

$$\frac{1}{T} \log \left( \frac{y_{it}}{y_{it-T}} \right) = a - [\log(y_{it-T})] \left[ \frac{1 - e^{\beta T}}{T} \right] + \gamma X$$

The second column has 7 country-level control variables, including 1/life expectancy, log(fertility rate), education rate, investment ratio, inflation rate, openness, and openness  $X$  terms of trade, all of which are from World Bank WDI. The third column adds export intensity onto the specification in the second column. Export intensity is from the authors' data.

**Table A1**  
Divergence in GDP

<b>Beta convergence results</b>			
	(1) Unconditional	(2) + Controls	(3) + Controls + Export intensity
$\beta$	0.0083* (0.0040)	0.0145 (0.0184)	0.0088 (0.0136)
<b>Observations</b>	12	12	12
<b>R-squared</b>	0.277	0.802	0.941

Sources: Data from Imbs and Pauwels (2019), World Bank WDI

Notes: Control variables are 1/life expectancy, log(fertility), education rate, investment ratio, inflation rate, openness, and openness X terms of trade.

\* Significant at 10 percent

\*\* Significant at 5 percent

\*\*\* Significant at 1 percent

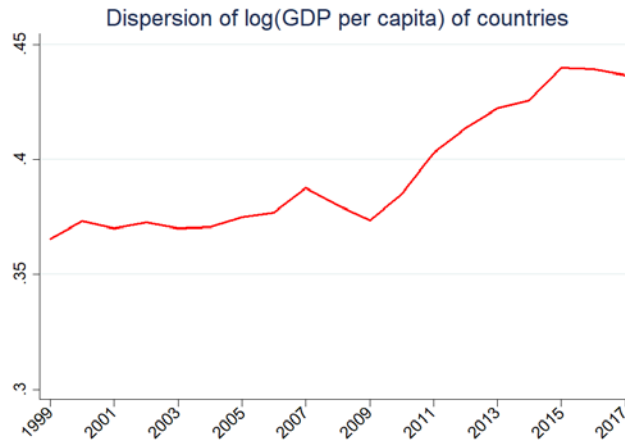
Chart A1 presents the sigma value of 12 EMU countries and their NUTS 2 regions respectively. Sigma is the un-weighted standard deviation of log of real GDP per capita, and the sample period is 2000-2017. Country-level GDP data is obtained from WDI, and the regional one is from Eurostat.

### Chart A1

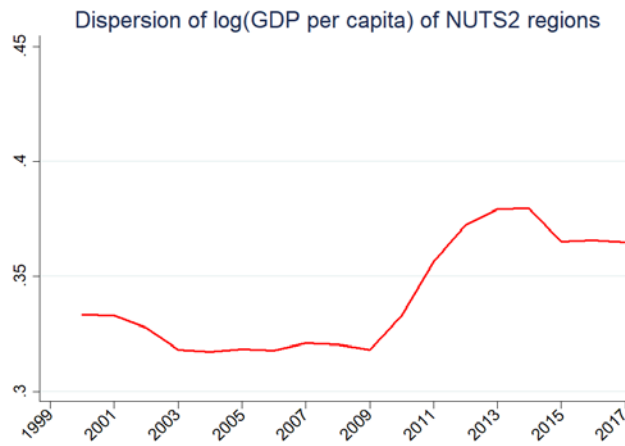
Convergence in GDP:  $\sigma = \text{sd}(\log(\text{GDP per capita}))$

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#### a) Country-level



#### b) Regional-level



Sources: World Bank WDI, Eurostat

Notes: Sigma is the unweighted standard deviation of log of GDP per capita. The sample includes 12 original EMU member countries: Austria (AUT), Belgium (BEL), Germany (DEU), Spain (ESP), Finland (FIN), France (FRA), Greece (GRC), Ireland (IRL), Italy (ITA), Luxembourg (LUX), the Netherland (NLD), and Portugal (PRT). Regional-level is based on the NUTS 2 regions of the above countries.

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# The single monetary policy: 20 years of experience<sup>1</sup>

By Peter Praet<sup>2</sup>, Arthur Saint Guilhem<sup>3</sup>, and Jean-Pierre Vidal<sup>4</sup>

## Abstract

20 years after its introduction the euro enjoys wide public support and is the second most important currency in the international monetary system. The European Central Bank (ECB) has demonstrated its capacity to act in sometimes very difficult circumstances, but monetary policy cannot and should not remain “the only game in town” when it comes to macroeconomic stabilisation. The ECB’s monetary policy strategy has, on the whole, successfully supported the implementation of a price-stability-oriented monetary policy. Yet the Governing Council’s formulation of the quantitative definition of price stability may have led to misperceptions about an asymmetric reaction function and could benefit from further clarification of the inflation aim. The changing role of the monetary pillar may gradually have brought about dissonance between its specific contribution to policy decisions and its role in their communication, which could be addressed by a clarification of the role of “cross-checking” in policy decisions.

## 1 Introduction

The introduction of the European Union’s own currency – the euro – 20 years ago was an unprecedented event in monetary history. Initially adopted by 11 EU Member States, the advent of the single currency was a milestone in European integration, bringing greater monetary stability to euro area countries, following decades of exchange rate fluctuations and disrupted trade relations that hindered the functioning of the Internal Market. Today the euro is the currency used by over 300 million people in Europe, where it benefits from high public support across the euro area. The euro area is a unique polity with a single monetary policy but 19 sovereign Member States responsible for their own fiscal and economic policies.

Economic and Monetary Union coincided with the emergence of a broad consensus among academics and central bankers on the main elements of an effective

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<sup>1</sup> This article builds on the presentation given by Peter Praet at the 2019 ECB Forum on Central Banking - 20 years of European Economic and Monetary Union. We are grateful to Claus Brand, Philipp Hartmann, John Hutchinson, Massimo Rostagno, Frank Smets and Isabel Vansteenkiste for their comments and/or input, and to Lennart Brandt and Maria Eskelinen for research assistance.

<sup>2</sup> Former Member of the ECB’s Executive Board (June 2011-May 2019).

<sup>3</sup> ECB, Directorate General Monetary Policy.

<sup>4</sup> European Investment Bank, Economics Department, and former Counsellor to the ECB’s Executive Board.

monetary policy framework, namely a firm commitment to price stability through the adoption of a numerical inflation target, and greater independence and transparency as regards monetary policy. With this in mind, the European Central Bank (ECB) was granted full independence and assigned a clear price stability mandate under the Treaty on the Functioning of the European Union (hereafter "TFEU", also known as Maastricht Treaty) that established Economic and Monetary Union (EMU). In 1998 the ECB's Governing Council adopted a quantitative definition of price stability, which it clarified in 2003 as inflation rates below, but close to, 2% over the medium term. The adoption of this quantitative definition helped the ECB to anchor long-term inflation expectations, which in turn increased the effectiveness of monetary policy in achieving macroeconomic stabilisation.

20 years later, while the key elements of the approach of central banks to monetary policy have remained unchanged, the financial crisis has resulted in a reassessment of a number of important aspects of the pre-crisis consensus, in particular to give more prominence to financial stability as an objective of macroeconomic stabilisation policies.<sup>5</sup> In the euro area, the sovereign debt crisis was a painful indicator that unsound fiscal policies in some Member States can threaten macroeconomic stability and make the achievement of price stability more challenging. Today the debate on monetary policy frameworks has turned to the impact of secular trends – especially the decline in the neutral rate of interest – on central banks' ability to achieve price stability in the future.<sup>6</sup> The ECB, like other central banks, is an open-minded institution. It has responded forcefully to threats to price stability over recent years, deploying a series of innovative measures that have successfully restored confidence and ensured price stability. It has been a case of "learning by doing" and the ECB has demonstrated its ability to adjust to an evolving environment and respond to new challenges as they arise.

In order to take stock of the last 20 years, this article reviews the ECB's monetary policy experience, drawing in part from recent ECB staff analysis.<sup>7</sup> Section 1 discusses the main elements of the ECB's monetary policy strategy – the quantitative definition of price stability and the two-pillar framework – and how they enabled the ECB to establish its credibility in the early years of its existence. Section 2 assesses the ECB's response to the crisis, while Section 3 examines interaction with other economic policies.

By way of a preview of our main conclusions, the ECB's monetary policy strategy has successfully supported the implementation of a price-stability-oriented monetary policy over the past 20 years. The quantitative definition of price stability has been instrumental in establishing credibility in the first decade, while the 2003 clarification

<sup>5</sup> See Bernanke (2011).

<sup>6</sup> The Federal Reserve has recently launched a review of its "Monetary Policy Strategy, Tools, and Communication Practices" addressing three main questions (see Clarida (2019)). First, whether the Federal Reserve should consider strategies that aim to reverse past misses of the inflation objective; second, whether existing monetary policy tools are adequate to achieve and maintain maximum employment and price stability, or whether the toolkit should be expanded; and third, how the Federal Open Market Committee's (FOMC) communication and implementation of its policy framework can be improved.

<sup>7</sup> Hartmann and Smets (2018) and Rostagno et al. (2019) are important sources for the evidence discussed in this article.

has contributed to strong anchoring of longer-term inflation expectations to below, but close to, 2%. The ECB's forceful reaction to protracted low inflation testifies to the Governing Council's determination to meet its policy aim regardless of the direction of price pressures driving inflation away from below, but close to, 2% over the medium term. Yet the formulation of the quantitative definition may lead to misperceptions of an asymmetric reaction function, which could eventually complicate monetary policy conduct in a low inflation environment. Importantly, the crisis has also demonstrated that the ECB cannot and should not be the only "game in town" when it comes to macroeconomic stabilisation policy in the euro area.

## 2 The price stability mandate and monetary policy in practice

### 2.1 The ECB's price stability mandate

The establishment of the euro was a response to the monetary disorder threatening the Internal Market in the aftermath of the demise of the Bretton Woods system. The loss of the dollar as an external anchor fixing the parity between the currencies of EU Member States resulted in repeated exchange rate instability undermining the free movement of capital and goods, thereby eroding the foundations of European integration.

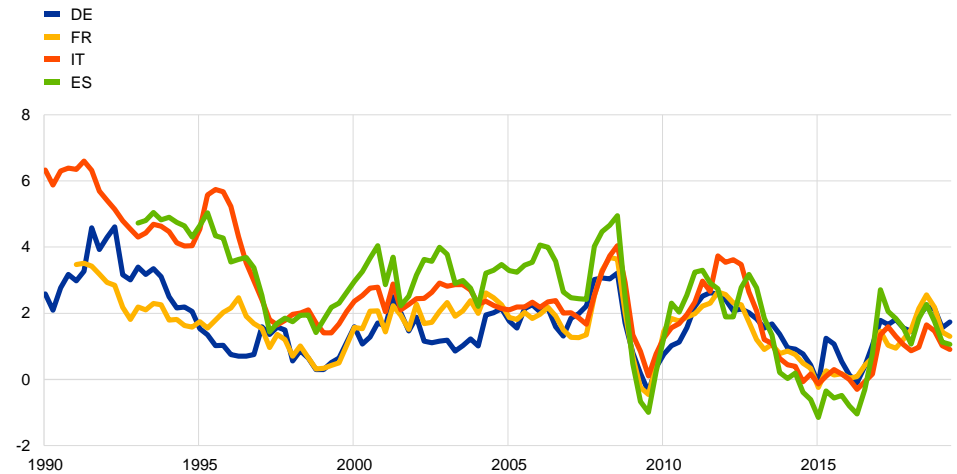
The TFEU therefore entrusted the ECB with the clear task of restoring monetary stability, essential to ensuring a prosperous Single Market. Article 127 of the TFEU states: "The primary objective of the ESCB shall be to maintain price stability. Without prejudice to the objective of price stability, the ESCB shall support the general economic policies in the Union [...]". The Treaty, however, does not specify the price stability objective in quantitative terms. By contrast, it does contain criteria specifying further the concept of excessive deficit (Article 126 of the TFEU and Protocol (No 12) on the excessive deficit procedure), whereby Member States' compliance with the requirement to avoid excessive deficit would be assessed with respect to reference values for deficit (3% of GDP) and public debt (60% of GDP).

The Maastricht Treaty initiated the process of restoring monetary stability in the EU. Member States wishing to adopt the euro needed to meet specific criteria designed to ensure economic convergence. However, the first half of the 1990s saw considerable and persistent differences in inflation across countries, with inflation considerably higher in Italy and Spain than in Germany and France (see Chart 1). The successful disinflation process in the second half of the 1990s dramatically reduced inflation levels and narrowed inflation differentials across euro area countries. In the late 1990s the first challenge facing the newly established ECB was to design a price-stability-oriented monetary policy strategy for the euro area as a whole.

**Chart 1**

HICP inflation in the four largest euro area economies

(percentages per annum)

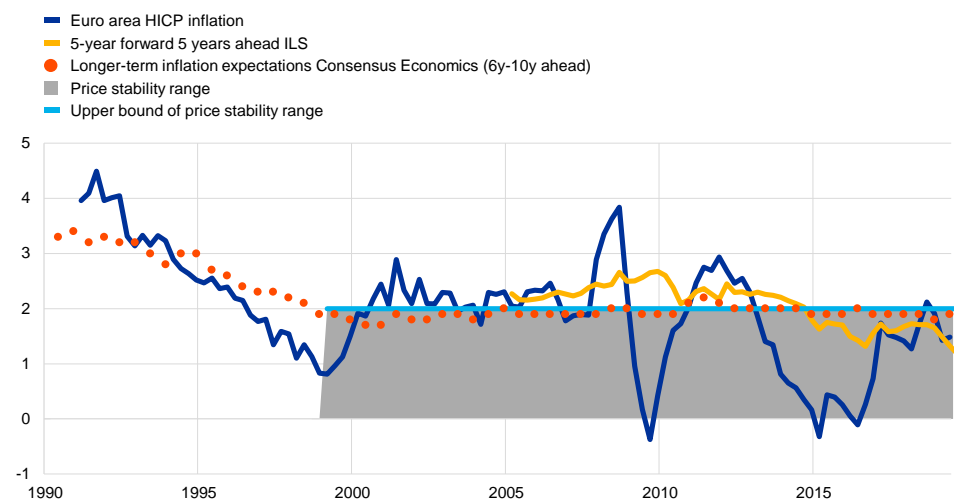


Source: Eurostat.  
Latest observation: 2019Q1.

**Chart 2**

Euro area inflation and inflation expectations

(percentages per annum)



Sources: Bloomberg, Eurostat, Consensus Economics.  
Latest observation: 2019Q1.

## 2.2 The Governing Council's definition of price stability

The notion of price stability enshrined in the Treaty fell short of providing an effective anchor for inflation expectations within the monetary union. In 1998 the Governing Council further specified the price stability objective assigned to the ECB by adopting a quantitative definition of price stability. It decided to define price stability as a year-on-year increase in the Harmonised Index of Consumer Prices (HICP) for the euro area of below 2%, while making clear that price stability should be maintained over

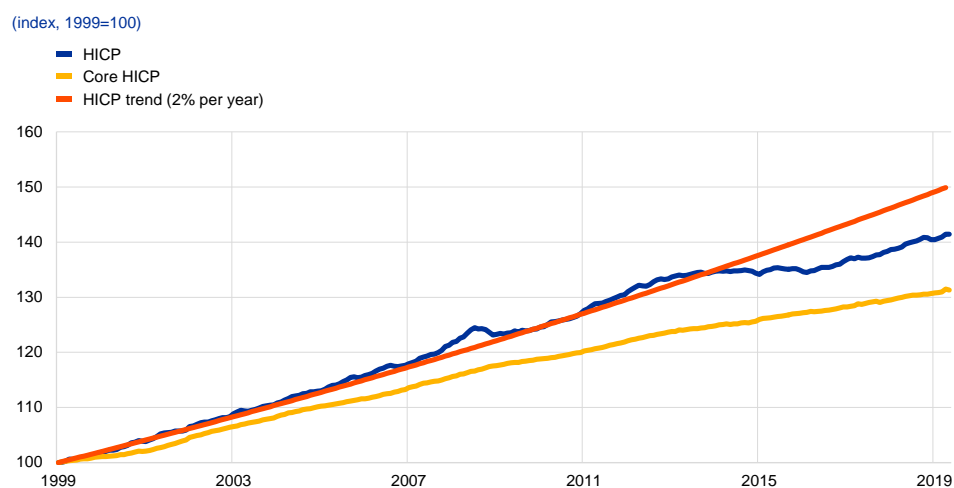
the medium term. That definition clearly stated that neither deflation nor inflation levels of more than 2% were compatible with price stability (see grey area in Chart 2). Importantly, it highlighted the fact that monetary policy had to be forward-looking and could only maintain price stability over longer periods of time. The time horizon over which monetary policy should seek to stabilise inflation is not set in stone, as it varies with the nature of shocks buffeting the economy and the state of the transmission mechanism. For example, supply shocks, typically related to commodity or oil price increases, exert immediate upward pressures on prices, but tend to weigh on economic activity. Provided inflation expectations remain well anchored, monetary policy can look through cost-push shocks, thereby avoiding introducing more volatility into the economy. Second-round effects of oil price hikes, however, would call for a more forceful monetary policy response, as incipient price and wage pressures could eventually ignite a vicious circle between prices and wages that would move the economy away from price stability. The Great Inflation of the 1970s is attributable to an adverse feedback loop of this kind, between prices and wages triggered by oil shocks. With central bankers still having vivid memories of this period, concerns about potential second-round effects of oil price increases on wages and prices became a recurring theme of monetary policy deliberations during the first ten years of the euro, and were still being raised prominently in the introductory statements to ECB press conferences held well into 2011.

The period leading up to EMU resulted in a successful disinflationary process combined with fiscal consolidation, with Member States' authorities having great incentives to meet the convergence criteria in order to be among the first countries to adopt the single currency. The euro was eventually introduced in 11 countries in 1999, with Greece joining two years later. In the early stages of EMU, inflation was relatively low in the euro area, reaching levels of less than 1% in 1999. During the convergence period, long-term inflation expectations significantly declined, with long-term inflation expectations – as measured by survey-based expectations of inflation six to ten years ahead – stabilising at around 1.8% in the three years following the introduction of the single currency. Interestingly, inflation expectations drifting down to lower levels sparked concerns about the strength of the anchoring of long-term inflation expectations to levels compatible with price stability. With the bursting of the dot-com bubble exacerbating those concerns, the risks of hitting the zero lower bound on nominal interest rates was the subject of much discussion among central bankers in the early 2000s.

Following a thorough review of monetary policy strategy, in 2003 the Governing Council stated that, in the pursuit of price stability, it aims to maintain inflation rates below, but close to, 2% over the medium term. This clarification was intended to address concerns relating to the perceived asymmetry of the definition of price stability as, under the 1998 quantitative definition, inflation stabilising at any level between 0 and 2% over the medium term could literally be considered as compatible with price stability. The likelihood of hitting the zero lower bound on nominal interest rates during downturns had materially increased in the recently-established low inflation regime that followed the disinflation process, thereby curtailing monetary policy's room for manoeuvre.

The aim of inflation below, but close to, 2% over the medium term allayed concerns about the insufficient room for monetary policy manoeuvre associated with the zero lower bound constraint on policy rates. In the context of the evaluation of the strategy in 2003, ECB staff analysis<sup>8</sup> pointed to the low probability of reaching the zero lower bound over business cycles. The inflation aim of "below, but close to, 2% over the medium term" was assessed as being appropriate in the interests of preserving the potency of monetary policy. It was also felt that against the background of a heterogeneous monetary union the inflation aim of below, but close to, 2% would make relative price adjustments across countries easier. Following the clarification of the monetary policy strategy, long-term inflation expectations increased and stabilised at just below 2% (see Chart 2), in line with the monetary policy aim announced by the Governing Council.

**Chart 3**  
Euro area HICP



Sources: Eurostat, ECB calculations.  
Notes: Core HICP is HICP excluding food and energy.  
Latest observation: May 2019.

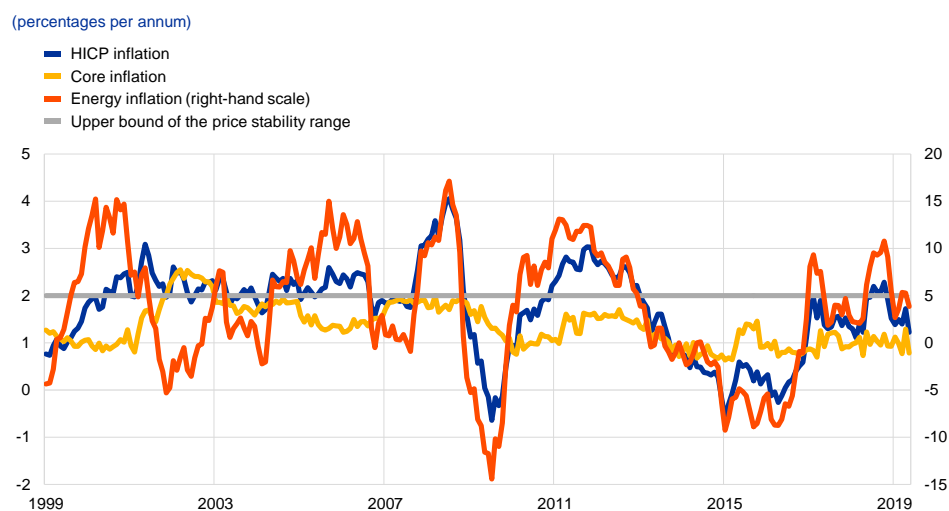
Taking a long-term perspective on inflation, Chart 3 shows trends in price levels since 1999. Headline consumer prices evolved broadly in line with a 2% trend until 2014. However, core inflation followed a lower trend, drifting away from the 2% trend well before the global financial crisis. As a result, the euro area entered the crisis with relatively weak underlying price pressures.

In the early years of the euro's existence, the ECB faced the daunting challenge of building its credibility in a large economic area consisting of countries with quite different inflation track records. It was therefore essential for the newly established central bank to prove it was willing and able to ensure price stability and to deliver inflation rates in line with its declared inflation aim. The quest for credibility came at the same time as a series of one-sided inflationary supply shocks. Oil prices increased more than tenfold over the first ten years of the euro, from about \$10 per

<sup>8</sup> See ECB (2003).

barrel in January 1999 to \$145 per barrel at the peak reached in July 2008, shortly before Lehman Brothers filed for bankruptcy.

**Chart 4**  
Euro area headline, core, and energy inflation



Sources: Eurostat, ECB calculations.  
Notes: Core inflation is HICP inflation excluding food and energy.  
Latest observation: May 2019.

Chart 4 shows headline, core and energy price inflation in the euro area since 1999. In spite of persistent oil price increases during the first decade of EMU, there were no clear signs of second-round effects passing through to core inflation. Core inflation, unlike headline, had a tendency to decouple from energy inflation over that period.

In the wake of the adoption of the euro as a stable currency, households, firms and, more generally, social partners that are key players in the determination of wages and prices seemed to internalise the central bank’s reaction function. This structural change in economic behaviour resulted in inflation expectations stabilising at levels below, but close to, 2%. As shown by Rostagno et al. (2019), this acted as a powerful self-stabilising mechanism preventing second-round effects from taking hold. Underlying inflationary pressures remained muted owing to the central bank’s newly acquired credibility. Other factors contributing to dampening inflation during this period included structural reforms that compressed wage growth in several euro area countries (e.g. the Hartz reforms in Germany) and the impact of globalisation on import prices, with the emergence of China as an economic powerhouse.

The extent to which the quantitative definition of price stability might have acted as a self-reflecting barrier conducive to an asymmetric monetary policy reaction function, whereby the central bank reacts more to inflation overshoots than undershoots, is an empirical question. While Rostagno et al. (2019) using a threshold-BVAR approach find evidence of two distinct regimes in the ECB’s monetary policy conduct, other approaches such as Taylor rule specifications fail to discriminate between two alternatives, namely an asymmetric reaction around a 2% inflation target versus a symmetric reaction around a relatively lower focal point. Hartmann and Smets

(2018), in particular, estimate a Taylor rule, as specified by Orphanides (2003), for the ECB and find no evidence for asymmetry in the monetary policy response around an inflation aim that is, however, lower than 2%. This issue has also been abundantly debated among market participants. Overall, this shows that the quantitative definition could benefit from a further clarification to dispel any remaining doubts about the inflation aim and the symmetry of the monetary policy reaction function around that aim.

## 2.3 The two-pillar approach

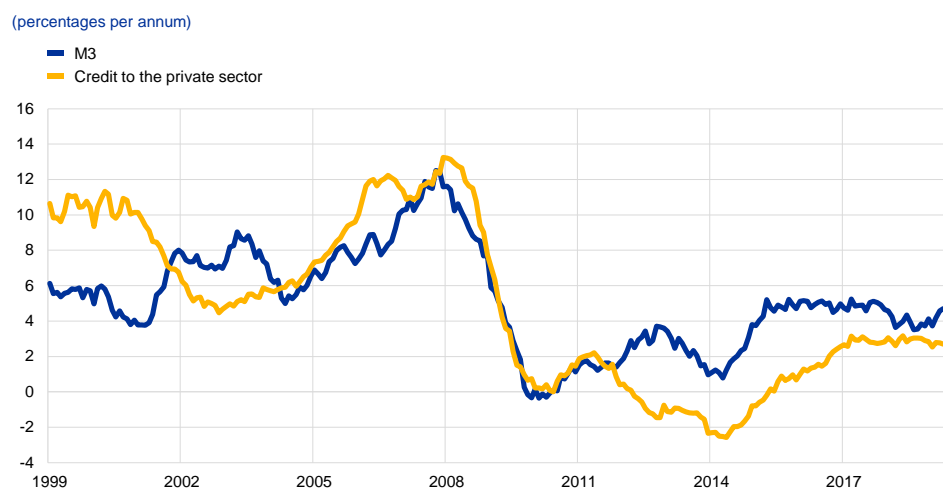
The Governing Council's monetary policy deliberations are informed by two complementary analytical perspectives, referred to as the "two pillars": economic analysis and monetary analysis. The 2003 clarification mentioned above removed the emphasis on the reference value of money, while broadening the monetary pillar to place greater emphasis on the counterparts of money, in particular credit growth and excess liquidity. The 2003 review also clarified the role of the monetary pillar, introducing the concept of "cross-checking", and modifying the hierarchy of the two pillars. Economic analysis, which has come first in the introductory statements since 2003, is meant to identify short to medium-term risks to price stability. This is followed by monetary analysis, as a means of cross-checking, from a medium to long-term perspective, the short to medium-term indications coming from the economic analysis. Cross-checking of economic and monetary analyses is still a feature of the introductory statement to the press conference held after Governing Council's monetary policy meetings. But it is not elaborated on in detail, reflecting that it has played only a minor role in the Governing Council's deliberations. Overall, the rather repetitive nature of the cross-checking section points to issues related to the nature of the monetary pillar's contribution to policy deliberations.

The monetary pillar is not a financial stability pillar, but it may allow incorporating elements of a "leaning against the wind" approach into the ECB's monetary policy strategy through the attention given by the Governing Council to developments in credit variables within its regular assessment of risks to price stability. Empirical analysis is however contrasted as to whether monetary analysis has affected monetary policy over and above the signals extracted from the economic analysis. Estimating a range of Orphanides rules for the euro area, Hartmann and Smets (2018) find no evidence of a significant role for various credit or monetary aggregates in ECB's interest rate setting. On the basis of a structural model including a financial sector, Rostagno et al. (2019) find some evidence that credit growth informed the ECB's reaction function.



## Chart 5

### M3 growth and credit to the private sector



Source: ECB  
Latest observation: April 2019.

Over time the money and credit view increasingly focused on the transmission of monetary policy through the banking sector. ECB staff carried out a great deal of analytical work during the financial crisis to understand the pass-through of unconventional monetary policy measures to lending conditions by opening the black box of banking intermediation. This included assessing heterogeneity in the pass-through of monetary policy measures to lending rates, the effect of targeted longer-term refinancing operations (TLTROs) on bank behaviour, or the impact of negative interest rates on banks' reactions to monetary policy.<sup>9</sup> This analysis was often able to build on individual bank balance sheet data. This allowed for a more granular approach and helped to deepen understanding of the bank lending transmission channel.

## 3 The ECB monetary policy response to the crisis

### 3.1 The global financial crisis (2008-09)

The global financial crisis marked a dramatic change in the policy environment. In the run-up to the crisis, debate among macroeconomists centred on the notion of the Great Moderation and on how to explain the decline in macroeconomic volatility experienced by advanced economies over nearly two decades. Sadly, macroeconomic volatility surged abruptly in the form of the greatest recession since the 1930s, thereby challenging the intellectual underpinning of conventional wisdom

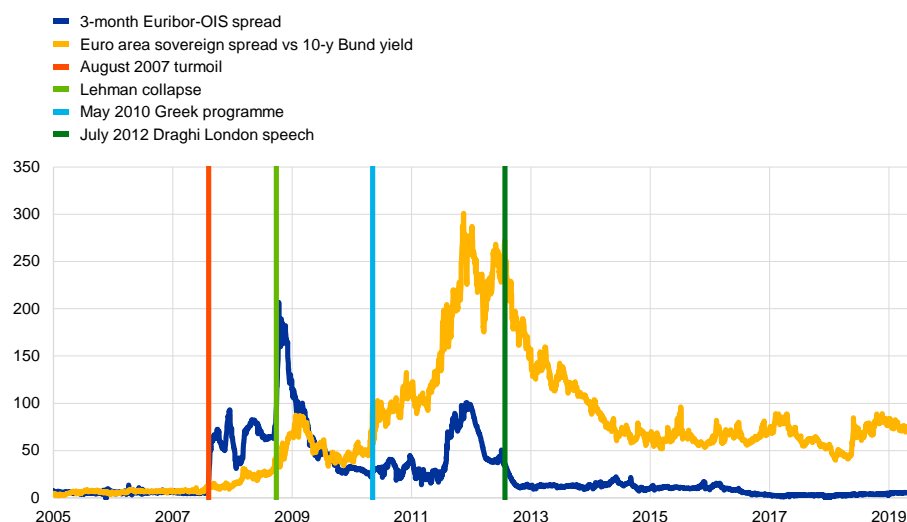
<sup>9</sup> For example, Altavilla, Canova, Ciccarelli, (2019) use individual bank information to assess the pass-through of monetary policy measures to lending rates in the euro area. Demiralp, Eisenschmidt and Vlassopoulos (2019) exploit the cross-sectional variation in banks' funding structures jointly with that in their excess liquidity holdings to assess the impact of negative interest rate policy on banks' reactions to lower policy interest rates. On negative rate policy, see also Heider, Saidi and Schepens (2019).

in macroeconomics. In Europe, the financial crisis morphed into an economic crisis and, eventually, an institutional crisis when markets challenged the creditworthiness of several euro area sovereigns and even the integrity of EMU. This led to forceful monetary policy responses and political leaders agreeing on a significant overhaul of the EMU institutional framework.

## Chart 6

### Euro area money and government bond market spreads

(basis points)



Sources: Bloomberg, Eurostat.

Notes: Euribor = Euro Interbank Offered Rate; € OIS = Euro Overnight Index Swap Rate. The euro area's 10-year yield is a GDP-weighted average of euro area member countries' government bond yields.

Latest observation: 05 June 2019.

In the early phases of the crisis, severe tensions emerged in the interbank market. In times of crisis, trust evaporates and even creditworthy borrowers find it hard to secure funding. Central banks were initially established with the objective of preventing liquidity strains from making banks insolvent, acting as a lender of last resort in times of financial stress. Chart 6 shows a traditional measure of money market stress – the spread between the three-month euro interbank offered rate (EURIBOR) and the overnight index swap (OIS) rate. This spread provides compensation for risk for unsecured lending on the money market. Credit risk in the interbank market rocketed in August 2007, when tensions first emerged, and remained elevated thereafter.<sup>10</sup>

These initial tensions were the first signs of a profound crisis, but at that point in time the prevailing view was that liquidity management tools were sufficient to address tensions on the interbank and other short-term funding markets. The ECB reacted forcefully as early as August 2007, when the first tensions emerged, by providing considerable liquidity under a fixed rate full allotment tender procedure in its main refinancing operations (MROs), whereby a bank's demand for liquidity is fully

<sup>10</sup> Tensions escalated on 9 August 2007, when France's largest bank froze redemptions by investors from three of its investment funds that held securities backed by US sub-prime mortgages.

satiated at a fixed price.<sup>11</sup> ECB liquidity-providing operations were able to relieve money market tensions, and by early 2009 the EURIBOR-OIS spread stabilised at lower levels, although still well above pre-crisis levels.

ECB monetary policy in the initial phase of the crisis was based on the “separation principle”, whereby liquidity management and stance considerations are distinct. The conduct of monetary policy focused on setting policy rates conducive to price stability, while market operations focused on ensuring that market turbulence would not impair the transmission of the policy rates to the economy. Liquidity operations served to complement conventional interest rate policy, rather than substituting it.

### 3.2 The sovereign debt crisis and its aftermath (2010-13)

The separation principle continued during the sovereign debt crisis. The Securities Markets Programme, established in May 2010, aimed to ensure depth and liquidity in the sovereign bond markets of distressed countries and restore the appropriate functioning of the monetary transmission mechanism. Its purpose was not to alter the monetary policy stance itself.

In April and July 2011 the ECB raised its policy rates at a time when liquidity provision continued to be abundant. These decisions were also in line with the principle of a separation between the monetary policy stance and the provision of liquidity. However, in the course of 2011, the degree of impairment within the monetary policy transmission mechanism reached levels which challenged the validity of the separation principle.

As the rate hikes of 2011 preceded a renewed episode of sovereign debt market stress and were undone in the second half of 2011, it is of course easy to be critical of them. In hindsight, it is more important to understand their rationale in real time and to assess the evolution of the monetary policy response to economic and financial developments at the height of the sovereign debt crisis.

The ECB's introductory statements from January 2011 onwards mentioned upside risks to price stability related to developments in energy prices and, to a lesser extent, to increases in indirect taxes and administered prices. In the light of upside risks to price stability, the Governing Council decided to increase the key ECB interest rates by 25 basis points in April 2011, further increasing them by 25 basis points in July 2011. While there were clear indications of upward pressure on wages

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<sup>11</sup> On 9 August 2007, the ECB announced a fine-tuning operation conducted as a fixed rate tender at the prevailing MRO rate, and under “full allotment” with all bids met at the prevailing rate. This new approach, dubbed “fixed rate full allotment”, which was successfully tested for the first time in August 2007, was to become a feature of the ECB's operational system after October 2008 (and has remained in place since then), and an important tool to fight the liquidity crisis. The injection of liquidity via the 9 August operation was massive, amounting to €94.8 billion, and helped move the overnight rate back to close to the MRO rate by the end of the trading day.

and prices<sup>12</sup>, the Governing Council's extreme sensitivity to second-round effects can arguably be attributed to the monetary policy experience preceding the global financial crisis, when by and large headline inflation was kept below, but close to, 2% over the medium term.<sup>13</sup> The introductory statements also refer to ample monetary liquidity accumulated prior to the period of financial market tensions as a factor potentially facilitating the accommodation of price pressures in the euro area.<sup>14</sup>

In the summer of 2011, when the sovereign debt crisis exacerbated and undermined the transmission of monetary policy, the ECB responded with a series of important monetary policy decisions. Given the announcements made by the governments of Italy and Spain concerning new fiscal and structural policy measures, in August 2011 the ECB announced that it would “actively implement” its Securities Markets Programme, and subsequently started to purchase Italian and Spanish government bonds.<sup>15</sup> In the autumn of 2011, the ECB announced additional enhanced credit measures to support bank lending and liquidity in the euro area money market<sup>16</sup>, including two longer-term refinancing operations with a maturity of three years, conducted under fixed rate full allotment, with the rate fixed at the average MRO rate over the life of the operation. These decisions were the first step in a long cycle of monetary easing which would culminate in the comprehensive package of measures announced in June 2014.

The set of measures announced at the end of 2011, in particular the two large-scale three-year liquidity-providing operations, helped restore some order in financial markets, as shown by the strong decline in the EURIBOR-OIS spread following their announcement (see Chart 6). After a period of relative calm in early 2012, however,

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<sup>12</sup> Using ECB staff projections in a Taylor rule specification, Hartmann and Smets (2018) find evidence that the 2011 rate hikes were broadly in line with the ECB reaction function. Rostagno et al. (2019), on the other hand, based on simulations using a structural model with a rich financial sector, fail to detect a positive tilt to the distribution of shocks underlying the inflation projections, even abstracting from supply shocks.

<sup>13</sup> See the introductory statement to the April 2011 press conference: “It is of paramount importance that the rise in HICP inflation does not lead to second-round effects in price and wage-setting behaviour and thereby give rise to broad-based inflationary pressures over the medium term.” This sentence was repeated in July 2011.

<sup>14</sup> *ibid.*: “While our monetary analysis indicates that the underlying pace of monetary expansion is still moderate, monetary liquidity remains ample and may facilitate the accommodation of price pressures” and “[...] monetary liquidity accumulated prior to the period of financial market tensions remains ample and may facilitate the accommodation of price pressures in the euro area.”

<sup>15</sup> See the statement by the President of the ECB on 7 August 2011: “The Governing Council of the European Central Bank (ECB) welcomes the announcements made by the governments of Italy and Spain concerning new measures and reforms in the areas of fiscal and structural policies. The Governing Council considers a decisive and swift implementation by both governments as essential in order to substantially enhance the competitiveness and flexibility of their economies, and to rapidly reduce public deficits. [...] It is on the basis of the above assessments that the ECB will actively implement its Securities Markets Programme. This programme has been designed to help restoring a better transmission of our monetary policy decisions – taking account of dysfunctional market segments – and therefore to ensure price stability in the euro area.”

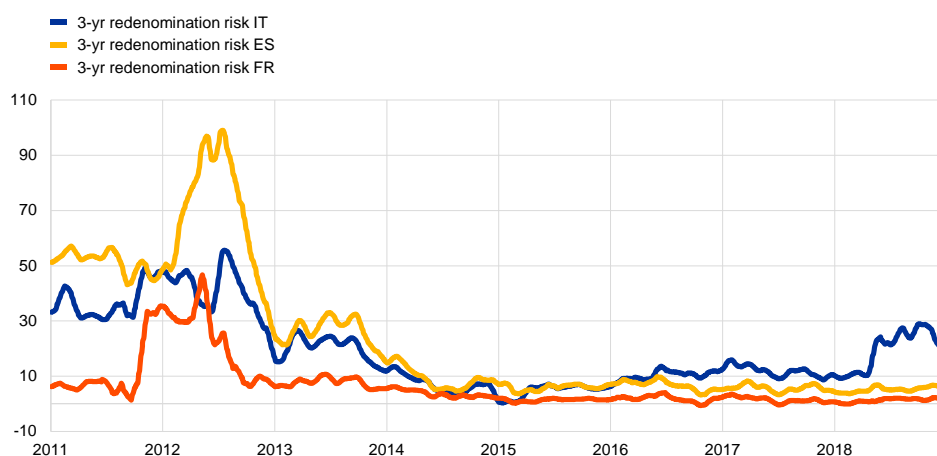
<sup>16</sup> More precisely, the ECB announced additional US dollar liquidity-providing operations, with the aim of alleviating tensions in euro area banks' funding; a new covered bond purchase programme; and two longer-term refinancing operations with a maturity of one year conducted as fixed rate tender procedures with full allotment. In November 2011, at the first meeting with the new President, Mario Draghi, the ECB reduced the interest rate corridor by 25 basis points, before a second rate reduction of the same size on 8 December, bringing the ECB's key interest rates back to the level reached a year earlier. Lastly, in December 2011 the ECB announced additional enhanced credit support measures to support bank lending and liquidity, comprising two three-year refinancing operations, and measures to increase collateral availability.

financial strains returned, as a number of euro area Member States remained caught in an adverse sovereign-bank feedback loop, fuelled by concerns that a sovereign default could jeopardise the stability of their financial system. The premium required by investors to compensate for the risk of a country leaving the euro area – the “redenomination risk” – had been rising continuously since early 2012 (see Chart 7), contributing to a surge in sovereign yields in financially vulnerable countries.<sup>17</sup> Stress was increasingly propagating to sovereign yields of other countries, as concerns were mounting that a break-up of the euro area could lead to contagion owing to tight financial and trade links across euro area countries.

### Chart 7

#### Redenomination risk in selected euro area countries at 3-year maturity

(basis points, 20 day moving average)



Sources: Thomson DataStream and De Santis (2019).

Notes: Redenomination risk is measured as a difference between Quanto CDS for Italy/Spain/France and for Germany. The Quanto CDS is computed as difference between the sovereign CDS quotes in dollars and euros.  
Latest observation: 26 May 2019.

In response to the crisis, the euro area summit on 28-29 June 2012 decided on a number of institutional reforms to the financial, budgetary and economic policy frameworks of EMU, notably the establishment of the main elements of a European banking union, making explicit reference to the need to break the connections linking sovereigns and banks. This was accompanied by the long-awaited establishment of a permanent backstop mechanism for euro area sovereigns through the creation of the European Stability Mechanism (ESM), which was established in October 2012.<sup>18</sup>

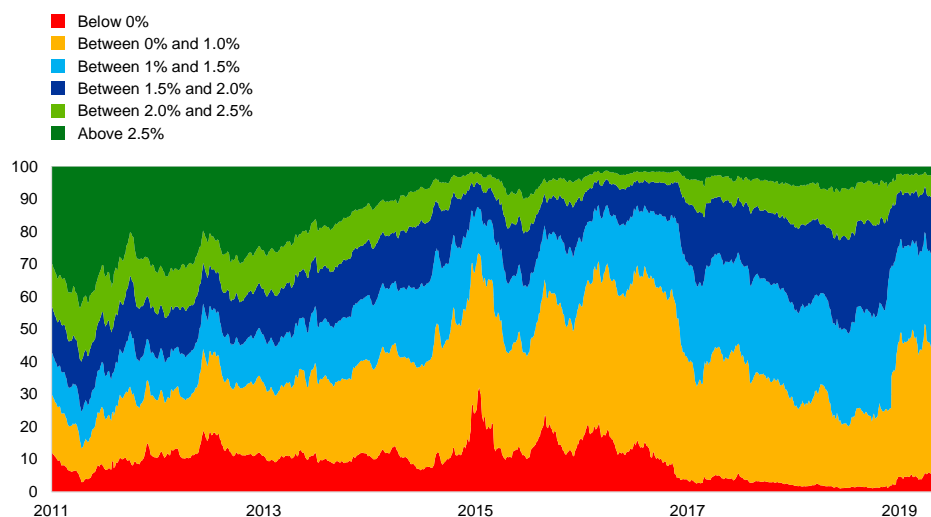
<sup>17</sup> See De Santis (2019).

<sup>18</sup> The ESM was a successor to the European Financial Stability Facility, which was set up as a temporary solution in June 2010. Discussions on the establishment of the ESM date back to October 2010 when the then President of the European Council, Herman van Rompuy, received a formal mandate from the Heads of State or Government to undertake consultations on a limited Treaty change to establish a permanent crisis management framework.

## Chart 8

### Option-implied distribution of average inflation over the next 5 years

(percentages per annum)



Sources: Bloomberg, Thomson Reuters and ECB calculations.

Notes: Probabilities implied by five-year zero-coupon inflation options, smoothed over five business days. Risk-neutral probabilities may differ significantly from physical, or true, probabilities.

Latest observation: 31 May 2019.

These decisions marked a step forward in strengthening the resilience of the architecture of EMU and paved the way for additional monetary policy easing. After President Draghi's remarks on 26 July 2012 that "within our mandate, the ECB is ready to do whatever it takes to preserve the euro", the Governing Council announced, at its August 2012 meeting, that it would undertake outright open market operations of a size adequate to achieve its inflation aim. This led to the design of a new programme, the outright monetary transactions (OMTs), announced at the September 2012 Governing Council meeting. While recalling its aim to "preserve the singleness of our monetary policy and to ensure the proper transmission of our policy stance to the real economy throughout the area", the Governing Council stated that OMTs would make it possible to "address severe distortions in government bond markets which originate from, in particular, unfounded fears on the part of investors of the reversibility of the euro", and provide "a fully effective backstop to avoid destructive scenarios with potentially severe challenges for price stability in the euro area".

### 3.3 Combating deflation risks: a multi-pronged strategy

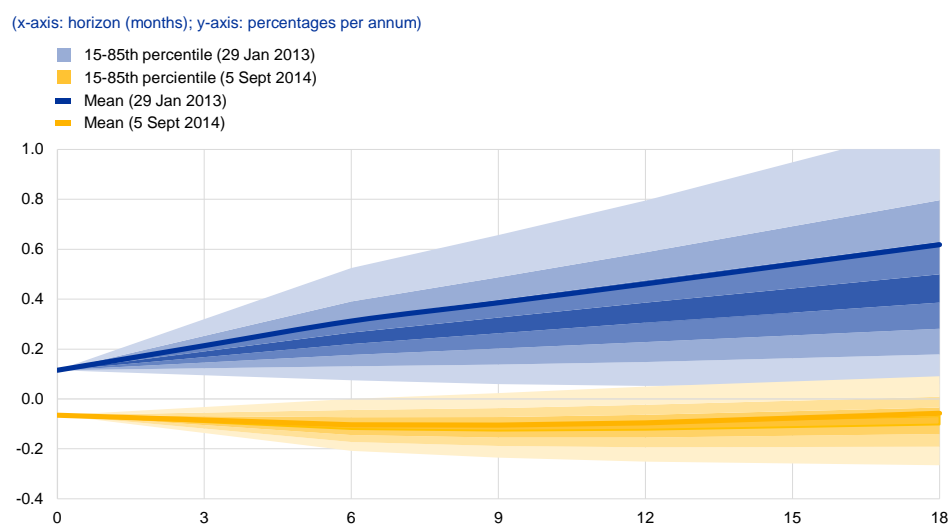
The OMT announcement successfully halted the market panic and subsequently led to a removal of redenomination risks (see Chart 7). This, in turn, led to a marked and lasting decline in sovereign yields, contributing to a substantial easing in financial conditions in the euro area. Yet the subsequent economic recovery, which took place between 2013 and 2014, was moderate, uneven and fragile. As a result, downside risks to price stability were increasingly apparent. Market-based measures of inflation expectations were drifting downward. The likelihood of low inflation for long

was increasing from less than 20% in January 2011 to more than 40% in May 2014 (for inflation below 1% five years ahead, see Chart 8).<sup>19</sup>

Deflationary risks were also on the rise, with interest rate policy having limited room for manoeuvre. Faced with these major threats to price stability, the ECB responded in June 2014 with a package of mutually reinforcing measures organised around three instruments, namely negative interest rates and forward guidance on rates, large-scale asset purchases, and funding for lending (TLTROs).

As regards rate policy, the ECB brought interest rates into negative territory in June 2014 when it decided to cut the deposit facility rate to -0.10%, an unprecedented move among major central banks.<sup>20</sup> In the view of the Governing Council, it was very important to signal that the lower bound for interest rates was not zero but potentially lower. The rationale was to prevent the economy from falling into a “liquidity trap” situation. By fostering expectations that rates could be less than zero, investors and consumers would continue to invest and consume. From the perspective of financial market investors, purchasing long-term bonds could still result in capital gains associated with further cuts in policy rates.

**Chart 9**  
Option-implied density of 3-months OIS rate in 12 months' time on selected dates



Sources: Bloomberg, ECB calculations.  
Notes: Risk-neutral densities of 29 Jan 2013 and 5 September 2014 derived from options on Euribor Futures. The mean and the percentiles are shifted to EONIA space by subtracting the Euribor3M-OIS3M spot spread.

Chart 9 shows the risk-neutral distribution of short-term rate expectations in September 2014 – after the introduction of negative rates – compared with January 2013, when the zero lower bound was still perceived as binding. Chart 9 suggests that the zero lower bound restriction likely prevented the long end of the curve from

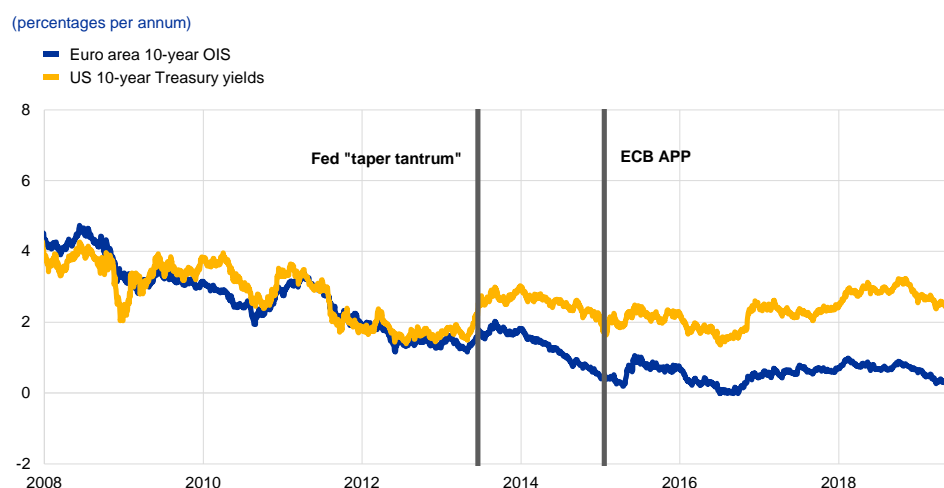
<sup>19</sup> The areas show the probabilities associated with different ranges of five-year ahead inflation rates based on option prices.

<sup>20</sup> Experience of negative interest rates prior to June 2014 include Switzerland in the 1970s and Denmark from July 2012 to April 2014. In both cases, however, negative rates were implemented with the specific aim of taming excessive appreciation of the currency due to large capital inflows.

coming down. In other words, it contributed to steepen the curve, with investors' expectations tilted towards future increases in interest rates. Removing the zero lower bound allowed a significant downward shift in rate expectations, thereby helping reduce interest rates along a broad maturity spectrum.

### Chart 10

#### Long term interest rates in the euro area and the US



Source: Bloomberg.  
Latest observation: 05/06/2019.

Forward guidance on key policy interest rates heightened the impact of negative interest rate policy. Rate forward guidance started in July 2013 and was effective in decoupling euro area longer-term rates from the United States in the context of the taper tantrum (see Chart 10). It also helped to anchor future rate expectations around the path consistent with the monetary policy reaction function, thereby helping flatten the curve at short to medium-term maturities.

In addition to rate policy, the ECB used its balance sheet capacity – both in terms of size and composition – very boldly to provide further assistance. This mostly consisted in large-scale asset purchases of private and public sector securities, which helped to lower interest rates further through the “duration channel”. By removing duration risk from the market, asset purchases fostered a reduction in the term premium required by investors to hold longer-term securities, thereby lowering yields in a wide range of market segments.<sup>21</sup>

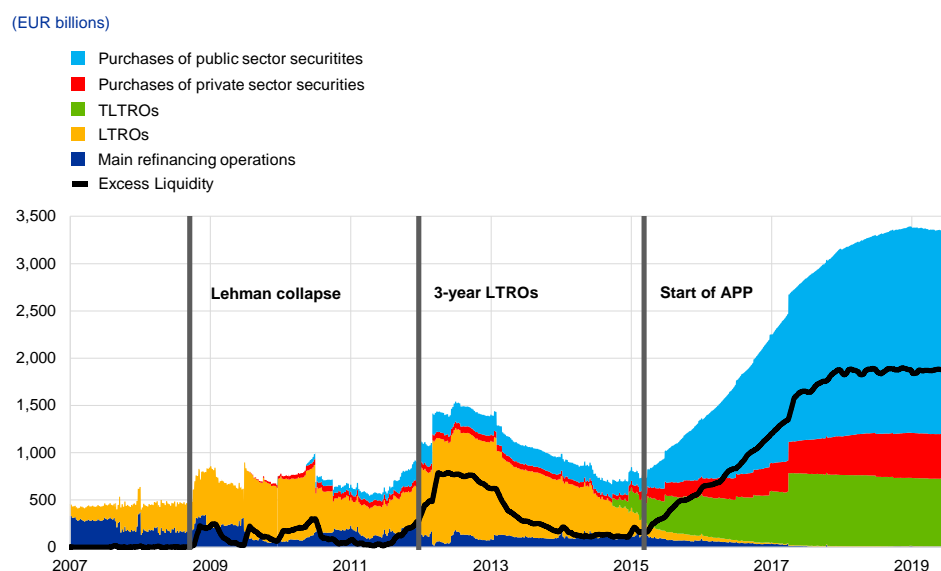
The use of balance sheet capacity to steer the monetary policy stance was a fundamental change from the way monetary policy had been conducted traditionally. The traditional demand-driven creation of central bank reserves was replaced with a supply-driven creation of reserves, with both the size and composition of the central bank balance sheet being relevant to the monetary policy stance.

<sup>21</sup> For an overview of the channels of transmission of ECB's asset purchases, see Hammermann et al. (2019). On the duration channel of ECB's asset purchases, see Eser et al. (2019).



One trigger for using the balance sheet as a monetary policy instrument was the previous experience with the three-year long-term refinancing operations that the ECB had launched in December 2011. In the course of 2013, when it became possible for borrowing banks to start exercising their early repayment option, financial conditions were improving and banks were relatively quick to reimburse the large amount of liquidity that they had borrowed in times of severe liquidity stress. As a result, the size of the ECB's balance sheet was receding quite rapidly (see Chart 11), precisely at a time when downside risks to price stability were rising. While it made sense, from a liquidity management perspective, for a bank to repay part of its allotment under the long-term refinancing operations, repayments were not only a sign of improving liquidity conditions in the banking sector, but also of ongoing deleveraging, whereby from a macroeconomic perspective, credit supply to the private sector was curtailed. Individually rational bank decisions resulted in detrimental effects on the economy as a whole. The reduction in excess liquidity also led to more volatile money market conditions, making the ECB's steering of money market rates more challenging. Overall, this experience showed the importance for the central bank to exert tighter control over the size of its balance sheet and the amount of liquidity available in the banking system. In addition, experience of other major central banks with asset purchases during the global financial crisis – in particular the Federal Reserve – suggested that it was not only the size of the balance sheet that mattered, but also its composition (the maturity and types of securities that the central bank accumulated on the asset side).

**Chart 11**  
Eurosystem monetary policy assets



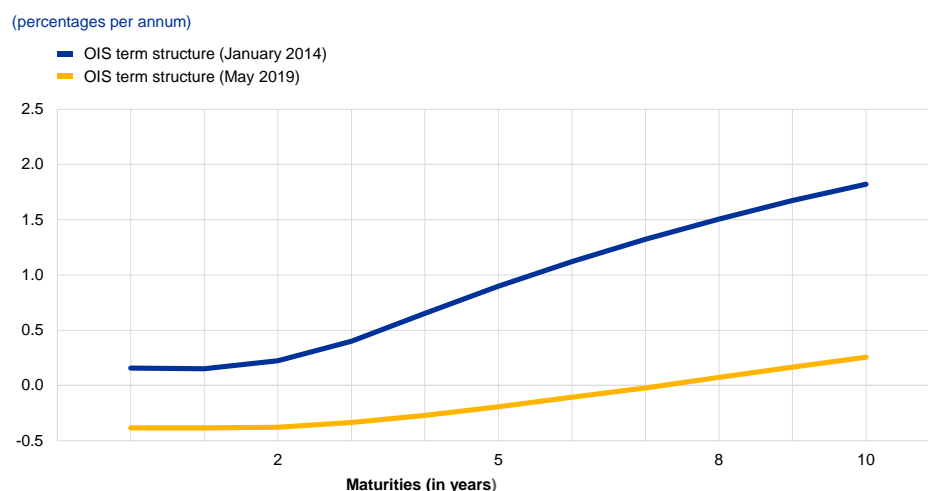
Sources: ECB, ECB calculations.  
Notes: Excess liquidity is liquidity provided in excess of autonomous factors and reserve requirements.  
Latest observation: 06 June 2019.

After announcing, in June 2014, a series of TLROs and purchases of asset-backed securities (ABS), the Governing Council started to refer to its balance sheet in public communications. In December 2014 it communicated that its recently adopted measures (covered bonds purchases, ABS purchases, and TLTROs) would “have a

sizeable impact on our balance sheet, which is intended to move towards the dimension it had reached at the beginning of 2012".<sup>22</sup> In January 2015 the ECB decided to launch an expanded asset purchase programme also encompassing government bonds of euro area Member States (starting in March 2015). These measures resulted in a significant expansion of the Eurosystem balance sheet to unprecedented levels (see Chart 11).

This was uncharted territory. The work of ECB staff was very important in assessing the impact of such a programme on financial conditions. In reality, the key policy questions were: How much duration extraction would be needed for a given impact on the term premium? What about the combined effects of the asset purchase programme and forward guidance on interest rates or portfolio rebalancing? What is the impact of signalling? While partial evidence was available based on central banks' previous experience in other jurisdictions, there was little experience available for the euro area. This was a case of learning-by-doing for the ECB.

**Chart 12**  
Term structure of OIS spot rates



Source: Bloomberg.  
Latest observation: 31 May 2019.

In this “great experiment”<sup>23</sup>, a good understanding of market sentiment and effective communication with and disclosure to the markets have been essential ingredients. The relationship between the central bank and the market is a two-way street: the ECB not only had to convey its policy intentions as clearly as possible, but also to examine carefully how market participants perceived its intentions. Importantly, communication should not be confined to markets, but should also include the public at large to address concerns that monetary policy actions might trigger in certain parts of society.

<sup>22</sup> See December 2014 introductory statement.

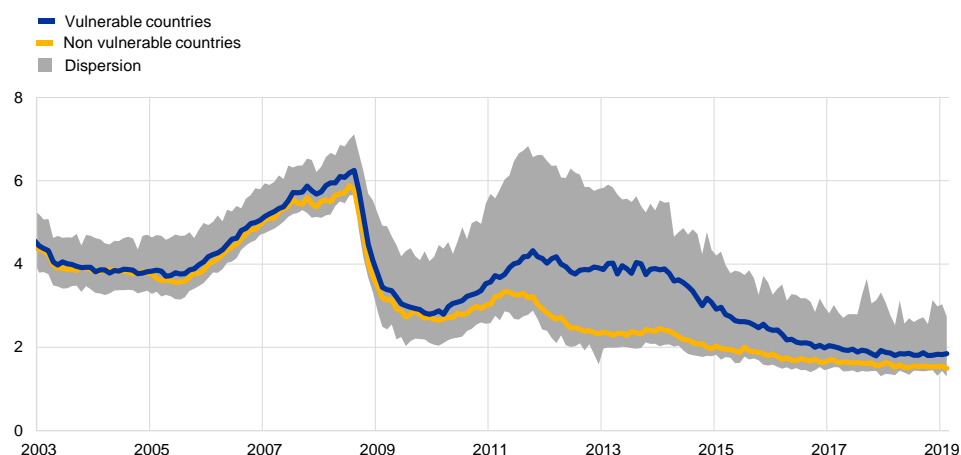
<sup>23</sup> The expression “great experiment” was coined by Bernanke (2013) to describe the founding of the Federal Reserve System’ in his account of the Fed’s 100-year history.

The transmission of the ECB's monetary policy measures to the financial system has been very effective in creating the financial conditions needed to bring inflation rates back to below, but close to, 2% over the medium term. This in part reflects the design of policy measures in ways that are mutually reinforcing. This ensured that policy measures affected all segments of the yield curve, thereby easing financial conditions more broadly.<sup>24</sup> The OIS forward curve – the risk-free curve used to price lending rates in euro area countries – has flattened significantly since June 2014, and across a wide range of maturities (see Chart 12). As a result, lending rates have declined significantly in both vulnerable and non-vulnerable countries, with a visible reduction in the cross-country heterogeneity that had hindered monetary policy transmission prior to 2014 (see Chart 13). This considerable easing of credit market conditions in all euro area countries has stimulated economic activity. A counterfactual exercise undertaken by ECB staff shows that growth and inflation would have been notably lower in the absence of non-standard measures (Rostagno et al. (2019)). These results are in line with international evidence, which points to the existence of significant effects of unconventional monetary policy on financial markets and the macroeconomy.<sup>25</sup>

### Chart 13

#### Composite indicators of NFCs' cost of borrowing from MFIs

(percentages per annum)



Sources: ECB, ECB calculations.

Notes: The indicator is computed by aggregation of short and long-term rates, using a 24-month moving average of new business volumes. Vulnerable countries are IE, GR, ES, IT and PT. Non vulnerable countries are BE, DE, FR, LU, NL, AT and FI. Within each country group, national rates are aggregated using 24-month moving averages of new business volumes as weights. Latest observation: April 2019.

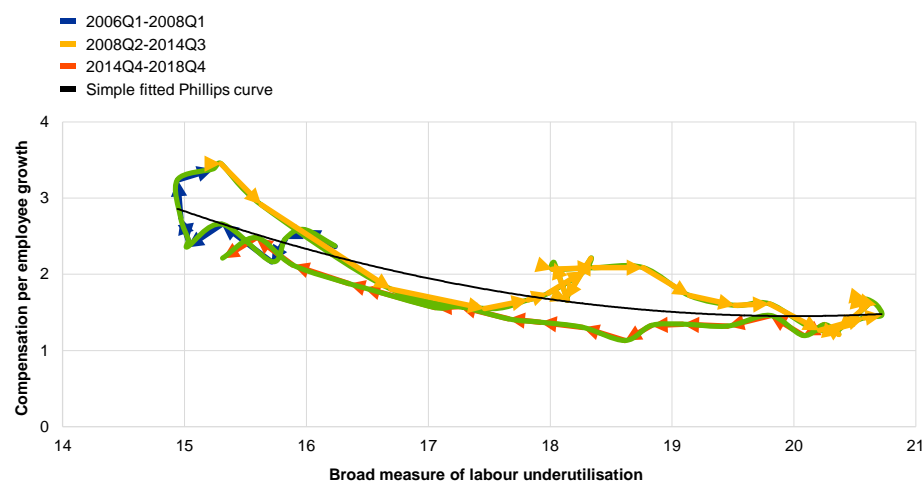
<sup>24</sup> Broadly speaking, negative interest rate policy acts mainly on the front end of the curve, with forward guidance reinforcing that impact further out into medium-term maturities, while asset purchases primarily influence the far end of the curve. The TLTROs, in turn, tend to influence credit spreads and bank margins. But there may be additional interactions beyond this. For example, there is evidence that negative interest rates have supported the portfolio rebalancing channel of the asset purchase programme by encouraging banks to lend instead of holding liquidity (see Demiralp, Eisenschmidt and Vlassopoulos (2019)). Conversely, there is evidence that the asset purchase programme supported rate forward guidance via signalling effects (see Altavilla, Carboni and Motto (2015)).

<sup>25</sup> Many studies have investigated the effectiveness of unconventional monetary policy. For the United States, see for example Del Negro et al. (2019). For a survey of international evidence on quantitative easing, see Haldane et al. (2016).

## Chart 14

### Euro area wage Phillips curve

(x-axis: percentage; y-axis: annual percentage changes)



Sources: Eurostat, ECB calculations.

Notes: The broad measure of labour underutilisation comprises (i) unemployed persons, (ii) underemployed part-time workers (i.e. part-time workers who would like to work more hours), (iii) persons who are seeking work but not available, and (iv) persons who are available but are not seeking work (this latter group includes discouraged workers). The measure is computed as a ratio to the extended labour force (i.e. the labour force plus those available, but not seeking work, and those seeking work, but not available). The black line represents a simple fitted Phillips curve. The fitted curve is based on data from 2006Q1 to 2018Q4. Latest observation: 2018Q4.

The output gap – a macroeconomic measure of unutilised resources in the economy – closed rapidly and labour market slack reduced to historically low levels. Nominal wages started to increase but the initial rise in wages was slow in comparison to historical benchmarks, pointing to a relative flattening of the wage Phillips curve for the euro area (see Chart 14). The limited pass-through from wages to prices remains puzzling (see Chart 15) and justified a strategy of “patience and persistence” based on the confidence that basic economic relationships prevail over the medium term.

## 4 Macroeconomic stabilisation beyond monetary policy

Macroeconomic stabilisation results from the combined effects of monetary and fiscal policy stances. The institutional setup of EMU is characterised by centralised monetary policy and decentralised fiscal policies. The global financial crisis has put this architecture to the test. The 2009 European Economic Recovery Plan provided for a coordinated fiscal stimulus amounting to approximately 1.5% of EU GDP.<sup>26</sup> In this context, the euro area fiscal stance loosened significantly in 2009 (see Chart 16). This countercyclical fiscal easing, combined with monetary easing, supported internal demand.

The crisis clearly proved that aggregate fiscal deficit and debt ratios are not relevant gauges for fiscal policy room for manoeuvre within a monetary union with decentralised fiscal authorities. The euro area fiscal deficit and debt ratios – albeit below US levels – did not offer much room for further fiscal loosening. Confronted

<sup>26</sup> See European Commission (2008).

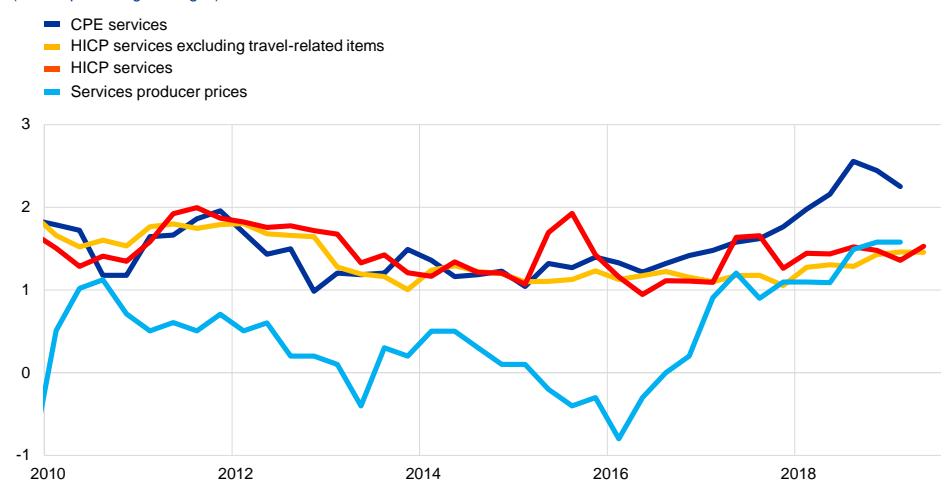
with increasing refinancing costs, euro area countries with weaker fiscal positions inevitably had to tighten their fiscal stances. This impossible trade-off between fiscal stabilisation and fiscal sustainability created a “catch-22” situation in several countries that eventually resulted in a systemic crisis that challenged the integrity of the euro area. The TFEU had not even envisaged the possibility of such a dire situation. The entire EMU architecture was based on the assumption that Member States’ compliance with the fiscal rules would be sufficient to rule out sovereign debt crises. This resulted in a significant procyclical tightening of the euro fiscal stance as a whole, precisely at the time when fiscal support was essential to shore up economic activity. This situation made monetary policy the “only game in town”.

The ECB took full responsibility for the situation and, acting in full compliance with its mandate, adopted bold monetary policy measures to ensure monetary stability, including warding off the risk of the euro area breaking up. Macroeconomic stabilisation policy, however, cannot and should not be the sole responsibility of the central bank. The crisis revealed the incompleteness of the architecture of EMU.

### Chart 15

#### HICP services excluding travel related items and services compensation per employee

(annual percentage changes)



Sources: Eurostat, ECB calculations.

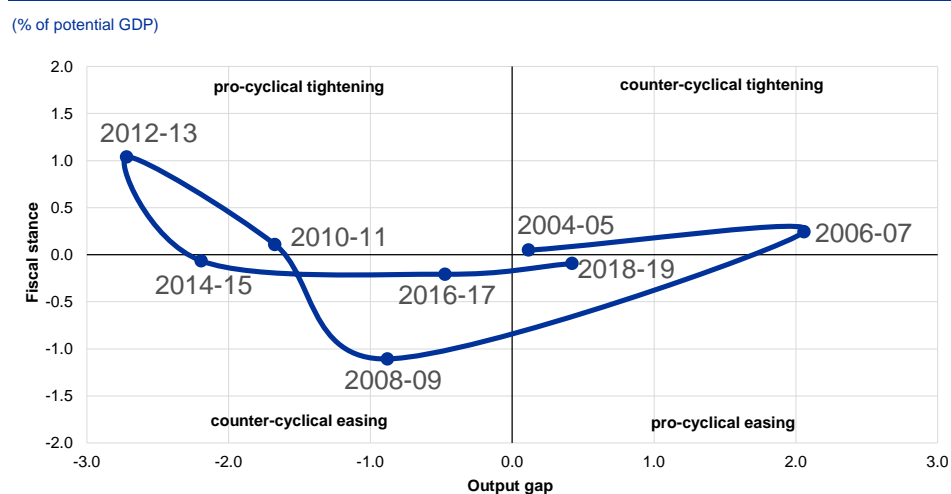
Notes: Travel-related items comprises airfares, package holidays and accommodation services.

Latest observation: 2019Q2.

European leaders acknowledged this incompleteness. They provided for a sovereign crisis management framework. An amendment to the TFEU eventually made it possible to establish a permanent crisis management institution: the ESM. Responsibility for banking supervision was assigned at EU level to the ECB, with the creation of the Single Supervisory Mechanism.

**Chart 16**

**Evolution of the fiscal stance and output gap**



Sources: European Commission, ECB calculations.

Notes: Fiscal stance is measured as the change in the cyclically adjusted primary balance for the period up to 2010 as figures are not available for the change in the structural primary balance. For the period 2011 onwards the fiscal stance is measured as the change in the structural primary balance.

Latest observation: 2019.

Further steps towards European integration are necessary and under discussion. A macroeconomic stabilisation policy for the euro area also needs the support of strong institutions. The TFEU set up a strong institution to manage monetary policy, but resorted to rules and coordination in other economic policy areas. In the future it will be important to ensure that the euro area has more room for manoeuvre on the fiscal policy side, including through establishing a fiscal stabilisation function for the euro area.<sup>27</sup> Establishing a genuine fiscal capacity is likely to take time, as Member States still have different visions of what institutional settings are appropriate for the euro area. Yet the creation of a meaningful fiscal capacity and a euro area safe asset are essential to ensuring the smooth functioning of Europe's EMU.

## 5 Conclusions

20 years after its introduction the euro is a stable currency benefiting from wide public support and is the second most important currency in the international monetary system.<sup>28</sup> However, the euro area has at times been placed under extreme stress, because of poor mechanisms for the prevention and correction of macroeconomic imbalances and of a number of other institutional weaknesses. Amid limited national fiscal room for manoeuvre and a lack of fiscal capacity for the euro area, monetary policy had to bear the brunt of the burden of macroeconomic stabilisation. The ECB has demonstrated its capacity to act in sometimes very difficult circumstances, but monetary policy cannot and should not remain "the only

<sup>27</sup> See European Commission (2015).

<sup>28</sup> See ECB (2019).

game in town” when it comes to macroeconomic stabilisation. This is a key issue, especially in the context of persistent disinflationary forces.

Over the past ten years, the major steps taken to shore up the institutional architecture of EMU have allowed the euro area to overcome successfully its first existential crisis. Yet these institutional reforms are still insufficient for ensuring a smooth functioning of the monetary union. In the years to come, it will be essential to create a fiscal capacity for the euro area, thereby improving macroeconomic stabilisation, and to implement structural reforms aimed at increasing the euro area’s growth potential.

In general, the ECB’s monetary policy strategy has successfully supported the implementation of a price-stability-oriented monetary policy over the past 20 years. The quantitative definition of price stability was instrumental in establishing credibility in the first decade, while the 2003 clarification helped to firmly anchor longer-term inflation expectations in line with the Governing Council’s aim of keeping inflation rates at levels below, but close to, 2% over the medium term.

In the aftermath of the Great Inflation, central banks have gained significant experience in combating excessive inflation. In order to bring down inflation expectations to levels compatible with price stability, they have communicated about their monetary policy strategies, including by announcing inflation targets. However, they have less experience in maintaining price stability in the context of persistently below-target inflation and of doubts about policy space in future economic downturns.

In the light of the above, two issues regarding the ECB’s monetary policy strategy have increasingly given rise to comments. First, how can we understand the Governing Council’s policy aim of inflation rates below, but close to, 2% over the medium term? In other words, is the ECB’s policy target symmetric or is the ECB’s reaction function more aggressive when inflation runs above 2%? Second, how can we assess the role of monetary analysis in monetary policy decisions?

Over the past few years, the ECB’s forceful response to protracted low inflation is indicative of the Governing Council’s determination to meet its policy aim, regardless of the direction of price pressures driving inflation away from 'below, but close to, 2%'. Yet the formulation of the quantitative definition may lead to misperceptions of an asymmetric reaction function, which could eventually complicate monetary policy conduct in a low inflation environment. Further clarification of the Governing Council’s inflation aim and of the symmetry of the policy reaction function around that aim could be beneficial to monetary policy conduct.

The two-pillar framework has supported the ECB’s monetary policy deliberations and communication of those decisions since the beginning of the single monetary policy. The role of the monetary pillar has nevertheless evolved significantly over time. This may have gradually brought about dissonance between its specific contribution to monetary policy decisions and its role in communicating them. Such dissonance may require the role of "cross-checking" in policy deliberations to be clarified. More

generally, it raises the question of the role of financial stability considerations and macroprudential tools in monetary policymaking.

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# Institutional architecture and policies: a critical assessment of the first 20 years of the single currency

By Laurence Boone<sup>1</sup>

## Abstract

This paper seeks to assess the first 20 years of the euro, distinguishing policy contributions from the structural and institutional features of the architecture of the European and Monetary Union (EMU). The analysis attributes most of the performance gap to institutional and structural deficiencies, and provides suggestions for the future. First, member states need to promote more structural policies that favour convergence and allow adjustments to economic shocks. Second, the fiscal rules need to be complemented by a fiscal stabilisation capacity, which could support monetary policy to stabilise the economy. Third, monetary policy has been innovative and adapted to circumstances, helping to support the euro area during the financial crisis. A review of the ECB monetary framework may help to strengthen further the ECB tools and mandate. Finally, financial policy remains too fragmented. Banking union needs to be completed to achieve effective private risk sharing and enhance the effectiveness of macroeconomic policies.

## 1 The euro area growth performance has disappointed over the past twenty years

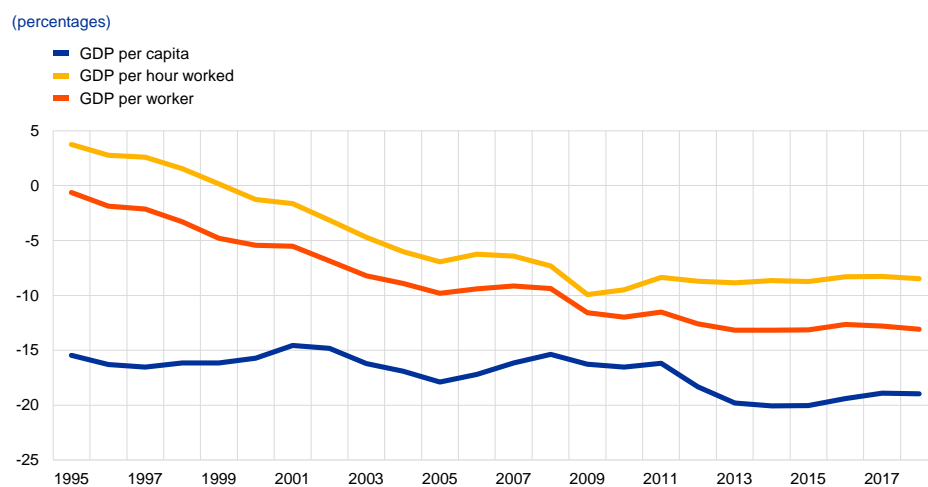
The euro area growth performance has disappointed over the past 20 years. Convergence in living standards, an explicit objective of the monetary union, has been at best uneven. The euro area has not been able to close the gap with the best performing OECD economies (see Chart 1). This is due partly to insufficient structural reforms throughout the period. In the aftermath of the global financial crisis there were intense reform efforts in some countries, but the pace of reform has since slowed.

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<sup>1</sup> OECD Chief Economist. The author thanks Aida Caldera Sánchez, Dorothee Rouzet, Théodore Renault, Nigel Pain, Véronique Salins, Álvaro Pina, Lukasz Rawdanowicz and Sveinbjörn Blöndal for helpful comments and/or discussions. Any errors are the author's.

## Chart 1

Gap to the best 9 non-EA OECD countries: EA15 (EST, LVA excluded)



Sources: OECD (2019), OECD Going for Growth Statistics (database).

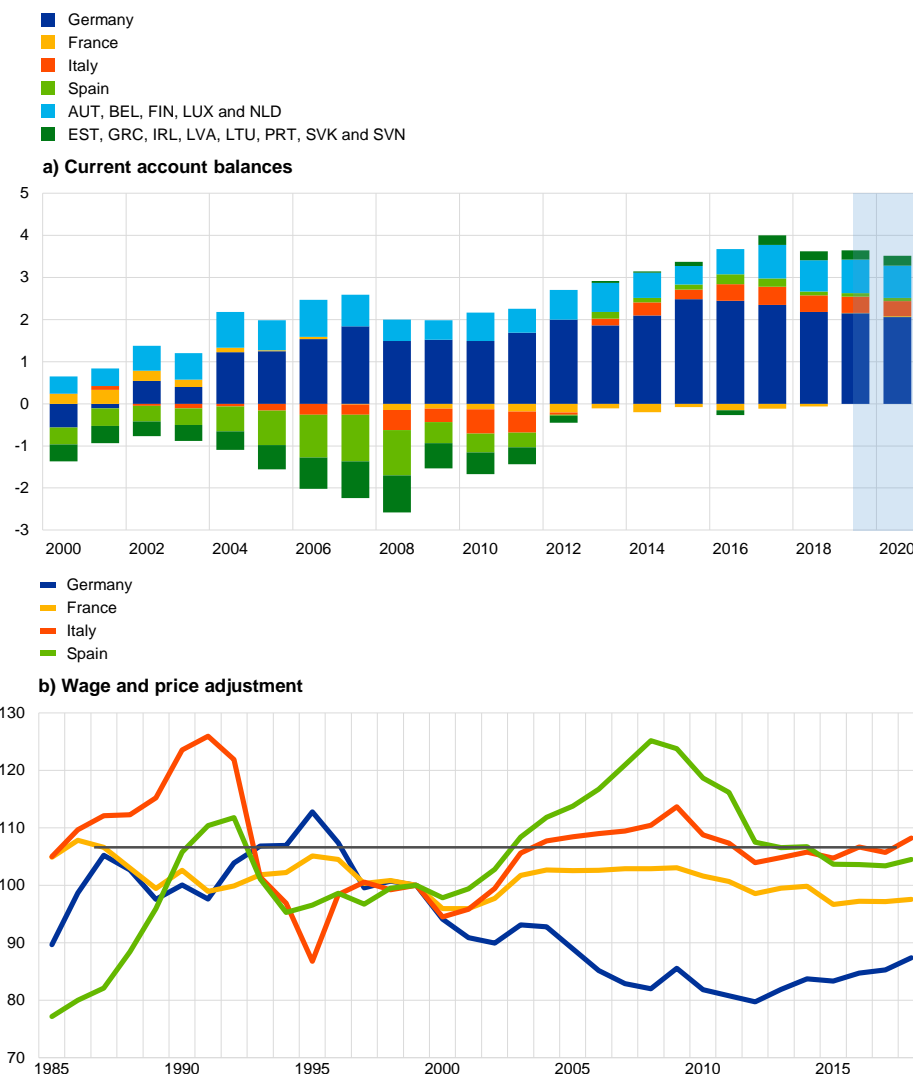
Notes: Euro area member countries that are also members of the OECD, except for Estonia and Latvia due to limited data availability (15 countries). The top 9 non-EA OECD countries are Canada, Denmark, Iceland, Japan, Norway, Sweden, Switzerland, the United Kingdom and the United States.

Structural adjustment mechanisms, which were supposed to help address shocks, have been limited. In particular, structural wage/price adjustments, which policy makers hoped would contribute to address imbalances and support convergence within the euro area, have been partial. The current account deficits that built up in the first ten years of the euro in some countries were reversed (see Chart 2A), with wage and price adjustment (see Chart 2B). However, large current account surpluses in other countries have persisted and in some instance continued to increase.

## Chart 2

### Structural adjustments have been limited

(a) % of EA17 GDP; b) Index 1999=100)



Sources: OECD (2019), OECD Economic Outlook: Statistics and Projections (database), May 2019; and OECD calculations.

Overall, when looking at the structural trends in the euro area, the promise of a gradual convergence in living standards did not fully materialise, while some imbalances persist. To some extent, this reflects a lack of structural policy reforms, which have not been deployed enough to lift living standards, while structural adjustment mechanisms such as wage-price adjustment have been one-sided. Having said that, given the importance of the crisis over the period, macro-economic policies are also likely to have played a very important role. Not everything is structural and another factor hampering convergence is lack of macro-economic adjustment mechanisms, which has undermined growth due to hysteresis effects. Hence, in this contribution, I focus on trying to distinguish possible policy errors from institutional deficiencies that hinder convergence and risk sharing in the monetary union, looking in turn at fiscal, monetary and financial developments since and during the global financial crisis.

## 2 The role of fiscal policy and institutions

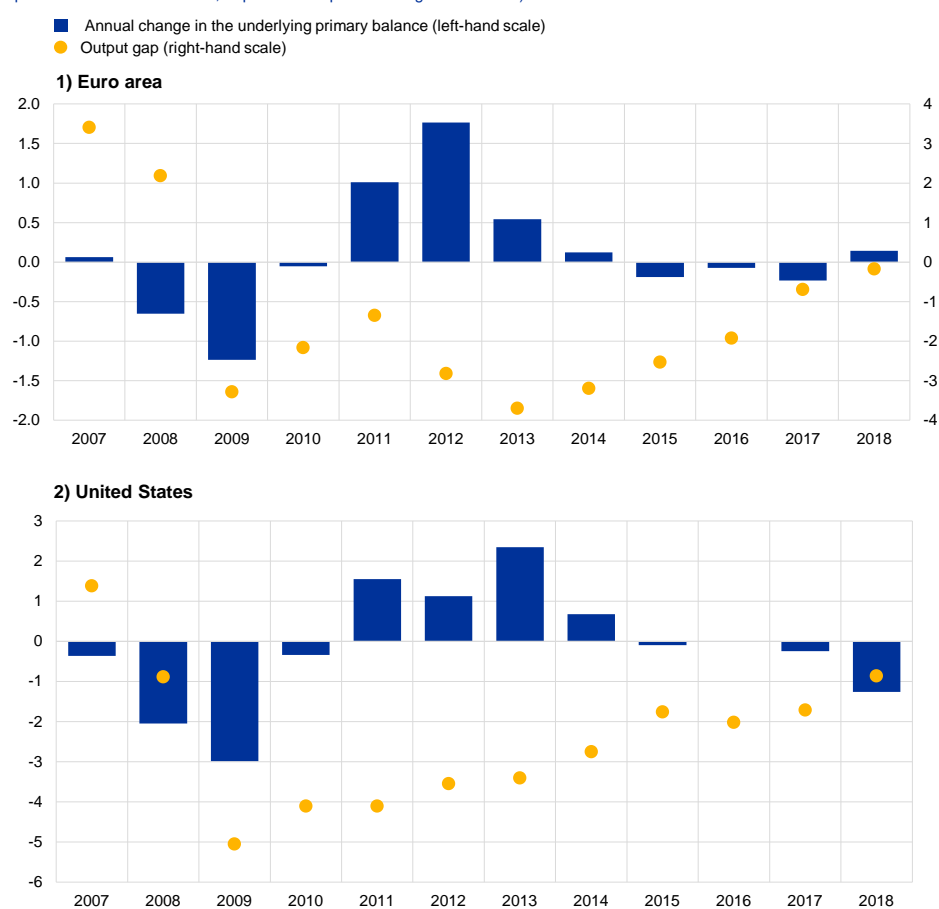
### 2.1 Policy

In 2009, there was a concerted effort for a large and synchronised fiscal stimulus to address the global financial crisis both in the EU as in the US, demonstrating that the EU can act with force when it decides to do so (see Chart 3A and 3B).

**Chart 3**

#### Change in the fiscal stance

(% points on the left-hand scale; % potential output on the right-hand scale)



Sources: OECD (2019), OECD Economic Outlook: Statistics and Projections (database), May 2019.

Notes: The Euro area aggregate refers to members of the Euro area that are also members of the OECD (17 countries).

As for the US, the fiscal stance reversed quickly to become procyclical in 2010-2013, which can be explained in part by the sequence of sovereign downgrades. With the benefits of hindsight, that turned out to be a synchronised mistake on both sides of the Atlantic. In the euro area, in particular, the fiscal tightening started while the output gap was still widening, whereas in the US the output gap was shrinking. Also, in the euro area, the adjustment was ruled at the individual country level and did not take into account spillovers across countries or the euro area-wide fiscal stance. The coordinated fiscal consolidation of 2012-2013 stopped any nascent recovery in the

euro area. This approach towards fiscal policy mirrored the premise of no fiscal transfers across euro area countries, and contributed to a sub-optimal policy stance for individual countries and for the euro area as a whole.

## 2.2 The role of institutional factors

The extent and the timing of consolidation partly reflects the institutional set-up. Fiscal rules have been a constraint at the individual level, but they have been reformed, and there is an impressive literature on how to keep improving the rules (Bénassy-Quéré et al. 2018, Conseil d'Analyse Économique 2018, German Council of Economic Experts 2018, Heinemann 2018). However, correcting the rules will not address the lack of coordination, which is at the origin of the “excess” consolidation that proved to be a policy mistake.

The lack of fiscal coordination hinders stabilisation efforts when a large shock hits the euro area. First, given the multi-country nature of the EMU, with 19 different Finance Ministries, fiscal coordination between countries is complicated, and runs the risk of resulting in an inappropriate aggregate fiscal stance from a euro area perspective. When some countries lack fiscal space and the economy is weak, a euro fiscal stance exclusively driven by rules focussing on individual countries' situation, may deliver insufficient support for the area as a whole. Also, leakages from countries implementing fiscal support towards other euro area economies, reduce the efficacy of the support for these countries themselves. Second, the absence or lack of coordination increases the likelihood of adverse market reactions, as markets are unsure of the coordination or cooperation across countries, as we have seen.

Conversely, greater fiscal coordination across the euro area could create fiscal space by strengthening confidence in the capacity of the euro area to address shocks, and because it would take spillovers into account. A euro area fiscal capacity could not only make coordination simpler, but also ensure a stabilisation response commensurate to a shock or demand gap, while sending the appropriate and unequivocal signal to markets.

## 3 The role of monetary policy

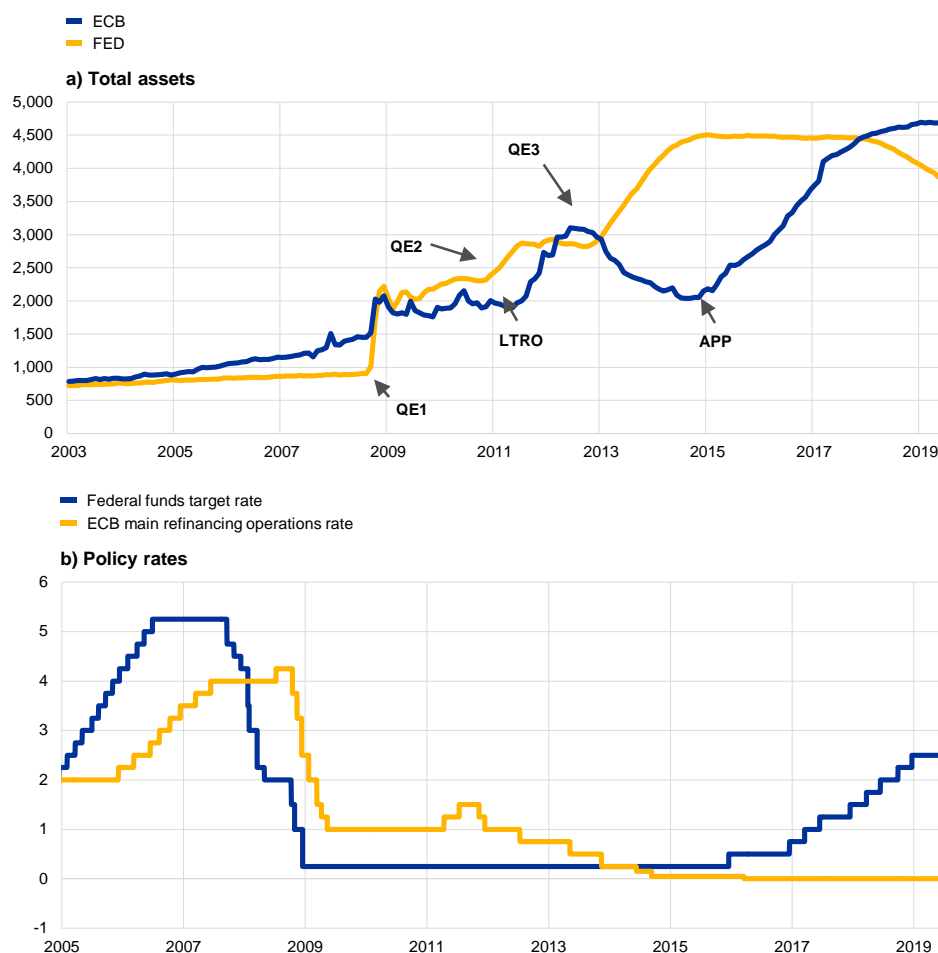
### 3.1 Policy

The ECB did fulfil its role of lender of last resort (LOLR) to banks through various means, providing ample liquidity to the banks (see Chart 4A and B), though the end of LTRO in 2013 created a (temporary) lack of liquidity. Since 2010, through the securities market programme (SMP) the ECB purchased government bonds of countries where monetary policy transmission had been severely impaired because of excessive market pressure. However, the SMP did not appear as a “nuclear weapon” to markets because of the self-imposed ex-ante limited size, and because

collateral policy, dependent on ratings by private credit rating agencies, was pro-cyclical, contributing to destabilise sovereign debt markets. Early in the crisis, the two policy rate increases in April and July 2011, taking the policy rate from 1% to 1.5%, were a mistake. The economy weakened markedly after the summer, in the wake of the acute market pressures on the sovereign debt of Spain and Italy, leading to a second round of interventions in the sovereign bond markets under the SMP. Moreover, it took until the summer 2012 for the ECB to appear as the pillar of euro area stability, with the “whatever it takes” speech and the subsequent announcement of the Outright Monetary Transactions (OMT). Then the ECB moved to quantitative easing (QE), on top of larger liquidity support and negative rates, in March 2015.

**Chart 4**  
ECB and FED policies

(a) EUR billions, USD billions; b) percentages)



Sources: Federal Reserve Board; and European Central Bank.

An immediate question is why more than two years were necessary in the euro area to move into QE, when growth was anaemic, inflation falling and other central banks had already increased largely their balance sheets. For instance, the Fed had started QE on a large scale more than four years before. That meant that in the United States, monetary accommodation was not only earlier, but also larger throughout the

episode of fiscal tightening, which may have contributed to support the economy and reduce the output gap over the period, unlike in the euro area.

## 3.2 The role of institutional factors

A number of institutional factors may have contributed to the delay in the ECB response to the crisis. First, consensus, and sometimes unanimity building could have played a role. There were signs of dissensions among countries as reflected by legal cases brought against the ECB in Karlsruhe and this may have delayed a large enough consensus decision to deliver QE. A second source of delay may be the complex political relation with the 19 fiscal authorities (Finance Ministers) as opposed to one fiscal authority in the US. As it appears, it took the Heads of State of EU Members to sign the Treaty on Stability, Coordination and Governance in the Economic and Monetary Union (TSCG) on March 2012, for the ECB to move in LTRO. And the package creating the Fiscal compact, the Banking union and the European Stability Mechanism (ESM) for the ECB to move into QE.

Furthermore, an institutional difference between the ECB and the Fed is obviously the ECB mandate. The ECB target appears less symmetric (is lower in effect) and single. If the ECB target, besides maintaining price stability, had also targeted employment, this would have relieved some of the pressure on the ECB given that employment is and has been performing well.

Consensus building may have been necessary to consolidate the credibility of a young ECB, especially when the fiscal response was hesitant. From this standpoint, the existence of a fiscal entity responsible for a euro fiscal stance would give more solidity, clarity to markets and an interlocutor for the ECB in crisis times. Also the implicit concern, notably from the press, on unanimity, may have been exaggerated.

Given this experience, and the fact that we cannot exclude that the mandate of the ECB may also constrain policy, a review of the monetary policy framework, including tools, governance, targets may be needed. Indeed, the last review took place in 2003, under Chief Economist Otmar Issing.

## 4 The role of financial policy

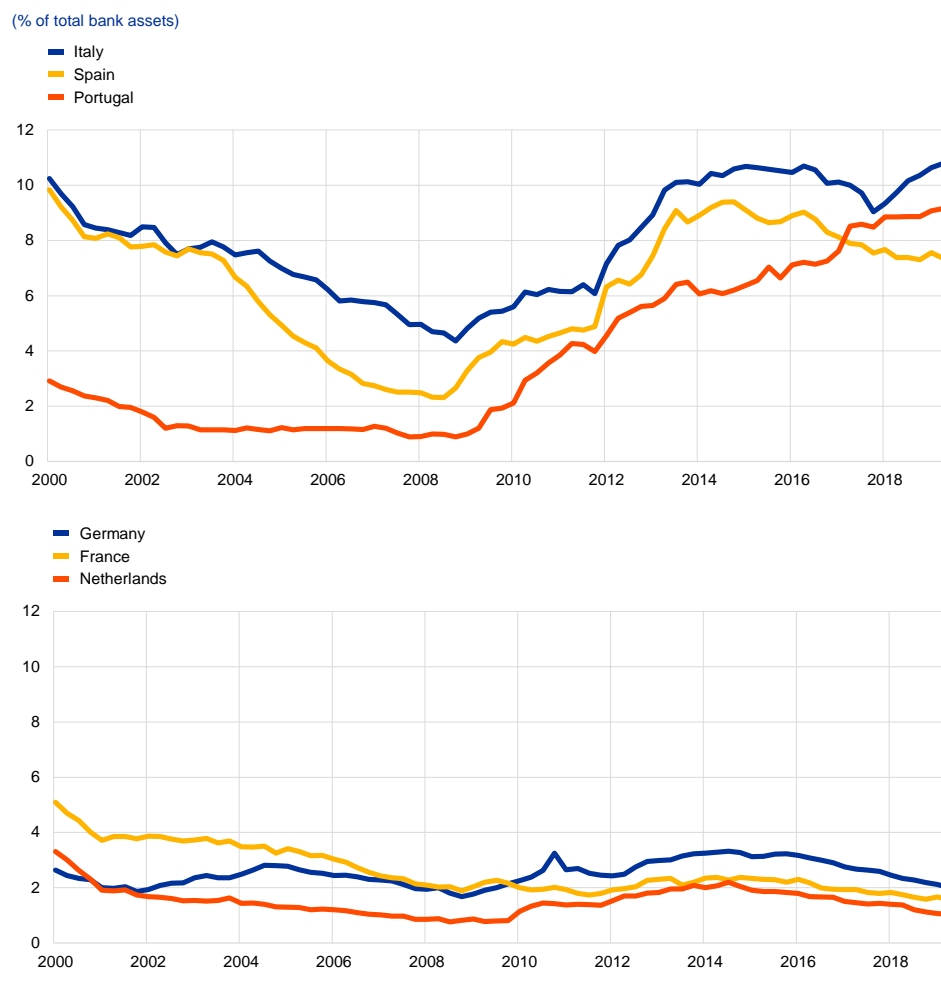
### 4.1 Policy

The financial system is a critical element of risk sharing across the union. In contrast with the US, Euro area banks did not clean up their balance sheets and recapitalise as fast as necessary. While stress tests were passed by all banks, yet there were a few bank failures soon after. When the new financial regime was voted, there was no transition process to speed up balance sheet cleaning. As a result, today encumbered banks' balance sheets and low profitability continue to hinder monetary policy transmission. Moreover, the sovereign-banks nexus, which connects



governments and their banks, contributed to amplify the crisis, and has not disappeared: redenomination risks have not been eliminated as shown by their resurgence in 2015 (see Chart 5).

**Chart 5**  
Holdings of domestic government debt securities



Sources: ECB; and OECD calculations.

## 4.2 The role of institutional factors

To be fair, there was little euro area financial policy at the onset of the crisis. In 2012, euro area governments announced decisive measures, but since then, implementation progress have been insufficient, and financial policy is not strong and integrated enough, limiting private risk sharing. More precisely, a framework for a banking union was designed in 2012 and later a capital market union. But progress has stalled. Banking union cannot be completed or break the links between banks and sovereigns as long as there is no common deposit guarantee or insurance and a large enough fiscal backstop for the single resolution fund (SRF). Financial supervision remains too much linked to the national level for a large part of the banking sector. Macro-prudential measures remain too decentralised to enhance a

credible, unified framework. The ESRB has few policy instruments, and only has the power to issue recommendations or warnings to national authorities. The ECB can only use tools that influence lenders' behaviour but not borrowers' behaviour, the latter remaining in the hands of national authorities. In addition, the capital markets union is making little progress.

## 5 Conclusion

With the benefit of hindsight, there have been some policy mistakes, but structural and institutional deficiencies still appear important enough to call for consolidating further the euro area institutional architecture. The EMU institutional framework needs to evolve.

- Structural policy: Member States ought to promote national (and European) policies that favour convergence and allow adjustments to economic shocks as efficiently as possible. This involves sufficiently flexible goods, services and labour markets. More needs to be done on this side, but it should be recognised that structural reforms may not be enough in the face of severe shocks or profound divergence.
- Fiscal framework: a fiscal framework for stabilisation is needed. Monetary policy, alone, cannot stabilise the economy, even less so at the zero lower bound (ZLB). Country-specific fiscal rules need to be complemented with a central entity that can design a euro area stance and enforce it. Coordination would create confidence and thereby generate endogenously fiscal space. A euro area budget for stabilisation would be even better: together with reformed rules, it would better ensure an appropriate stance for the euro area. A euro fiscal stabilisation framework would also help the ECB to have an interlocutor in times of crisis (and a clearer stance for the design of monetary policy).
- Monetary policy: monetary policy has been innovative and evolved with circumstances, buffering shocks, promoting growth, employment and inflation as well as reducing fragmentation. As for the Fed, the Canadian central bank and the Riksbank, it would be helpful to reassess the toolbox, after all the innovations created and implemented during the global financial crisis to ensure the stability of the toolbox. And if policy makers felt it appropriate, promoting the employment objective would also help.
- Financial policy: the financial policy framework remains too fragmented and too horizontal, as there is lack of a "euro area" policy. Banking union needs to be completed to achieve effective private risk sharing, sever the sovereign-bank nexus and enhance the effectiveness of macro policies in general.

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# The euro at 20: challenges and solutions

By Markus Brunnermeier<sup>1</sup>

## Abstract

While in the first 20 years of the Euro the ECB established a stable inflation anchor, the euro crisis revealed severe shortcomings of the financial architecture. Managing the euro crisis was hindered by differing economic philosophies across the euro area. Nevertheless, significant progress was made. Limited monetary policy space amounts to a significant challenge. This calls for a shift in policy focus away from short-term interest rates towards risk premia and spreads. Macro-prudential tools—in addition to maintaining financial stability—can also be used to manage the macroeconomy and affect risk premia. They also have the advantage of managing different regions separately and thereby optimize across the currency area. Finally, the ECB could modify the inflation target to reflect the dangers of persistent regional deviations from euro-wide inflation.

## 1 Bridging different economic philosophies

On its 10th birthday, the Euro was considered a big success. The price stability mandate was successfully implemented. Many observers initially feared that Euro inflation would significantly exceed that of the German Deutsch Mark. In fact, average inflation in the euro area was even lower than the Deutsch Mark's inflation in the previous decades. The ECB had inherited the Bundesbank's credibility and commitment to low inflation.

Despite this considerable achievement, inflation rates across countries within the euro area persistently diverged—contributing to imbalances that emerged when the euro crisis erupted.

The ECB has recently made previously unimaginable progress in fortifying the European financial architecture. Just to name a few accomplishments, the ECB established the European Stability Mechanism (ESM), strengthened and broadened its operating framework, and made big strides towards the Banking Union.

Despite these successes, many challenges remain. When the euro crisis erupted across many countries in the euro area periphery, national philosophical differences about how to manage a macroeconomy became strikingly visible. These differences were always there, but hidden and lurking in the background.

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<sup>1</sup> Princeton University, NBER, CEPR, CESifo,

While these differences are often subtle and not very clear-cut, it is easier to contrast the disparate philosophies when we simplify them into black-and-white terms. One can group countries into two groups: the Nordic countries, which tend to follow the German view, and the remaining countries, which tend to follow what I will call the French view. Germany and France are powerful EU members; if they do not agree, little happens in the EU. Hence the emphasis on the “Rhine Divide”.

It is important to build bridges across these two economic philosophies to avoid gridlock in resolving future challenges. There are four dimensions of philosophic disagreement between France and Germany, the two most powerful players in the euro area<sup>2</sup>.

## 1.1 Rules vs. discretion

The first dimension concerns rules versus discretion. The Germans are primarily rule driven. They want to have an ex ante set of rules that must be followed, whereas the French are much more interventionistic and favor state discretion.

But the French approach is much more subtle than just using discretion. Discretion gives rise to a time inconsistency problem. The policy maker promises today to do something tomorrow, but when tomorrow comes he may use his discretion to change the plan. Of course, the public anticipates this, so promises are not credible. For this reason, the French approach is more nuanced. In certain dimensions, they make a strict commitment without wiggle room—a straitjacket—in order to overcome the commitment problem. In other dimensions, however, they like to maintain full flexibility. By contrast, the Germans like a system with rules, escape clauses, and autonomous safety valves so that they do not have to intervene ex post at all. This is a very different approach.

One important example of French straitjacket commitments is the refusal to restructure government debt. It was the Germans who pushed for Private Sector Involvement (PSI), Greek debt restructuring, at Deauville in October 2010.

How can one implement a straitjacket commitment never to default? By stuffing domestic banks with domestic government bonds. Under those circumstances, any sovereign default would destroy the banking system. According to the French approach, it is therefore unlikely that a government would choose that option. In a sense, domestic banks are taken hostage to credibly signal to the market that a government will likely not default on its bonds. This is a powerful commitment device that has a straightforward implication for bank regulation. Banks should be allowed to hold government bonds without requiring any equity cushion.

The Germans, by contrast, favor a different approach to banking regulation. They prefer risk weights on sovereign bonds such that banks hold an extra equity cushion

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<sup>2</sup> This section draws heavily on Brunnermeier (2017) HOOVER and Brunnermeier, James and Landau (2016).

to insure against a sovereign bond restructuring. With such an arrangement, debt restructuring would not destroy the banking system.

Without an extra bank equity cushion, the diabolic (doom) loop between sovereign risk and banking risk emerges. When sovereign risk goes up, the banks suffer because the sovereign bonds decline in value. This lowers banks' equity, possibly to such an extent that they have to be bailed out. As the bailout probability goes up, the price of government bonds declines, which in turn erodes banks' equity, and so on. In addition, there is a second diabolic loop. As banks suffer losses, they reduce their lending activity to the real economy. This, in turn, slows down economic growth, which lowers government tax revenue. With lower tax revenue, the fiscal situation worsens, and government bonds decline further in value. This translates into further losses for the banks, and so on. These amplification problems can only be avoided if banks have considerable equity to absorb shocks.

## 1.2 Solidarity vs. liability

The second dimension of difference concerns solidarity versus liability. The French favor a fiscal union with joint liability, where everyone is liable for everybody else. In contrast, German Ordoliberalism emphasizes that a departure from the liability principle leads to moral hazard distortions. They stress that if you are in charge, you are liable and that bailouts should be limited. The French pushed for joint liability in Eurobonds, while the Germans refused any joint liability bond structure. Angela Merkel insisted that “never in my lifetime will there be a Eurobond.” Note that the French approach is not totally inconsistent: if you have a straitjacket commitment where you never default on your bonds, then you can have joint liability because participants will not default even in difficult circumstances. However, in extreme circumstances when default is unavoidable, the country will be in deep trouble.

## 1.3 Liquidity vs. solvency

The third dimension in differing economic philosophies is over liquidity and solvency. Whenever financial disaster strikes, the French reaction is, “There is a liquidity problem. We have to intervene,” while the Germans say, “There is a fundamental solvency problem. One is just throwing good money after bad.” There are two forms of liquidity problems. One is a multiple equilibrium liquidity problem—a situation where the economy goes from a good equilibrium to a bad equilibrium. All it takes to avoid a bad equilibrium is a “big bazooka.” Just display the big bazooka, and the monetary problems will be solved. One could argue that Mario Draghi's London speech in the summer of 2012 announcing the Outright Monetary Transactions (OMT) program was such a bazooka. The OMT was ultimately specified only in the late summer and never activated. Nevertheless, the interest rates of peripheral government bonds declined persistently during the summer.

A second liquidity problem arises due to amplification and spiral effects. This occurs when strategic complementarities are less pronounced, and the demand curve is not

inverted or s-shaped, but is like an inverted integral (script S-shaped). In such circumstances, if one puts in an extra euro of bailout money, one gets a benefit that far exceeds that of a single euro. In other words, a bailout has a positive expected net present value. It is a good deal. And what is the net present value of a bailout? It is the present value of bailing out minus the present value of not bailing out. The present value of not bailing out depends on the estimated extent of contagion, or systemic risk. If refusing a bailout leads to huge spillovers across the whole euro area, doing so incurs catastrophic costs. There is considerable disagreement over this issue. From a French perspective, the contagion effects are very large, while the Germans think they are manageable.

## 1.4 Demand stimulus vs. austerity and reforms

The fourth dimension centers on the old debate: Keynesian stimulus or austerity and reforms?

Everyone agrees that in a recession aggregate demand is depressed, and you do not want to create additional uncertainty by introducing reforms that further depress demand. French observers push for Keynesian stimulus based primarily on this argument.

Germans, meanwhile, put forward a political economy argument. One has to use a crisis to push through austerity reforms. Only during a crisis can a government convince the public that it must enact reforms to maintain the country's long-term sustainability. The essential difference concerns timing and whether one emphasizes economic arguments or political economy arguments.

## 1.5 Historical lesson: flexible philosophies

One might conclude that the situation in Europe is hopeless because the two main countries driving economic and political integration have such different economic approaches. How can there be any long-run consensus in the European Union?

However, there is hope when realizing that during their histories both France and Germany have switched sides in terms of which economic philosophy to follow. These differences are not written in stone but are actually quite flexible. At first sight it appears that France is a centrally organized country ruled by discretion. You can always intervene ex post. You can't do this in Germany because you have a federal structure and thousands of little dukes will intervene. So you need ex ante rules to govern the system.

Interestingly, a historical perspective reveals that laissez-faire reluctance to intervene is a French idea. The great free-market thinkers before the twentieth century were French. And in the eighteenth and nineteenth centuries Germany had embraced cameralism, a strong-state tradition, and intervention. Frederick the Great frequently intervened in the Prussian economy, as did imperial Germany in the nineteenth century. In inter-war Germany, of course, it was the Nazis who favored centralized

power and extensive state intervention in the economy. It was only after World War II that these positions reversed themselves.

After the war, the Ordoliberals—an economic school with roots in Freiburg—argued that continuous government intervention was too arbitrary. They posited that government power needed *ex ante* rules to restrain its reach. They also strongly promoted competition to avoid any concentration of power, be it political or economic. Meanwhile, the Allies emphasized competition because it distributed power away from Berlin. Germany then had its economic miracle after World War II. Things went well, and everyone fell in love with the new arrangement.

France went in the opposite direction. The 1930s had required considerable austerity. The government's budget was severely cut, and at that time, the biggest part of the budget was military spending. When Germany quickly defeated France in 1940, French thinkers argued that austerity measures had weakened France and made it more vulnerable to German attack. Thus the dirigiste, interventionist approach became much more powerful, and France switched to the other side. The overall—and hopeful—message is that the difference in economic approaches is not permanent.

## 2 Limited monetary policy space and shift to risk premia

The ECB has significantly reduced its policy interest rate even into negative territory. There is limited room to cut rates further. Once the ECB hits the reversal interest rates, further cuts become counter-productive.

This calls for a shift away from risk-free interest rate policy towards a focus on risk premia. The ECB can affect risk premia in several ways. First, the ECB can reduce the price of risk. Second, the ECB can reduce the risk itself. Exogenous risk shocks are beyond anyone's control, but endogenous risk can be attenuated by reducing the prevalence of amplification mechanisms and spirals.

### 2.1 Reversal interest rate

What is the effective lower bound on monetary policy? In a bank-dependent economy like the euro area, there exists a reversal interest rate.<sup>3</sup> Below that rate, a rate cut depresses the economy rather than stimulating it.

Following an interest rate cut, two opposing forces affect banks' net worth. On the one hand, banks make capital gains on assets with long-term fixed-rate coupon payments (e.g. bonds). On the other hand, the rate cut reduces banks' net interest income going forward. The yield they obtain per unit of liability employed decreases.

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<sup>3</sup> This section draws large on Brunnermeier and Koby (2018).



The reversal interest rate has four determinants: (i) banks' long-term fixed-income asset holdings, (ii) banks' equity capitalization, (iii) the tightness of capital constraints, and (iv) the deposit supply elasticity faced by banks. Higher initial holdings of long-term fixed-income assets imply a larger maturity mismatch, resulting in a larger asset revaluation that decreases the reversal interest rate. Low initial bank capitalization and restrictive capital constraints both imply that, *ceteris paribus*, when rate cuts cause profitability to drop, the capital constraint tightens sooner. Finally, highly elastic deposit supply reduces banks' interest income as savers move deposits into higher-yield accounts. This raises the reversal interest rate.

In addition, there is a "creeping up effect". Over time a low interest rate environment becomes less effective in stimulating lending and hence the macro-economy. Here's the intuition: negative effects on lower net interest income cumulate every period, while asset revaluation effects fade as bank assets mature. In other words, a rate cut far in the future decreases banks' profitability but without revaluation gains if all initial fixed-income holdings have matured by then.

## 2.2 Shift from interest rate to risk premia focus

With limited policy space to reduce the short-term risk-free interest rate, monetary policy has one remaining option: rather than rely on the risk-free interest rate, zoom in on risk premia and term premia.

The interest rate that economic actors face typically includes a risk premium, e.g. in the form of term spreads or credit spreads. The risk premium is the product of the price of risk and risk itself. Importantly, better risk sharing does not only reduce (endogenous) risk, and hence the risk premium; it also reduces the price of risk. Formally, the price of risk is related to marginal investors' risk aversion and the volatility of their wealth in equilibrium. If risk is reduced, investors' wealth is less risky and hence they demand a lower price for risk.

Both effects, reducing risk itself and reducing the price of risk, significantly reduce risk premia. Lowering risk premia lowers the effective interest rate for investing in real investment projects. Boosting investment stimulates economic growth.

## 2.3 Reducing endogenous risk due to flight to safety with European safe assets

Practically, the aim should be to reduce unnecessary risk by distributing exogenous risk more efficiently across all actors in the economy. In addition, monetary policies should reduce endogenous self-generated risk by reducing the unnecessary risk amplification caused by potential runs and spiral effects. Monetary policy has the power to change asset pricing and therefore improve risk sharing across different sectors and different agents in the economy. Though monetary policy can sometimes have redistributive effects, Brunnermeier and Sannikov (2016) shows that the net effect can boost the economy such that all participating agents might be better off.

One unnecessary endogenous risk is flight-to-safety capital flows across borders. Occasionally, financial markets switch from a risk-on regime to a risk-off regime. These switches induce economic agents to replace risky assets with safe assets. Because only certain core European countries supply safe assets (in the form of their government debt), safe assets are asymmetrically supplied. Hence, any flight-to-safety capital flows lead to cross-border capital flows. This makes it more expensive for periphery European governments to service their debt, which in turn increases default and denomination risk. Redesigning the government debt market in a way that creates a truly European safe asset would significantly reduce this risk.

As part of the Euro-nomics group, I proposed in 2011 the European Safe Bonds (ESBies), which are now referred to as SBBS (Sovereign Bond Backed Securities). Instead of having a Eurobond with joint and several liability, one can create a European safe asset via securitization. The idea is to first pool national sovereign bonds—say, up to 60 percent of a country's GDP. Then, one tranches the pool into a senior bond—the safe asset—and a junior bond. Importantly, this is not a Eurobond since there is no joint liability. This European safe asset eliminates cross-border flight-to-safety capital flows. Instead, investors transfer capital from the risky junior bond to the senior bond. Importantly, both bonds are European – they are bonds without a national passport.

As safe assets, the ESBies have another advantage over domestic government bonds. When a crisis occurs, the senior bonds do not lose their value since they are protected by the junior bonds. The diabolic (doom) loop will not emerge. Another form of endogenous risk is switched off.

## 3 Heterogeneity within a currency area

### 3.1 Regional MacroPru as a macro instrument

Interest rate policy has the advantage that it “gets in all the cracks” of the economy and cannot be easily circumvented by market participants. On the other hand, macro-prudential policy also has some advantages. It can be deployed on more focused targets. This is especially important when a uniform monetary policy is applied to a currency area that is heterogenous and faces asymmetric shocks. As argued in Brunnermeier (2010), macroprudential policy can be used to “optimize” a non-optimal currency area.

More generally, macroprudential policy is not only a tool to achieve financial stability. It can also steer and stimulate the macroeconomy. Lax macroprudential policy stimulates the economy by lowering the price of risk and reducing various risk premia.

In recent times, tight macro-prudential policy slowed down economic growth, while aggressively accommodative monetary policy tried to boost investment and growth by pushing investors into riskier asset classes. Policy hit the brakes and pushed the

accelerator at the same time. One might argue that tighter macro-prudential policy complements accommodative monetary policy by controlling the risk taking that low interest rates induce. Nevertheless, it is challenging to find the right balance given the interaction between both instruments.

In any case, macro-prudential policy can be applied at the regional or national level. This precise tool can help counter imbalances when they build up, and ease tensions when business cycles decline.

### 3.2 Inflation divergence targeting – reweighting countries

Another way to address heterogeneous inflation across the euro area is to target an inflation divergence measure in addition to average inflation. When inflation across euro area member states persistently diverges over a sufficiently long time horizon, monetary policy could potentially assign a higher weight to inflation in certain countries (compared to the usual weights assigned). Of course, interest rate policy is only a single instrument for the whole euro area. By the Tinbergen Principle, one cannot control regions separately. Ultimately, as outlined in the previous subsection, policymakers must consider using macroprudential instruments to manage the national macroeconomy – even in the absence of any financial stability considerations.

## 4 Conclusion

On the euro's 20th birthday, its supporters can celebrate the low inflation rate that has prevailed in the euro area. Nevertheless, the euro became vulnerable to crisis when policymakers underestimated the danger arising from the build-up of imbalances and inflation divergence across the euro area. During the euro's second decade, the euro area was consumed with crisis management. The crisis spurred great progress in building a more stable financial architecture, especially establishing the ESM and moving towards a banking and capital markets union. However, the architecture is not yet complete. The crisis revealed simmering tensions between different underlying economic philosophies. These differences can be categorized into four dimensions: rules vs. discretion, solidarity vs. liability, liquidity vs. solvency and Keynesian stimulus vs. austerity. The ECB increased its influence during the euro crisis through various unconventional monetary measures. However, the space for further action is now limited. This calls for a shift away from focusing on the interest rate and towards zooming in on risk premia. Risk premia can be reduced by lowering endogenous risk and the price of risk. Finally, macro-prudential instruments should be used not only to maintain financial stability but also as tools to manage the macroeconomy. These tools have the additional advantage that the ECB can calibrate them differently for each region in the currency area, allowing us to optimize the currency area. Finally, one might also want to modify the inflation target. Simply following the average inflation target across the euro area might not be appropriate if regional inflation persistently deviates from the average.

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# The second decade of the euro: old challenges in new clothes

By Ricardo Reis<sup>1</sup>

## Abstract

Ten years ago, the first decade of the euro was judged a success on account of the stability of inflation, the widespread global use of the currency, and the ECB's independence from fiscal pressures and national governments. Using the same three criteria, this essay evaluates the second decade. On the positive side, (i) inflation is still close to target, (ii) the euro remains the second most used global currency, and (iii) the ECB resisted attempts at fiscal dominance during challenging times. On the negative side, (i) the need for relative price adjustments within the currency union can put downward pressure on inflation, (ii) the euro is unlikely to grow further without a euro-wide safe asset, and (iii) the independence of the ECB in its lender of last resort functions is neither clear nor necessarily desirable.

## 1 Introduction

Evaluating twenty years of the euro over fewer than ten pages is not an easy task. One place to start is with the evaluation provided by the ECB president, Jean-Claude Trichet, ten years ago when the euro was ten years old. Trichet (2009) concluded that: "The euro is a historic achievement. Its first ten years have been a success." More important than his verdict are the three criteria he used to evaluate success. The first was *stability*, understood as the ability to keep inflation and expected inflation near the ECB's target. The second was the *role of the euro*, namely in promoting and helping to complete the single European market. The third was *institutional independence*, in which he highlighted the ability of the ECB to solely focus on its target of price stability, independently of national governments and fiscal concerns. A few months earlier, the vice-president of the ECB added an elaboration to the role of the euro, namely its global dimension as a currency that is widely used by financial markets and in invoicing exports. Papademos (2009) concluded: "The euro has been a resounding success: it has established itself as a stable and credible currency, which has become the second most important currency in the world after the US dollar."

In this essay, I will stick to the narrow mandate of assessing the euro at twenty according to these three criteria: stability, its role, and its independence. The focus

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<sup>1</sup> A.W. Phillips, Professor of Economics, London School of Economics. This project has received funding from the European Union's Horizon 2020 research and innovation programme, INFL, under grant number No. GA: 682288.

will be on the last ten years, from 2009 to 2019. The decade started with a financial crisis in 2008-10. It was quickly followed by a sovereign debt crisis in the European periphery in 2010-12. The last few years, since about 2015, have seen a sluggish recovery and low inflation. All combined, interesting times for a currency in its infancy.<sup>2</sup>

## 2 Stability: the value of one euro

The chapter in the Founding Treaty that deals with monetary policy starts with a clear statement (article 127): “The primary objective of the European System of Central Banks shall be to maintain price stability.” In October of 1998, the governing council of the ECB stated that its interpretation of price stability was: “year-on-year increase in the Harmonised Index of Consumer Prices (HICP) for the euro area of below 2%. Price stability is to be maintained over the medium term.” In May 2003, this was clarified as “below, but close to 2% over the medium term,” and just yesterday President Draghi clarified further that “our policy aim was fully symmetric, and it was symmetric around the level that we had established in 2003: below, but close to, 2%. It is achieving this aim over the medium term that steers our policy decisions.”

The precise symmetry of the target, or its numerical value, is up to interpretation that may change over time. Common to all of these official statements are the references to 2%, and to the medium term. Unlike other inflation-targeting central banks, the ECB has always been committed to what today might be called average inflation targeting, which in the academic literature goes under the name of price-level targeting. Chart 1 therefore evaluates the stability of the euro using this yardstick, represented by a yellow curve that rises at 2% per year.

The first decade of the euro was indeed a success: inflation in January of 2009 was almost exactly where the 2% medium-run target says it should be. The following five years are equally accurate. However, since January of 2014 a persistent gap has emerged.

At first, one could dismiss this deviation. It amounted to inflation in each of the last five years being a few decimal points below 2%. When the Treaty put an emphasis on price stability, the signatories had in mind double-digit, or perhaps even negative, inflation. That a few decimals could be discussed in the media as being concerning would from their perspective be seen as a mark of success. Moreover, anyone who has worked with price indices is well aware of the measurement errors in inflation estimates that make you suspicious when too much is made of decimal changes.

Yet, here the medium-run emphasis bites. It forces us to look not at annual inflation but at the yellow versus the blue line, where decimal deviations in the same direction accumulate year after year. The deviation from target today is large and significant. The price stability of the euro is just about starting to be in danger.

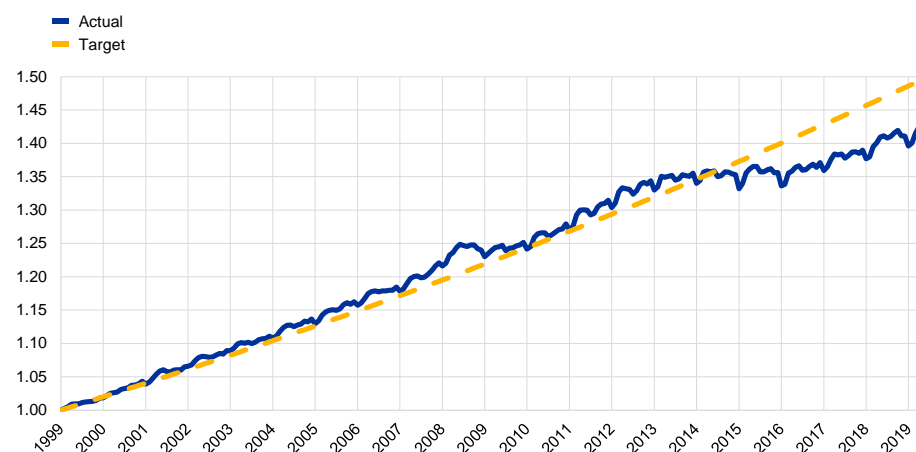
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<sup>2</sup> For a comprehensive assessment of the first twenty years of the ECB, see Hartmann and Smets (2019).

## Chart 1

### Inflation in the eurozone: actual versus target

(HICP index, 100 = Jan 1999)



Sources: ECB statistical warehouse.

Notes: The target grows at 2% per year.

In his speech at this conference, Mario Draghi noted that in order to average below, but close to, 2% then inflation has to exceed 2% sometimes. In his dinner speech, Olivier Blanchard reminded us that the fundamental challenge of any currency union is the adjustment of relative prices. To correct current account imbalances within the Eurozone, inflation in surplus regions must be higher than 2%; otherwise it will either be negative in deficit regions, or it will lead to output gaps (or both). I will offer a third perspective, different but complementary to these two.

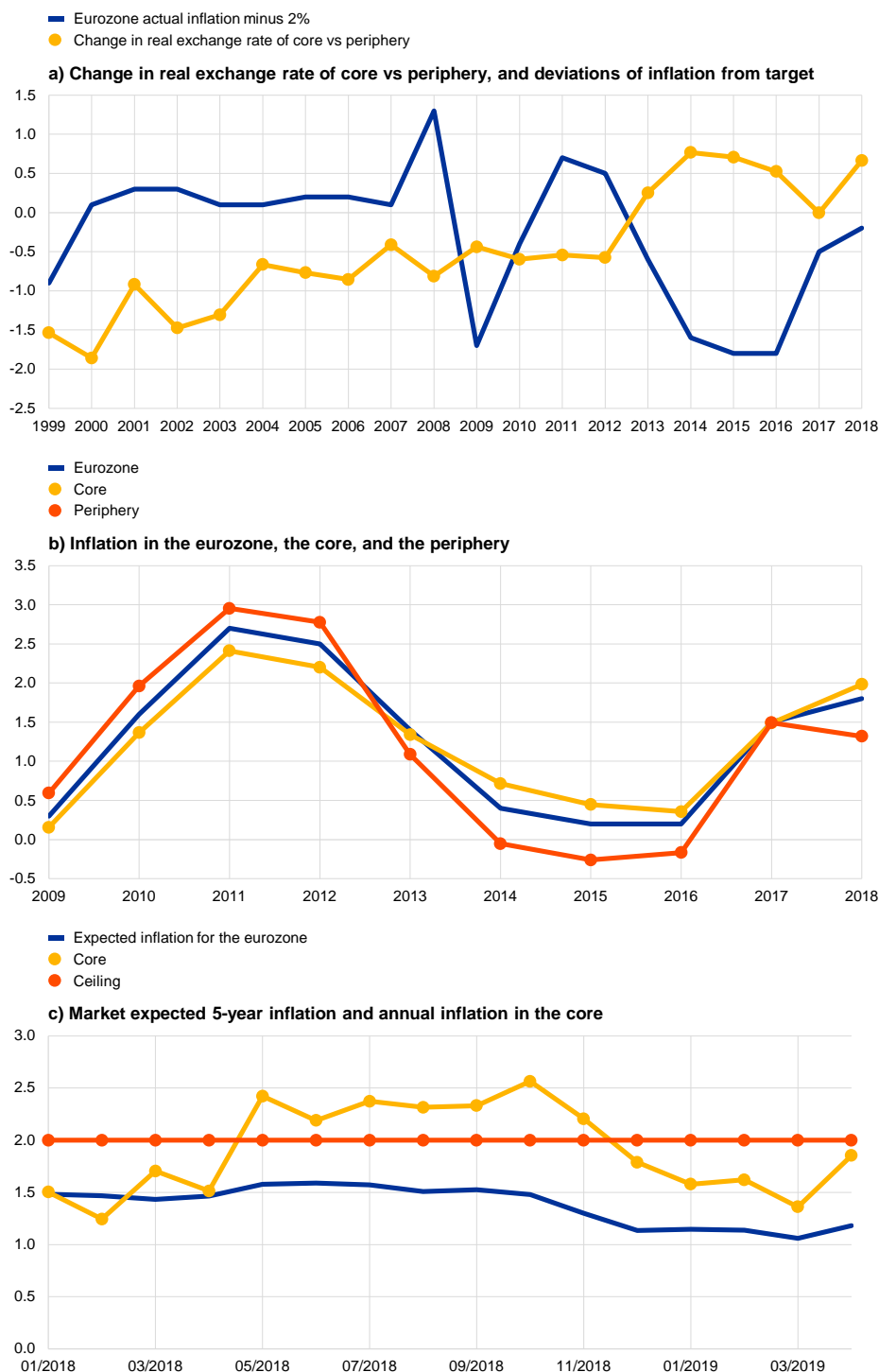
Think of the eurozone as two regions, call them  $c$  and  $p$ . Inflation in the eurozone is an average of inflation in each region. The ECB's mandate states that eurozone inflation must be equal to or below 2%. But consider also a further objective, that inflation in region  $c$  cannot exceed 2% as well, on account of a special aversion of its citizens to higher inflation and their national interpretation of the Treaty. Two scenarios are then possible.

In the first scenario, the real exchange rate between regions  $c$  and  $p$  depreciates, for whatever reason. By definition of the real exchange rate, inflation in region  $c$  will be below inflation in region  $p$ . The two objectives can be satisfied with eurozone inflation at 2% or near it. In the second scenario, the real exchange rate appreciates. Since inflation in region  $c$  must be at most 2%, and appreciation means inflation in  $c$  is above inflation in region  $p$ , it inexorably follows that eurozone inflation will be persistently below its 2% target.

## Chart 2

### Inflation in the eurozone: regions and real exchange rates

(a and b: %, year; c: %, month)



Sources: ECB statistical warehouse, Datastream.

The top panel of chart 2 plots the deviation of eurozone inflation from 2% as well as the real exchange rate within the eurozone between the *c* and *p* regions. They stand for countries at the core—France and Germany, accounting for approximately one



half of the eurozone's consumption—and countries in the periphery—Greece, Ireland, Italy, Portugal and Spain, which weight about one third of the eurozone's price index. It is noticeable that it was precisely in 2013 that a persistent appreciation in the core relative to the periphery started taking place. At that date, there was a shift from the first to the second scenario described above. At that date as well, eurozone inflation became significantly below 2%.

The middle panel of chart 2 decomposes the real exchange rate into the inflation rates in the two regions. While in the first fifteen years of the euro, inflation in the periphery tended to exceed that in the core, the roles reversed in the last five years. In the first fifteen years, targeting “below, but close to, 2%” led to almost exactly 2% inflation; in the last five years, it has meant inflation persistently hovering around 1.5%. Having 2% inflation in the eurozone would have required inflation in France and Germany to be well above 2%.

The bottom panel of the chart insists further by plotting annual inflation at the monthly frequency during the last twelve months in the core region. Also in the chart is expected inflation in the eurozone 5-years out, extracted from inflation swap contracts. During the last year, inflation in the core was temporarily slightly above 2%. Consistent with the account above, this positive deviation has led to expected inflation for the eurozone becoming permanently well below 2%.

### 3 Role of the euro: its global use

During the second decade, four more countries joined the eurozone: Slovakia, Estonia, Latvia, and Lithuania. No country has ever left the euro. This was not a small feat. At the height of the eurozone sovereign debt crisis, betting markets and some commentators at times put the probability that one country would leave the euro at above 50%. The ECB won the battle for the integrity of the eurozone.

From another perspective, the last decade was not so positive. The use of the euro in invoices for exports outside the eurozone fell during this decade; see chart 3. Likewise, the weight of the euro in official holdings of currency reserves around the world fell as well. The Papademos verdict in the introduction is still accurate: the euro is, by far, the second world currency. But during its second decade, the euro lost ground to the dollar and has seen the renminbi steadily rise.

Moving from outcomes to policies, the evaluation is gloomier. During the financial crisis, the Federal Reserve created US dollar swap lines with the ECB, among other central banks. With European financial institutions holding significant investments in dollars, these swap lines provided a lender of last resort that kept investment in dollar-denominated securities steady.<sup>3</sup> This liquidity policy sustained the dominant role of the US dollar in the world. In a few countries in Eastern Europe, the financial system was likewise reliant on euro funding, and its banks held euro-denominated

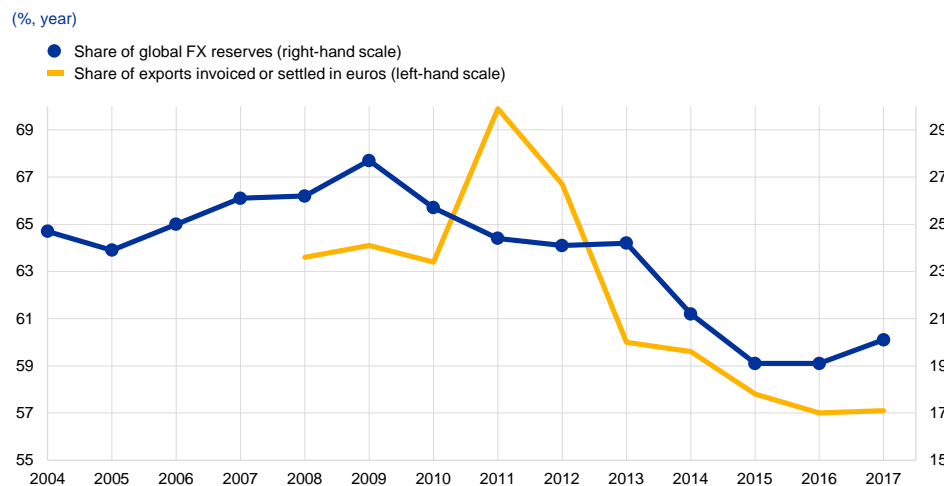
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<sup>3</sup> Bahaj and Reis (2018) discuss the role of the swap lines, highlight the mechanism through which they work, and empirically test their effectiveness.

investments. Unlike the Fed, the ECB was reluctant to extend euro swap lines to these countries.

### Chart 3

#### The international use of the Euro in invoicing and reserves



Sources: ECB (2018) "The international role of the euro" statistical appendix.

Presently, the prospect of Brexit looms large. The euro's global role requires a financial centre that deals in euros. By reaping economies of scale, it allows for lower transaction costs in financial deals that involve the euro. If London loses that role, and if it is replaced by a dispersed set of European cities, trading in euros may become more expensive, no matter what the ECB does.

Looking forward, the euro cannot grow in its use as a currency worldwide without there being a euro-wide safe asset. With a limited supply of safe assets in euros that provide a positive yield, it is costly for other countries to hold more foreign reserves in euros. Exporters outside of the eurozone are unable to hedge currency fluctuations, so it is risky for them to invoice their exports in euros. The capital market union cannot be complete since abundant safe assets are crucial to provide collateral for operations and to prevent periodic flights to safety from causing sudden stops at the national level. There are many arguments for why a euro-wide safe asset is important, no matter what form this asset may take, for the sake of the internal stability of the eurozone and to prevent a repeat of what happened in 2010-12. But even leaving crises aside, the global role of the euro is severely hampered by the absence of a euro-wide safe asset.

## 4 Independence: EMU and fiscal policy

The unique challenge facing the ECB is that it is a single monetary authority facing many fragmented fiscal authorities. Article 130 of the Founding Treaty provided direction to this monetary-fiscal interaction by stating: "When exercising the powers and carrying out the tasks and duties conferred upon them by the Treaties and the Statute of the ESCB and of the ECB, *neither the European Central Bank, nor a*

national central bank, nor any member of their decision-making bodies *shall seek or take instructions* from Union institutions, bodies, offices or agencies, *from any government of a Member State* or from any other body.” (My emphasis added.) The ECB is independent from the fiscal authorities, and a strict reading of the Treaty suggests that the scope for coordinating policies with governments is very limited.

During its first decade, the ECB succeeded at upholding this independence. There was barely any public pressure from fiscal authorities for monetary policy to generate more seigniorage revenues or to rebate more net income to the national Treasuries. The ECB was committed to its inflation target and it never flinched at any suggestion that it might be best to inflate away some of the growing public debt.

Both forms of potential fiscal dominance became more attractive during the second decade. The sovereign debt crisis of 2010-12 and the political deadlocks around it led to calls for the ECB to actively redistribute resources across countries. The painful slow recovery in many European countries, which are saddled with high public debt, made it tempting to use the ECB’s ability to generate resources in order to relax austerity. In spite of these, the ECB retained its independence from fiscal authorities.<sup>4</sup>

At the same time, the financial crisis brought liquidity policies to the forefront of what a central bank does. The theory and best practice of lender of last resort to both individual banks and financial systems as a whole relies on two stages. First, the central bank should lend to illiquid but solvent institutions. Sometimes, it is inevitable that the illiquid evolve into becoming insolvent. At that time, taxpayer money is at stake so that any further action has clear fiscal consequences. The central bank should call the Treasury and let it decide whether to set up a bailout with public funds or not.

In a deep financial crisis, and when lending of last resort happens, the strict separation of monetary and fiscal policy is neither possible nor desirable. In many states of the world, the illiquid remain solvent, and the central bank can neither seek nor take instructions from governments, but in some states of the world, this separation is not tenable.

In these, hopefully rare, cases who can the ECB call? In the last decade, the ECB answered this question in different ways according to the circumstances. When it came to isolated and small national banks in Cyprus, Portugal or Spain, the ECB withdrew (or threatened to withdraw) access to its liquidity operations from illiquid and likely insolvent banks. This forced the national Treasuries to either undertake a resolution of these banks or to sell them to other banks. National fiscal authorities shouldered the burden of the losses associated with these outcomes.

In response to the systemic crisis that spread through the whole financial system of the periphery countries, the ECB instead called and worked with the European Commission and with the International Monetary Fund. It joined them in a troika that

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<sup>4</sup> Reis (2013) discuss the fiscal challenges facing the ECB, and Reis (2019) surveys the different fiscal linkages and potential forms of fiscal dominance of central banks.

imposed and supervised a mix of reforms in the banking sector with fiscal measures and structural adjustment policies.

Finally, by purchasing large amounts of national sovereign bonds, the ECB made it possible for one country in the eurozone to default at the expense of others. These redistributions could happen because the losses by the ECB would be shared among all through lower dividends from the central bank. To limit this potential redistribution, the ECB introduced rules dictating that most of the purchases of the national sovereign bonds would be made by the corresponding national central bank so any potential losses would stay within the country. This prevents direct risk sharing from quantitative easing arising in the state of the world where there is sovereign default.

In light of the price stability mandate, these three complementary approaches were successful. Fiscal dominance, in the sense of the central bank being forced to sacrifice inflation control, was avoided. Whether these policies were the best from the perspective of social welfare in the eurozone is more debatable, but it is also a discussion best left for another day. Moving forward though, none of these approaches bind the ECB for the future, nor do they establish a framework or set of rules for future relations. The question of who the ECB will call remains.

The absence of a clear relation between monetary and fiscal authorities can directly cause problems. For instance, it would be reasonable for the ECB to be too conservative in its liquidity policies knowing that it will not be able to transition out of them if the illiquid turn out to be insolvent. It may refuse to be a lender of last resort in a wider set of circumstances or earlier than if it had a clear fiscal counterpart. Yet, this may well be inefficient because the ECB might not internalise the large fiscal costs that arise when a failing bank is excluded from the ECB's liquidity facilities.

From the opposite direction, perhaps the ECB will keep on providing liquidity beyond the point where it should. When a large financial institution that operates in many regions of the eurozone becomes insolvent, different national Treasuries will have an incentive to play games of chicken with each other where the first to blink pays the fiscal costs. During the war of attrition when resolution is delayed, the ECB may be stuck in the middle supporting an insolvent institution.

A related issue is that much of macroprudential policy in the eurozone is conducted at the national level. In spite of the single supervisory mechanism, many of the actual tools of macroprudential regulation are decided by national authorities, often in institutions that depend on the Treasury. Yet, when a macro systemic crisis arises, the central bank is invariably the first respondent. It is inevitable that the central bank will have to interact with the macroprudential authorities even if they are branches of the government. The line that separates having interactions from taking or giving instructions is thin.

In short, I have tried to make three points. First, that all lender of last resort operations are ultimately fiscal. Theory shows this, and the history of major central banks as well as the IMF confirms it. During the 2007-09 financial crisis, decisions in the United States about Bear Sterns or Lehman Brothers were ultimately made by

the Treasury in coordination with the Federal Reserve. Decisions made by the IMF on international lending of last resort always involve taking and giving instructions to fiscal stakeholders, including those in the board of the IMF, and those in the countries seeking assistance.

Second, that because the ECB is the lender of last resort in the eurozone but there are fragmented fiscal bodies, it is possible that a lack of coordination between them could lead to inferior outcomes. I discussed the actions taken in the last decade, noting that they preserved price stability, respecting the mandate of the ECB. Whether they were the best for social welfare is less clear.

Third, that one has to think hard about how to formulate the independence of the ECB from the fiscal authorities when it comes to these policies. Article 130 can be interpreted too strictly. Lender of last resort policies always require some coordination with fiscal authorities. Clarified rules, or a better statement of institutions in this regard, are a missing part of the Euro's architecture that may soon become relevant.<sup>5</sup>

## 5 Conclusion

Was the second decade as successful as Jean-Claude Trichet and Lucas Papademos judged the first decade of the euro to have been? In some ways, it is defensible to conclude that the second decade was actually *more* successful than the first. The challenges were arguably larger and yet, inflation remains under control, the euro is still the second largest global currency, and the independence of the ECB is preserved while preventing a financial collapse and providing ample liquidity.

At the same time, these outcomes leave the ECB with some important questions unanswered as it enters its third decade. How does it interpret and define its inflation target in light of the need for relative price adjustments between different regions in the currency union? How can it promote the global role of the euro if the political bodies continue to fail to deliver a euro-wide safe asset that completes the architecture of the capital market union? How can we re-think and re-state the independence of the central bank as a lender of last resort in its relations with the fiscal authority and with macroprudential regulators?

The crisis should hopefully have taught European policymakers that failures in the architecture of the eurozone that leave questions unanswered sooner or later get exposed in a crisis. The same will surely happen when the next crisis comes about. Whether the third decade of the euro will be a success depends on the answers that are given to these three difficult questions.

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<sup>5</sup> Reichlin (2019) in the context of the Eurozone, and Goodhart (1999) more generally, provide alternative discussions of the challenge behind liquidity policies and the lender of last resort.

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# Building the euro: moments in time, lessons in history

Speech by Jean-Claude Juncker<sup>1</sup>

## 1 Introduction

Mr President,

And for many of you, dear friends.

It is my pleasure to be here and I would like to start by thanking Mario Draghi, another good friend, for inviting me here this morning.

I am told that it is rare for a politician like me to be invited to speak to this prestigious forum. I have to say I understand and I respect this policy. Central banks must be respected when it comes to their role and independence.

One of the great powers and responsibilities of being a central banker is that you can move markets with a single line in a speech. Every word counts a billion. And this is why I always admire Mario's speeches, which are priceless pieces of art.

It is fair to say that I am better suited to being a politician. I can say what I think – from time to time I can say what I think – which is what I plan to do today.

So allow me to tell you the story of the euro – my story – which is a little bit different from yours. I am privileged to have been part of this adventure from the very start. And it is my personal experience and vision that I would like to share with you today

As someone who has witnessed every twist and turn of the last thirty years of European politics, I can confirm that the road has not been easy. But I remain astonished by the strength and the relevance of the project.

As every European success story, it is full of crises and lessons learned. Too often we lose sight of how far we have come and the true value of that success.

Today, I want to stop the clock on six moments in time, six lessons in history that have shaped the euro and the European Union as we know it.

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<sup>1</sup> President of the European Commission

## 2 Six lessons in history: six moments that shaped the Euro and the European Union

### Lesson 1: The euro is a political project for our grandchildren - The 1992 Exchange Rate Mechanism crisis

The first moment in time goes back to the crisis of the European Exchange Rate Mechanism in 1992.

This story starts one year earlier when, as a Finance Minister during the Luxembourgish Presidency of the Council, I was in charge of the economic and monetary aspects of the Intergovernmental Conference. This led to the Maastricht Treaty of December 1991, which paved the way for the single currency.

This is a time from which there are only two survivors: the euro and myself. And only one of us is here to stay.

Two years after the fall of the Berlin Wall, the signing of the Maastricht Treaty was a proud European moment.

Together with the launch of the European single market and the recently published Delors Report of 1989,<sup>2</sup> the Maastricht Treaty was about creating a new future for Europe. It was about Europe taking its destiny into its own hands.

But, as often in Europe, our collective will was soon put to the test. Under the pressure of the markets, the United Kingdom chose to leave the European Exchange Rate Mechanism in September 1992.

To make the deal at Maastricht possible, I had already proposed the year before – that was in May 1991, Jean-Claude Trichet was there, and others – the British ‘opt-out’ from the single currency. And now the United Kingdom was leaving the Exchange Rate Mechanism.

In some ways, I believe this parting of ways was perhaps the start of the journey that led to ‘Brexit’.

Other countries also faced increased market pressure. In 1993, the Finance Ministers of Germany and the Netherlands also wanted to leave, because they believed their economic fundamentals were, by far, much stronger than those of France and of others.

For me as a then young Finance Minister of Luxembourg, a country with even better fundamentals, this put me in a very uncomfortable situation. Our currency at that time was the Belgian franc and if those countries left, Luxembourg would be under pressure to follow, putting Belgium in great difficulties.

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<sup>2</sup> “Delors Report” on Economic and Monetary Union in the European Community, Committee for the Study of Economic and Monetary Union, 17 April 1989.



During these long negotiations, it was – this may surprise you – the British Chancellor of the Exchequer, Kenneth Clarke, who woke us up. He said out loud in the room: ‘If you let Germany and the Netherlands go, you will never have the single currency. And personally, I would like my grandchildren to be able to pay in euro one day.’ The British Chancellor Kenneth Clarke, a real statesman.

He was right. We had to find a solution and look at the bigger picture. And this is what we did by widening the intervention bands of the Exchange Rate Mechanism from 2.25% to 15%, to make the system less vulnerable to speculation. It was a difficult moment. Jean-Claude Trichet was there, Yves Mersch you were also there, like Jean-Claude, as Director of the Treasury. I remember that, because I had to convince French Finance Minister Bérégovoy of the merits of the independence of the central bank.

The next day, after this decision, all the newspapers and leading academics wrote that it was the end of the single currency, when in reality it was the rescue of the single currency.

But at this point, I have to make a solemn confession to a room full of central bankers.

While we were working to find a solution, the Luxembourgish Government secretly printed 50 billion in a new – and secret – currency: the Luxembourgish franc.

We even put the image of the Grand Duchess Charlotte who died in 1985, on the face of the banknotes in order to hide our intentions as much as possible. Because we said to ourselves: nobody will believe that we are launching a new currency in Europe with the image of the old Grand Duchess.

Such action would be totally unthinkable, irresponsible, reckless in our currency union. But back then, relying on the currency of another country, in the case of Luxembourg vis-à-vis Belgium, and exposed to the risks of the markets, we had to hedge ourselves against all eventualities. Luckily, the Luxembourgish franc never had to be used and, standing here today decades later, I strongly reject this sort of behaviour!

The little story stayed a well-kept secret between the Grand Duke, the Prime Minister Jacques Santer and myself, until we burned all the notes on 1 January 1999, the day the euro was introduced. That was a major performance by the Luxembourgish army by the way. For once, they had a job to do: burning the money we never used.

## Lesson 2: The rules do not need to be stupid – The Stability and Growth Pact crisis 2003

To the second lesson: The rules do not need to be stupid. Because the second moment stems from what I call the Stability and Growth Pact crisis of 2003.

France and Germany contravened the rule that the deficit should not go beyond 3% of GDP.<sup>3</sup> Under the pressure of these two countries, the Council of Ministers decided not to adopt the formal corrective remedies proposed by the Commission.<sup>4</sup> The Commission took the decision of the Council to Court and both Council and Commission partly lost.<sup>5</sup> A very European story.

These were early days – more than fifteen years ago – but it clearly showed the risk of the rules being bent for some Member States for political reasons. The legislative framework has been strengthened in the meantime, but interestingly, the Court already confirmed at the time that rules should be applied with some discretion, taking all circumstances into account.

And this is the approach I have taken since I took office as President of the Commission. Yes, the fiscal rules are here to be respected by everyone, however complex they have become. But, at the same time, the rules can and must make both practical and economic sense. This is also what the rules foresee.

This is why, faced with the risk of a sluggish recovery, the European Commission over which I have the privilege to preside has made use of the flexibility that exists within the fiscal rules to allow European economies the time and space they needed to recover and reform.<sup>6</sup> And when risks of slippage appeared, we took the time to negotiate hard to put the countries back on the sustainable path.

Just think of Spain and Portugal three years ago. Had we been rigid in our approach to the fiscal rules and prematurely applied financial sanctions, these countries would not have had such robust growth and been able to correct their public finances. The credit also goes to the governments of these countries, which chose a credible and cooperative path – for the benefit of their citizens.

I am saying this because we often get a lot of criticism for our job of fiscal surveillance – from both sides of the spectrum – which is a good sign. By the way, it is the Council of Ministers which ultimately decides on fiscal surveillance in the European Union, not the Commission. And I am pleased to report that the Council has followed all the recommendations of the Commission in recent years.

Frankly, when one looks back, the facts speak for themselves. Over the last four years this flexible approach is estimated to have boosted the European economy by 0.8% and helped create 1.5 million jobs, while allowing government debt and deficit to fall significantly, in particular within the euro area. I am confident that history will prove us right.

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<sup>3</sup> Article 1 of what is now Protocol 12 to the Union Treaties.

<sup>4</sup> Based on what are now Articles 126(8) and 126(9) TFEU.

<sup>5</sup> Judgment of 13 July 2004, Commission v Council, C-27/04, EU:C:2004:436.

<sup>6</sup> COM (2015) 12. Making the best use of the flexibility within the existing rules of the Stability and Growth Pact.

### Lesson 3: The euro is a matter of common interest - Greece 2010

There is a third lesson and it is that the euro is a matter of common interest.

This third moment in time, the third lesson, comes from Greece when, in October 2009, the Government admitted that official statistics had misrepresented the real debt and deficit figures for years. The Greek Government revised the 2009 deficit forecast from 3.7% to 12.7% of GDP. The final figure was above 15%. Similarly, the figure for Greek government debt at the end of 2009 increased from €272 billion to €301.1 billion, with the highest ratio of debt to GDP for any EU country.

This fuelled mistrust and uncertainty at all levels. And it revealed one of the biggest contradictions and absurdities of Europe's Economic and Monetary Union.

The truth is that Eurostat had sent 10 delegations to Athens with a view to improving the reliability of Greek statistics from 2004 to 2010. However, Member States had been resisting tighter EU rules on statistics for years with Prime Ministers, Finance Ministers, governments arguing that national sovereignty was more important than trustworthy and comparable data.

I have to accept my part of responsibility because I was amongst those who asked the Commission not to pursue this in that way. I voted against the proposal of the Commission to give more power and to give more independence to Eurostat. That was a major mistake. Had we done the right thing, we would never have experienced the Greek crisis as we did.

The actions of these institutions, Eurostat and others should be accountable and transparent, which also means that they should be anchored in the European Union's decision-making process. This is why I push for intergovernmental solutions inherited from the crisis years to be incorporated into the institutional framework of the European Union over time.

### Lesson 4: The euro requires resolve: Mario Draghi's "whatever it takes"

The fourth moment in time relates to the summer of 2012 and your words, Mario, announcing that the European Central Bank was ready to do 'whatever it takes to preserve the euro'.

You had taken office less than a year before, coming after my good friend Jean-Claude Trichet. At the time the euro area was at the brink of falling back into recession. Greece, Ireland and Portugal were under enormous stress and under financial programmes. The fragmentation of financial markets threatened the integrity of the euro area and the survival of the euro was at risk.

Your calm and confidence not only pacified the markets, it saved me – the President of the Eurogroup at the time – from many more sleepless nights.

I know I am not supposed to comment on the policy of the European Central Bank but allow me to say how glad I am that you were there. And I can only commend the bold action of the ECB<sup>7</sup> and our close relationship in recent years.

In that same speech of July 2012, you were also right to point out that many market actors and commentators underestimated the political capital invested in the euro project. The euro requires resolve and it deserves determined leaders. These are stronger than markets.

## Lesson 5: The euro is irreversible - Greece crisis July 2015

The fifth moment, the fifth lesson, is the fight to keep Greece in the euro in 2015. Many Leaders have now taken credit for saving Greece on one night in July of that year. I believe there is some artistic licence in some of these memoirs. Success has many parents, but failure is always an orphan! But just as quickly as politicians appear to claim success, so disappear the many pundits – often from across the pond – who predicted Grexit and the end of the euro. Where are they now?

For those of us who were at the centre of the storm for months, the negotiations were long and tense. But we knew the importance of the fight.

A fight to overcome years of prejudices, ideologies and mismanagement. A fight to strike the right balance between solidarity and responsibility and safeguard the future of the European Union as a whole. A fight to make sure that the efforts required made sense – not in an economic textbook but in the lives of the Greek people. A fight to find European solutions to European problems.

Of course, the real efforts and the real courage were shown by the people of Greece. Our job was to support them. This is why the Commission mobilised up to €35 billion for Greece from various EU funds for investment, which triggered an estimated 2% GDP increase in that country.

It is also why I personally insisted that the programme goes through a social impact assessment and contained a strong social dimension. This, for instance, helped cut the price of medicines and led to the rollout a guaranteed minimum income scheme for the most vulnerable.

The issue was not solved overnight, despite what some think.

Most people have forgotten about the fact that even after the so-called deal, Greece was actually about to default on its debt to the European Central Bank.

Once again, we did what it took and the Commission mobilised a short-term loan worth €7 billion in bridge financing under the European Financial Stabilisation Mechanism to prevent Greece from crashing out of the euro by accident.

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<sup>7</sup> This was recently backed up by General Court of the European Union and the Court of Justice of the European Union, both ruling that the ECB acted in public interest by ensuring the stability of the euro area as a whole.

Today, it is with pride that I can say that Greece is in its rightful place at the beating heart of Europe and of the euro.

Together, we showed that the euro is irreversible. And we all knew it had to be.

## Lesson 6: The euro is a strategic asset in today's world - the Iran nuclear deal and the international role of the euro

There is a final moment, a kind of sixth lesson, and we are still living in that moment. It started back on 18 May last year when the United States announced its decision to withdraw from the Iran nuclear agreement and to reinstate sanctions.

The decision caused far-reaching problems for European companies to continue trading and doing business.

For many Europeans, this was a kind of wake-up call: it showed how isolated and fragile we can be, how reliant we still remain on others. And it showed that it was time for the euro to strengthen its global role.

Time will tell but I believe this could prove to be what we could call our 'Nixon moment'.

We can indeed draw many parallels to 1971 when President Nixon took the U.S. dollar off the gold standard and ended the fixed exchange rate system that had existed since World War II.

This was the moment when Europe decided to move towards its own European Monetary System, the first step towards the single currency which would see the light thirty years later.

Europeans were lucky that they could fall back on the report drawn up by Pierre Werner in 1970 setting out a plan towards an Economic and Monetary Union.<sup>8</sup>

His plan was already there but it took a global crisis for it to be used and for Europe to take a leap forward. We should not wait for the next crisis to do what we know we have to do.

For our own sovereignty, we need to think afresh the strategic role that currencies play in today's world. And this is why the Commission has set out a new agenda to strengthen the international role of the euro.<sup>9</sup>

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<sup>8</sup> "Werner Report" on the realisation by stages of Economic and Monetary Union, 8 October 1970.

<sup>9</sup> COM (2018), 796. Towards a stronger international role of the euro; and SWD (2019) 600. Strengthening the international role of the euro.

### 3 Applying the lessons

These six moments, these six lessons are all examples of crises. But every time we have been challenged, we have found solutions and even surprised ourselves with what we can achieve. This is a fitting way to tell the story of European construction.

These moments also have one lesson in common. They show that the euro has never been a purely technical or economic matter. It is first and foremost a political project about people, about history and about unity. It is about lessons learned, and a collective ambition for the future.

This is why, when I took office as President of the Commission five years ago, I had three priorities in mind.<sup>10</sup>

Firstly, to make sure the euro delivers for Europeans and to boost jobs, growth and investment. This came at a time when Europe was struggling to emerge from its worst crisis since the Second World War, and when populists used the euro as the symbol of 'austerity'. Since then, we have come a long way together.

13.4 million jobs have been created in the European Union since this Commission took office in November 2014 – 9.5 million of those in the euro area. Employment is now at a record high and unemployment at a record low since the turn of the century.

If these jobs had been destroyed, it would be the fault of the Commission and of the ECB, so let us take our part of the credit for once!

Think of the impact of the monetary policies adopted by the European Central Bank.

Think of the flexibility used within the rules of the Stability and Growth Pact.

Think of the impact of the European plan for investment, the so-called "Juncker Plan", which has unlocked around €400 billion of additional investment across Europe.

This Plan is no longer called "Juncker Plan", by the way. They decided to call the Plan "Juncker Plan", because they wanted to pre-identify the one who would be responsible for the failure. Now it is a success, it is no longer called the "Juncker Plan", it is the European Fund for Strategic Investments.

Think of the deepening of the single market in all its forms and the positive impact of the EU's trade policy, with unprecedented deals made with Canada and Japan. Under my mandate, we have concluded 15 trade agreements with other parts of the world and I think that this effort has to be pursued.

There is still work to do but our European economies are growing and people across our Union are feeling the difference.

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<sup>10</sup> 'A New Start for Europe: My Agenda for Jobs, Growth, Fairness and Democratic Change' – Political Guidelines for the next European Commission, 15.7.2014.

Secondly, I knew that we needed to complete the Economic and Monetary Union to support our single currency and deliver better for the real economy. The European Central Bank cannot do it all alone.

We have made big strides forward, notably on the European Banking Union, which has helped reduce non-performing loans back to pre-crisis levels and strengthen the capital buffers of euro area banks by more than €234 billion since 2014. Through the launch of a Capital Markets Union, we are also making it easier for businesses to access the financing they need.

We are also making progress towards a dedicated budget line for the euro area. This would come in the form of an instrument of convergence and competitiveness, helping to steer reforms and investment. I have been calling for this for a long time and the Commission put the proposal on the table more than one year ago. I expect – and Mario Draghi will attend – Friday's Euro Summit to take this forward and call for a swift conclusion of the legislative work.

All in all, I believe we can now say that Europe's Economic and Monetary Union is more robust than ever before, but there is still a lot more to do. We need a common deposit guarantee to complete our Banking Union. We need simpler fiscal rules and a stabilisation function for the euro area. And we need to build a common treasury and develop a euro area safe asset over time.

With the help of Mario, we have charted the way forward through what is known as the Five Presidents' Report of June 2015.<sup>11</sup> We have come a long way, but there should be no complacency.<sup>12</sup>

Thirdly, and lastly, I wanted to put more heart and soul back into the European project. More politics. More humanity. I want people to see the euro not just as a currency, but as a way to deliver a fairer society, in line with the values of our social market economy.

This is why I prioritised a strong social agenda, the proclamation of a European Pillar of Social Rights and a relaunch of the social dialogue at all levels. This is why I pushed for fair taxation in the European Union and the combat against tax evasion. This is why we are engaging in a strong fight against money laundering.

All of this has contributed to a changing tone and a changing narrative on the euro, to reconciling the citizens of Europe with their currency.

The talk of 'Grexit', implosion and contagion, of the euro as a 'threat' to cohesion has rightly been replaced by a better understanding of the single currency as a source of

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<sup>11</sup> 'The Five Presidents' Report: Completing Europe's Economic and Monetary Union', by: Jean-Claude Juncker in close cooperation with Donald Tusk, Jeroen Dijsselbloem, Mario Draghi and Martin Schulz, 22.06.2015. The report was preceded by an 'Analytical Note on the Economic and Monetary Union (EMU)' by Jean Claude Juncker, Donald Tusk, Jeroen Dijsselbloem, Mario Draghi, discussed at the informal European Council on 12 February 2015.

<sup>12</sup> COM (2017) 821. Further steps towards completing Europe's Economic and Monetary Union: a roadmap; and COM (2019)279, Deepening Europe's Economic and Monetary Union: Taking stock four years after the Five Presidents' Report.

protection and empowerment, and as a strategic asset for Europeans in this unsettled world.

And the support for the euro has reached an all-time high: 75% of euro area citizens are now in favour of the single currency. Looking back to where we come from, I am prouder of this than many other statistics or figures.

## 4 Conclusions

Dear friends, the euro is now the second currency in the world. It is the single currency of the European Union.

Without the UK, the economies of the euro area represent 85% of the GDP of the European Union. More Member States will join the euro area in the coming years.

Standing on the shoulders of many European statesmen, we have turned an improbable aspiration into a daily reality for hundreds of millions of Europeans.

The coins and banknotes in our pockets are worth far more than the numbers written on them. They are the tangible symbol of a united Europe that promises peace, protection and prosperity.

The only way to honour the legacy of all those who made our success possible is to continue delivering on these promises of our single currency.

It has been my life's work and my great pride to have played a small part in a journey that has a long way to go. And I have been very privileged to travel along with all of you.

Thank you.



# Spatial agglomeration and superstar firms: firm-level patterns from Europe and U.S.

By Laura Alfaro, Maggie X. Chen and Harald Fadinger<sup>1</sup>

## Abstract

We characterize the agglomeration patterns of industries and plants in Europe, distinguishing Eurozone countries and the U.S. Using a micro-level index, we quantify the degree of geographic concentration in industrial activities and explore how firm heterogeneity, industry attributes, and location fundamentals jointly explain the observed patterns. Our analysis shows that there is a clear hub-and-spoke structure in the geographic distribution. Larger and more productive plants, especially the superstars of each industry, are more centred than their smaller, less productive counterparts. The greater agglomeration surrounding superstars is particularly pronounced in the Eurozone but not present in the rest of Europe. Location fundamentals also play an important role and can sometimes mitigate the importance of agglomeration economies around large firms. Regions with different levels of economic development, including in education and technology, exhibit distinct agglomeration patterns. The findings suggest heterogeneity in the ability of regional policies to build superstar-centred industry clusters.

## 1 Introduction

In recent decades, falling transportation costs, dismantled policy barriers, and rapid technological progress have precipitated an explosion of cross-border flows in goods, services, investments, and ideas. This phenomenon, particularly in Europe where European integration has been predicated on the free movement of goods, services, labour and capital, can rapidly reshape the landscape of economic geography and business network. A key driver of this phenomenon is the “superstar firms”, a group, first coined by Rosen (1981), consisting of the very large, productive firms that have come to dominate particular industries.<sup>2</sup> Engaging in increasingly complex organization decisions at home and abroad and transporting products,

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<sup>1</sup> Harvard business School, [lalfaro@hbs.edu](mailto:lalfaro@hbs.edu); George Washington University, [xchen@gwu.edu](mailto:xchen@gwu.edu); University of Mannheim, [harald.fadinger@uni-mannheim.de](mailto:harald.fadinger@uni-mannheim.de). We thank Zineb El Melouki, Sarah Jeong, Christopher Montgomery, and Diane Tchawa for valuable research support. Harald Fadinger gratefully acknowledges financial support from DFG (CRC TR 224) and Laura Alfaro HBS research funds.

<sup>2</sup> In this paper we define superstar firms by size and activities relative to their peers. For other characterizations see Autor et al. (2017).

tasks, capital, and technology across countries, superstar firms have risen to the centre of globalization and industrial activities.<sup>3</sup>

The dominance of a few firms---multinational firms (MNCs) in particular--- and the emergence of industrial clusters often surrounding them have created an important paradox of globalization. On the one hand, it is long recognized that geographic proximity could lead to agglomeration economies including lower transport costs between input suppliers and final good producers (vertical linkages), horizontal labour-market and capital-good market externalities due to proximity of firms with similar demand for labour and capital goods, and technology diffusion occurring at close distances. These agglomeration economies can be particularly strong around superstar and multinational firms as these firms tend to be more productive as well as more intensive in capital and knowledge. On the other hand, as the movement of goods, people and ideas becomes easier through economic integration, the benefits of agglomeration economies are expected to decline. In contrast, however, as noted by Glaeser (2010), we observe continuing dominance of superstar firms, industrial clusters, and cities despite reductions in transportation and communication costs and the competition implications of geographic concentration.

In this paper, we characterize the agglomeration patterns of industries and firms. In a sharp departure from the existing literature, instead of assuming firms are created equal, we treat each plant as the unit of observation and explore the geographic distribution of economic activities surrounding each firm. Existing evidence shows that there is significant productivity heterogeneity across firms within each industry and across countries.<sup>4</sup> We explore how this heterogeneity, in conjunction with benefits of agglomeration, affects the formation of industrial landscape.

- Our analysis compares agglomeration patterns in the U.S. with those in the European Union. Within the European Union, we separate the Eurozone from other countries, since the former economies face deeper integration of capital markets compared to other EU economies due to the common currency. Specifically, we ask: Is there agglomeration around highly productive firms? Is agglomeration driven by multinationals? Does the Euro area share similar patterns to the U.S. and the rest of Europe? How do countries within the euro area differ following the Global Financial Crisis? In addition to firm productivity and internationalization, what is the importance of internal market and regional characteristics and policies such as population, income, and region-specific human capital and R&D investment?
- Examining how the degree of agglomeration varies with firm attributes including productivity, size, multinational status and regional characteristics allows us to assess the potential benefits and costs provided by geographic proximity to the superstars relative to the effects of location fundamentals and the ability of

<sup>3</sup> As Mayer and Ottaviano (2007) note “internationalized firms are superstars.” They are bigger, generate higher value added and pay higher wages.

<sup>4</sup> Existing evidence (see, e.g., Helpman, Melitz and Yeaple 2004; Alfaro, Charlton, Kanczuk, 2009; Chen and Moore, 2010; Bloom et al, 2016, Alfaro and Chen, 2018) shows that there is significant productivity heterogeneity within each industry, particularly between multinational and non-multinational firms. See Navaretti et al. (2011) for a comparative study of European firms.

regional policies to attract regional industry clusters centred around superstar firms.

To take into account the role of firm heterogeneity, we develop a new micro index of agglomeration and measure the level of agglomeration centring each individual plant, following an empirical methodology introduced by Duranton and Overman (2005) (henceforth, DO) and extended in Alfaro and Chen (2014, 2019). This index treats space as a continuous metric and identifies agglomeration at the most disaggregated level. It is constructed using precise latitude and longitude information of each establishment and the distance between each pair of establishments.

Based on the index, we study how the ability to attract agglomeration varies across plants and how firm heterogeneity, reflected in productivity and size, leads to different levels of ability to attract agglomeration. Specifically, we examine how a given plant's characteristics (such as size, productivity, age, foreign ownership, and the number of products) and its industry's characteristics (such as capital intensity, skilled-labour intensity, and R&D intensity) might jointly explain the extent of agglomeration surrounding the plant. This step constitutes a sharp departure from the existing literature which has focused primarily on aggregate-level agglomeration and assumed all nodes in the cluster are created equal.

To mitigate the concerns of reverse causality, we explore the dynamics in the data and examine the spatial relationship between incumbent and entrant plants. We measure the distance between each pair of incumbent and entrant firms and construct the micro index to capture the degree to which entrants agglomerate towards each individual incumbent. Exploring the agglomeration between new and existing plants enables us to mitigate the potential reverse causality between firm characteristics and the level of agglomeration. Second, we identify the role of firm characteristics in determining the level of agglomeration by comparing plants located in the same disaggregated region.

To achieve this goal, we employ a unique worldwide establishment-level dataset, WorldBase, that provides detailed physical location, ownership, and activity information for manufacturing plants in more than 100 countries. The dataset's detailed location and operation information for over 40 million plants, including multinational and domestic, offshore and headquarters establishments, makes it possible to compare the agglomeration of different types of establishments. We use the plant-level physical location information in our data to obtain latitude and longitude codes for each establishment and compute the distance between each pair of establishments within the plant's primary industry. We then construct the index of agglomeration based on the distance between each pair of establishments.

Our analysis shows that firms are far from equal within each industrial cluster. There is a clear hub-and-spoke structure in the geographic concentration of industrial activities. More productive and larger establishments are more centred by other firms than their smaller, less productive counterparts.<sup>5</sup> The greater agglomeration

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<sup>5</sup> In their comparative study of European firms, Navaretti et al. (2011) stress the importance of firm level characteristics in accounting for competitiveness.

surrounding superstar firms is most pronounced in the Eurozone followed by the U.S. In the non-Eurozone European countries, superstar plants actually attract less agglomeration. In the U.S. and in the Eurozone, MNC establishments also attract significantly more agglomeration than domestically-owned plants, while this is not the case in Europe outside of the Eurozone.

The different patterns in Eurozone and non-Eurozone European countries (Eastern Europe primarily) could reflect the different scope of agglomeration economies in these regions. In Eurozone and the U.S., economic activities by superstar firms and multinationals are likely to involve more skill and capital intensive upstream tasks such as component production, while in Eastern Europe affiliates of superstar and multinational firms are more likely to engage in unskilled-labour intensive downstream tasks such as assembly, where there are limited positive agglomeration economies and more negative factor- and product-market competition effects.

Regional attributes also play an important role. In fact, the majority of the variation in agglomeration patterns remain to be driven by regional location fundamentals such as market access and production cost. Specifically, the regional attributes account for 30-70 percent of the agglomeration. Exploring the heterogeneous role of superstar firms, we find that higher regional human capital levels are associated with more agglomeration around larger and more productive plants, particularly in Europe. In contrast, larger regional R&D spending is associated with less agglomeration of economic activity around these plants in Europe.

We then analyse the agglomeration densities post-crisis in euro countries. The Global Financial Crisis, triggered by a liquidity shortfall in the U.S, led to a sharp contraction in economic activity in the Eurozone, followed by a protracted long-lasting slump. Consistent with the shock being interpreted as one that increased trade barriers, we find the effect of superstars to be particularly weak in countries harshly hit by the crisis (Greece, Ireland, Italy, Portugal and Spain).

Firms' location decisions affect their productivity with broader implications for growth and convergence. The consolidation and emergence of industrial clusters represents great opportunities and challenges for policy makers. Several policy implications emerge from these results. Policies aimed at building industrial zones and foreign investment should take into account the different abilities of firms to stimulate new entrepreneurship activities. Firms with better performance and superior economic characteristics such as greater productivity can help attract more entrants and generate a domino effect in the formation of industrial clusters. An incentive structure whereby favourable incentives are offered first to potential hub firms could be more effective than a uniform incentive system in generating overall productivity gains. However, the design of such an incentive structure should be cautious and carefully devised to assess the potential of agglomeration economies across regions and industries.

The rest of the paper is organized as follows. Section 2 reviews the related literature. Section 3 discusses the data and methodology. Section 5 describes the patterns observed and presents the emerging stylized facts. Section 6 presents the results

and relationships between agglomeration and growth. The last section presents policy implications and suggestions for future research.

## 2 Overview of the literature

This paper is closely related to several strands of literature.

First, the paper builds on the existing economic geography literature that examines domestic agglomeration.<sup>6</sup> The agglomeration of economic activity, long recognized by regional and urban economists and economic historians, is one of the salient features of economic development.

Transaction costs, broadly defined (including the cost of transmitting goods and information), affect not only firms' decisions to geographically separate production tasks but also their decisions to locate next to one another. They also affect firm productivity. Geographic proximity to large firms implies more intense competition in final good, input and factor markets. The competition lowers the prices of final goods and raises input and factor costs which may lead to less successful (productive) firms exiting from the market. Output prices are also key determinants of firms' organization choices and vertical integration (Alfaro, Conconi, Fadinger, Newman, 2016). Agglomeration can also induce costs by, for example, increasing labour and land prices. Firm boundaries affect incentives and thus firm productivity, which in turn affects industry performance.

On the other hand, proximity may imply benefits.<sup>7</sup> Agglomeration economies, which stress the benefits of geographic proximity between individuals or firms in realizing product- and factor-market externalities and technology diffusion, play a particularly important role. These benefits include lower transport costs between input suppliers and final good producers (vertical linkages), labour-market and capital-good-market externalities due to the proximity of firms with similar demand for labour and capital goods (common pool of resources), and technology diffusion thanks to low costs of technology transfer at close distance.

An overview of this vast literature is beyond the scope of our paper; we focus below on empirical studies most closely related to our analysis.<sup>8</sup> An extensive body of

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<sup>6</sup> The New Economic Geography (NEG), initiated by Krugman (1991), studies the incentives and effects of economic agglomeration. See Ottaviano and Puga (1998), Head and Mayer (2004), Ottaviano and Thisse (2004), Rosenthal and Strange (2004), Duranton and Puga (2004), and Redding (2011) for excellent reviews of the literature.

<sup>7</sup> Marshall (1890) first introduced the idea that concentrations of economic factors, such as knowledge, labour, and inputs, can generate positive externalities. Three factors have been emphasised by these studies: market access to suppliers and customers, labour market pooling, and technology spillovers. One set of theories about agglomeration economies study the gains that come from reduced costs of moving goods across space (Krugman, 1991). A second set of theories emphasises labour market pooling and the benefits of moving people across firms (Marshall, 1890). A third set argues that cities speed the flow of ideas, which creates human capital at the individual level and facilitates innovation (Jacobs, 1968). Some of these theories stress the benefits that come from co-location of diverse firms; others emphasize the gains from single-industry agglomerations.

<sup>8</sup> Another important strand of empirical literature concerns one of the key theoretical predictions of new economic geography models. That is, the idea that factor prices should vary systematically across locations with respect to market access. See Redding and Venables (2004) and Hanson (2004).

research examines the distribution of population and production across space and the economic characteristics and effects of spatial concentrations. Important literature in urban economics, led by Ellison and Glaeser (1997, 1999), Rosenthal and Strange (2001, 2003), Duranton and Overman (2005, henceforth DO, 2008), Ellison, Glaeser and Kerr (2009), and Alfaro and Chen (2014, 2019) have examined patterns of agglomeration as a function of industry characteristics. These studies shed light on the role of Marshallian agglomeration forces in explaining cross-industry variation in spatial concentration in function of industry characteristic.

### **Concentration and agglomeration: Europe and U.S.**

The following recent papers evaluate the effects of agglomeration on innovation and productivity in Europe and the U.S.

Evidence on the collocation of industries in the U.S. shows that firms locate near industries that are suppliers or customers (Ellison, Glaeser, and Kerr, 2007).<sup>9</sup> Rosenthal and Strange (2001) find both labour market pooling and input-output linkages to have a positive impact on agglomeration. The effect of knowledge spillovers is also significant, but mostly at the local level.

Several recent studies contribute an understanding of U.S. agglomeration trends since the early 2000s. Buzard et al. (2017) map the zip codes of 1,700 private R&D labs and identify four major clusters in the Northeast Corridor (Boston, New York, Philadelphia, and Washington, D.C.) and three major clusters in California (Bay Area, Los Angeles, and San Diego).

Gutierrez and Philippon (2017) review firm clusters to test two main hypotheses that explain concentration and low investment among U.S. industries – decreasing domestic competition and the efficient scale of operation. By comparing these U.S. industries to Europe, they conclude that the efficient scale of operation cannot be the main explanation for concentration. The paper also conducts tests to show that decreasing domestic competition in the US causes low investment, concluding that it caused a shortfall of non-residential capital of 5-10% by 2016.

Additional studies attempt to measure the impact of agglomeration on industry productivity. For example, Forman, Goldfarb and Greenstein (2016) study the Bay Area's increase in innovation from 4% of all successful US patent applications in 1976 to 16% in 2008, and attribute this growth to co-agglomeration in invention across technologies.

The different areas of focus for these studies highlight various explanations for the relationship between concentration and productivity. Rigby and Essletzbichler (2002) touch on several key explanations. Using U.S. Census data of U.S. metropolitan firms, they present evidence that multiple subfactors of spatial concentration affect

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<sup>9</sup> In a survey of the literature Glaeser and Gottlieb (2009) note there is abundant evidence that manufacturing firms in the U.S. choose location to reduce transport costs, but this does not seem to be an important part of urban comparative advantage today. The urban role in reducing transport costs seems to be more important for service firms. The largest body of evidence supports the view that cities succeed by spurring the transfer of information (skilled industries are more likely to locate in urban areas and skills predict urban success).

productivity in different ways, including input-output linkages, occupational distribution, and embodied technological spillovers.

Andersson, Burgess and Lane (2007) apply a U.S. dataset to quantify the benefits of agglomeration on the matching of workers and jobs, showing positive effects of thicker urban labour markets on assortative matching in terms of worker and firm quality. Using the US Census and National Longitudinal Survey of Youth, Bacolod, Blum and Strange (2009) similarly review impacts of concentration on workers. The authors conclude that agglomeration has a larger impact on wages and productivity for work that requires thinking and social interaction rather than manual labour, thus contributing to the knowledge spillovers theory.

Greenstone, Hornbeck and Moretti (2010) also quantify agglomeration spillovers by tracking the impact of a new “Million Dollar Plant” on the total factor productivity (TFP) of incumbent plants in the same county. Five years after the new plant opening, TFP of incumbent plants in the “Million Dollar Plant” county is 12% higher than TFP of incumbent plants in other counties. Consistent with some theories of agglomeration economies, this effect is larger for incumbent plants that share similar labour and technology pools with the new plant. They also find a relative increase in skill-adjusted labour costs, indicating that the ultimate effect on profits is smaller than the direct increase in productivity.

Ciccone (2002) estimates that agglomeration effects on labour productivity in France, Germany, Italy, Spain, and the UK are slightly smaller than in the US, with an elasticity of labour productivity with respect to employment density of 4.5 percent compared to 5 percent in the US.

Overman and Puga (2009) examine the role of labour market pooling and input sharing in determining the spatial concentration of UK manufacturing establishments. They find sectors whose establishments experience more idiosyncratic employment volatility and use localized intermediate inputs to be more spatially concentrated.

Firms are generally more productive in larger cities. This trend is attributed to two main explanations – agglomeration economies (cities promote interactions) and firm selection (fierce competition weeds out unproductive firms). Several European studies support the agglomeration economies theory. For example, Helmers and Overman (2017) provide evidence that proximity to a large scientific research facility in the U.K. disproportionately benefits institutions that are closer to the infrastructure through improved distribution of knowledge. Additionally, Combes et al. (2012) use French establishment-level data to provide evidence in favour of the agglomeration theory and to challenge the hypothesis that firm selection explains productivity differences.

Fritsch and Changoluisa (2017) find support for the firm selection theory by assessing correlations between new start-ups and productivity. Using evidence across 71 West German planning regions, the study finds that new businesses – not just innovative, technologically advanced firms – induce higher productivity in incumbents. They do not find significant benefits generated by knowledge spillovers



or the provision of better inputs, attributing productivity instead to fiercer market competition.

Similarly, Gordon and McCann (2005) agree that while agglomeration explains innovation dynamics in London, firms do not perceive advantages of informal information spillovers from agglomeration. Their analysis comes from surveys of London firms, so it would be interesting to compare perceived effects with actual effects of knowledge spillovers on productivity.

Alfaro, Conconi, Fadinger and Newman (2018) find the higher domestic prices the more vertically integrated are the firms producing that product in that country. The effect is larger precisely where organizational decisions ought to be more responsive to domestic prices, i.e., for firms that only serve the domestic market. These results suggest that policies that affect product prices can have direct effects on firm organization.<sup>10</sup>

By contrast, the role of firm attributes in shaping the formation of clusters remains mostly unknown.<sup>11</sup> However, the international trade literature has paid particular attention to the role of multinational firms and examined their agglomeration patterns, incentives and implications.

### **Agglomeration, trade and multinationals**

MNCs are likely to exhibit different motives of agglomeration than domestic firms due to their greater revenue and productivity, vertically integrated production, and higher knowledge- and capital-intensities. In contrast to domestic production, which emphasises domestic geography and natural advantage, multinational production stresses foreign market access and international comparative advantage. Moreover, as highlighted in growing literature (e.g., Helpman, Melitz, and Yeaple, 2004; Antràs and Helpman, 2004, 2008; Alfaro and Charlton, 2009; Alfaro and Chen, 2018), the economic attributes and organization of multinationals are, by selection, distinctively different from average domestic firms. Thus, the advantage of proximity can differ dramatically between multinational and domestic firms.

Compared to domestic firms, multinationals are often the leading corporations in each industry, with large volumes of sales and intermediate inputs. Externalities in the movement of workers from one job to another can also affect MNCs, which are characterized by similar skill requirements and large expenditures on worker training. MNCs can have a particularly strong incentive to lure workers from one another because the workers tend to receive certain types of training that are well suited for working in most multinational firms (business practices, business culture, etc.).

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<sup>10</sup> The authors also study the effect of trade policy on the degree of organizational convergence across countries, as the theory suggests that countries with similar domestic price levels should have firms with similar ownership structures. Differences in vertical integration across countries are significantly larger in sectors in which differences in domestic prices to be larger. Differences in vertical integration indices are smaller for country pairs engaged in regional trade agreements. This effect is stronger for customs unions, which impose common external tariffs vis-à-vis non-members and should thus be characterized by stronger price convergence.

<sup>11</sup> Most research, however, has tended to focus on the effects of industry characteristics and regional natural advantage, treating each industrial cluster as a homogeneous entity. Rosenthal and Strange (2003) offer one of the few disaggregated analyses in this area.



Moreover, MNCs' proximity to one another shields workers from the vicissitudes of firm-specific shocks. External scale economies can also arise in capital-good markets.<sup>12</sup> MNCs may also face significant market entry costs when relocating to a foreign country because of, for example, limited supplies of capital goods. An additional motive relates to the diffusion of technologies. Given their technology intensity, technology diffusion from proximity to technologically-linked firms and industries can be particularly attractive to MNCs. Technology can diffuse from one firm to another through the movement of workers between companies, interaction between those who perform similar jobs, or direct interaction between firms through technology sourcing.<sup>13</sup> The literature has found consistent evidence that MNC agglomeration patterns differ from those of their domestic counterparts.

In the field of international trade, the advantage of proximity and low transport costs between customers and suppliers has received particular attention. A number of studies have examined the role of production linkages in multinationals' location decisions (see, e.g., Head, Ries and Swenson, 1995; Head and Mayer, 2004; Crozet, Mayer and Mucchielli, 2004; Blonigen, Ellis and Fausten, 2005; Bobonis and Shatz, 2007; Amiti and Javorcik, 2000). These studies show that MNCs with vertical linkages tend to agglomerate regionally in countries such as the U.S., China, and members of the EU.

A number of studies, including Head, Reis and Swenson (1995) and Blonigen, Ellis and Fausten (2005), exploit the Japanese institution of vertical keiretsu and examine the location interdependence of vertically linked Japanese plants. The evidence suggests that members of the same keiretsu (an informal business group consisting of companies with interlocking shareholders) tend to settle in the same states in the United States. For example, Head, Ries, and Swenson (1995) estimate the location choices of Japanese firms who set manufacturing factories in the U.S. during the period 1980-1992. They find that Japanese investments do not mimic domestic plants; rather, their agglomeration is driven by positive externalities of colocation rather than fundamental forces (such as infrastructure, natural resources, and labour). The authors note that the dependence of Japanese manufacturers on the "just-in-time" inventory system exerts a particularly strong incentive for vertically-linked Japanese firms to agglomerate.

Head and Mayer (2004) study the location choices of Japanese firms in Europe and find that regions with greater market potential (larger number of existing foreign affiliates) are more likely to be selected by multinationals. The authors find fundamental forces (market potential) to matter. In particular, the authors find a 10 percent increase in a region's market potential to increase the likelihood of

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<sup>12</sup> Geographically-concentrated industries offer better support to providers of capital goods (e.g. producers of specialized components and providers of machinery maintenance) and reduce the risk of investment (due to, for example, the existence of resale markets). Local expansion of capital-intensive activities can consequently lead to expansion of the supply of capital goods, thereby exerting a downward pressure on costs.

<sup>13</sup> This has been noted by Navaretti and Venables (2004), who predict that MNCs may benefit from setting up affiliates in proximity to other MNCs with advanced technology (e.g., "so-called centres of excellence"). Affiliates can benefit from technology spillovers, which can then be transferred to other parts of the company.

multinational entry by 3 to 11 percent. However, these forces do not fully explain location choices as they can also be driven by forces of agglomeration.

Crozet, Mayer and Mucchielli (2004) and Bobonis and Shatz (2007) study the determinants of location choices by foreign investors in France and in the U.S., respectively, finding evidence of clustering. The authors find that targeted policies influence foreign investments while regional- or state-level policies do not seem to affect the location of FDI. Crozet, Mayer and Mucchielli (2004) find agglomeration forces to be an important determinant of foreign firm investments in France, while Bobonis and Shatz (2007), using data on the U.S. state-level stock of foreign-owned property, plant, and equipment (PPE), find agglomeration to be an important externality.

Alfaro and Chen (2014, 2019) assess the different patterns underlying the global agglomeration of multinational and non-multinational firms using a spatially continuous index of agglomeration and a unique worldwide plant-level dataset from World Base. The analysis shows that the offshore agglomeration patterns of MNCs are distinctively different from those of their headquarters and their domestic counterparts.

## 3 Data

### 3.1 Firm data cross-country coverage

Our empirical analysis uses a unique worldwide establishment dataset, WorldBase, that covers more public and private establishments in more than 100 countries and territories. WorldBase is compiled by Dun & Bradstreet (D&B), a leading source of commercial credit and marketing information since 1845. D&B---presently operating in over a dozen countries either directly or through affiliates, agents, and associated business partners---compiles data from a wide range of sources including public registries, partner firms, telephone directory records, and public websites.<sup>14</sup>

For each establishment in the dataset, WorldBase reports detailed information on location, ownership, and economic activities. Four categories of information are used in this paper: (i) industry information, including the four-digit SIC code of the primary industry in which each establishment operates; (ii) ownership information, including headquarters, domestic parent, global parent, status (for example, joint venture and partnership), and position in the hierarchy (for example, branch, division, and headquarters); (iii) detailed location information for both establishment and headquarters; and (iv) operational information, including sales, employment, and year started.

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<sup>14</sup> For more information please visit the [D&B website](#). The dataset used in this paper was acquired from D&B with disclosure restrictions. See Alfaro et al. (2016) and Alfaro et al. (2019) for a detailed description of the data.

D&B's WorldBase is, in our view, an ideal data source for the research question proposed in this study. Its broad coverage and detailed plant location information enables us to examine agglomeration on a global and continuous scale. Viewing agglomeration on a continuous scale is important in light of the increasing geographic agglomeration occurring across regional and country borders, as we explain in detail in the next section.<sup>15</sup> In addition, the database reports detailed information for multinational and non-multinational, offshore and headquarters establishments. This makes it possible to compare agglomeration patterns across different types of establishments to investigate how the economic geography of production evolves with different forms of firm organization.

In this paper, we restrict analysis to comparisons between countries in Europe and the United States. Appendix Table 1 lists the countries included. We use the 2004/5 vintage of the dataset to characterize the early years following the adoption of the euro. We then explore related patterns using the 2018/19 vintage, a period post-crisis.<sup>16</sup> We limit the main analysis to manufacturing sectors for tractability.

In terms of the final sample, an establishment is deemed an MNC foreign subsidiary if it satisfies two criteria: (i) it reports to a global parent firm, and (ii) the headquarters or the global parent firm is located in a different country. The parent is defined as an entity that has legal and financial responsibility for another establishment. We drop establishments with zero or missing employment values and industries with fewer than 10 observations.<sup>17</sup>

## 3.2 Geocode information

Using postal code information of each plant in the dataset we obtain latitude and longitude codes for each establishment using different methods.

We obtained data from the Geocoding Databases for Europe, a database that includes latitudes and longitudes of cities and postcodes of most European countries for free download and from GeoNames, a website containing geographic information on every country.<sup>18</sup> We also use Google's Geocoding API software, well known as an industry standard for transportation data, to verify the data. The software provides more accurate geocode information than most alternative sources.

We apply the Haversine formula to the geocode data to compute the great-circle distance between each pair of establishments. We limit the analysis to firms within a given 3-digit manufacturing sectors for computational reasons.

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<sup>15</sup> Examples of cross-border clusters include the metalworking and electrical-engineering cluster involving Germany and German-speaking Switzerland; an electric-machinery cluster involving Switzerland and Italy; a biotech cluster spreading across Germany, Switzerland, and France; an automobile industry cluster that crosses the border of Germany and Slovakia; the Ontario-Canada-Michigan-US (Windsor-Detroit) auto cluster; and the South US-Northeastern -Mexico cluster.

<sup>16</sup> D&B WorldBase vintage 18/19, obtained from Bisnode Deutschland GmbH, Darmstadt.

<sup>17</sup> Requiring positive employment helps to exclude establishments registered exclusively for tax purposes.

<sup>18</sup> The websites are [Clearly and Simply](#) and [GeoNames](#), respectively.

### 3.3 Additional data

We examine activity at the regional, rather than country level, and include a series of regional characteristics such as market size, natural and comparative advantages as additional regressors to capture the effect of regional location fundamentals.

For Europe, the data was compiled from the Eurostat Regional Database at the NUTS 2 level of disaggregation. For the U.S., we obtained information at primarily the state or province level.<sup>19</sup>

The regional characteristics systematically available across countries and included in our final sample are GDP per capita, population density, schooling (percentage of labour force with more than secondary education), all measured in 2004 or the closest year available (to mitigate causality concerns). For the new vintage we use data close to 2016 or the closest available. We also include regional R&D expenditure. We use the OECD STAN data and NBER-CES Manufacturing Industry Database to construct industry capital and skilled-labour intensities, which are defined as, respectively, the ratio of investment and of non-production workers' payrolls to value added.<sup>20</sup> Each industry's R&D intensity is measured using the median firm's ratio of R&D expenditure relative to value added based on the COMPUTSTAT database.<sup>21</sup>

## 4 Methodology

In this section, we describe the empirical methodology we use to quantify the global agglomeration of firms.

We compute plant-level agglomeration densities to measure the degree to which a plant is proximate to other plants following an empirical methodology introduced by Duranton and Overman (2005) and extended in Alfaro and Chen (2014, 2019). The index contains information on the extent of localization by industry and the spatial scales at which it takes space. In contrast to traditional indices, which tend to define agglomeration as the amount of activity taking place in a particular geographic unit, this spatially continuous index separates agglomeration from the general geographic

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<sup>19</sup> For the U.S., population and education attainment data were collected from the U.S. Census; GDP and income/compensation statistics were collected from the Bureau of Economic Analysis; roadway statistics were from the Federal Highway Administration; employment data was collected from the Bureau of Labour Statistics, all at the state level. Port data was from World Port Source, and tax rates were compiled from Ernst and Young, Deloitte, KPMG, and the World Bank's Doing Business report.

<sup>20</sup> In additional robustness we also use upstreamness (average distance from final use) measures from Antràs and Chor (2013).

<sup>21</sup> Constructing the proxies of agglomeration economies using the U.S. industry account data is motivated by three considerations. First, compared to firm-level input-output, factor demand, or technological information, industry-level production, factor and technology linkages reflect standardized production technologies and are relatively stable over time, limiting the potential for the measures to endogenously respond to agglomeration. Second, using the U.S. as the reference further mitigates the possibility of endogenous production, factor, and technology linkage measures, even though the assumption that the U.S. production structure carries over to other countries could potentially bias our empirical analysis against finding a significant relationship. Third, the U.S. industry accounts are more disaggregated than most other countries', enabling us to dissect linkages between disaggregated product categories.

concentration and is unbiased with respect to the scale of geographic units and the level of spatial aggregation.

As noted in Head and Mayer (2004b), measurement of agglomeration is a central challenge in the economic geography literature. There has been a continuous effort to design an index that accurately reflects the agglomeration of economic activities.

Most existing indices have tended to equalize concentration and colocation with activities located in the same administrative or geographic region (measured by the number of firms or the size of production in the region). Three issues arise with these measures. First, these indices can be strongly driven by industrial concentration. Industries with a small number of establishments may appear spatially concentrated when they are not. Second, many indices cannot separate general geographic concentration due to location attractiveness from agglomeration. Manufacturing plants can be attracted to the same location because of location characteristics but this is interpreted as agglomeration. The index developed by Ellison and Glaeser (1997) provides a solution to the above two issues.

Duranton and Overman (2005)<sup>22</sup> address the unresolved issue of the dependence of the existing indices on the level and method of geographic disaggregation, and develop a “continuous-space concentration index”. By equating concentration with activities in the same region, previous indices omit concentrated activities separated by administrative or geographic borders while overestimating the degree of concentration within the same administrative or geographic units.

DO’s index thus exhibits several properties essential to agglomeration measures. It is comparable across industries and captures cross-industry variation in the level of agglomeration. The index controls for industrial concentration within each industry. Its construction is based on a counterfactual approach and controls for the effect of location factors (such as market size, natural resources, and policies) that apply to all manufacturing plants. By taking into account spatial continuity, the index is unbiased with respect to the scale and aggregation of geographic units. In addition, the index offers an indication of the statistical significance of agglomeration. The estimated parameters of the variables represent the net effect, costs and benefits, of similar factor demand structures on agglomeration decisions.

However, the construction of this index poses two constraints. First, the index requires detailed physical location information for each establishment. As described above, the WorldBase dataset, supplemented by a geocoding software, satisfies this requirement. Second, the approach is extremely computationally intensive, especially for large datasets.

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<sup>22</sup> Duranton and Overman (2005), DO, construct an index to measure the significance of agglomeration in the U. K. DO’s index has been adapted by other studies such as EGK’s measurement of the agglomeration of U.S. pairwise industries.

## 4.1 Agglomeration indices

The empirical procedure to construct the agglomeration index has three steps.

In the first step, we estimate an actual geographic density function for each establishment in a given industry based on the distance to every other plant in the same industry that was established after the establishment date of the incumbent plant. In the second step, we obtain counterfactual density functions based on establishments in the same industry to control for factors that affect all plants in the industry. In the last step, we construct the agglomeration index to measure the extent to which an establishment in a given industry attracts agglomeration at a threshold distance relative to the counterfactuals.

### Step 1: Kernel estimator

We first estimate an actual geographic density function for each establishment in a given industry.

We obtain for each establishment  $i$  with primary industry  $k$ , the kernel estimator of bilateral distances at any point  $d$  (i. e.,  $f_i(d)$ ). Formally, we obtain

$$f_i(d) = \frac{1}{n_i h} \sum_{j: \text{density}_k(T) > 0} K\left(\frac{d - d_{ij}}{h}\right) \quad (1)$$

where  $n_i$  is the cardinality of  $i$ 's industry cluster,  $h$  is bandwidth, and  $K$  the kernel function. All kernel estimates are calculated using a Gaussian kernel with the bandwidth set to minimize the mean integrated squared error.

Note that even when the locations of nearly all establishments are known with a high degree of precision (as is the case with the data we use, as described below), distance---and estimated trade cost---is only an approximation of the true trade cost between establishments. One source of systematic error, for example, is that the travel time for any given distance might differ between low- and high-density areas. Given the potential noise in the measurement of trade costs, we follow DO in adopting kernel smoothing when estimating the distribution function. We limit the analysis to firms within the same 3-digit sector to ease the computation burden.

### Step 2: Counterfactuals

In the second stage, we construct a counterfactual kernel estimator for each establishment, i.e.,  $\bar{f}_i(d)$ . Here we use the mean kernel estimates of each industry as the counterfactual. This enables us to control for all factors common to establishments in the same industry and to focus on each establishment's deviation from its average counterpart.

We compare the kernel estimators at various distance thresholds. We focus on 50km but we also considered lower thresholds (10, 20) and higher distance thresholds, such as 200, 400, and 800 km.

### Step 3: Agglomeration density

Finally, we construct the density index for each establishment, i.e.,

$$density_i(T) \equiv \sum_{d=0}^T (f_i(d) - \bar{f}_i(d)). \quad (2)$$

This index captures the relative probability that other establishments agglomerate with  $i$ , as opposed to  $i$ 's counterfactuals, within distance  $T$ .

Establishments with the greatest density are the hubs of each cluster whereas those with relatively low densities emerge in the periphery.

## 4.2 Empirical procedure

With the plant-level agglomeration densities at hand, we measure the degree to which a plant is proximate to other plants and examine how plant characteristics (such as productivity, ownership structure, size, age and the number of products), and industry characteristics (such as capital intensity, skilled-labour intensity, and R&D intensity) might jointly explain the extent of agglomeration centred around each plant.

We run the following specification:

$$Density_i(T) = \alpha + \beta\theta_i + \gamma Z_r + D_k + \varepsilon_i \quad (3)$$

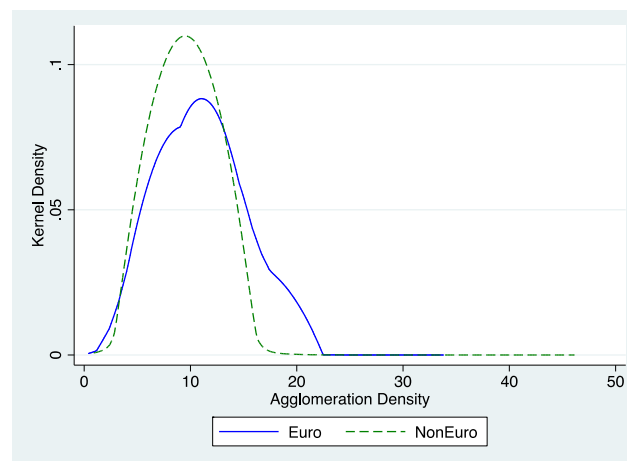
where  $Density_i(T)$  is the estimated density of establishment  $i$ 's network that captures the probability of other establishments agglomerating around  $i$ , as opposed to  $i$ 's counterfactuals in the same host country and industry, within a threshold distance  $T$ . We obtain estimates of  $Density_i(T)$  based on the previously methodology for different thresholds (50, 100, 200, 400 km). For our baseline results, we report the estimation results based on plant-level agglomeration indices at 50 km.

On the right-hand side of equation (3) we use labour productivity as our main measure of firm performance. We include a vector of industry dummies, represented by  $D_k$ , to control for industry specific factors. We include series of geographical controls  $Z_r$ , to control for regional variables. This enables us to focus on the effect of heterogeneity in determining the extent of agglomeration.

**Figure 1**

Densities Across Regions: Euro and Non-Eurozone countries

(Kernel Density (%): Agglomeration at 50km)



Sources: Authors calculation using WorldBase.

Notes: Plant-level agglomeration density distributions for Euro and Non-Euro countries at 50k.

Figure 1 compares the distributions for countries in the European Union showing the euro countries to have higher mean density. The distribution for euro countries also shows more dispersion and a “hub and spoke” pattern. Fatter tails may be associated with higher economic activity and value added firms reach higher productivity thresholds. Table 2a provides main descriptive statistics of the agglomeration indices by region. The plant-level agglomeration index captures the probability relative to the industry average to get an entrant in the same 3-digit sector within less than T km from the location of the incumbent. Because the relative entry probability has a low baseline value, we scale the percentages by 100 for better readability.<sup>23</sup> Two stylized facts emerge from the Table. The mean agglomeration density at 50 km is 2.9<sup>24</sup> in the U.S., 11.6 in the Eurozone and 14.6 in the rest of Europe. Europe features more agglomeration compared to the U.S. For example, when comparing 20km and 50km indices, mean agglomerations nearly double in all regions.

Tables 2b and 2c provide summary statistics for the main variables of analysis. Our main explanatory variable of interest will be plant performance, measured as labour productivity (in U.S. Dollars). Figure 2 shows the distribution of plant-level log labour productivity across different regions. Labour productivity is approximately log normal both in Europe and in the U.S. In our sample, plant-level labour productivity in manufacturing is slightly larger in Europe than in the U.S. Within Europe, the Eurozone has significantly more productive plants than the rest of Europe, where plants have on average lower productivity than in the U.S.

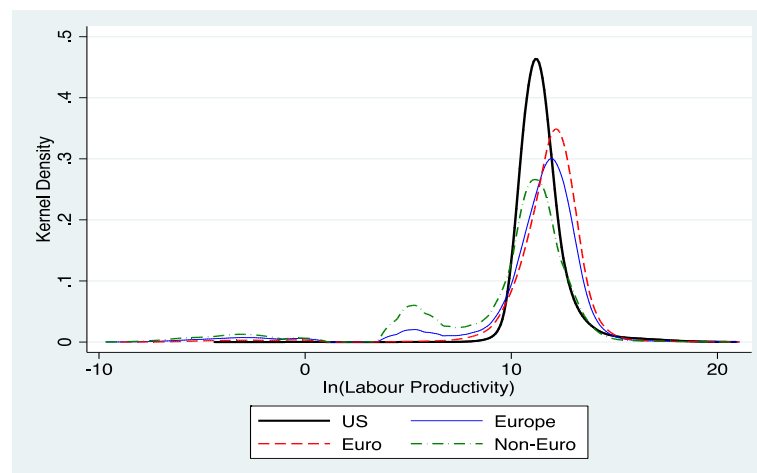
<sup>23</sup> The scale of the agglomeration index is driven by the scope of the dataset and the empirical methodology. Because we consider new entry and take into account the distance of all establishment pairs across continents, kernel estimates at each distance level will be low.

<sup>24</sup> This corresponds to 0.03, 0.12 and 0.14 percentage points, respectively. The estimates can be interpreted as follows, for one hundred entrants, what is the probability of having at least one at 50km (then axis represents percentage points).



**Figure 2**  
Productivity: Densities Across Regions

(Kernel Density (%): Ln(Labour Productivity))



Sources: Authors calculation using WorldBase.  
Notes: Ln(labour productivity) density distributions for U.S, Europe Euro and Non-Euro countries.

## 5 Results

### 5.1 Agglomeration and firm performance

We first investigate the relationship between the density of economic activity within a 50-kilometer distance around the location of the plant (within a given 3-digit sector) and plant-level characteristics. The role of firm size in fostering economic activity as measured by productivity is well established in the literature (Mayer and Ottaviano, 2007; Redding, 2011). More productive are more likely to compete successfully and expand abroad. We also control for multinational status and firm complexity (proxied by multiproduct firms). We run the following regression at the plant level:

$$Density_{i,k}(T) = \beta_1 performance_i + \beta_2 multinational_i + \beta_3 \log(age_i) + \beta_4 multiproduct_i + \gamma'X_r + \delta_k + \varepsilon_i \quad (4)$$

where  $performance_i$  is  $\log(\text{labour productivity})$ ,  $multinational_i$  is a dummy for multinational affiliate,  $multiproduct_f$  is a dummy for the plant being active in multiple 4-digit industries,  $age_i$  is calculated from the year started information in the dataset,  $\delta_k$  is a 3-digit industry fixed effect. The industry fixed effects control for differences in industry factors which may affect the relationship between regional economic density and plant performance. Finally,  $X_r$  is a vector of region controls, that includes, regional population density and per-capita GDP, the fraction of the population who have successfully completed post-secondary education in the regional population and regional R&D spending (in logs). These regional variables control for fundamental factors, as well as policies that may affect regional productivity and thereby impact both on economic activity and firm performance.

To allow for geographic heterogeneity of the effects, we always estimate the regressions separately for four macro regions: the U.S., Europe, and we also separate Europe into the Eurozone and other European economies.

We first present results for log(labour productivity) as a measure of firm performance (Tables 3a and 3b). We find that the degree of agglomeration varies sharply across plants in the same industry. At 50 km, labour productivity matters. Both in the U.S. and in Europe (even though the relationship is weaker), there is a positive association between the density of economic activity and plant-level (log) labour productivity. Plants with larger labour productivity tend to attract significantly more agglomeration. However, within Europe there is a stark difference between Eurozone countries, where the association between labour productivity and agglomeration is very strong and non-Eurozone countries, where this relationship is much weaker, unless a full set of regional controls is included. In terms of economic magnitudes, a one-standard-deviation change in log labour productivity, is associated with an increase in economic density by around 0.05 standard deviations in the U.S., 0.1 standard deviations in the Eurozone and 0.005 standard deviations in the rest of Europe.<sup>25</sup>

There is also more agglomeration around older firms in the U.S. and in the Eurozone. The age control is positive in the U.S. and in the Eurozone but negative in Europe outside of the Eurozone. Finally, the number of products produced by each plant has a significant effect on agglomeration. There is more agglomeration around multiproduct more complex firms.

### Multinational firms

Similarly, both in the U.S. and in Europe, there is more agglomeration of economic activity around affiliates of multinational companies and the effect is of similar magnitude in both regions. Again, this similarity hides substantial heterogeneity within Europe. While the association between agglomeration and the plant's multinational status is positive and large in the Eurozone, the same relationship is negative outside of the Eurozone, i.e. in non-Eurozone Europe, multinationals attract less agglomeration. In terms of economic magnitudes, in the U.S. multinational status of the plant is associated with a 0.22 standard-deviation increase in agglomeration. In the Eurozone, the increase in agglomeration corresponds to 0.37 standard deviations of agglomeration, while in Europe outside of the Eurozone multinational status is associated with a decrease in agglomeration of 0.35 standard deviations.<sup>26</sup>

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<sup>25</sup> These numbers are based on the coefficients from the first specification for each region and are computed using the standard deviations of the explanatory and dependent variables reported in Appendix Table 1a. In particular,  $0.05 = 0.09 * 1.05 / 1.72$  for the US,  $0.1 = 0.24 * 2.13 / 5.2$  for the Eurozone and  $0.005 = -0.005 * 4.16 / 4.32$  for the rest of Europe.

<sup>26</sup> These numbers are based on the coefficients from the first specification for each region and are computed using the standard deviations of the dependent variables reported in Appendix Table 1.a. In particular,  $0.22 = 0.38 / 1.72$  for the US,  $0.37 = 1.93 / 5.2$  for the Eurozone and  $-0.35 = -1.57 / 4.32$  for the rest of Europe.

**Finding 1: There is more agglomeration of economic activity around more productive plants, in particular in the U.S. and in the Eurozone.**

**Finding 2: There is more agglomeration of economic activity around affiliates of multinationals, in particular in the U.S. and in the Eurozone, but not in Europe outside of the Eurozone.**

In Table 4 we show that the above results are robust to measuring the density of economic activity using a 100-kilometer or 200-kilometer distance around the plant instead of using a 50-kilometer distance.

### Superstar firms

Next, we test if “superstar” firms, defined as plants that are within the top 5% or top 1% of the labour productivity distribution within a given 2-digit sector within each region,<sup>27</sup> attract additional agglomeration compared to more productive plants. We thus add to our previous specification a “superstar” dummy that equals one if a given plant belongs to the top 5% of labour productivity in a 2-digit sector. (We also use a top 1% cut-off in an alternative specification, which delivers similar results. Results available upon request.).

The regression specification is now given by:

$$\begin{aligned} \text{Density}_{i,k}(T) = & \beta_1 \text{performance}_i + \beta_2 \text{multinational}_i + \beta_3 \log(\text{age}_i) \\ & + \beta_4 \text{multiproduct}_i + \beta_5 \text{superstar}_i + \gamma' X_r + \delta_k + \varepsilon_i \end{aligned} \quad (5)$$

The results of this specification are presented in Tables 5a and 5b. In the U.S., the superstar dummy is positive and significant, indicating that superstar plants attract additional agglomeration compared to plants that are simply more productive (around 0.08 standard deviations more agglomeration). Similarly, in Europe superstar status is also associated with additional agglomeration but this hides heterogeneity. In the Eurozone, the superstar dummy is positive, highly significant and very large (it corresponds to an around 0.33 standard-deviations increase in agglomeration). Around half of the superstar effect is driven by multinationals, as can be seen from the next column, where the superstar-dummy decreases from 1.2 to 0.6 once we add the multinational dummy. This result suggests that smaller plants decide to agglomerate towards highly productive plants, in particular affiliates of MNCs, and that the benefits of being close to these more internationalized firms outweigh the costs. However, this is not the case for plants outside of the Eurozone, where the association between superstars and agglomeration is strongly negative.

**Finding 3: There is more agglomeration of economic activity around superstar plants in the Eurozone and in the U.S. There is less agglomeration of economic activity around superstar plants in Europe outside of the Eurozone.**

Overall, the association between plant performance and agglomeration is stronger in the U.S. and in the Eurozone compared to Europe outside of the Eurozone,

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<sup>27</sup> We calculate supersize firms for U.S., Europe, Eurozone and non-Eurozone countries.

indicating that plants in the first two regions benefit more from spillover effects than their high-performance competitors.

## 5.2 Agglomeration, regional policies, and firm performance

We now address the question of whether regional policies, such as investment in human capital or R&D spending, are associated with more agglomeration of economic activity or if these effects are driven more by standard agglomeration forces such as population or income.

Looking again at Tables 3a and 3b, we add regional control variables in column 3. First, note that these regional variables explain a major share of the variation in agglomeration. The R-squared of the first two specifications, which include only plant-level controls and industry dummies, is around 0.05 to 0.3, i.e. these variables explain around 5 to 30 percent of the variance of plant-level agglomeration. When adding the regional controls, the R-squared increases to between 0.3 and 0.7 so that these regional variables explain an additional 15 to 40 percent of the variation in agglomeration across plants.

Focusing on the role of individual regional variables, the association between income per capita and agglomeration is weak in the U.S. and in the Eurozone and not statistically significant. By contrast, the relationship is negative in Europe outside of the Eurozone, where richer regions attract significantly less agglomeration.

Moreover, in all macro regions there is a positive relationship between population density and agglomeration, even though it is less significant in the Eurozone than in the U.S. and in Europe outside of the Eurozone. In terms of economic magnitudes, a one-standard-deviation increase in regional population density is associated with a 0.7 standard-deviation increase in agglomeration in the U.S., while these effects are weaker in Europe (0.03 s.d. in the Eurozone, and 0.25 s.d. in the rest of Europe).

In terms of policy variables, both regional human capital and R&D investment have significant effects on agglomeration. The association between the fraction of the population with post-secondary education and agglomeration is negative in all regions and statistically significant in the U.S. and in Europe outside of the Eurozone: a one-standard-deviation increase in this variable reduces plant-level agglomeration by 0.17 standard deviations in the U.S., by 0.28 standard deviation in the Eurozone and by 0.3 standard deviations in the rest of Europe.

Finally, regional R&D spending has no significant impact on agglomeration in the U.S., while the same variable is highly positively correlated with agglomeration in Europe. Separating again the Eurozone from the rest of Europe, we see that results for Europe are driven by the Eurozone economies. In terms of economic magnitudes, a one-standard-deviation increase in regional R&D spending is associate with a 0.2 standard-deviation decrease in agglomeration in the U.S., a remarkable 2 standard-deviation increase in the Eurozone and a 0.08 standard deviation increase in the rest of Europe.

Overall, regional R&D investment plays a prominent role in explaining differences in agglomeration across European regions, while regional variation in human capital is a more important driver of agglomeration in the U.S.<sup>28</sup>

**Finding 4: Higher levels of regional human capital are associated with less agglomeration of economic activity in manufacturing in all macro regions (the U.S., Eurozone, and rest of Europe). Higher levels of regional R&D spending are associated with more agglomeration in manufacturing in Europe, in particular, inside of the Eurozone.**

Next, we investigate the role of regional variables in attracting agglomeration around high-performance plants. To this end, we augment our previous specification by interacting firm performance measures with regional variables. In particular, we compare interactions of firm-level (log) labour productivity with population density, GDP per capita, post-secondary schooling, and regional R&D spending (in logs). We first add the regional variables and their interaction with firm performance one by one and then include them simultaneously in the regressions. The modified regression specification is:

$$Density_{i,k}(T) = \beta_1 performance_i + \beta_2 multinational_i + \beta_3 \log(age_i) + \beta_4 multiproduct_i + \beta_5 performance_i X_r + \gamma' X_r + \delta_k + \varepsilon_i \quad (6)$$

The results of this specification are presented in Tables 6a and 6b.

We emphasise here the role of policy variables by first focusing on regional human capital. The direct impact of post-secondary schooling is negative in all macro regions except for the Eurozone (at least in the specifications including all region controls), whereas the interaction of regional human capital with plant-level labour productivity varies across regions. It is negative in the U.S. and Eurozone and positive in the rest of Europe. Thus, while in the U.S. and Eurozone a higher level of regional human capital is associated with relatively less agglomeration around highly productive plants, in Europe outside of the Eurozone it induces relatively more agglomeration around high-performance plants.

Turning to regional R&D spending, the direct impact of regional R&D on agglomeration is positive in the U.S. and eurozone and negative in the rest of Europe. The sign of the interaction term with labour productivity varies across regions as well: it is negative in the U.S. and in the Eurozone and positive in Europe outside of the Eurozone. Hence, higher regional R&D spending is associated with comparatively weaker agglomeration effects around high-productivity plants in the

<sup>28</sup> As noted by Trichet (2019): “If there is no doubt that the single currency offers additional new economic opportunities and additional new potential for growth to all member countries, it clearly doesn’t mean that belonging to a single currency is a guaranty to attaining the highest-level GDP per capita. ... a State economic success still depends heavily on the quality of the economic management, on the progress made in terms of productivity and on the level of investment ...”

U.S. and in the Eurozone and more agglomeration around high-productivity plants in Europe outside of the Eurozone.<sup>29</sup>

In Tables 7a and 7b we repeat the same specifications using interactions with superstar dummies. Again, the results are similar.

**Finding 5: Better location fundamentals lower the gains from, and hence the incentives of, agglomeration, especially around superstars.**

### 5.3 Agglomeration, firm performance and sector characteristics

We now investigate how sector characteristics affect agglomeration. In particular, we focus on the sectoral intensity in non-production workers over value added (a proxy for skill intensity), R&D intensity, and capital intensity (measured as investment over value added). Thus, instead of including sector fixed effects, we first directly control for these sector characteristics. The regression specification is now given by:

$$\begin{aligned} \text{Density}_{i,k}(T) = & \beta_1 \text{performance}_i + \beta_2 \text{multinational}_i + \beta_3 \log(\text{age}_i) \\ & + \beta_4 \text{multiproduct}_i + \gamma' X_r + \mu' s_k + \varepsilon_i \end{aligned} \quad (7)$$

where  $s_k$  is the characteristic of sector  $i$  (skill intensity, R&D intensity, and capital intensity).

Results for each macro region are reported in the first two specifications of Tables 8a and 8b.

The first specification only includes firm and sector controls, while the second one adds regional controls. As is obvious from the R-squared of these specifications, firm and sector characteristics explain only 2 to 19 percent of the variation in agglomeration across firms, while regional characteristics mostly account for the major share of the variation in this variable. Thus, while sector characteristics are not that important for explaining variation in agglomeration patterns, they do have some impact on agglomeration.

We first discuss the role of R&D intensity in agglomeration. The coefficient of this variable is negative in the U.S. and in Europe outside of the Eurozone, indicating that more R&D-intensive sectors attract less agglomeration in these regions. Inside the Eurozone, this variable has no significant effect on agglomeration. The impact of higher skill intensity is also heterogeneous across regions; while more skill-intensive sectors attract less agglomeration in the U.S., the opposite is the case in Europe, both inside and outside of the Eurozone. Finally, more capital-intensive sectors

<sup>29</sup> Among other variables, tax policy positively correlates with agglomeration in Eurozone countries (not significant) while it has a negative and significant correlation in non-Euro countries. In all regions, firms tend to agglomerate more in urban areas than in intermediate and rural ones.

feature greater agglomeration, as indicated by the positive significant coefficients on sectoral capital intensity.<sup>30</sup>

**Finding 6: More capital-intensive sectors attract more agglomeration in all regions and more skill-intensive sector attract more agglomeration in Europe, particularly in the Eurozone.**

Next we turn to the question of how sector characteristics interact with plant performance in shaping agglomeration patterns. We thus modify our regression specification and include an interaction term between plant performance and sector characteristics:

$$Density_{i,k}(T) = \beta_1 performance_i + \beta_2 multinational_i + \beta_3 \log(age_i) + \beta_4 multiproduct_i + \beta_5 performance_i s_k + \gamma' X_r + \delta_k + \varepsilon_i \quad (8)$$

where  $s_k$  is the characteristic of sector  $i$  (skill intensity, R&D intensity, capital intensity). The direct impact of sector characteristics is absorbed by the sector fixed effects.

Results for these regressions are presented in the third, fourth and fifth specifications of Tables 8a and 8b. These results, however, need to be analysed with caution as they tend not to be significant to a full specification of fixed effects, and better proxies may be warranted.<sup>31</sup> Focusing on R&D intensity, for example, we find that the interaction term between plant-level labour productivity and R&D intensity is not statistically significant in most specifications, albeit positive for the eurozone. Further disentangling the role of private and public research may be an interesting venue for future research.

## 5.4 Post crisis period: shocks and agglomeration

Shocks can have heterogeneous effects on the distribution of firm performance. For example, if shocks reduce trade barriers, they can increase firm dispersion and the share of highly productive firms and superstars.<sup>32</sup> To illustrate the effects of shocks on firm distribution, we look concretely at the evolution of agglomeration in Europe after the Global Financial Crisis. The Crisis can be considered a negative shock by increasing costs, broadly defined.

<sup>30</sup> When analysing the relation with the distance to final goods, firms with higher upstreamness tend to agglomerate relatively more, while more productive firms tend to agglomerate relatively less.

<sup>31</sup> Comparing industries at 2 digits, firms tend to agglomerate around manufacturing sectors more linked to natural resources sectors (e.g. wood/furniture in Europe, tobacco/textiles in US.) with somewhat stronger effects in the US. There is strong agglomeration around capital intensive industries (chemicals, rubber, metals and machinery, etc.) and transportation in particular in the Eurozone regions.

<sup>32</sup> For example, Altomonte et al. (2007) compare Italian firm productivity distribution in 1997 and in 2004 following the introduction of the euro. The distribution had fatter tails in 2004 and a relative hollowing of the intermediate range of productivity levels, suggesting that the share of firms above the performance threshold on the global markets had likely increased. Note that overall effects may be non-linear given the different forces and reductions in competition can temper overall positive effects, as noted by Guitierrez and Phillipon (2017).

The 2008-09 Global Financial Crisis was notable for its speed, severity, and international span. The Crisis, triggered by a liquidity shortfall in the U.S. banking system in 2007, soon spread to non-financial sectors and economies around the world. Many countries experienced substantial declines in output, employment, and trade.

The contraction in the Eurozone countries has been particularly long lasting, as the financial crisis soon became a sovereign debt one. European firms faced large additional macro-economic shocks as the Global Financial Crisis hit European banks and markets. Many European countries slid into sovereign debt problems. Industrial production and merchandise trade in the European Union declined and the unemployment rate soared. In 2008, the ECB announced that it would lend as much as needed at a fixed rate tender and expanded the options for collateral. It also cut its primary policy rate from 4.25% to 1%. The ECB created the Securities Market Program (SMP), allowing it to purchase government debt in the secondary market. In 2010 the European Financial Stability Facility (EFSF) was created to provide financial assistance to Eurozone countries experiencing economic crises.

Bekes et al. (2017) document substantial differences in country, industry and firm performances in the Eurozone countries. In particular, the authors document great declines in performance by Spanish firms, while Austrian and German firms suffered relatively smaller contractions.<sup>33</sup> In Italy, the Crisis led to a deep and long recession, leading to an increase of non-performing loans and prolonged contraction of bank credit (Schivardi et al. 2017).

In order to analyse the effects of the Crisis, we use firm-level data from D&B for 2018 and rerun equation (4). We present results for (log) labour productivity as a measure of firm performance in Table 9, columns (1)-(4). Within Eurozone countries, there continues to be a strong and positive association between the density of economic activity and plant-level (log) labour productivity. Plants with greater labour productivity tend to attract significantly more agglomeration. Smaller firms continue to agglomerate around more productive firms as well as multinationals, firms which tend to be centrally placed in the technology and ownership networks. The relation is now negative for countries outside the euro area.

Columns (5)-(8) show results of running equation (5), which adds the super-productive firms dummy using the recent vintage of the data. More productive firms in Europe attract additional agglomeration. However, the relation of superstar status seems to be weaker. If we consider the Crisis a shock that increased trade barriers, broadly defined, one may expect a reduction in the share of high performers, with potential effects on agglomeration around these firms. Moreover, within Europe there is a stark difference between Eurozone countries hit by the Crisis (Greece, Italy, Ireland, Spain, and Portugal) and the rest of the Eurozone countries. Column (6) shows the association between labour productivity of superstar firms and

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<sup>33</sup> The Spanish economy witnessed an unprecedented boom-bust cycle over the 2003-2013 period, both in terms of real activity and credit. Credit supply shock had a sizable direct and downstream propagation effects on investment and output throughout the period, especially during the 2008-2009 Global Financial Crisis (Alfaro et al., 2018).



agglomeration to be insignificant for countries not particularly hit by the Crisis. However, in countries that were strongly affected by the Crisis (Ireland, Italy, Greece, Spain and Portugal) and non-Eurozone countries, the relation is negative and significant. Smaller plants, however, continue to agglomerate towards MNCs.

**Finding 7: The Global Financial Crisis, seen as a negative shock, was association with lower agglomeration around high-productivity plants and superstars in crisis countries.**

## 6 Agglomeration and growth

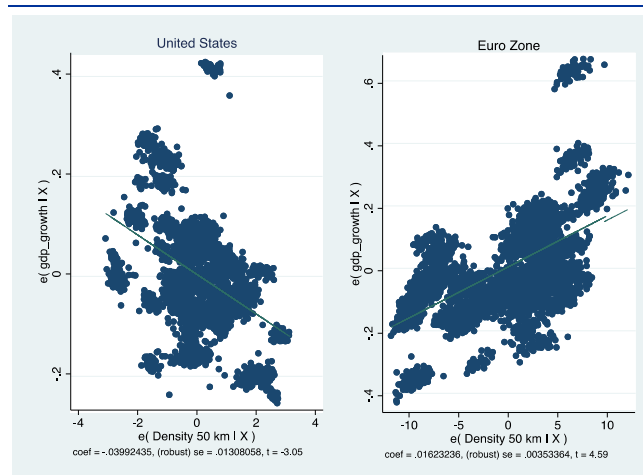
After having investigated the role of plant performance and regional policies for agglomeration, we now briefly investigate the relationship between regional agglomeration and growth. To this end, we average our firm-level agglomeration index at 50 km at the industry-region level (either taking simple averages or sales-weighted averages). We also compute regional average GDP growth rates between 2005 and 2017 for each European NUTS2 region and each U.S. province and run the following regression at the region level:

$$growth_r = \beta \text{Density}_{k,r} + \gamma' X_r + \delta_k + \varepsilon_{k,r} \quad (9)$$

We add a set of regional controls measured in the initial year 2004: the level of GDP per capita, population density, the fraction of the population with more than secondary education and R&D expenditure. As we showed before, these regional controls are correlated with agglomeration and are potentially also drivers of GDP growth. The regression also includes sector fixed effects. Since the dependent variable varies only at the regional level, while the explanatory variable of interest varies at the industry-regional level, we cluster standard errors at the region level. Omitted variables are, of course, a concern, and one should be careful not to interpret these relationships as causal.

Results are presented in Table 10 and Figure 3. Some interesting patterns emerge. In the U.S., regional GDP growth correlates negatively with agglomeration, while the same relationship is positive in Europe. In the U.S., a one-standard-deviation increase in agglomeration leads to a 6-percentage-point reduction in total regional growth over the 12-year period. The association between growth and agglomeration is particularly strong within the Eurozone, where a one-standard-deviation increase in agglomeration is associated with a 6-percentage-point increase in growth. Outside of the Eurozone, the effect of a one-standard deviation increase in agglomeration is only around half as large (3 percentage points). Thus, higher levels of agglomeration in manufacturing are associated with faster regional GDP growth in Europe but not in the U.S. This may, of course, reflect the fact that in the U.S. regions specializing in manufacturing were overall in decline during the 2000s, while some of the most strongly performing regions in core Europe heavily specialized in manufacturing.

**Figure 3**  
Agglomeration and Growth



Sources: WorldBase, Eurostat, US Census and BEA.  
Notes: Partial correlation plots for the United States, from column (2) and for Eurozone, column (4), of Table 10.

## 7 Conclusion

*“The long-term goal of Europeans should be to run optimally their single currency economy, avoiding the kind of sustained divergences that created the sovereign risk crisis and, at the same time, to give all their chances to member countries and to the area as a whole to catch up in terms of job creation and standard of living.” Trichet (2019)*

Competitiveness and growth are crucial for the sustainability of the European project (Altomonte et al., 2012). Over the long run, productivity growth is sustained by “leading firms’ experimentation with new ideas, the broad diffusion of advanced technologies and business practices and the reallocation of scarce resources to their more productive uses” OECD (2017). Healthy dynamic clusters are key. Marshall (1890) first introduced the idea that concentrating economic factors, such as knowledge, labour and inputs, can generate positive externalities. It is not the mere presence of large, productive, or internationalized firms, but rather their agglomerative tendencies that are increasingly important to understand in order to shape policies accordingly.

Our analysis shows that firms, including multinationals, are far from equal within each industrial cluster. Some firms are significantly more centred than others. Different groups of factors aid in explaining the heterogeneous level of agglomeration across firms. First, firm characteristics matter. Larger and more productive establishments are centred with more agglomeration than their smaller, less productive counterparts, in particular in the U.S. and in the Eurozone. Agglomeration around superstar plants is most pronounced in the Eurozone. In the non-Eurozone European countries, superstar plants actually attract less agglomeration. In the U.S. and in the Eurozone, MNC establishments also attract

significantly more agglomeration than domestically-owned plants, while in Europe outside of the Eurozone this is not the case.

Overall, in the U.S. and Eurozone there is more agglomeration around high performance plants (particularly multinationals), reflecting greater potential spillovers from leading firms due perhaps to the more skill- and capital-intensive activities engaged by firms in these regions. In contrast, the economic activities of superstar firms are more likely to be unskilled-labour intensive outside of the Eurozone, limiting the scope of agglomeration economies.

Regional attributes also play an important role. Regions with different levels of economic development including education and technology exhibiting distinct agglomeration patterns. Specifically, we find that location characteristics such as human capital levels and R&D spending could sometimes weaken the incentive to agglomerate around large firms. Higher regional human capital levels are associated with less agglomeration around larger and more productive plants, in particular in the U.S. and in the Eurozone. Similarly, larger regional R&D spending is associated with less agglomeration of economic activity around these plants in Europe. Regarding the concentration of economic activity around affiliates of multinationals, we uncover that both in the U.S. and in Europe outside of the Eurozone, larger regional R&D investment is associated with more agglomeration around these plants. This is not true in the Eurozone, where this association is negative. Similarly, outside of the Eurozone and the U.S., larger regional human capital levels are associated with more agglomeration around multinationals.

Policies shape the environment in which firms operate. An important component is R&D, which contributes to more agglomeration in manufacturing in Europe, while more human capital leads to less agglomeration, probably by inducing specialization outside of the manufacturing sector. However, R&D spending does not induce agglomeration around high productivity plants. Overall, better location fundamentals seem to lower the incentives and gains to agglomerate around super productive firms. Data measurement is, of course, a concern. Exploring and disentangling the role of public and private spending may shed further light on this question.

We present suggestive evidence of a positive relationship between agglomeration and growth in Europe, but not in the U.S. Of course, we take caution in positing causality implications. We conjecture that the negative effect in U.S. may be driven by a decline in regions that are specializing in manufacturing and display high levels of agglomeration in these industries. In the Eurozone, the relationship between growth and agglomeration in manufacturing was positive: core regions (e.g. Bavaria) that are heavily specialized and agglomerated in manufacturing fared relatively well. The effects of the crisis seem to have particularly hit high performing firms.

Policies aimed at improving industry performance should pay attention to firm productivity distribution and not only focus on the average performance. They should also consider the impact of the thickness of the tails of the distribution of firms and firm heterogeneity in accounting for agglomeration economies. Moreover, firm heterogeneity suggests that “one-size-fits-all” policies might not be the most

effective. Of course, policymaking needs to balance as well political economy considerations and concerns related targeted taxation, spending and regulation.

Several potential extensions of our analysis are worthy of attention. Future research should further aim to understand the mechanisms through which superstar firms attract agglomeration differently in different regions, particularly the role and interaction of private (within firms) and public policies (e.g. firm-level R&D versus public). Further analysis of the relationship between capital market integration and capital goods externalities can also yield additional insights. For example, we uncovered evidence of agglomeration around capital intensive sectors. What is the role of deeper local capital markets around star firms/agglomerated centres? Concerns focus on potential employment and linkages to suppliers, but what are the effects on cluster dynamism of, for example, lending to underperforming firms? As documented by the OECD (2017), unhealthy banks and the lack of incentives to deal with non-performing loans may lead to the “evergreening” of loans to weak firms. The capacity of firms to mobilise and efficiently allocate resources defines competitiveness. As such, limits to efficient mobilisation may affect firm productivity and, more generally, the economic environment.

Although the movement of goods, people and ideas has become easier through economic integration, we observe continuing dominance of certain firms, industrial clusters and cities despite reductions in transportation and communication costs. An important direction for future research points towards understanding how agglomeration patterns have changed with the rise of protectionism and uncertainty. The effects of protectionism and uncertainty may be non-linear and alter firms’ incentives to agglomerate in different ways.

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# Discussion of: “Spatial agglomeration and superstar firms: firm-level patterns from Europe and the U.S.” by Laura Alfaro, Maggie X. Chen and Harald Fadinger

By Gianmarco I. P. Ottaviano<sup>1</sup>

## Abstract

Alfaro et al. (2019) add an important dimension to the debate on the observed lack of regional convergence in the European Union (EU) by suggesting that local dynamics at the micro level can have relevant implications for aggregate outcomes at the macro level. In particular, the paper’s findings imply that such lack of convergence may be partly attributed to the fact that bigger, more productive firms (including multinational companies) co-locate and, crucially, each of them brings along its own vast “court” of smaller firms. This way the spatial density of economic activities “centred” on a few “superstar” firms (more productive, more intensive in capital and knowledge) may significantly contribute to uneven regional development, which is making some aspects of policy management harder than expected in the European and Monetary Union (EMU).

## 1 Agglomeration: from micro to macro

The project of European integration of “one market, one money” (Commission of the European Communities, 1990) was based on a promise of inclusive development that would benefit all regions of the Old Continent, in particular the least prosperous. This promise rested on the expectation that lower barriers to the international movement of goods, labour and capital in an integrating Europe would eventually lead to regional convergence in prices, factor returns and thus living standards between and within countries. In this respect, the adoption of a common currency would become both the natural facilitator *ex ante* and the natural implication *ex post* of the envisaged convergence.

Such expectation mainly derived from neoclassical growth arguments founded on the assumptions of constant returns to scale and perfectly competitive markets. In some of their more sophisticated versions, these arguments acknowledged the long-

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<sup>1</sup> Professor of Economics, Boroli Chair in European Studies, Bocconi University.

term horizon in which convergence would take place but considered, if not convergence, at least regionally balanced growth as the inevitable final outcome of economic integration. This is the economic essence of the “European dream” (Ottaviano, 2019). On the one hand, as economic growth is typically driven by what happens in a limited number of dynamic geographical areas that lead the way, any leap forward along the development path requires the geographical concentration of economic activities and thus an ineluctable division of areas in more and less developed. The emergences of an economic “core” and an economic “periphery” are two sides of the same coin. On the other hand, the implied polarization of the economic landscape is not an issue as long as automatically the success of more dynamic areas ends up benefiting also less dynamic ones. If the core grows, also the periphery will eventually grow. As time goes by, the wealth gap between the two remains constant and may even shrink as long as it is easier to follow than to lead the way. In this respect, European integration promotes inclusive development. It not only allows for the concentration of economic activities in the most dynamic regions that are the engines of growth, but also facilitates the diffusion of such growth to the least dynamic areas thanks to their belonging to a common economic space.

Unfortunately, to date, the promise of inclusive development does not seem to have been kept and the strengthening of regional imbalances is increasingly becoming a threat not only to the social cohesion, but also to the political stability of the European Union. Twenty years after the introduction of the euro, it is therefore of paramount importance to understand the causes of this lack of geographical convergence.

While this issue has received a lot of attention both in academic and policy circles (Iammarino, Rodríguez-Pose and Storper, 2017), the paper presented by Alfaro, Chen and Fadinger adds an important dimension to the debate by supporting the idea that local dynamics at the micro level can have relevant implications for aggregate outcomes at the macro level. In particular, the authors’ findings suggest that the observed lack of regional convergence in the EU may be partly due to the fact that bigger, more productive firms (including multinational companies, MNCs) co-locate and, crucially, each of them brings along its own vast “court” of smaller firms. This way the spatial density of economic activities centred on a few “superstar” firms (more productive, more intensive in capital and knowledge) can significantly contribute to uneven regional development.

That said, the co-location of superstars is not the focus of the paper, which instead provides a detailed analysis of the patterns of agglomeration around the most productive establishments in Europe and, for comparison, the US. This is achieved by designing and implementing a new index of spatial concentration that, by treating space as a continuum, solves the so called “modifiable areal unit problem” (MAUP). This problem arises from the fact that, when point-based measures of spatial phenomena are aggregated into “areas”, the resulting summary values can be affected by both the shape and scale of the aggregation unit. Hence, the choice of the aggregation unit can be in itself a source of statistical bias undermining sound econometric analysis.

Alfaro, Chen and Fadinger use their index to show that some establishments are indeed significantly more “centred” than others in that they are surrounded by a larger court of smaller establishments within the same radius distance. Specifically, within each industrial cluster, larger and more productive establishments are centred with more agglomeration than their smaller, less productive counterparts. Firms’ characteristics also interact with regions’ attributes as better location fundamentals (such as human capital and R&D spending) can weaken the incentive to agglomerate around superstar firms.

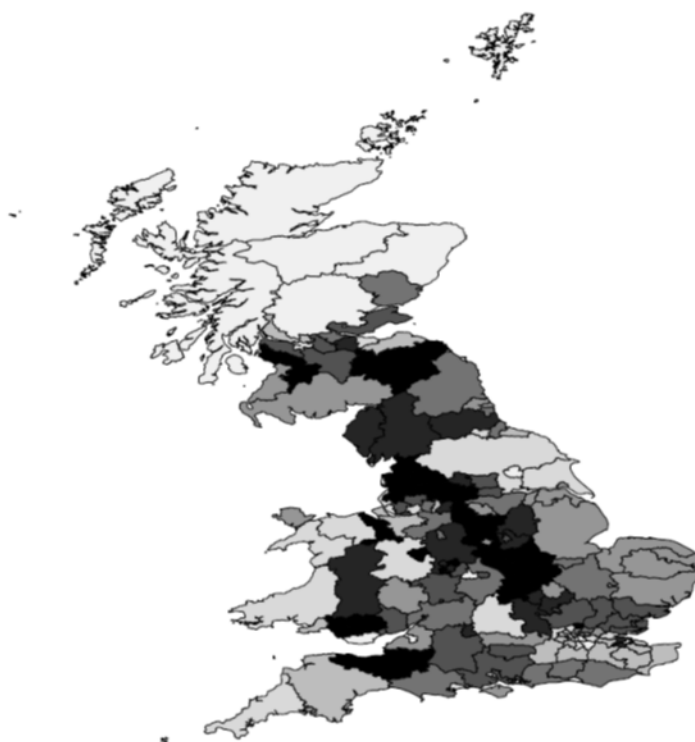
## 2 Why agglomeration matters

Is agglomeration and growth in the core a matter for policy concern only because, as already discussed, it makes the periphery worse off in relative terms? Not necessarily. As pointed out by Breinlich, Ottaviano and Temple (2014), an additional concern is that growth and agglomeration in a core area could make those living in the periphery worse off even in absolute terms. This is particularly worrying when there are barriers or frictions that restrict the mobility of individuals or firms, and labour mobility may be especially difficult for the poor. However, there are ways in which injustice could arise even when mobility is unrestricted. It may be that human capital is relatively costly to acquire in poorer regions. Since children cannot choose where to locate and tend to remain in the same regions as their parents, regional disparities can contribute to differences in life chances and inequality, lower social mobility and possible poverty trap. Moreover, as it takes time for the spatial economy to react to localized shocks, there could be lengthy periods for which regional differences in wellbeing persist while those who leave declining regions are likely to experience significant disruption in their lives, relative to the residents of more prosperous regions.

When the exit option is very costly or even impossible, people stuck with an ailing local economy cannot but voice their discontent by voting. Colantone and Stanig (2018a) find that the vote for Brexit was a vote against regional disparities caused by the asymmetric effects of globalization across UK regions as measured à la Autor, Dorn and Hanson (2013) by a region’s initial specialization in sectors more exposed to imports from non-European low-wage countries (the so-called “China shock”; see Figure 1). In this respect, the Brexit vote can be interpreted as the protest of those who feel that their regions have experienced only the costs but not the benefits of the current wave of globalization: foreign competition, factory closures, persistent unemployment, stagnating purchasing power, deteriorating infrastructures and public services, rising social exclusion, brain drain, dwindling local tradition and identity, growing uncertainty about the future.

**Figure 1**  
UK Map of the “China shock”

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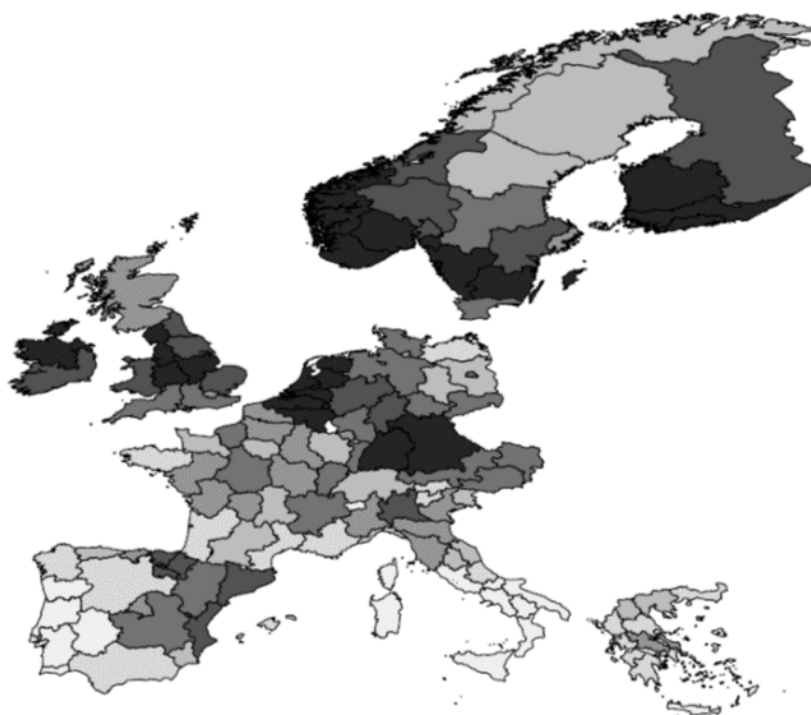
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Source: Colantone and Stanig (2018a).  
Note: NUTS 3. The darker the region, the stronger the shock.

Analogously, Colantone and Stanig (2018b) show that the unequal distribution of the costs and benefits of globalization helps explain also the rise of the “radical right” in continental Europe. The areas hit harder by the “China shock” are those where electoral support grew more for the protectionist right and fell more for the liberal left, while the support for the liberal right and the protectionist left were largely unaffected. A possible interpretation is that, as the redistribution of the costs and benefits of globalization has not worked, people have started demanding protection against its unwelcome effects.

However, political turmoil in Europe is not only about globalization. Colantone and Stanig (2018b) find that the regions voting more for the radical right are not only those hit harder by import competition associated with the “China shock”, but also those hit harder by import competition associated with the eastern enlargement of the European Union. From 2004 to 2007, the EU added 12 Eastern countries to its previous 15 members. The “East wind” (measured analogously to the “China shock”) started blowing from the new to the old members with growing imports from European low-wage countries. Eventually, the regional effects of the enlargement on electoral outcomes are comparable and sometimes stronger than those of globalization.

**Figure 2**  
Europe's Map of the "China shock"



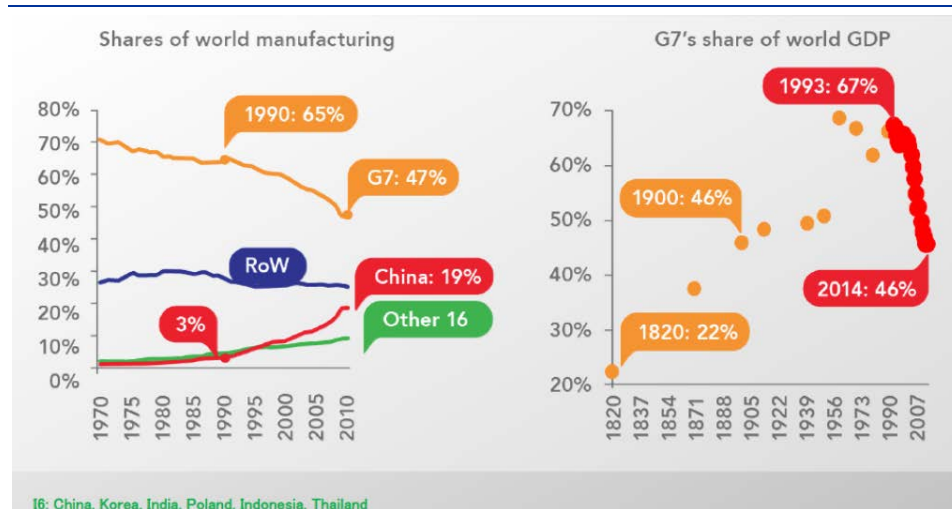
Source: Colantone and Stanig (2018b).  
Notes: NUTS 2. The darker the region, the stronger the shock.

### 3 “Great convergence” and “Great divergence”

That European integration would be accompanied by more pronounced regional imbalances was largely unforeseen based on the economic models that were dominant at the onset of the Single Market and the Common Currency. As previously discussed, these models, founded on the notions of constant returns to scale and perfect competition, predicted that lower trade barriers, freer labour and capital mobility, and eventually a common currency, would lead to the gradual convergence of prices and wages across European countries and regions. In other words, once the integration process was completed, no persistent differences in prices and wages would be possible. Convergence in real GDP have indeed materialized between countries, but divergence has emerged within them.

This duality is consistent with two broader trends of the world economy. Globally, due to offshoring and technology transfer, manufacturing and GDP shares have shifted from G7 to a few developing countries (first of all China): this is the “Great convergence” (Baldwin, 2016; see Figure 3). Locally, due to skill-biased technological change and skilled-biased globalization, the economic geography of G7 countries has become more polarized between outward-looking dynamic growth centres and inward-looking stagnating backwaters: this is the “Great divergence” (Moretti, 2012).

**Figure 3**  
The “Great convergence”

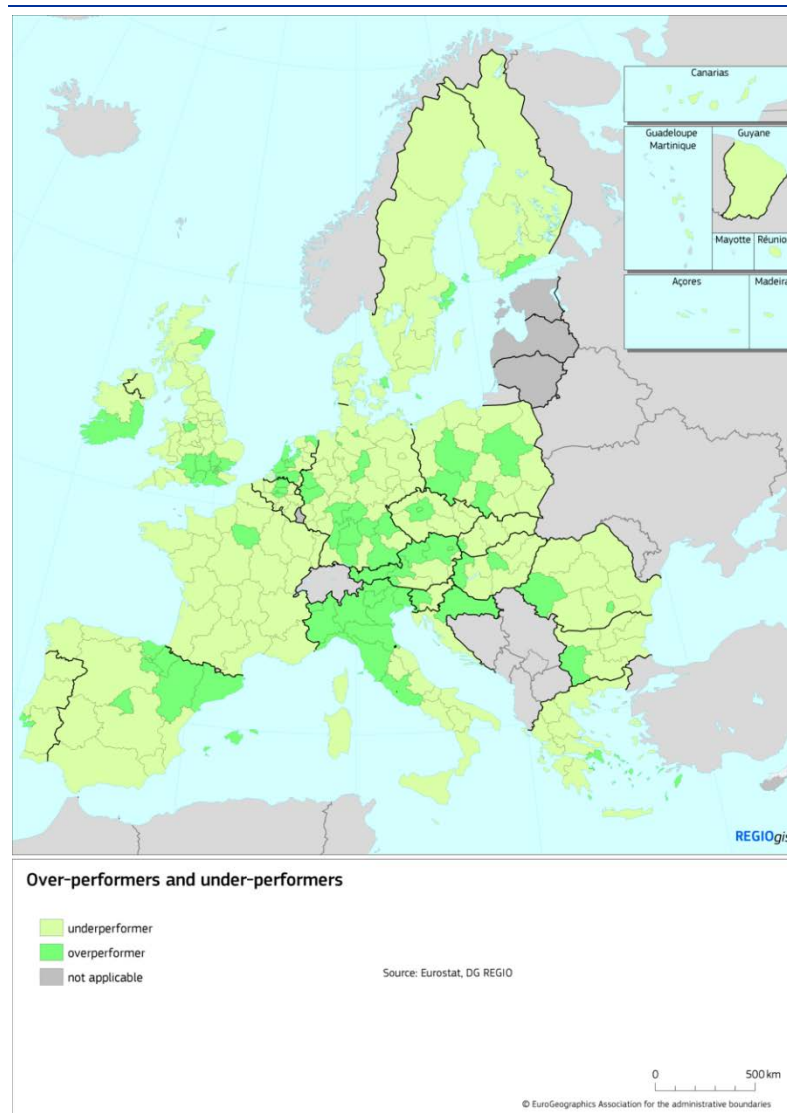


Source: Baldwin (2016).

Iammarino, Rodriguez-Pose and Storper (2017) show that across Europe the interaction of economy-wide forces and regional characteristics has created a geography made up of countries, regions, and city-regions that form different development “clubs” depending on their per capita personal income. To the top income club typically belong large metropolitan and capital city-regions as well as highly urbanised areas consisting of networks of cities, specialised in high-quality goods and services. Several of these regions are attractive destinations for the mobile population and have high productivity growth. This club tends to include “over-performers”, that is, regions that over the long-term outperform their national average and thus generate more than their share of European wealth (see Figure 4).

The main insight to be gauged from the paper by Alfaro, Chen and Fadinger is that the growing dominance of few superstar firms (surrounded by their courts of ancillary firms) may help understand why we observe a growing dominance of industrial clusters and cities, despite the reduction in transportation and communication costs in Europe and the competition implications of geographic concentration.

**Figure 4**  
The “Great divergence” in Europe



Source: Iammarino, Rodríguez-Pose and Storper (2017).

## 4 Lessons of EMU for EMU

The resilience of regional divergence vindicates those that had voiced their concerns about the common view at the onset of the project “one market, one money” that every aspect of policy management would become easier in the European and Monetary Union (EMU). In 1993 Paul Krugman wrote an essay entitled “Lessons of Massachusetts for EMU”. His point was that there were good reasons to believe that economic integration could promote rather than reduce regional divergence, if not in income per capita, certainly in the structure of the local economy. To understand why, one simply has to allow for increasing rather than constant returns to scale. For instance, a key aspect of regional specialization is the dependence of regional economies on export clusters held together by localized scale economies that are



external to (perfectly competitive) firms. These clusters are more likely to form in a more integrated economy because a reduction in the transactions costs (transportation expenses, tariffs, or differences in regulation) between two regions make it more likely that any given degree of external economies is enough to lead to the geographical concentration of an industry. The same may hold in the present of scale economies that are internal to (imperfectly competitive) firms (Fujita, Krugman and Venables, 1999; Baldwin et al, 2003).

It is worthwhile concluding with Krugman's words: "[My essay] does not argue that EMU will be a bad thing, but it points out that the combination of 1992 and EMU will tend to produce some new stabilization problems at the regional level. Theory and the experience of the US suggest that EC regions will become increasingly specialized, and that as they become more specialized they will become more vulnerable to region-specific shocks. Regions will, of course, be unable to respond with counter-cyclical monetary or exchange rate policy. Furthermore, in an environment of high factor mobility such shocks will tend to have permanent effects on output, which will tend to immobilize fiscal policy as well. In the US the heavily federalized fiscal system offers a partial solution to the problem of regional stabilization. Unless there is a massive change in European institutions, this automatic cushion will be absent."

What we have been reminded since the crisis is that even heavily centralized national fiscal systems currently seem to offer solutions to the problem of regional stabilization that are even more partial *within* than between countries in the age of the great (global) convergence and the great (local) divergence.

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# Demographic changes, migration and economic growth in the euro area

By Axel Boersch-Supan<sup>1</sup>, Duarte Nuno Leite<sup>2</sup> and Johannes Rausch<sup>3</sup>

## Abstract

This paper describes how population aging will shape long run economic development in the euro zone. We argue that the extent of the demographic changes is dramatic and will deeply affect future labor, financial and goods markets. The expected strain on public budgets – especially public pension, health and long-term care systems – has received prominent attention, but population aging poses many other economic challenges that threaten productivity and growth if they remain unaddressed, thereby also putting central banks under pressure.

While aging is global, there are marked differences in the underlying causes, speed and extent of aging across countries, even within the euro zone. These differences will generate different growth paths and change the international pecking order. Thanks to the globalization of labor, financial and goods markets, however, these differential demographic developments can be exploited together with higher capital intensity and digitalization. This offers large chances during the aging process.

## 1 Overview

The expected change in the age structure in virtually all industrialized countries – but also in many developing countries – is dramatic and will lead to a substantially higher proportion of older people in the world. This will happen even in spite of the large current migration streams and even if fertility were to increase as Section 2 of this paper will show.

The aging process will deeply affect future labor, financial and commodity markets. On a macroeconomic level, labor will become relatively scarce in the aging countries while capital will become relatively more abundant. This will precipitate changes in the relative price of labor, will lead to higher capital intensity, and might generate large international flows of labor, capital and goods from the faster to the slower

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<sup>1</sup> Munich Center for the Economics of Aging (MEA) at the Max Planck Institute for Social Law and Social Policy; Department of Economics and Business, Technical University of Munich (TUM), Munich, Germany; National Bureau of Economic Research (NBER), Cambridge, Massachusetts, United States.

<sup>2</sup> Munich Center for the Economics of Aging (MEA) at the Max Planck Institute for Social Law and Social Policy, Munich, Germany; Center for Economics and Finance at University of Porto, Portugal (CEF-UP).

<sup>3</sup> Munich Center for the Economics of Aging (MEA) at the Max Planck Institute for Social Law and Social Policy, Munich, Germany.

aging countries. On a microeconomic level, the age composition of the labor force will change which might affect labor productivity. Consumption and savings patterns are likely to alter when the elderly become a larger proportion of consumers and savers, with widespread implications for goods and financial markets.

Section 2 sets the demographic stage by showing that, while aging is global, there are marked international differences in the speed and the extent of the aging processes. Europe and Japan have already much older populations than North America. In Asia, some countries start from a relatively young population, but aging there is very quick. A particular dramatic example is China. Differences are large even within the euro zone. E.g. Italy and Germany are aging much faster than France. Due to the globalization of our economies, we cannot disregard these differential changes. International flows of capital, goods and services, and labor – in descending order of mobility – will be important mechanisms which are able to moderate the effects of population aging in the euro zone.

Quantifying these mechanisms and their effects is the aim of Section 3, the core of this paper. It uses a multi-country overlapping generations (OLG) model to assess the orders of magnitudes involved during the aging process. Starting point are the fundamental components that determine the euro zone's output and income. Let output  $Y$  (GDP) be

$$Y = A \cdot F(L, K)$$

From a macroeconomic point of view, the main effect of aging is to reduce the relative size of the labor force  $L$  as a share of total population  $N$ . We refer to this as “structure effect”. In some countries, the labor force  $L$  will even decline in absolute size. We call population decline the “size effect”. Unless this is compensated by an increase in total factor productivity  $A$  and/or an increase in the capital stock  $K$ , output will decline. Since  $L$  is changing quite differently across countries, it is important to distinguish between the structure and the size effect in order to understand potential cleavages within the euro zone.

From a more individualistic point of view, per capital output is

$$\frac{Y}{N} = A \cdot f\left(\frac{L}{N}, \frac{K}{L}\right)$$

Per capita output  $Y/N$  may stay constant or even increase, in spite of a shrinking population  $N$  (and a decreasing total output  $Y$  along with it) if labor force participation  $L/N$  and capital intensity  $K/L$  increase. Such increases may come endogenously or by policy action; they are a source of chances during the aging process. Herein also lays the insight that digitalization and aging may actually help rather than harm each other.

Finally, not all income needs to come from domestic production. In addition to wages and capital income from domestic production, equivalent to  $Y$ , foreign direct investment may create capital income from foreign production. GNP may become substantially larger than GDP if foreign direct investment creates large returns. Here are major chances during the global aging process. We will show that for a stylized

euro zone economy, a substantial part of the aging burden would be endogenously compensated by higher capital intensity, e.g. via digitalization, and international exchange if these forces were free to move.

The remainder, however, needs to be addressed by active reform. Here, public pension systems play a key role. Section 5, after a short digression on housing markets and asset returns in Section 4, is devoted to their critical role. The paper will not deal in any narrow sense with the many detailed issues of pension reform but shows that pension reform may have important macroeconomic implications for future rates of return and international capital flows.

While the core of paper addresses macroeconomic issues, some fundamental elements such as the propensity to save and the productivity of an aging work force require a microeconomic view to be fully understood. This will be done in Section 6.

While the paper mainly addresses issues in the real economy, Section 7 will provide a brief overview on the controversial issue whether, and if how, population aging affects inflation. There is no firm answer for the euro zone since there are forces which create deflationary pressures and other forces which increase inflation. Again, these forces differ as much across countries as their demographic features vary. Distinguishing the structure from the size effect is important as well as the policy reactions to the increasing burden of financing pensions and healthcare.

Section 8 therefore concludes with a discussion of policy options for central banks in the light of current policy backlashes in the euro zone and the significant differences in the demographic developments across member countries.

## 2 Demographics

Throughout the world, demographic processes are determined by the so-called demographic transition which is characterized by falling mortality rates followed by a decline in birth rates, resulting in population aging and thereby reducing the population growth rate or turning it to negative. While this basic mechanism of population aging is similar in most countries, extent and timing differs substantially. Europe and some Asian countries have almost passed the closing stages of the demographic transition process while Latin America is only at the beginning stages (Bloom and Williamson, 1998).

### 2.1 Demographic forces and the heterogeneity of population aging

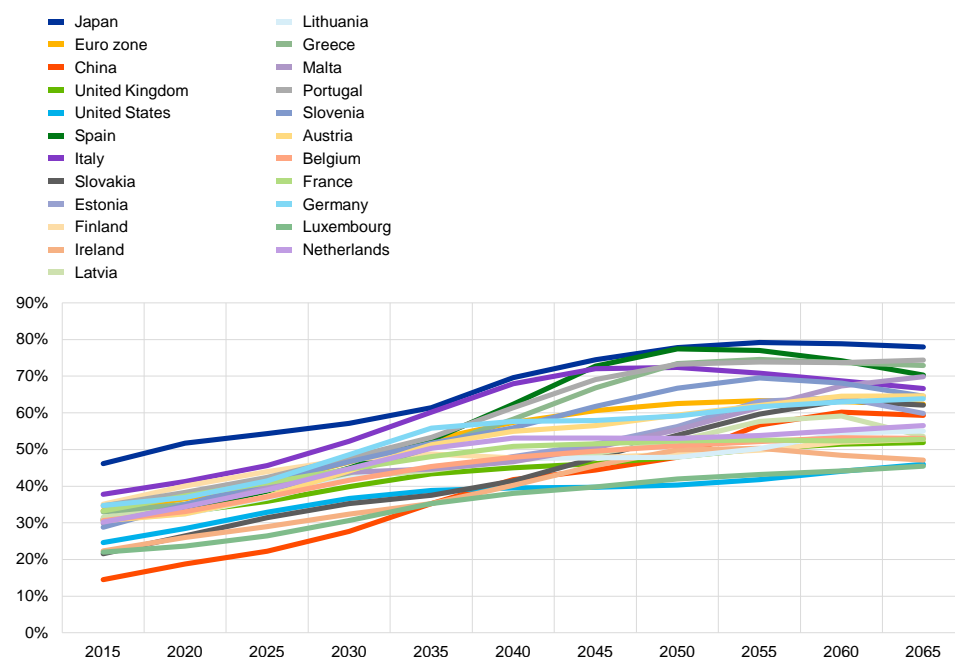
In order to understand the heterogeneity of population aging, it is helpful to distinguish between four demographic forces: the secular increase of life expectancy, the historically given babyboom-babybust transition, current and future fertility, and migration. Depending on their relative magnitude, these forces may or may not imply population decline (the size effect); in any case will they change the structure of the population, best captured by the old-age dependency ratio which relates the number

of people deemed old (say 65+ years of age) to the number of people deemed being in workable age (say age 20-64).<sup>4</sup>

### Chart 1

#### Old-age dependency ratio (65+/20-64) in the euro zone, China, Japan, US and UK

(number of persons 65+ as percentage of persons 20-64 years old)



Source: UN World Population Projections, Revision 2017.

Chart 1 shows that Japan has the highest old-age dependency ratio, while first China and later the US have the lowest old-age dependency. It is remarkable that the countries in the euro zone fill almost the entire range in between, with Italy and Spain as the oldest and Ireland and Luxembourg as the youngest countries. The reason for these large differences is the different relative magnitude of the four demographic forces. This can best be seen in the population pyramids drawn in Chart 2, referring to 12 countries and 2 points in time, 2017 and 2040.

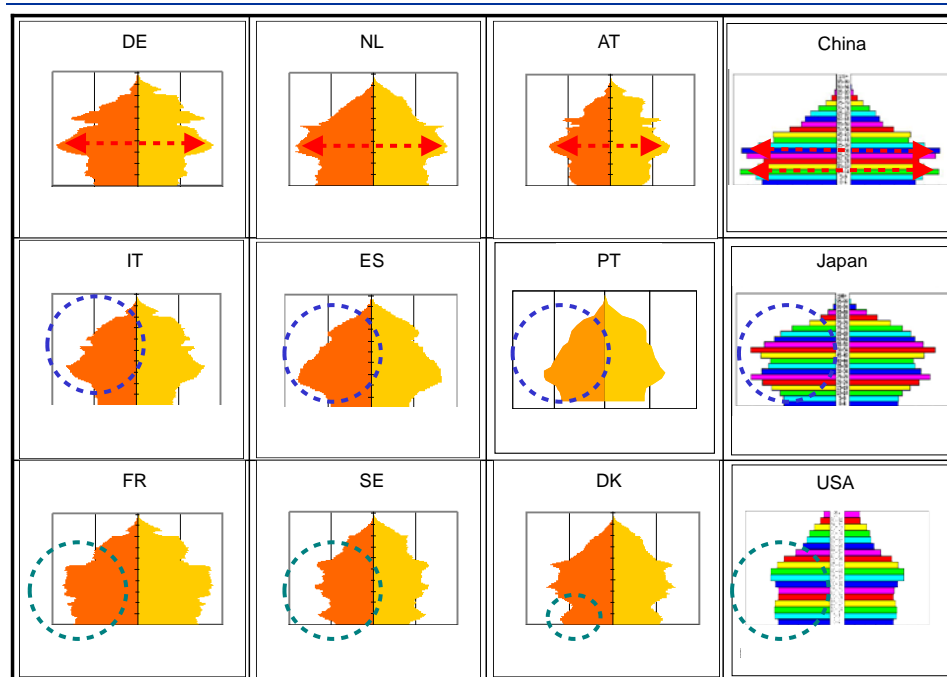
The first row of countries in Chart 2 (Germany, Austria, the Netherlands) shows the large effect of the babyboom-babybust transition. This transition is larger than in other countries due to the aftermath of World War II which lasted longer in these countries than in others. What some call “age wave” will therefore happen later than e.g. in the US. China, due to other historical reasons during the Mao era, also features marked demographic peaks and troughs.

The second row shows countries (Italy, Spain, Portugal, and Japan) which had for quite some time a combination of high life expectancy and persistently low fertility. This is reflected in the large proportion of older individuals which dominates the population pyramid.

<sup>4</sup> We will address the arbitrariness of these definitions in Section 6.3. Especially critical is the assumption that old age begins at a fixed age which remains constant although longevity increases.

**Chart 2**

Demographic forces and population structure, 2015



Sources: Eurostat and US Bureau of the Census.

Finally, there are also countries with relative high fertility and thus mild aging. Chart 2 takes France, Sweden, Denmark, and the US as examples. Their aging process is mainly generated by the secular increase in life expectancy, and their pyramids do not exhibit the “stem of a mushroom” clearly visible for the countries in the first two rows.

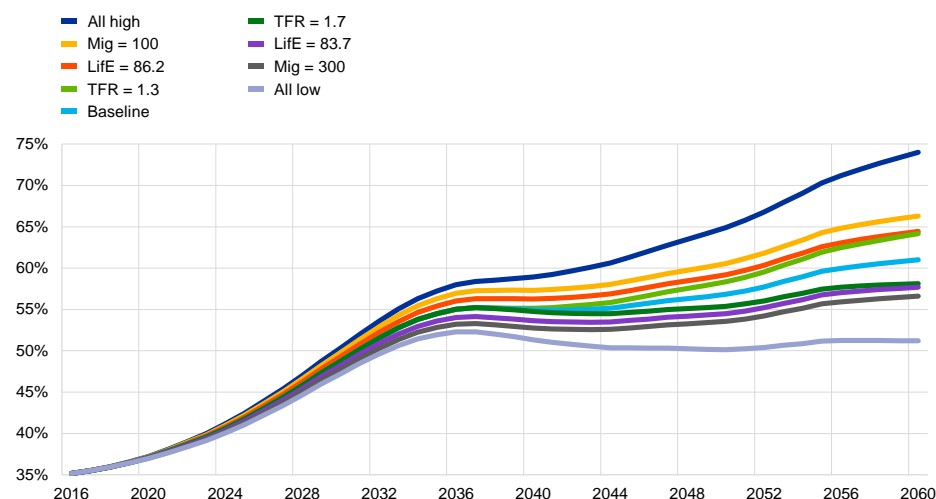
## 2.2 Reliability of demographic projections

These historically given international differences will also dominate in the future (Chart 1). Mortality and fertility patterns rarely change dramatically within the time span of a generation. Exceptions such as the babyboom-babybust transition are due to dramatic events like World War II. Thus, compared to economic projections, medium run demographic projections (i.e., one generation ahead until the 2040s) are reasonably precise because most of the population one generation ahead is already alive. Formidable challenges, however, are longer run projections and a satisfactory description of the uncertainty involved in these projections. The usual procedure is to create scenarios with plausible medium and extreme assumptions. Chart 3 shows an example taken for Germany. It depicts deviations from the baseline in all three demographic dimensions (migration, life expectancy and total fertility rate) and their extreme combinations. The main message from these exercises is that population aging will have large (here: increase of dependency by 50%) or even very large effects (here: more than double the dependency) but most probably not only small effects, and we can exclude with certainty that there will be no effects.

### Chart 3

#### Old-age dependency ratio (65+/20-64) in Germany under alternative assumptions

(number of persons 65+ as percentage of persons 20-64 years old)



Source: Own computation based on PENSIM model (Börsch-Supan and Rausch, 2019).

## 2.3 Can migration compensate for population aging?

This also holds with respect to the largest wild card in demographic projections, namely migration. Taking again Germany as an example, its statistical office has predicted a decline in the German population in each projection since the early 1980s. It has never occurred because migration was always larger than predicted. While we have many theoretical models describing the link between economic circumstances and migration, we do not have quantitative models that are able to predict how aging and other future events will affect migration.

Similarly to Chart 3, we can run counterfactual simulations of population size and dependency ratios for various assumptions about the number and age structure of migrants. The result of these exercises is threefold: First, migration has stabilized population size in many euro zone countries contradicting earlier projections; second, however, even very large migration waves are unlikely to compensate the population shrinkage that will occur when the babyboom generation will die; third, even extremely large migration waves will not undo the structural effect of a change in the dependency ratio, whatever the size of the population may be. This is depicted in Chart 4 for Germany.

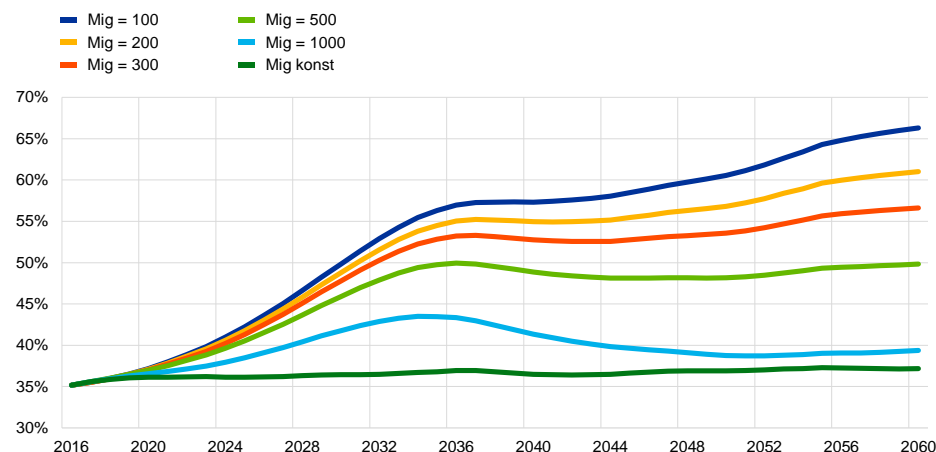
Even if net migration (“Mig” in Chart 4) would be 500,000 individuals per year for the next decades (yellow line, this is 2.5 times the long-run average of about 200,000 individuals, light blue line), it would not stop the increase in the German dependency ratio. To do so, net migration would need to be about 1.5 million individuals on average for the next 15 years, peaking at 2.1 million in 2021 (green line). This should be compared with the exceptional migration into Germany in 2015 which was about

950,000 individuals (net). In 2017, net migration into Germany was 417,000 individuals.<sup>5</sup>

#### Chart 4

#### Effect of migration on dependency ratio (Germany)

(number of persons 65+ as percentage of persons 20-64 years old)



Source: Own computation based on PENSIM model (Börsch-Supan and Rausch, 2019).

## 2.4 Short- vs. long-run effects of a fertility increase

A sufficiently large increase in fertility will reduce the old-age dependency ratio in the long run. It has, however, no impact on the old-age dependency ratio and labor supply for almost one generation (Chart 5). The simple reason is that newborns have to grow and be educated until they are able to enter the labor market. Since the babyboom-babybust transition is the main demographic challenge in the euro zone and strains resources particularly between 2020 and 2040, even a new babyboom in the immediate future would not alleviate this transitional burden. Even with a total fertility rate (“TFR” in Chart 5) of 2.1 which exactly replaces the current population, the old-age dependency would remain at a much elevated level even in the distant future.

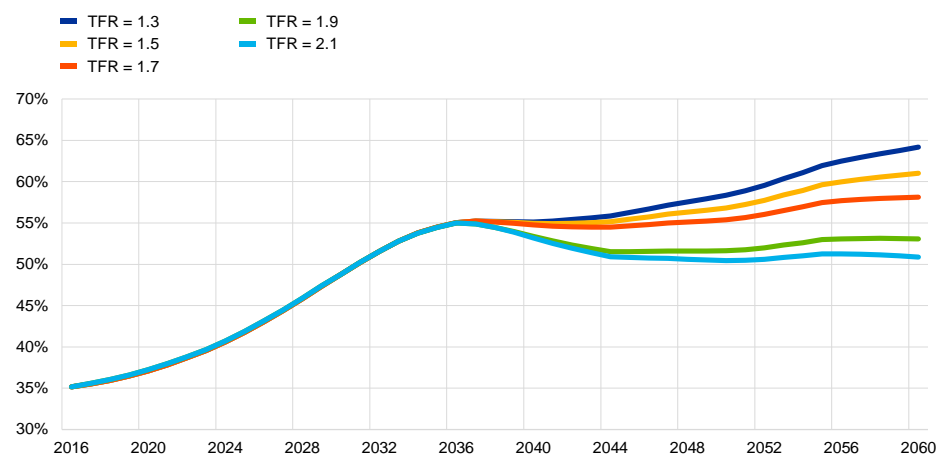
<sup>5</sup> We are grateful for the comments by Anna Maria Mayda who pointed out that there are important direct and indirect effects strengthening the positive effects of immigration which are ignored in these calculations. An additional direct effect is the higher fertility among recent migrants. An important example for an indirect effect is the increased high-skilled female labor force participation among the natives due to the additional availability of services and, potentially, an increase in foreign direct investments due to a general higher openness in the wake of immigration. In turn, however, Chart 4 also abstracts from integration and other costs typically associated with immigration.



## Chart 5

### Effect of a fertility increase on the dependency ratio (Germany)

(number of persons 65+ as percentage of persons 20-64 years old)



Source: Own computations based on PENSIM model, (Börsch-Supan and Rausch, 2019).

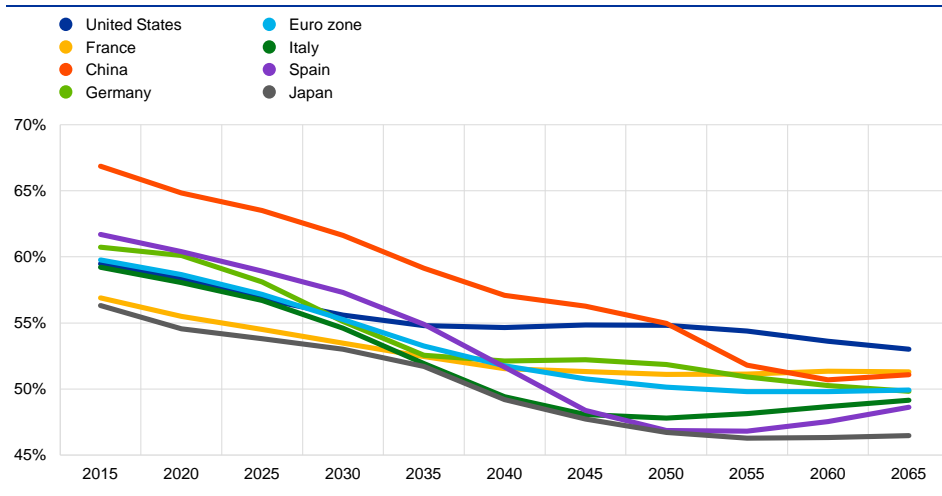
## 2.5 Labor supply projections

In addition to demography, understanding the development of the labor force during the next decades is crucial for the analysis of the effect of population aging on economic growth, wages and asset returns because the long run macroeconomic development is dominated by fundamentals such as the relative scarcity of labor and the relative abundance of capital. A first indication is the size of the working age population (say, defined as age 20-64). Their decline is truly remarkable, see Chart 6, and even more so the difference across countries. Relative to total population, the U.S. will lose about 7.8% of their working age population between 2015 and 2050. In the euro zone, the loss is more than twice as high (16.1%). The loss is particularly high in Spain and Italy (24.0 and 19.3%).

Slightly more sophisticated predictions of labor supply build on such demographic projections by multiplying their population counts with labor force participation rates specific to age, gender, etc. Chart 7 depicts the results of such an exercise on the structure of the German labor force. It shows that the average age of the labor force is strongly increasing until the babyboom is reaching retirement age which will be between 2020 and 2030. Note that the strong increase of the elderly share in the work force between 2000 and now does not appear to have damaged much the German economy, in spite of opposite predictions which have been based on the assumption of a strongly declining productivity with age. Section 6.3 will briefly explain this outcome.

### Chart 6

#### Working age population of France, Germany, Italy and US, 2005-2050

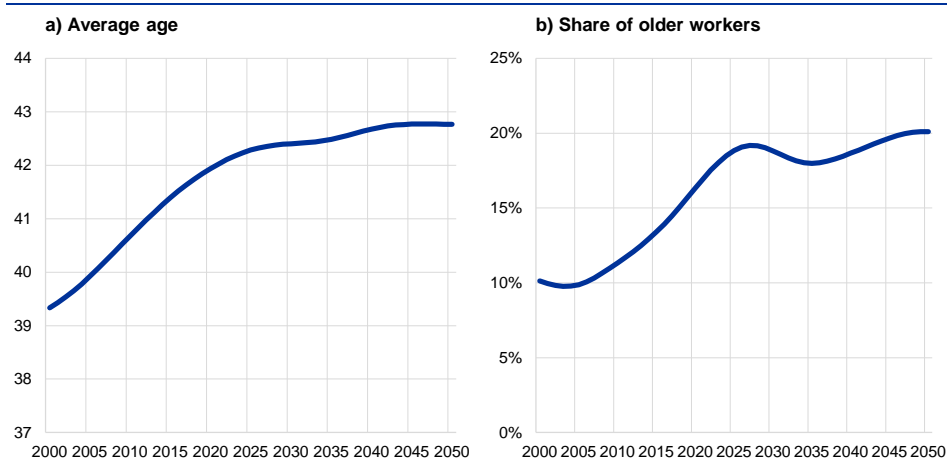


Source: UN World Population Projections, Revision 2017.

While these exercises provide a good indication for the challenges to come, they have severe limitations. First, labor force participation rates are policy related; for example, they heavily depend on the rules determining labor market entry (e.g. through the education system) and exit (e.g. through pension rules such as the statutory retirement age). Second, actual employment is endogenously determined by labor supply and demand both of which depend on the prevailing wage which in turn is affected by demographic change since the scarcity of individuals in working age relative to population size will exert upwards pressures on wages.

### Chart 7

#### Average age and share of older workers in Germany's labor force



Source: Statistisches Bundesamt (German Statistical Office) 2003.

### 3 Implications for labor and capital markets in the euro zone: a GE-OLD approach

We therefore use a multi-country overlapping generations model with endogenous labor supply and demand to study the general equilibrium effects of population aging on economic growth, savings, wages, international capital flows and rates of return to capital. We do not model the entire euro zone but represent it by a population-weighted aggregate of its three largest economies, France, Germany and Italy (“EU3”).

#### 3.1 The model

Börsch-Supan, Härtl and Ludwig (2014) extend the overlapping generations model of the Auerbach and Kotlikoff (1987) type in several dimensions: they acknowledge the international trade and capital flows of European countries by a multi-country version of the model (Börsch-Supan, Ludwig and Winter 2007); they model the large frictions in European labor markets via a distinction between exogenous and endogenous labor supply components (Börsch-Supan and Ludwig 2010); and, relevant for Section 5 of this paper, they add a model of an earnings-related pay-as-you-go public pension scheme typical for France, Germany and Italy which combines aspects of a defined contribution system with those of defined benefits. Section 6 will justify some of the model’s assumptions. Section 7 adds money in the utility function in order to study the effect of aging on inflation (Härtl and Leite 2018).

##### 3.1.1 Household behavior

Households have standard preferences over consumption and leisure. As a non-standard feature, we model total labor supply of a household of age  $j$  is the product of an exogenous component  $l_j$ , and an endogenous component  $h_j$ . The exogenous component  $l_j$  can be thought of as the maximum life-time number of hours possible for a household, given by restrictions in labor market entry (e.g. due to length of mandatory schooling), restrictions during main working life (e.g. by the availability of day care facilities for families, or the 35-hour week in France), and in older age by restrictions through mandatory retirement. Households have some ability to choose their preferred labor supply by choosing  $h_j$ , the endogenous component of labor supply. They can be thought of hours within the maximum life-time number of labor hours  $l_j$ . This ability, however, is limited and asymmetrical as  $h_j$  may not exceed an upper limit  $\bar{h}$ .

More formally, a household of age  $j$  at time  $t$  in country  $i$  derives utility from consumption  $c_{t,j,i}$  and leisure  $1 - l_{t,j,i} \cdot h_{t,j,i}$  where the household’s per period utility function is given by

$$u(c_{t,j,i}, 1 - h_{t,j,i} \cdot l_{t,j,i}) = \frac{1}{1 - \theta} \left( c_{t,j,i}^\varphi (1 - l_{t,j,i} h_{t,j,i})^{1-\varphi} \right)^{1-\theta} \quad (1)$$

The maximization problem of a cohort born in period  $t$  at  $j = 0$  is given by

$$\max \sum_{j=0}^J \beta^j \pi_{t,j,i} u(c_{t+j,j,i}, 1 - l_{t+j,j,i} h_{t+j,j,i}) \quad (2)$$

where  $\beta$  is the pure time discount factor. In addition to pure time discounting, households discount future utility with their unconditional survival probability

$$\pi_{t,j,i} = \prod_{k=0}^j s_{t+k,k,i}$$

Here,  $s_{t+k,k,i}$  denotes the probability to survive from period  $t + k$ , age  $k$  to period  $t + k + 1$ , age  $k + 1$  in country  $i$  with  $s_{t,0,i} = 1$ . Since the time of death is uncertain, we assume that accidental bequests resulting from premature death are taxed by the government at a confiscatory rate and used for otherwise neutral government consumption.

Denoting total assets by  $a_{t,j,i}$ , maximization of the household's intertemporal utility is subject to a dynamic budget constraint given by

$$a_{t+1,j+1,i} = a_{t,j,i}(1 + r_t) + \lambda l_{t,j,i} h_{t,j,i} w_{t,j,i} (1 - \tau_{t,i}) + (1 - \lambda) p_{t,j,i} - c_{t,j,i} \quad (3)$$

where  $\lambda = 1$  for  $j = 0, \dots, R$  and  $\lambda = 0$  for  $j > R$  and  $R$  is the exogenous retirement age.  $\tau_{t,i}$  denotes the contribution rate to the pay-as-you-go financed public pension system and  $p_{t,j,i}$  the pension income, see below.

As pointed out above, maximization is subject to the constraint that the endogenous component of labor supply ("hours worked within the limit") are positive and may not exceed the upper limit  $\bar{h}$ . Since the model cannot distinguish between the limit  $\bar{h}$  and the exogenous labor supply component, we normalize  $\bar{h}$  to one:

$$0 \leq h_{t,j,i} \leq 1 \quad (4)$$

In those variants of our model in which the labor supply is fully exogenous, we replace the constraint (4) with the constraint that  $h_{t,j,i} = 1$  for all  $t, j, i$ .

### 3.1.2 Pension system

The government organizes a prototypical European earnings-related pay-as-you-go financed pension system. Benefits are given by

$$p_{t,i} = \rho_{t,i} \cdot w_{t,i} \cdot (1 - \tau_{t,i}) \cdot EP_{t,j,i} \quad (5)$$

where  $\rho_{t,i}$  denotes the net replacement rate (generosity of the pension system) and  $\tau_{t,i}$  the contribution rate of the pension system in country  $i$  at time  $t$ . Earnings points  $EP_{t,j,i}$  accumulate over the life-cycle according to

$$EP_{t+1,j+1,i} = EP_{t,j,i} + l_{t,j,i} h_{t,j,i} \quad (6)$$

Households thus earn one earnings point if they receive average wage income in a given period.

Our model households understand the linkage between contributions to the pension system and pension payments in old age. Therefore, relative to a flat benefit pension system, labor supply distortions are smaller but not zero because the rate of return on the capital market exceeds the implicit return of the pension system. The main policy parameters of the pension system are either the net replacement rate  $\rho$  or the contribution rate  $\tau$ . The other parameter is determined endogenously since the pension system's budget is assumed to always be balanced. If  $\rho$  is large, public pensions substantially crowd out private saving through the households' saving decision given by (1) and (2).

### 3.1.3 International capital flows

The euro zone has strong trade and corresponding international capital flows especially with the US and China. We model these flows by assuming that saving and investment decisions are governed by a common global interest rate which, via international capital flows, equalizes the return to capital across countries. Assets held by households in country  $i$  therefore do not necessarily equal the capital stock in country  $i$  nor does saving necessarily equal investment in a single country.

### 3.1.4 Equilibrium

The main driver of the model is demography. It is exogenously determined by mainstream assumptions about fertility, mortality and migration (United Nations 2017). The demographic model determines cohort sizes and thus both the size of the total population and the age structure of it, thus the two main elements of population aging. Production and wage setting in each country is neoclassical. Equilibrium is achieved if supply equals demand in the national labor markets and in the global capital market. Numerical solution and calibration follows Börsch-Supan, Härtl and Ludwig (2014).

## 3.2 Results

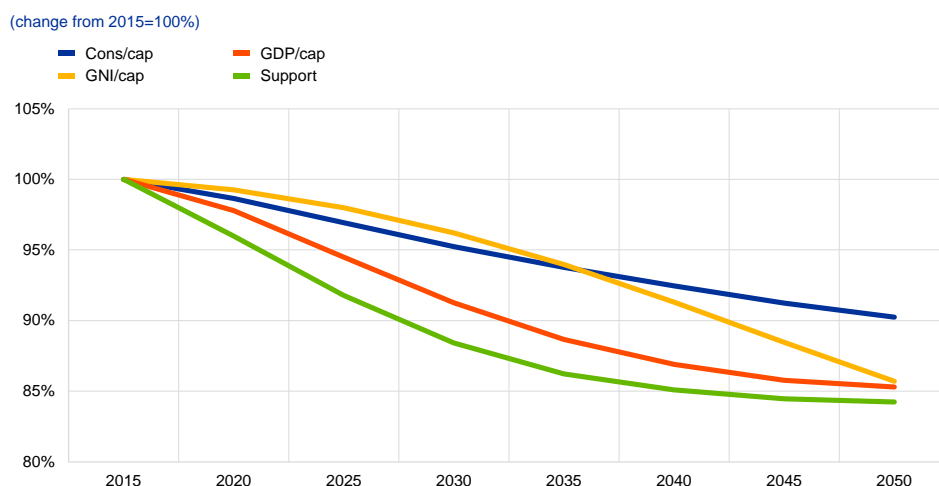
We present results on labor supply, GDP and GNP growth, per capita consumption, international capital flows, wages and return to productive capital in three steps. Step 1 is a baseline with exogenous labor supply based on current labor force participation rates. Step 2 keeps labor supply exogenous but gradually increases retirement age and female labor force participation. At the same time, labor market entry age as well as unemployment is decreased. Finally, step 3 endogenizes labor supply.

### 3.2.1 Baseline economic growth

Our baseline is defined as status quo in terms of labor market and pension system. We assume constant age and gender-specific labor force participation rates and a constant replacement rate  $\rho_{t,i}$ , see equation (5). Initially, we also assume equal productivity for all ages. All results refer to the euro zone as represented by EU3, the population-weighted aggregate of France, Germany and Italy. As their populations age, the support ratio declines by 11.6 percent from 2015 until 2030. As a consequence, GDP per capita would decline by 8.7 percent and consumption per capita by about 4.8 percent relative to a non-aging economy with the same total factor productivity if policies and behavior were to remain at the current status quo (Chart 8). All variables are normalized to 100% in 2015 and net of an underlying TFP trend. Chart 8 therefore represents the pure effect of population aging on these aggregates.

**Chart 8**

De-trended growth of GDP, GNP and consumption per capita, EU3, 2005-2050

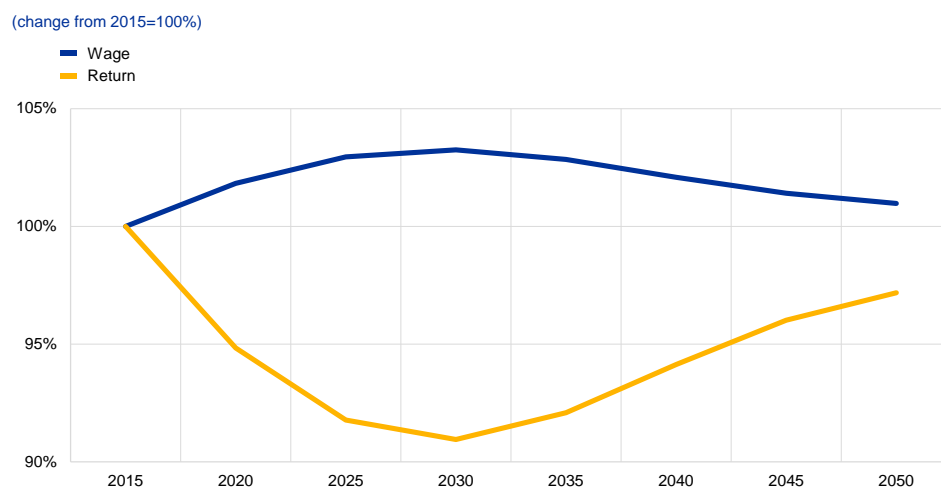


Source: Updated from Börsch-Supan, Härtl and Ludwig (2014).  
Note: Variables are normalized to 100% in 2005 and net of TFP trend.

A first observation is that the decline of GDP per capita is smaller than the decline of the support ratio. This is because scarce labor due to population aging is partially substituted by additional capital. This adaptation occurs in response to rising wages and falling rates of return to capital depicted in Chart 9, to be discussed further in Subsection 3.2.5.

**Chart 9**

**Wages and rates of return to productive capital, EU3, 2005-2050**



Source: Updated from Börsch-Supan, Härtl and Ludwig (2014).  
Note: Variables are normalized to 100% in 2015.

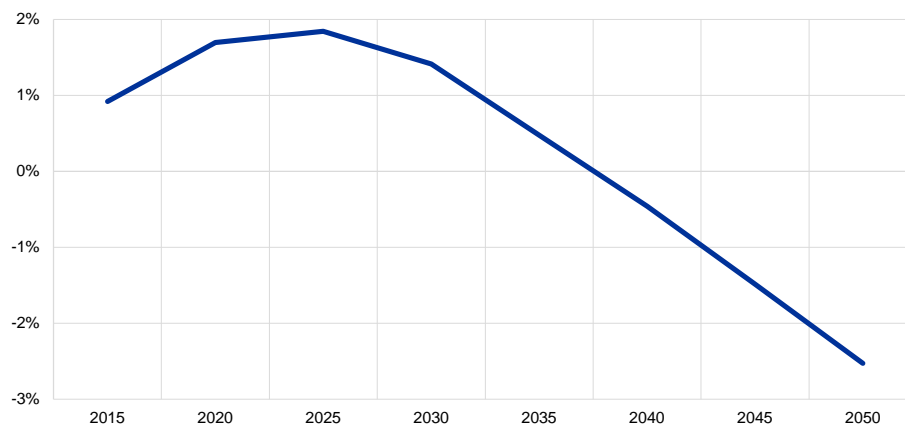
### 3.2.2 International capital flows

The second observation is the difference between GDP and GNI per capita. Since the US is aging much less than Europe, the return to capital would fall less (and wages increase less) than in Europe if these two regions were economically isolated. In an open economy setting, however, European households will invest in foreign capital deriving higher returns until a common interest rate is achieved in equilibrium. From a life-cycle point of view, such behavior differs according to age: eventually, households will repatriate their foreign savings and, according to the life-cycle mechanism underlying equations (1) and (2), enjoy their retirement consumption. The aggregate effect depends on demography. The large cohort sizes born in the 60s and 70s lead to first rising, then falling net capital outflows, until they turn negative after about the year 2035 (Chart 10).

## Chart 10

### International capital flows from EU3 to US, 2005-2050

(international capital flows from EU3 to US as percentage of EU3's GDP)



Source: Updated from Börsch-Supan, Härtl and Ludwig (2014).

Note: Capital flows are saving minus domestic investment in Europe, relative to GDP and normalized to a balance of 0.91% in 2015 (IMF, 2017).

These international capital flows reach almost 2% of GDP and are substantial in the sense that consumption per capita falls by about 5 percentage points less than GDP per capita in 2050. It also implies that de-trended GNI per capita is substantially larger than de-trended GDP per capita until about 2055 (Chart 7). In the short run, these capital flows become even larger if the rest of the world, seen from Europe, includes the large Asian economies. This is shown by Börsch-Supan and Ludwig (2009). It is noteworthy, however, that the long-term effect is smaller than maybe expected because the higher speed of the population aging process in Asia will generate convergence of population structures between Asia and Europe.

### 3.2.3 Exogenous increase of labor force participation

Keeping age and gender-specific labor force participation rates constant during the demographic transition is counterfactual. Between 2000 and 2010, several major policy changes happened. The Monti government in Italy dramatically increased the Italian retirement age. In Germany, the statutory retirement age is gradually raising from 65 in 2011 to 67 years in 2029. In France, the minimum pensionable age of 60 has been raised to 62. The change in the European high school and university system (the so-called Bologna process) is expected to decrease schooling duration by about 2 years. Labor force participation of women has changed in a secular fashion. Structural unemployment in the euro zone has fallen until the financial crisis hit. We therefore model the following four changes in labor force participation:

- increase in the retirement age by 2 years;
- decrease in the job entry age by 2 years;
- convergence of female labor force participation to 90 percent of the rate for men;



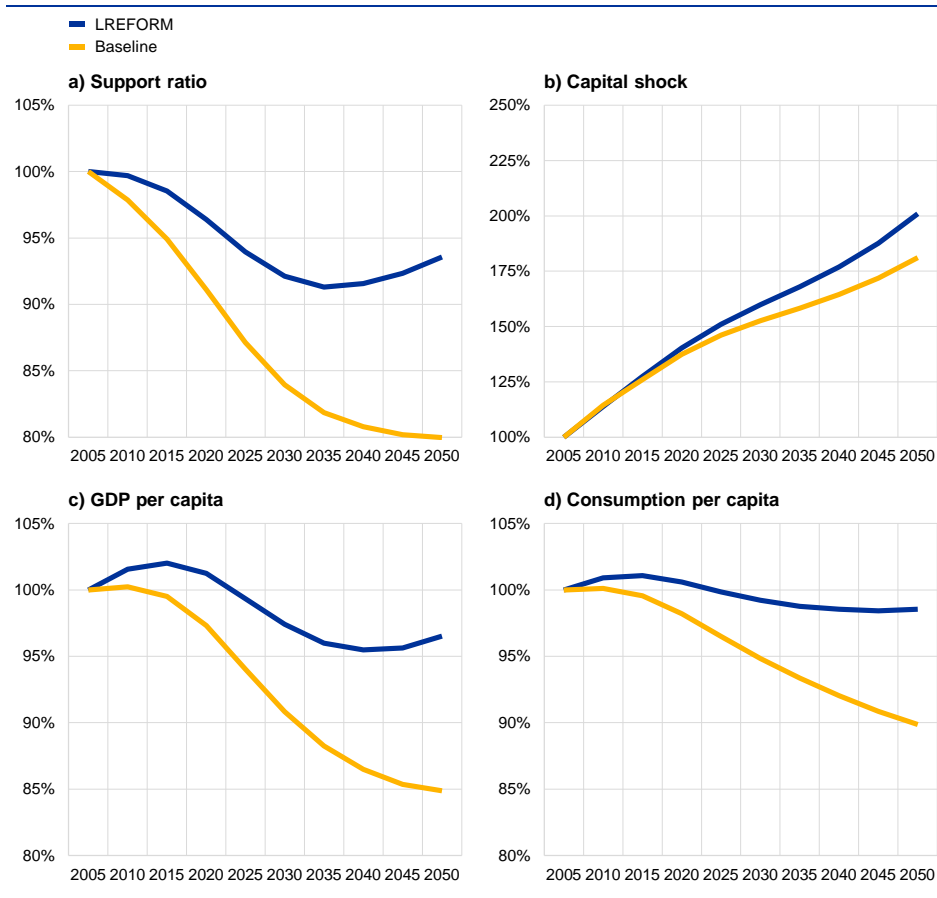
- reduction of unemployment to the NAIRU rate (Ball and Mankiw, 2002).

These changes are assumed to occur gradually (linearly) between 2005 and 2030; hence the base year of the following projections is 10 years earlier than in the preceding section.

Chart 11 summarizes the effects of these exogenous changes (“LREFORM”), comparing it to a baseline without any changes, starting with the assumption that hours’ supply  $h_j$  is exogenous. In this case, the economy increases its capacity accordingly and the decline in the support ratio is offset to about 94% (upper left panel in Chart 11). In addition, saving and investment behavior react leading to a small increase in the domestic capital stock relative to the baseline scenario (upper right panel), thereby increasing GDP per capita slightly above the trend of the support ratio (lower left panel). Furthermore, added saving flows to abroad increase consumption per capita stronger than per capita GDP (lower right panel). As a result, economic living standards, here measured as per capita consumption, can essentially be stabilized in spite of population aging in the EU3 countries representing the euro zone.

**Chart 11**

Exogenous increase of labor force participation in the EU3 countries, 2005-2050



Source: Based on Börsch-Supan, Härtl and Ludwig (2014).

Note: All series normalized to 100% in 2005. GDP and consumption per capita are net of TFP growth.

This is an important result. In spite of population aging, the euro zone does not necessarily have to experience declining growth. Demography as such is not destiny, rather the euro zone's ability to make and sustain reforms that better activate the available working-age population.

### 3.2.4 Endogenous labor supply

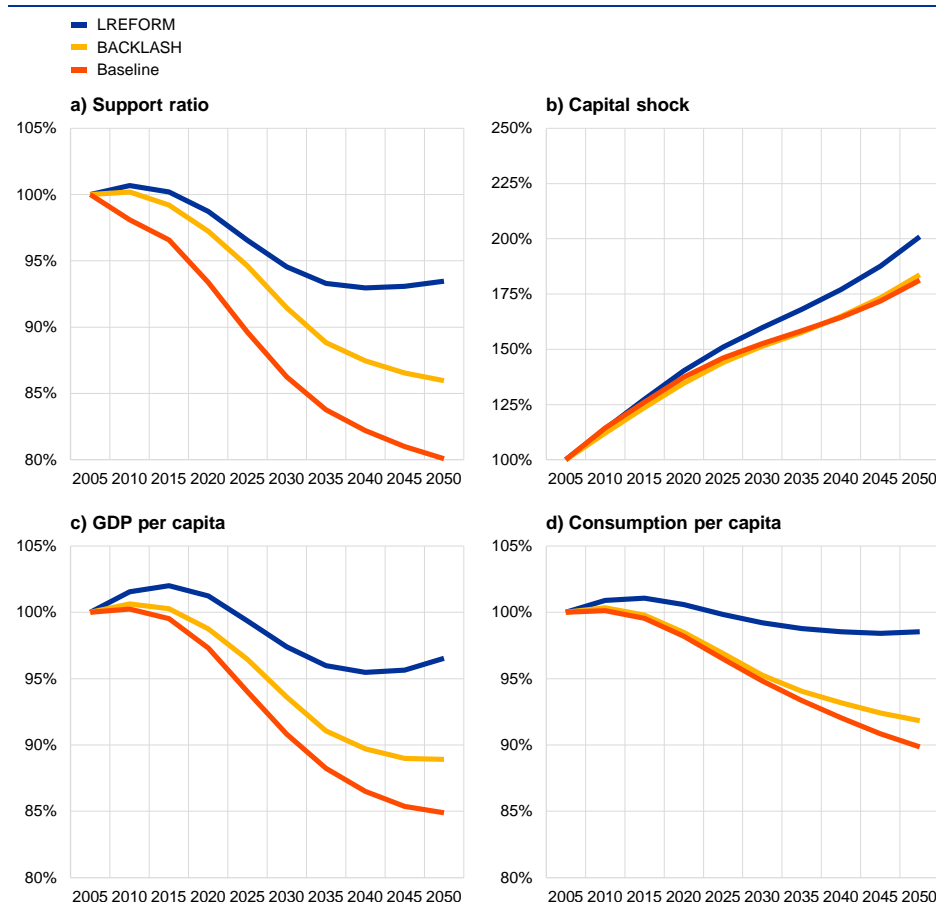
Attempts to execute the policies delineated in the preceding subsection, however, have faced stiff opposition in all three EU3 countries. Hence, the exogenous increase in labor force participation depicted in Chart 11 may be wishful thinking. We model such opposition and eventual policy backlash as substitution between the endogenous component  $h_j$  and the exogenous component  $l_j$ . In the absence of constraints, the two components of labor supply are perfect substitutes such that the exogenous variation of  $l_j$  leaves the labor supply of the household unaffected: as the age-specific employment  $l_j$  is exogenously increased, the household endogenously decreases hours worked,  $h_j$ . The exogenous variation of  $l_j$  affects total effective labor supply, however, for those households for whom the time endowment constraint  $\bar{h}$  is binding. As a consequence, the exogenous employment variation of  $l_j$  has a positive effect on labor supply but the overall effect is substantially smaller than in the previous section where labor supply was fully exogenous. This is indicated in the middle trajectories in Chart 12. The behavioral backlash to labor market reform in Europe is large: labor supply now increases less than a half of what it would have been when hours were exogenous (upper left panel). Accordingly, GDP and consumption per capita do not even closely achieve the level of an otherwise comparable non-aging economy as it did in Chart 11.

The size of the backlash effect is large. It is driven by a perfect substitution between the exogenous and the endogenous components of labor supply among the unrestricted households. Stricter labor supply restrictions (such as minimum hours' constraints) will generate smaller backlash effects.

The exercise in this section shows that the euro zone not only needs to initiate structural reforms but that it is essential to also sustain them over long periods of time.

**Chart 12**

Growth with endogenous labor supply in the EU3 countries, 2005-2050



Source: Based on Börsch-Supan, Härtl and Ludwig (2014).  
Note: All series normalized to 100% in 2005. GDP and consumption per capita are net of TFP growth.

### 3.2.5 Asset meltdown

Several articles in the popular press have raised the fear that an asset meltdown might occur when the baby boomers will decumulate their assets. The academic literature is less alarmistic, see e.g. Poterba (2001), Abel (2001) or Brooks (2002).

Poterba (2001, p. 582) finds it “difficult to find a robust relationship between asset returns on stocks, bonds, or bills, and the age structure of the U.S. population over the last seventy years. The correlations that do emerge are stronger between Treasury bill returns, and long-term government bond returns, and demographic variables, than between stock returns and demography. Most measures of demographic structure, however, do not show a statistically significant correlation with asset returns. These findings stand in contrast to the results of general equilibrium models for asset returns, which suggest a clear link between age structure and returns. One possible interpretation of these findings is that, even though changes in age structure do affect asset demand, these effects are simply too small to be detected among the other shocks to asset markets.”

Abel (2001) criticizes Poterba's approach by pointing out missing saving motives, especially bequests. Brooks (2002, p. 405) picks up this critique and estimates that "baby boomers can expect returns on retirement saving about 100 basis points below current returns."

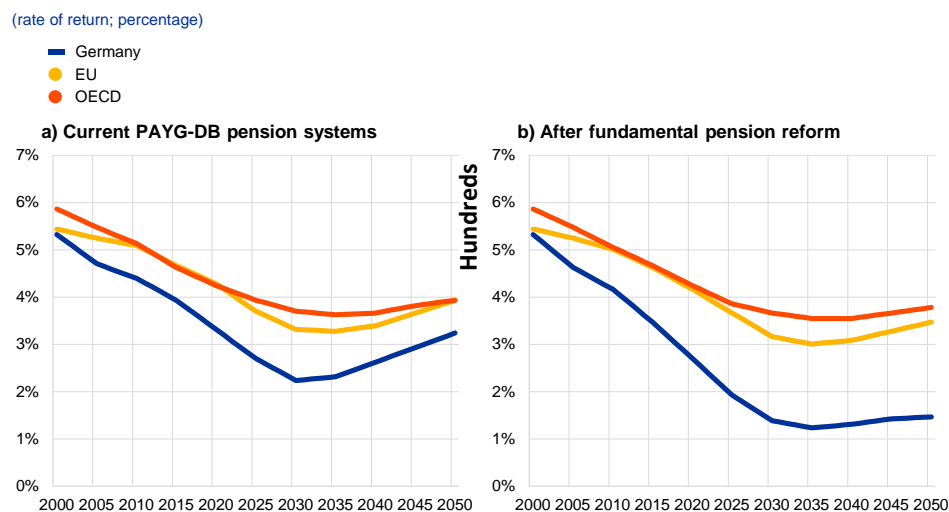
Our own work as depicted in Chart 9 predicts a rather modest decrease in the rate of return in the euro zone due to population aging: approximately 9% or 45 basis points on a basis of an average rate of return on productive capital of 5%. This modest decline in the returns of assets due to demographic transition has been repeatedly observed by several studies in the last decades (Arnott and Chaves, 2012; National Research Council, 2012). More recently, Carvalho et al. (2016) found that demographic change in developed countries caused a drop of at least 150 basis points between 1990 and 2014. Projections for the years 2005/2010 to 2030 are in the range from 79 basis points to 180 basis points (Aksoy et al., 2019; Gagnon et al., 2016). Long-run projections until 2080, as the ones in Krueger and Ludwig (2007) and Attanasio et al. (2007), show that the decline on rates of return on capital could range from 79 to 330 basis points depending on the openness of the economy.

There are several aspects worth noting. First, closed-economy models like Brooks (2002) miss the important fact of international capital flows under global aging. The return on capital can be improved by international diversification, that is, by investing pension savings in countries with more favorable demographic transition paths. This is the point made also by Krueger and Ludwig (2007) and Attanasio et al. (2007). Second, this effect depends on the relative size of the domestic and the international capital market, thus on the perimeter of international capital flows. Third, the size of the domestic capital market depends on the nature of the pension system and reforms that decrease pay-as-you-go pensions in favor of funded pensions (often called "fundamental pension reform", see Section 5.1).

These aspects are depicted in Chart 13 where we model six hypothetical scenarios, namely the interaction of three perimeter and two pension reform scenarios: (a) Germany as a closed economy, (b) free capital flows between Germany and the rest of the EU, and (c) free capital flows between Germany and the rest of the OECD, interacted with (Chart 13a) current PAYG pension systems and (Chart 13b) fundamental pension reform. Note that the domestic market in Chart 13 is Germany, while it was the EU3 in Chart 9, hence effects are larger in Chart 13 as compared to those in Chart 9.

### Chart 13

#### Projections of the rate of return to capital under alternative pension systems and capital mobility scenarios



Source: Updated, based on Börsch-Supan, Ludwig and Winter (2007).  
 Notes: This chart shows projections of the rate of return to capital. Germany: Germany as a closed economy, EU: perfect capital mobility in the EU area, OECD: perfect capital mobility in the OECD area. Panel b: Pension reform only in Germany.

Chart 13a shows that a decrease in the rate of return on capital is evident for both the closed-economy and the two open-economy scenarios. However, the decrease is modest. Even in the closed-economy case, a decrease of the rate of return of about 1.4 percentage points – as measured by the difference between the rate of return in 2000 and the minimum for the period 2030-2040 – is closer to the upper bound values in the literature (Aksoy et al., 2019) and, still, much less than claimed in the public press. Moreover, it is apparent that closed-economy models overestimate this reduction of the rate of return: its projected decrease is only about 1 percentage point for both capital mobility scenarios. We observe two effects: first, the level of returns is higher, and second, the decline is smaller and smoother than in the closed-economy scenario.

The beneficial effects of openness to international capital markets become even more evident when we analyze the effects of a fundamental pension reform (Chart 13b). If a fundamental pension reform were implemented in Germany and if Germany were a closed economy, then the additional decrease of the rate of return to capital would be about 0.8 percentage points. However, as the right panel shows, there is virtually no difference of the rate of return between the two pension system scenarios if capital is freely mobile within the OECD. In the intermediate case, when capital mobility is restricted to the EU area, the decrease would only be around 0.2 percentage points.

This interaction between global aging and pension reform is an important finding. It suggests that household savings induced by a fundamental pension reform should be invested internationally, not only for reasons of risk diversification but also for the sake of higher returns that are available in other countries with different aging processes and more favorable capital/labor ratios.

## 4 A brief digression on housing markets

The asset meltdown hypothesis has earned particularly attention by the forecast of Mankiw and Weil (1989) who estimated that housing prices will drop between 1990 and 2010 to half of their original levels. We now know that this has not materialized. The main problem with this analysis is the use of cross-sectional data to infer aging effects. In a cross-section, the consumption of living space appears to fall with age. If this effect were real, population aging implies a decline of housing demand with an associated drop in house prices. This conclusion is wrong for several reasons. First, there are strong cohort effects: young birth cohorts entering the housing market have been more prosperous than the current generation of pensioners. Even if incomes and assets are likely to grow more slowly in the future than in previous decades, housing demand will increase during the next 20 years simply because individuals from richer post-war generations make up a larger proportion of the overall population. A third trend, which can also be viewed as a cohort effect and is likely to increase demand, is the move away from multi-generation homes to households occupied by single people, linked to the desire of pensioners to remain independent for as long as possible. In addition to these cohort trends, there are scale effects: smaller households typically have a higher floor area per person. Demand for residential space will therefore fall less than might be feared on the basis of pure population forecasts. Finally, rising life expectancy will induce higher demand for living space. Medical progress is improving the health of people of pensionable age and will enable more pensioners to live independently within their own four walls for longer. Healthy life expectancy has been increasing by about 2.5 years per decade. This effect alone will increase housing demand by more than 3% per decade.

## 5 The critical role of pension reform

The simulations in Chart 11 contain an increase of the retirement age by two years. This is an important first and in our view the most important component of a pension reform designed to adapt the pay-as-you-go (PAYG) pension systems typical in the euro zone (see Subsection 3.1.2) to demographic change – here to longer lives. In addition, pension reform needs to address the sudden transition between babyboom and babybust which generates a sudden increase in pension expenditures. This is particularly pronounced in those countries that were depicted in the upper row of Chart 2, as can be seen in Chart 3 for Germany between 2020 and 2035. If PAYG systems are defined benefit (DB) systems with a politically determined relatively high replacement rate, then such a sudden increase will generate an equally sudden increase of the contribution rate necessary to balance the budget. This has been the case in many public pension systems in the euro zone, especially in France, Germany and Italy.

Recently, however, reforms have initiated a process which introduces elements of notional defined contribution (NDC) systems in these DB systems. Such reforms will smooth the increase of the contribution rate at the expense of a slower increase in pension benefits. Italy introduced a formal NDC system of the Swedish type for new entrants. Germany introduced a “sustainability factor” which adjusts pension benefits

not only to productivity increases, but also to the ratio of pensioners to workers, effectively transiting to a mixed system with DB and defined contribution (DC) features within the PAYG systems. This section models this second component of pension reform, using the model of Section 3.1.

## 5.1 Transition towards DC

We simulate two policies to set the replacement and the contribution rate which bracket the current mixture of DB and DC:

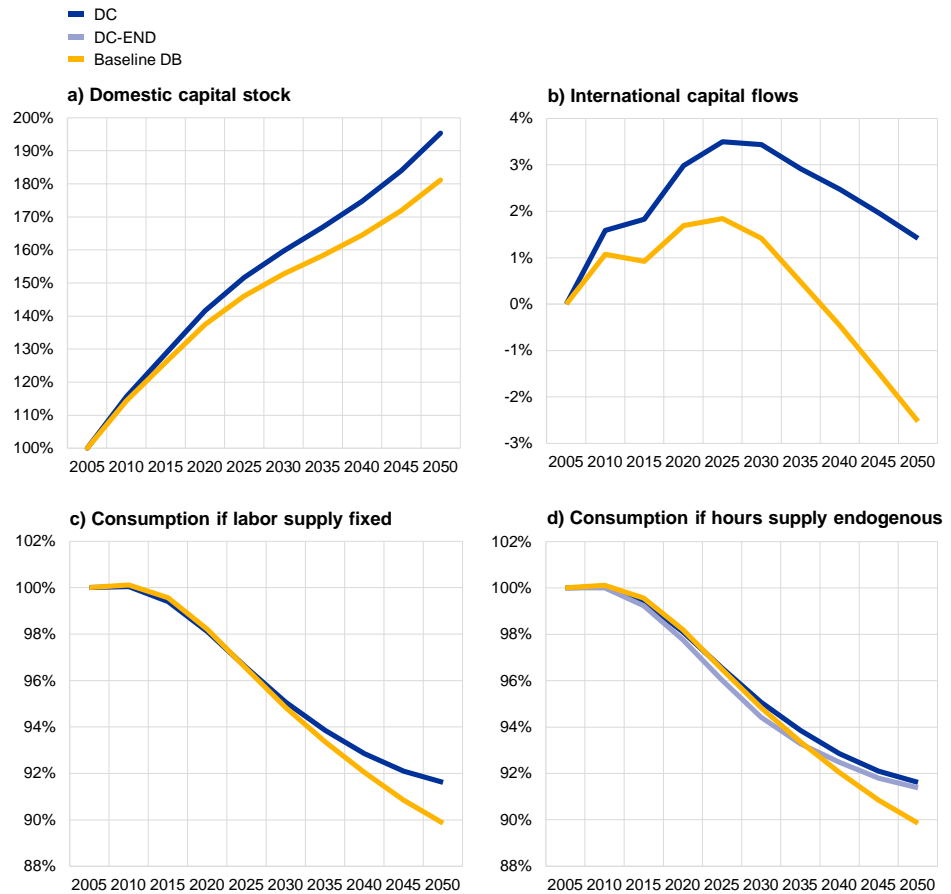
- the replacement rates are constant and roughly correspond to the 2010 levels (OECD, 2013). This corresponds to a PAYG-DB system; the contribution rate adjusts accordingly to maintain a balanced budget;
- the contribution rates are frozen at their 2010 levels corresponding to a PAYG-DC system; the replacement rate adjusts accordingly to maintain a balanced budget.

As in Section 3.2.3, these changes are assumed to occur gradually (linearly) between 2005 and 2030.

Chart 14 shows the resulting increase in the EU3's capital stock, expressed in relation to GDP and for the case of exogenous labor supply. The base case is a PAYG-DB system in which the replacement rate is fixed. In a PAYG-DC system, the declining replacement rate induces workers to save more for their retirement, resulting in a larger domestic capital stock. Moreover, also international capital flows increase substantially to about 3.5 percent of GDP, more than offsetting the reversal after 2035 in the baseline scenario since the new young cohorts keep building up assets to finance their retirement consumption. The higher capital stock plus the larger foreign assets lead to higher consumption per capita. Such pension reform steps will not only generate reaction in saving behavior but also influence labor supply. However, compared to the reactions to labor market reform, the negative behavioral responses are small as can be seen in the lower panels of Chart 14.

## Chart 14 Pension reform

(change from 2005=100%, except b) where 2005=0%)



Source: Based on Börsch-Supan, Härtl and Ludwig (2014).

Notes: Capital stock is a multiple of GDP. Capital flows are saving minus domestic investment in Europe, normalized to a balance of 0.91% in 2015. All other series normalized to 100% in 2005. All figures net of TFP growth.

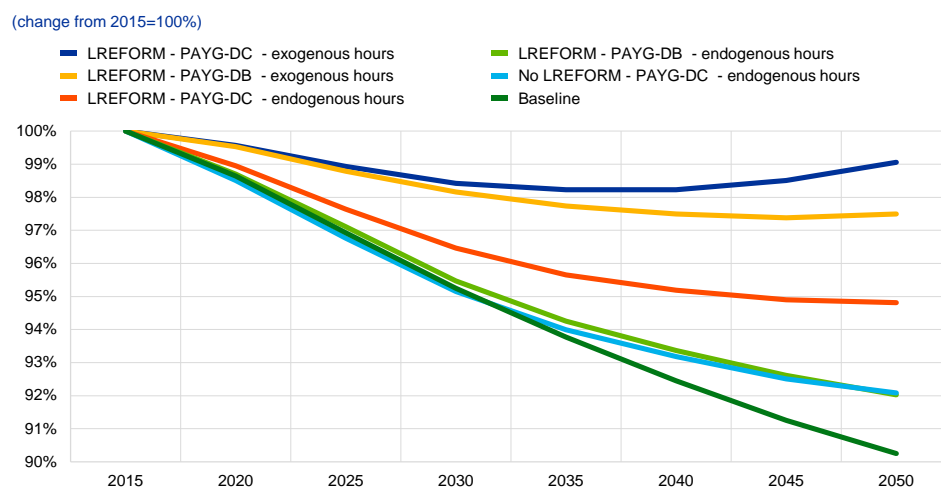
## 5.2 Policy interactions

Due to the interaction effects between pension system and labor markets, a smart combination of pension and labor market policies can do more than each of such policies in isolation. These interaction effects are shown in Chart 15. It combines the reform steps in Section 3.2.3 with those of Section 5.1. Such a combination will reduce the baseline decline of consumption per capita (circles in Chart 15) to about a half (triangles in the chart). While creating more labor supply and switching from a DB to a DC pension system would increase de-trended consumption per capita each by about 1.8 percentage points, the combined effect of labor market and pension reform is 4.8 percentage points, including their interactions which are about 25% of the total effect.



**Chart 15**

**Consumption per capita when policies are combined**



Source: Updated from Börsch-Supan, Härtl and Ludwig (2014).  
Note: Variables are normalized to 100% in 2015 and net of TFP trend.

## 6 Microeconomic underpinnings

While the core of this paper addresses macroeconomic issues, the behavioral assumptions of our basic model rely on microeconomic underpinnings and need micro data to be understood and justified. We address four fundamental aspects: the propensity to save, the forward view of households, and the productivity and health of an aging work force.

### 6.1 Life-cycle saving behavior

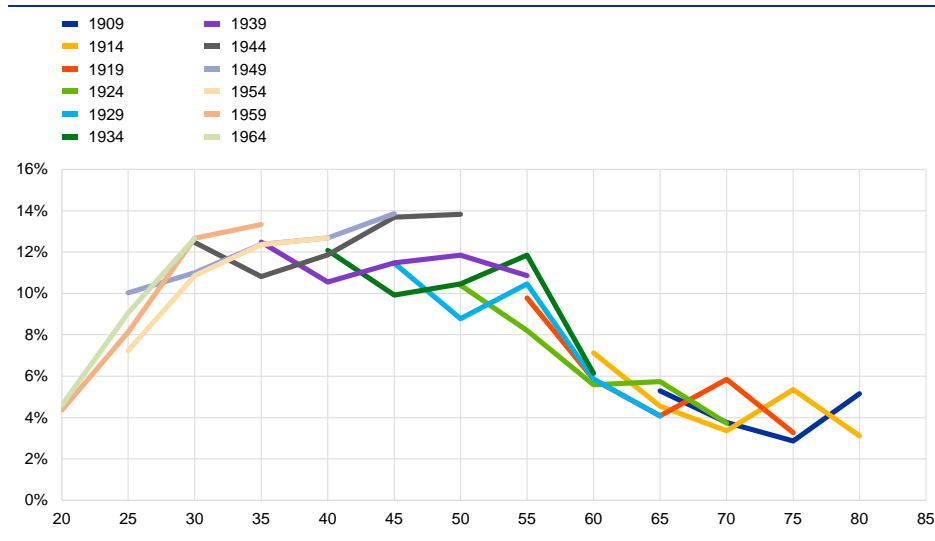
Does population aging decrease household saving? Theoretical arguments that establish this link build on the well-known life-cycle theory of consumption and savings by Modigliani, Ando and Brumberg (Modigliani and Brumberg, 1954; Ando and Modigliani, 1963). The aggregation of individual, cohort-specific life-cycle savings profiles leads to a decrease of national saving rates in an aging economy. In a general equilibrium model of forward-looking individuals, it is not only the current demographic structure that alters the time path of aggregate savings, but also future demographic developments. There are two main channels for effects of demographic change on domestic capital formation. First, decreasing labor supply reduces demand for investment goods since less capital is needed. Second, in a closed economy, a decline in national savings leads to a decline in investment by definition. In an open economy, the link between these two aggregates is broken to the extent that capital is internationally mobile.

While the theory is straightforward, it is less clear to which extent the stylized microeconomic savings theory by Modigliani applies to reality. Chart 16 shows

German saving rates by age (corrected for cohort effects). While we recognize the hump-shape predicted by Modigliani, we do not observe any dissaving in old age.

### Chart 16

Age-specific saving rates by age and cohort



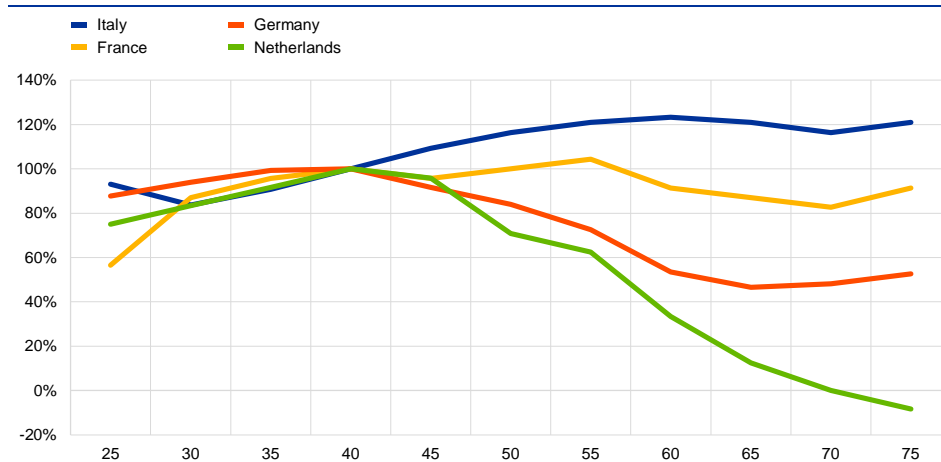
Source: Börsch-Supan, Reil-Held and Schnabel (2003).

This sheds considerable doubt on the realism of predictions based on the simple life cycle hypothesis. Such predictions are likely to overestimate the decline of saving rates if the true saving behavior looks more like Chart 16. We do not know much, however, about how the current saving behavior might change in the face of global aging. In particular, pension reform away from pay-as-you-go-financed pensions towards funded pensions might change saving behavior because it revives the retirement saving motive. To understand this, we need cross-national studies on saving behavior, since only international comparisons provide the policy variation needed for such analysis.

The power of such studies can be seen in Chart 17 which shows, by age group, median saving rates in France, Germany, Italy and the Netherlands. They are based on a comparable longitudinal framework, represent life-cycle saving purged from cohort effects, and employ comparable variable definitions and data sources as part of the International Saving Comparisons Project (Börsch-Supan, 2003). Newer data is currently collected as part of the Eurosystem's Household Finance and Consumption Survey (HFCS). At this point, the HFCS has still too few waves to construct similar cohort-corrected saving profiles by age.

**Chart 17**

Age-specific saving rates (cohort corrected)



Source: Börsch-Supan (2003).

The saving profiles in France, Germany and Italy are rather flat and show no dissaving in old age. One possible explanation is that the high replacement rates of the public pension systems in these countries have made private retirement income largely unnecessary. If other saving motives, such as precaution and intergenerational transfers, are more important than retirement saving, age-saving profiles are likely to be much flatter than under the textbook life-cycle hypotheses which predicts saving in young and dissaving in old age. This explanation is in line with the work by Jappelli and Modigliani (1998) who argue that the main mechanism for “retirement saving” in Italy is the PAYG system. While we lack the most appropriate counterfactual – French, German and Italian data from times when these countries had no PAYG systems – Chart 17 depicts the case of the Netherlands which have, as opposed to France, Germany and Italy, only a small base pension provided by their PAYG public pension system. All additional retirement income in the Netherlands has to be provided by (mandatory) savings plans, commonly provided through occupational pension plans. Chart 17 shows that the median Dutch household has a much more pronounced hump-shaped life-cycle savings profile than the median French, German and Italian households, and it exhibits dissaving among the elderly as they draw down their mandatory saving accounts.

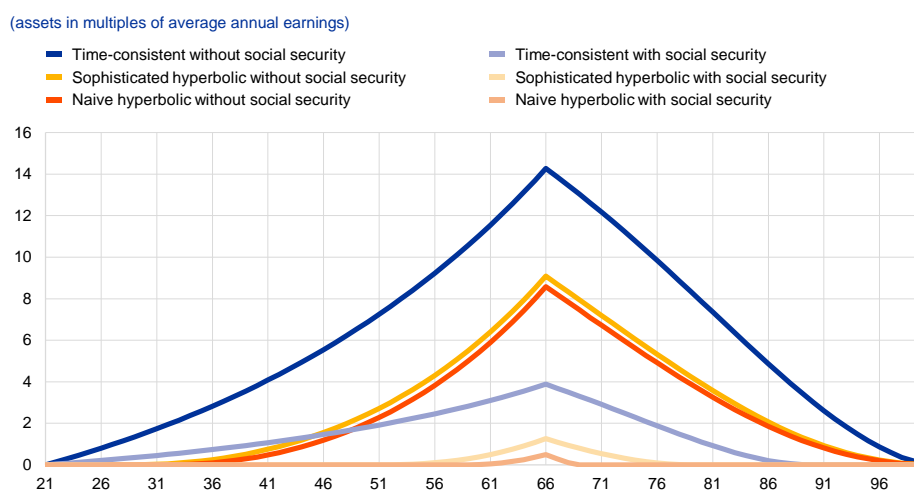
This cross-national microeconomic evidence suggests that the consumption-smoothing mechanism employed in the OLG model may be a quite appropriate prediction device. A pension reform towards a multi-pillar system with a substantial portion of funded retirement income will revive the retirement motive for saving in France, Germany and Italy. In fact, these systems will look very similar to the current Dutch system. Hence, it is likely that saving rates among the young will increase (to accumulate retirement savings), and saving rates among the elderly will decline sharply (because they will dissolve their retirement savings).

## 6.2 Myopia and procrastination

Another key assumption is the forward look implicit in the formulation of the households' optimization. Will our conclusions change if human behavior is less rational than assumed so far? Börsch-Supan, Härtl and Leite (2017) have developed multi-country OLG models with households who exhibit time-inconsistent behavior by postponing saving decisions.

### Chart 18

#### Asset accumulation and decumulation for time-consistent and procrastinating individuals, with and without a pay-as-you-go system



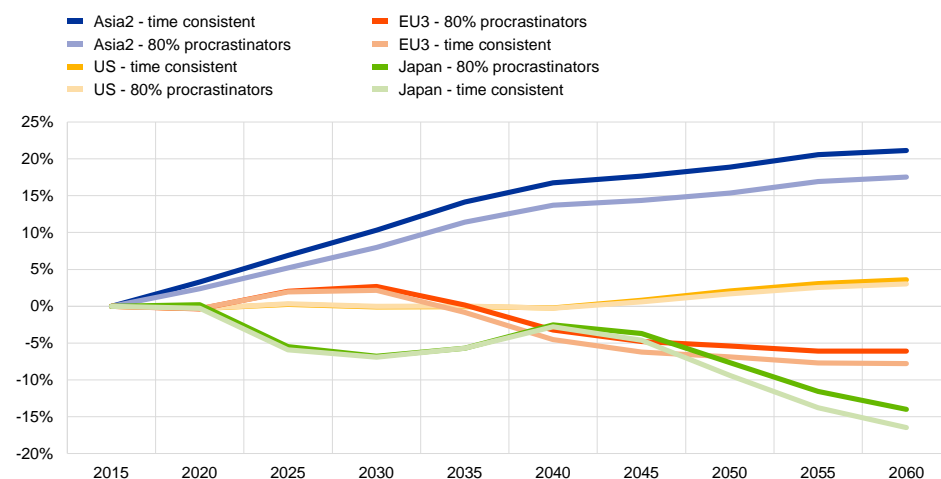
Source: Börsch-Supan/Härtl/Leite 2017.

The main implication of such behavior is that saving rates will be lower. Hence, assets at retirement (Chart 18) and, as a consequence, also international capital flows (Chart 19) will be lower if procrastinating behavior (“pb”) prevails. The basic patterns, however, remain qualitatively unchanged relative to time-consistent (“tc”) behavior. Hence, our main conclusions drawn in Sections 3 and 5 are relatively robust even if one deviates from the neo-classical life-cycle hypothesis/permanent income paradigm.

## Chart 19

### International capital flows under time-consistency and procrastination

(international capital flows from indicated region to rest of world as percentage of indicated region's GDP)



Source: Börsch-Supan/Härtl/Leite 2017.

## 6.3 Age, productivity and health

Our basic macroeconomic model distinguishes cohorts only by their size. Age per se, however, and its implications on productivity and health, is absent in our abstract model. The implicit assumption is that health and productivity are flat across the relevant age range.

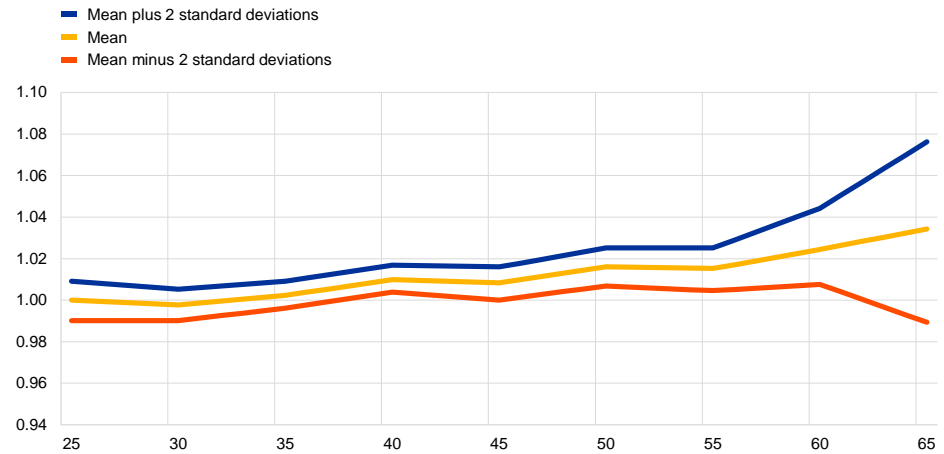
This is a controversial assumption. With regards to productivity, the macroeconomic literature usually assumes an increasing and then decreasing profile with a peak somewhere between age 30 and 45 (e.g. the seminal work by Altig et al. 2001). Similarly, health is assumed to decline sharply around retirement age.

Recent microeconomic evidence differs from these assumptions that are often dubbed as “stylized facts”. Börsch-Supan and Weiss (2016) and Börsch-Supan, Hunkler and Weiss (2019) have observed productivity in taylorized production processes in the manufacturing and service industry using very big data sets and econometric methods avoiding artefacts from the omnipresent selection effects in labor demand and supply. As opposed to the frequently taken view, productivity is essentially flat over the relevant age range. This holds both for the manufacturing (automotive assembly, Chart 20) and the service industry (insurance, Chart 21).

### Chart 20

#### Age-specific productivity in automotive assembly

(inverse severity-weighted number of errors)

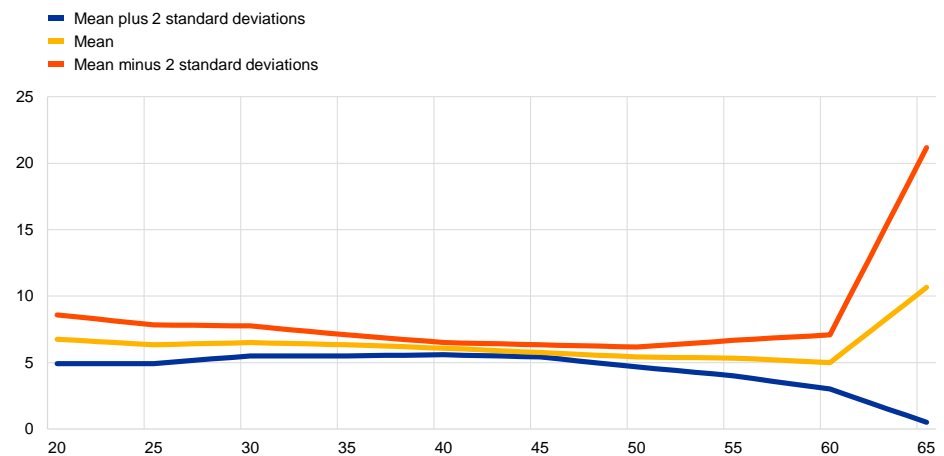


Source: Börsch-Supan and Weiss, 2016.

### Chart 21

#### Age-specific productivity in the insurance industry

(tasks per unit time)

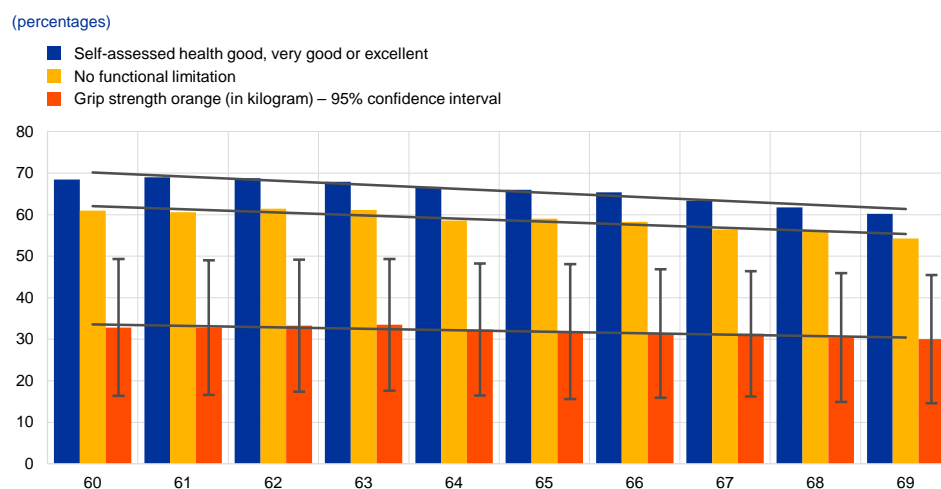


Source: Börsch-Supan, Hunkler and Weiss, 2019.

Data from the Survey of Health, Ageing and Retirement in Europe (SHARE) show that health changes less with age than often assumed (Börsch-Supan et al. 2013). Chart 22 shows the development of self-rated health (blue bars), functional health (green bars) and muscular strength (red bars). They decline very slowly during the “retirement window”. The error bands on the red bars show that within cohort variation is much larger than the difference in average health between 60 and 69 year old persons.

**Chart 22**

**Subjective and functional health by age in 11 euro-zone countries**



Source: Own computation using data from the Survey of Health, Ageing and Retirement in Europe.

Charts 20-22 show that there is no such thing as a fixed age at which old-age begins as suggested by the definition of old-age dependency ratios (e.g., in Section 2.1 and Chart 1). The false belief in a fixed beginning of old age also underlies the resistance against increasing the retirement age: on the employers' side the belief that productivity is low for older workers; on the employees' side the belief that health is already bad during the retirement window. Our evidence shows that productivity does not decrease measurably between age 55 and 65, and that health is declining only very slowly and smoothly during the retirement window between age 60 and 69.

## 7 Aging and inflation

So far, this paper has focused on the real economy. However, population aging may also affect inflation. A controversial discussion has emerged on this topic during the last decade. Especially the Japanese experience shows a striking connection between a steady increase of the age dependency ratio and a steady decline in inflation since its peak in the 1970s.

Robert Gordon, Alvin Hansen and Larry Summers called the attention to these twin patterns, which seem to fit in with the idea of that slower population growth and change of population structure are connected and are one of the causes for lower inflation and stagnant growth (Hansen, 1939; Summers, 2014 and Gordon, 2014). The absence of upward pressure of price and wage inflation during the recovery from the Great Recession, also called the “missing inflation puzzle”, has called extra attention to this debate (IMF 2016, 2017; see also Constâncio 2015).

In spite of the suggestive power of the Japanese experience, the current literature does not find a consensus. Results so far show a puzzling mix of contradicting empirical findings. Lindh and Malmberg (1998; 2000) and Juselius and Takáts (2016) look at age structure and inflation and find a robust correlation between the share of

net savers (workers) and lower inflation while a higher share of dis-savers (young retirees) boosts inflation. Nishimura and Takáts (2012) find opposite outcomes and state that a larger base of working age people has a positive impact on inflation. Similarly, Gajewski (2015) and Yoon et al. (2014) find a negative relation between the share of older people and inflation for different samples of OECD countries. Katagiri (2012) and Anderson et al. (2014) for Japan, and Bobeica et al. (2017) for the euro area, reinforce this view by demonstrating that population aging exhibits deflationary tendencies. Yoon et al. (2014) also find that population growth has a positive impact on inflation for Japan, the same positive correlation found for OECD countries by Shirakawa (2012). In contrast to these findings, McMillan and Baesel (1990) find a negative relation between total population growth and inflation, indicating that shrinkage in population due to aging would lead to inflationary tendencies.

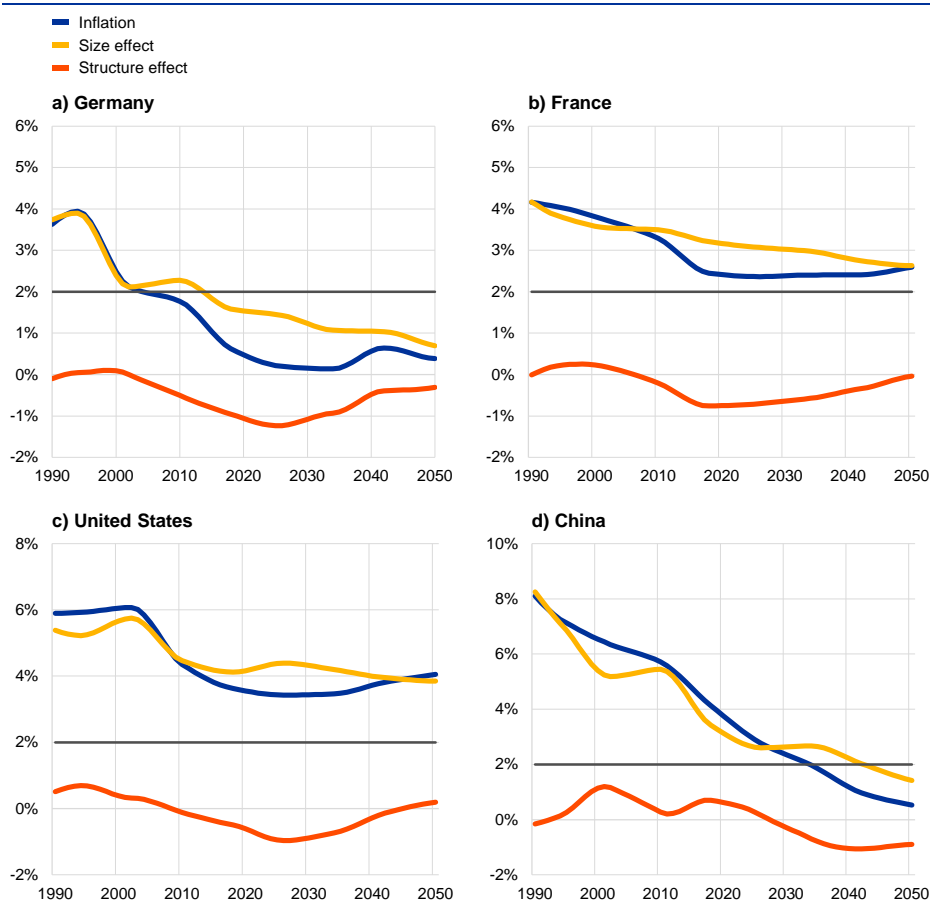
Some papers have offered theoretical explanations of these mechanisms. Examples are Lindh and Malmberg (1998; 2000), Fujiwara and Teranishi (2008), and Galí (2017). These papers take a business-cycle view; the latter two by using Neo-Keynesian models. In this respect, they lack a long-run perspective, which seems necessary in order to understand the impacts of population aging on inflation since the demographic transition is a very slow moving process that takes several decades.

Härtl and Leite (2018) therefore formalize the mechanisms that may explain how demographic change influences inflation with the help of a Computational General Equilibrium (CGE) model based on a long-term OLG structure. A key point of their analysis is to distinguish two components of population aging: a change in the demographic structure and a change in population size. While the lack of population growth is a main driver of deflationary pressures, the change of the demographic structure has an ambiguous effect and shapes the dynamics of inflation. The structure effect depends on which age groups dominate aggregate saving and consumption. If the largest age group is in its high spending years, inflationary tendencies prevail; if the largest age group spends little, deflation dominates. The timing of the babyboom, which is different across countries even within the euro zone (see Charts 1 and 2 in Section 2), thus creates cross-national differences in the relation between simple demographic measures and inflation rates. This may explain some of the apparent contradictions in the above-cited empirical literature.

Chart 23 shows results of the model by Härtl and Leite (2018). It distinguishes total inflation (blue solid line), structure and size effects (dashed lines). The upper panel relate to Germany and France, the lower panels to China and the US. All four countries exhibit a downward trend of inflation (blue solid line). This is due to the size effect: a slowing trend in population growth or even population decline will lead in all countries to a decrease in aggregate consumption that reduces money demand and, hence, exerts deflationary pressures.



**Chart 23**  
Aging and inflation



Source: Härtl and Leite (2018).

Countries which are far along in a strong demographic transition, such as Germany, already face deflationary pressures while France, with much weaker population aging, still features positive inflation. China will experience a similar trend as Germany in the next decades. Young countries, however, with high fertility rates like France and the US, will further go through inflationary pressures stemming mostly from the size effect. Nevertheless, also in these countries the baby-boom generation will soon approach old age (structure effect). Hence, while inflationary pressures will remain positive, they will be substantially dampened by demographic change in the next decades.

During the period from 2015 to 2025, the structure effect accounts for a reduction of inflation of around 50% relative to the equilibrium steady state in all countries except for China, which still benefits from a higher share of younger population. The decline in the relative size of the age groups, which are at the peak of lifecycle consumption, leads to a decline in consumption and money demand, negatively affecting inflation. This structure effect is especially prominent in the euro zone and the US during the next decade because first the baby-boom, then the baby-bust generations will then enter their retirement and dissaving phase.

The relative magnitudes of size and structure effect depend on the demographic history of a country and its stage in the demographic transition. Simple cross-national comparisons may confound size and structure effect, thereby leading to the contradicting results found in the empirical literature.

Härtl and Leite (2018) do not claim that inflation dynamics only depend on demographic change. There may be other and dominating reasons for the Japanese experience or the “missing inflation” in spite of the monetary interventions in the wake of the Great Recession. Nevertheless, they provide a consistent set of mechanisms, which show that demographic change has long-run impacts on inflation on the one hand and delivers insights on short-run phenomena observed nowadays on the other hand, for instance, the missing inflation puzzle.

## 8 Conclusions

Global aging will affect labor, product and capital markets in fundamental ways, which will change the growth path of GDP and the wealth of nations. We understand the basic mechanisms behind these changes, are able to trace some of the complex feedback effects in general equilibrium, and have presented some rough orders of magnitudes. Our central result is that economic growth is of course threatened by a declining total labor force and especially a declining ratio of workers to population, the support ratio. The decline of economic growth, however, is lower than the decline of the support ratio.

The first reason is that higher capital intensity, strengthened by digitalization, is a helpful mechanism to increase labor productivity in times of scarcity of labor. Partially, this will happen automatically as the supply of labor and capital will react to increasing wages and falling returns as response to the scarcity of labor relative to capital. While falling returns are far from an “asset meltdown”, they suffice to incentivize an increase in capital intensity.

The second reason is that capital markets can diversify the demographic risks generated by labor scarcity. They are therefore strategic markets in a globally aging world. International capital flows increase GNI relative to GDP for the next few decades and therefore dampen the decrease of economic growth as conventionally measured.

These two endogenous forces – higher capital intensity and larger international diversification – are neither sufficient to fully offset the effect of population aging on economic growth nor will they come as automatically as described by our model.

Public policy needs to take care and can offset the remaining effect of population aging on economic growth. It can influence these slow moving, demographically-driven changes of labor, product and capital markets mainly on the microeconomic level – most directly by adapting labor markets to a situation in which labor is becoming increasingly scarce. The main policy tools in order to utilize labor reserves are retirement, education and child-care policies which increase old-age, young-age and female labor force participation.

However, increasing the retirement age, as natural as it sounds given longer lives, is the “third rail” in politics due to its unpopularity. Pension reforms have created backlashes in France, Italy and Germany, led to new early-retirement pathways and thereby reduced labor supply especially among skilled workers. This paper has modelled these backlash effects; they are large. Section 6 has shown that they rest on wrong assumptions such as declining productivity and health during the relevant age ranges. While it is not the task of central banks to change labor market and pension policies, supporting all policies that strengthen economic growth and contributing to falsifying wrong assumptions is certainly a worthy cause.

Higher capital intensity and larger international diversification may not come as automatically as described by our model. While relying more on capital markets than on the pay-as-you-go mechanism has significant positive side effects on economic growth, bad governance, limited competition and lack of information and transparency have done a lot of damage to the acceptance of funded pension schemes. These problems need to be addressed – including by central banks – when one wants to exploit the positive effects of funding, including capital intensity and larger international diversification.

The international transmission mechanisms that generate the helpful effects of diversification also do not work smoothly. Understanding and minimizing the opposition to the free flow of capital, addressing the sources of instability in global financial markets, and fostering policies that reduce frictions and instability are important goals also for central banks in order to exploit the chances of population aging.

Important for central banks is the insight that aging and inflation are related through complex mechanisms than cannot be easily disentangled in the data by the simple descriptive methods that have produced the contradicting results of the empirical literature on this topic. A key point to understand whether ageing is inflationary or deflationary seems to be the distinction between size and structure effect. The size effect (a shrinking population) leads to lower aggregate demand and thus deflationary pressures. The structure effect depends on which age groups dominate aggregate saving and consumption and can therefore be inflationary or deflationary. The relative magnitude of size and structure effects depend on the demographic history of a country and its stage in the demographic transition, hence different countries can show opposing effects of aging on inflation even if observed at the same calendar time.

Our final point is therefore that the ECB and the central banks in the euro zone face the same dilemma in addressing population aging as in many other monetary policy areas, namely the dilemma between a homogenous policy and heterogeneity across the member countries. Economic growth, the leverage for structural reforms, the extent of policy backlashes, and even deflationary tendencies all depend to some degree on the demographic development which is significantly different even within the euro zone.

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# Discussion of “Demographic changes, migration and economic growth in the euro area” by Axel Börsch-Supan, Duarte Nuno Leite and Johannes Rausch

By Anna Maria Mayda<sup>1</sup>

## Abstract

The role of immigration in a context characterized by population aging is complex, as it involves several channels besides the direct effect of immigration on the size of the working age population (the direct effect being driven by immigrants' younger average age).

## 1 Main lessons from the paper

Börsch-Supan, Leite and Rausch (2019) focus on the macroeconomic impact of population aging on labour, financial, and goods markets, and more broadly on the effect on growth and productivity, in the euro zone area.

The authors first point out that, given the production function  $Y=A \cdot F(L, K)$  (where  $Y$ ,  $A$ ,  $L$  and  $K$  represent, respectively, GDP, technology, labour supply and capital), aging can affect the labour supply either: relative to the population, by reducing  $L/N$  (“structural effect”); or in absolute terms, by reducing  $L$  (“size effect”). To the extent  $L$  decreases, a decrease in output can only be avoided through an increase in  $A$  or in  $K$ . (Similarly, to the extent  $L/N$  decreases, a decrease in output per capita can only be avoided through an increase in  $A$  or in  $K/N$ ).

The authors also emphasize that “International flows of capital, goods and services, and labour – in descending order of mobility – will be important mechanisms which are able to moderate the effects of population aging in the euro zone” (page 1). In particular, “foreign direct investment may create capital income from foreign production. GNP may become substantially larger than GDP if foreign direct investment creates large returns” (page 2). In other words, FDI can increase GNP and compensate for the impact of aging on  $Y$  (i.e. GDP).

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<sup>1</sup> Georgetown University and CEPR. I would like to thank Campion Hall, Oxford University, for hosting me while I was working on this piece. The views expressed are my own.



To systematically quantify the macroeconomic effects, the authors use a multi-country OLG model and consider three different scenarios, where they assume:

1. exogenous labour supply based on current labour force participation rates: in this scenario, population aging has sizable (detrimental) effects on the euro zone, in terms of the old-age dependency ratio, labour supply, GDP and GNP growth, per capita consumption, international capital flows, wages and returns to capital.
2. exogenous labour supply based on the labour force participation rates which correspond to a variety of policy reforms (higher retirement age, higher female labour force participation, lower labour market entry age, lower unemployment): in this scenario, the harmful impact of population aging on the variables considered above is greatly reduced. As a consequence, the authors state: “In spite of population aging, the euro zone does not necessarily have to experience declining growth. Demography as such is not destiny, rather the euro zone has the ability to make and sustain reforms that better activate the available working-age population” (page 16);
3. endogenous labour supply based on the labour force participation rates driven by the behavioral response of workers to the policy reforms: in this scenario the impact of policy reforms is to a large extent undone. This scenario shows what happens when there is a backlash to policy reforms.

## 2 The role of immigration in a context characterized by population aging

The authors consider four drivers of the demographic transition associated with population aging:

- the secular increase of life expectancy;
- the historically given baby-boom baby-bust transition;
- current and future fertility; and
- migration.

The authors point out that, since immigrants come in their prime working age, they likely increase  $L$  (“size effect”) and  $L/N$  (“structure effect”). However, according to the paper’s analysis, these effects are small in magnitude. Given “various assumption about the number and age structure of migrants” (page 6), the authors conclude that the mitigating effect of migration on population aging is limited, in particular:

- even very large migration waves are unlikely to compensate the labour force ( $L$ ) reduction that will occur when the baby-boom generation will die;
- even extremely large migration waves will not undo the structural effect of a change in the dependency ratio.

The authors show their findings on the impact of migration in a context characterized by population aging in Charts 3 and 4. In particular, in Chart 3, Börsch-Supan, Leite and Rausch (2019) show the old-age dependency ratio (65+/20-64) in Germany under alternative assumptions about: the number of immigrants to Germany; German fertility rates; and life expectancy. In Chart 4, the authors show the old-age dependency ratio associated with different numbers of immigrants to Germany.

## 2.1 Fertility rates of immigrants vs. natives

In my discussion I will focus on the role that immigration can play in a context characterized by population aging. While the authors consider the direct effect of immigration on the size of the working age population due to immigrants' younger average age, I will discuss other channels through which immigration affects  $L$  (or  $L/N$ ) and more broadly  $Y$  (or  $Y/N$ ) that should also be taken into account.

In Charts 3 and 4, the authors assume that immigration affects the size of the working age population only because of immigrants' younger average age. However, note that migrants have higher fertility rates than natives (see Table 2 reported below from Adserà and Ferrer (2014)), so an increase in migration has an impact both in the short run (because of a younger population structure) and in the long run (because of higher fertility rates). In other words, some of the recent increase in fertility rates in the euro zone area took place as a consequence of immigration, hence some of the impact of increased fertility rates should be causally attributed to immigration.

My point can be better understood going back to Charts 3 and 4 in the paper. Combining a given increase in migration with the corresponding increase in fertility driven by that migration, the overall mitigating effect of migration on population aging is larger than calculated by Börsch-Supan, Leite and Rausch (2019).

Table 2: Share of births and total fertility rates (TFR) of natives and immigrants.

Country	Period	% Births		TFR <sup>(a)</sup>		Source
		Migrants	Nationals	Native	Immigrant	
Austria	2000		13.5	1.29	2.03	Kytir 2006
	2005		11.7			Kytir 2006
Belgium (Flanders)	2003-04	16.81	12.4			VAZG 2007
	2001-05			1.50	3.00	
Denmark England - Wales	1999-03	13.5	11.1	1.69	2.43	Statistics Denmark 2004
	1980	13.3				Schoorl 1995
	1995	12.6				ONS 2006
	2001			1.6	2.2	ONS 2006
	2005	20.8				ONS 2006
France	2006	21.9				ONS 2007
	1991-98	12.4		1.65	2.5	Toulemon 2004
						Prioux 2005; Heran and Pison 2007
Germany	2004	15	12.4	1.8	3.29	
	1980		15			Schoorl 1995
	1985		11.2			Schoorl 1995
	1995		16.2			Statistisches Bundesamt 2006
Italy	2004		17.6			Statistisches Bundesamt 2006
	1999		5.4			ISTAT 2007
	2004		11.3	1.26	2.61	ISTAT 2006, 2007
Netherlands	2005		12.2			ISTAT 2007
	1996	15.5				CBS Statline 2006
Spain	2005	17.8		1.65	1.97	CBS Statline 2006
	1996		3.3			INE 2006 & 2007
	2000		6.2	1.19	2.12	
	2004		13.7			
	2006		16.5	1.32	1.64	Roig Vila and Castro Martin 2007
	2005	19.5	11.8	1.72	2.01	Statistics Sweden 2006
Switzerland	1980		15.3			Coleman 2003
	1997			1.34	1.86	Wanner 2002
	2000		22.3			Coleman 2003
	2005		26.3			SFSO 2006

Source: Data compiled from Tables 1 and 2 a & b in Sobotka (2008)

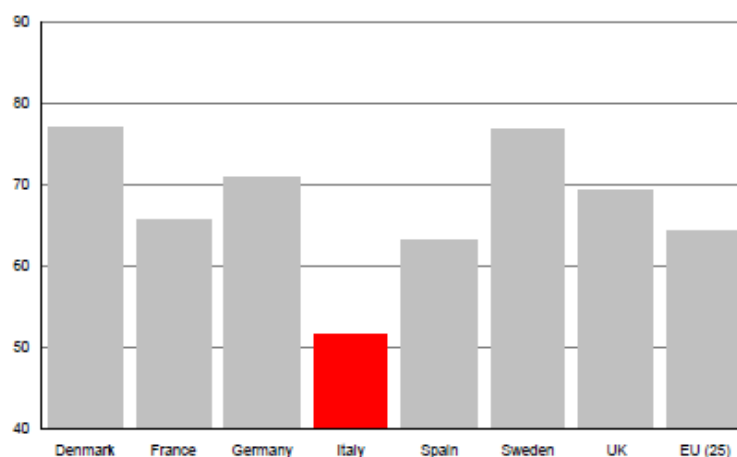
(a) TFR data is for Native nationals (instead of natives) and foreign nationals (instead of immigrants) in Austria, Flanders, France in 2004, Italy, Spain and Switzerland.

## 2.2 Price channel and implications for labour force participation

Empirical evidence in the immigration literature has shown that low-skilled immigration has reduced the prices of low-skilled labour intensive goods and services (see Lach (2007) for a demand-based explanation; and Cortes (2008) for a cost-based explanation). Other papers have shown that, as a consequence of these prices effects, low-skilled migration has increased the extent of labour force participation of high-skilled women, specifically the number of hours worked (see Cortes and Tessada (2011) for evidence on the United States; Barone and Mocetti (2011) for evidence on Italy; and Farrè, Gonzales and Ortega (2011) for evidence on Spain). In particular, high-skilled women have been able to outsource household related tasks such as child-rearing to low-skilled immigrants (whose arrival has led to lower prices of these services) and work longer hours. Higher labour force participation of women can in part offset the impact of aging on the labour force (as shown in the second scenario investigated by the authors, where one of the policy reforms considered implies an increase in women labour force participation).

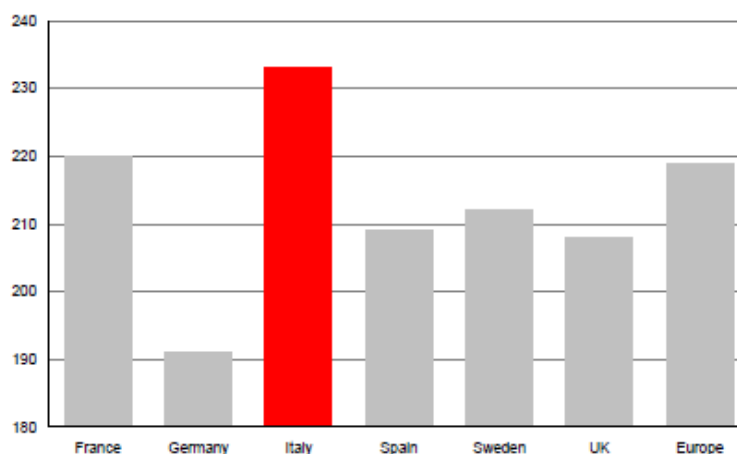
Figures 1-3 reported below from Barone and Mocetti (2011) show that, exactly in those countries in the euro zone where female labour force participation is lowest and the time devoted to domestic work by female workers is especially high, i.e. Italy and Spain, there is an especially high fraction of foreign employment in private households.

**Figure 1: Female Labor Force Participation**



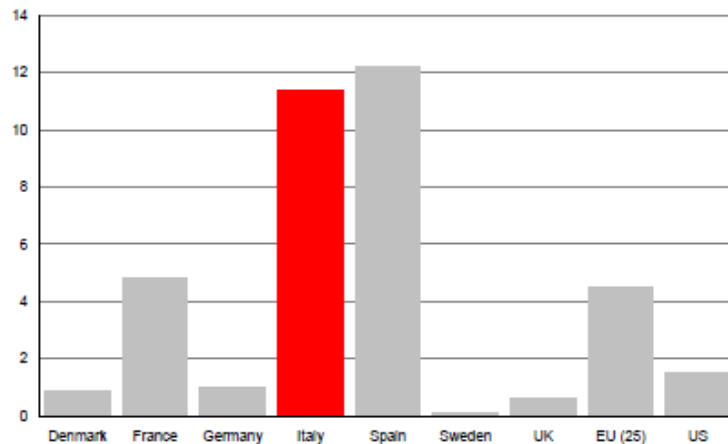
Figures refer to 2008. Source: Eurostat ([http://nui.epp.eurostat.ec.europa.eu/nui/show.do?dataset=fsi\\_act\\_a&lang=en](http://nui.epp.eurostat.ec.europa.eu/nui/show.do?dataset=fsi_act_a&lang=en)).

**Figure 2: Number of Minutes per Day Devoted to Domestic Activities**



Minutes per day devoted to domestic work by employed females. The domestic work indeed includes all the activities relative to meal preparation, house cleaning, household members' care, plant and animal care, goods and household maintenance, shopping, and various other tasks. The figure for Europe is obtained as a simple average of the 15 countries contained in the database of the *Harmonised European Time Use Survey*. Source: Istat (2008).

**Figure 3: Fraction of Foreign-born Employment in Private Households**



Figures refer to 2007 (for EU25 refer to 2005–2006 average). Source: OECD (2008).

### 2.3 Long-term care

Related to the latter point, one of the services supplied by immigrants within the household is long-term care. In countries, like Southern European countries, where it is mostly families (as opposed to public or private institutions) that provide care for the elderly, immigrants fill an important gap – given the limited supply of native providers. And of course population ageing in Europe is expected to significantly increase the demand for long-term care. (Note that empirical evidence on the migration of long-term care providers is scarce in the economics literature).

### 2.4 Health care

Population aging will also increase the demand for health care services. The share of immigrant workers in the health sector is substantial, especially in some countries in the euro zone (see Table 3.3 reported below from WHO (2014)). For example, according to the WHO (2014), by 2008 almost half of the nurses employed in Ireland were foreign trained, and the same is true for over a third of the doctors registered there (Dustmann, Facchini and Signorotto 2018).

Table 3.3 *Foreign-trained (or foreign) nurses and doctors in selected OECD countries, based on professional registries (WHO, 2014, p. 87)*

	Year <sup>a</sup>	Number	Share (%)
<b>Nurses</b>			
<b>Foreign-trained</b>			
Finland	2008	530	0.5
Netherlands	2005	3479	1.4
Sweden	2007	2585	2.6
US	2004	100791	3.5
Denmark	2005	5109	6.2
Canada	2007	20319	7.9
United Kingdom	2001	50564	8
New Zealand	2008	9895	22.1
Ireland	2008	37892	47.1
<b>Foreign</b>			
Belgium	2008	2271	1.5
France	2005	7058	1.6
Portugal	2008	2037	3.6
Italy	2008	33364	9.4
<b>Doctors</b>			
<b>Foreign-trained</b>			
Poland	2005	734	0.6
Austria	2008	1556	4.1
France	2005	12124	5.8
Denmark	2008	1282	6.1
Netherlands	2006	3907	6.2
Belgium	2008	289	6.7
Finland	2008	2713	11.7
Canada	2007	14051	17.9
Sweden	2007	6034	18.4
Switzerland	2008	6659	22.5
US	2007	243457	25.9
United Kingdom	2008	48697	31.5
Ireland	2008	6300	35.5
New Zealand	2008	4106	38.9
<b>Foreign</b>			
Slovak Republic	2004	139	0.8
Japan	2008	2483	0.9
Greece	2001	897	2.5
Italy	2008	14747	3.7
Germany	2008	21784	5.2
Portugal	2008	4400	11.1
Norway	2008	3172	15.9

<sup>a</sup> Notes: Country data sources: Austria: Austrian Medical Chamber; Belgium: Federal Public Service Health, Food Chain Safety and Environment; Canada: CIHI Workforce Trends of Regulated Nurses in Canada, SMDBI Scott's Medical Database; Denmark: Labor Register for Health Personnel, National Board of Health, Nursing Adviser; Finland: National Supervisory Authority for Welfare and Health (Valvira); France: ADELI, DREES, Ordre des Médecins; Germany: Bundesärztekammer; Greece: General Secretariat of the National Statistical Service of Greece; Ireland: An Bord Altranais, Irish Medical Council; Italy: AMSI Associazione Medici di Origine Straniera, based on ENPAM, Federazione Ipsasvi; Japan: Statistic Bureau, Ministry of Internal Affairs and Communication; Netherlands: BIG Register (Bevoegden in de Individuele Gezondheidszorg); New Zealand: Ministry of Health, Information Directorate, Nursing Council of New Zealand; Norway: Den Norske Lægeforening; Poland: Polish Chamber of Physicians and Dentists; Portugal: ACIDI, I.P., Immigration Observatory, Ordem dos Enfermeiros; Slovak Republic: Ministry of Health of Slovak Republic; Sweden: Swedish National Board of Health and Welfare; Switzerland: FMH Swiss Medical Association; UK: General Medical Council, Nursing and Midwifery Council; US: American Medical Association, National Council of State Boards of Nursing (NCSBN).

## 2.5 Innovation/productivity channel

Up to now, I have focused on low-skilled immigration. But note that the distribution of immigrants is often bi-modal, i.e. it is characterized by both low-skilled and very high-skilled immigrants.

There is abundant anecdotal evidence that the contribution of immigrants to innovation, entrepreneurship and education can be substantial. For example, in the United States immigrants account for about one quarter: of U.S.-based Nobel Prize recipients between 1990 and 2000, of founders of public venture-backed U.S. companies in 1990-2005, and of founders of new high-tech companies with at least one million dollars in sales in 2006 (Wadhwa, Saxenian, Rissing and Gereffi 2007). These authors also report that 24 percent of all patents originating from the U.S. are authored by non-citizens. In addition, Borjas (2005) shows that foreign students receive over fifty percent of all doctorates granted in the field of engineering.

Systematic evidence on the impact of high-skilled immigration on innovation and technology is available for the United States (see for example Hunt and Gauthier-Loiselle (2010), Kerr and Lincoln (2010), Doran et al (2014)). Some evidence exists for the euro zone area, in particular Denmark and France. Parrotta et al. (2014) analyze the connection between worker diversity within a firm and its patenting activity using data for Denmark and find that ethnic diversity leads to more patenting. Work in progress by Mayda, Orefice and Santoni (2019) shows that high-skilled immigration has increased patenting and innovation in France.

Most papers in the literature show that skilled immigrants have a positive impact on innovation<sup>2</sup>, and as a consequence on productivity (A), through potentially:

- Knowledge flows from origin countries;
- Selection effects on observables (field of study) and unobservables (ability, motivation);
- Task specialization (research vs. administration tasks);
- Greater labour mobility across firms which gives rise to knowledge diffusion across firms.

As the authors point out, increases in A can offset the impact of population aging on GDP and GDP per capita. Hence the discussion in this section is relevant to fully understand the role of immigration in a context characterized by population aging.

## 2.6 Other considerations

The authors mention FDI as a possible mitigating factor of the effect of population aging. A growing literature shows that immigrants and even refugees increase FDI to immigrants' and refugees' countries of origin (Javorcik, Ozden, Spatareanu, and Neagu (2011); Burchardi, Chaney and Hassan (2018); Mayda, Parsons and Vezina 2019).

Another important point is what Dustmann, Facchini and Signorotto (2018) denote "The Floridization of Europe: Old Age North–South Migration," i.e. the movement of old individuals during retirement from the North to the South of Europe for reasons related to amenities (better weather conditions), prices (lower cost of living), etc. One important factor driving elderly migration is the portability of social security benefits from the origin to the destination country. However, there is not much systematic evidence for the case of Europe (while some evidence exists for the U.S.).

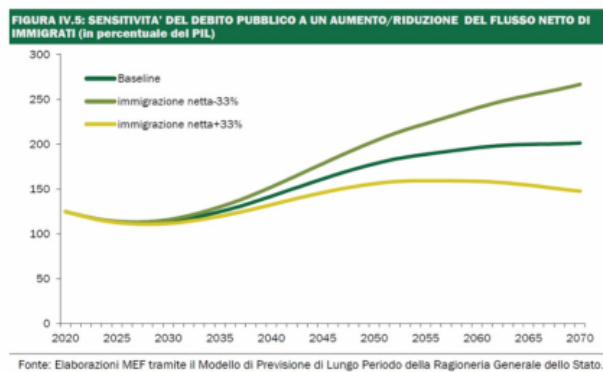
Finally, I have not directly discussed the impact of migration on public finances. There is an extensive literature on this channel (see for example the survey in Dustmann, Facchini and Signorotto (2018)). In relation to the fiscal effect of immigration, it is crucial whether immigration is permanent vs. temporary, i.e.

<sup>2</sup> See Hunt and Gauthier-Loiselle (2010), Kerr and Lincoln (2010) and Parrotta et al. (2014), although a recent study by Doran et al. (2014) questions this finding and has re-opened the debate.

whether migrants later in life go back to their country of origin. European countries display significantly higher outmigration/return rates compared to the more traditional destination countries (Dustmann and Görlach 2016). This implies that, lacking portability of retirement benefits from the destination to the origin country, temporary migrants are even more likely than permanent ones to contribute on net to the destination country's welfare state.

In general, the fiscal impact of immigration varies a lot across studies/countries and depends on various assumptions, for example about the participation in the welfare state of immigrants vs. natives. As pointed out by Boeri (2019), a telling example is the fiscal impact of immigration in Italy as shown in the Figure reported below, which is from the first Document of Economics and Finance of the Conte government (Documento di Economia e Finanza 2018, p. 108). The figure shows three scenarios of public debt in the next 50 years: 1. with net immigration equal to the actual forecast (dark green line); 2. with net immigration higher by a third relative to the forecast (yellow line); 3. with net immigration lower by a third relative to the forecast (olive green line). In the latter case, with immigration lower by a third, the Italian debt to GDP ratio is predicted to almost double compared to the current value; while in the case when immigration is higher by a third, the debt to GDP ratio levels off. Boeri (2019) suggests that one of the reasons for these findings is that, according to a study by INPS, immigrants in Italy contribute more to the welfare state than they receive.

## Immigrazione e debito pubblico: l'opinione del governo



### 3 Conclusions

The role of immigration in a context characterized by population aging is complex, as it involves several channels besides the direct effect of immigration on the size of the working age population (the direct effect being driven by immigrants' younger average age).



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# Turning the euro into a global currency should be a high priority for Europe

By Marcel Fratzscher<sup>1</sup>

## Abstract

Europe is struggling to stand its ground in an increasingly hostile global order in which it can no longer rely on US leadership and China is becoming more assertive. A strong global role of the euro is a crucial and widely underestimated instrument for Europe to defend its economic and political interests. Stopping the decline of the international importance of the euro and extending it into true global role should therefore be a top priority for Europe's politicians.

The United States has benefited from the exorbitant privilege of the US dollar's global dominance for close to a century, ever since the US dollar replaced the pound sterling as the preeminent global currency in the 1920s. This facilitates trade and financing for US firms and has lowered the US government's debt servicing costs as foreigners are eager to hold US Treasuries as the ultimate global safe asset. The global dominance of the US dollar has also shielded the US economy from much of the impact from the global financial crisis as investors worldwide fled to safety into US assets.

US President Trump has crossed a red line by abusing the global dominance of the US dollar as a geopolitical instrument, trying to cut Iran and other countries off from the international payments system and threatening others. His trade conflicts, erratic economic policy choices and the increase in US sovereign debt may not threaten the US dollar's global dominance any time soon, but it is inducing investors to seek alternative safe assets and diversify out of the US dollar.

China is pursuing an active strategy of developing the renminbi (RMB) as an international currency. Although these attempts have taken some beating since 2015, the renminbi has established itself as the predominant regional currency within Asia, with neighbouring countries managing their exchange rates as much or more vis-à-vis the RMB as the US dollar. The lack of RMB convertibility and closeness of China's capital account still severely limits the RMB's potential, but it is only a matter of time for this to change.

A potentially even bigger challenge for the ECB and the euro could come from the rise of private currencies. Facebook announced the launch of its Libra, which will be

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<sup>1</sup> President, German Institute for Economic Research (DIW)

backed by a basket of official currencies, and potentially reaching its 2.6 billion users. At best, currencies such as the Libra will erode central banks' ability to conduct monetary policy. At worst, it could trigger a financial crisis not less severe than the global crisis of 2008-09, with monetary authorities on the hook to provide a massive liquidity backstop and bailing out financial institutions relying heavily on such private currencies.

Europe has responded to these shifts in the geopolitical and financial paradigms with an air of indifference. The European Central Bank's (ECB) position on the international of the euro has until recently been one of benign neglect. As the latest release of the ECB's report shows, the international role of the euro has declined strongly over the last 15 years and remains close to an all-time low. The main reason for this decline is a political failure to complete economic and monetary union (EMU).

The euro area lacks a common safe asset and deep and liquid financial markets, which will be made worse by Brexit as most trade of euro denominated assets is still taking place in the City of London. The euro area is highly fragmented financially, with investors heavily focused on national markets. Capital markets union is still in its infancy and banking union remains incomplete. The euro area has with the European Stabilisation Mechanism (ESM) an important, though limited, crisis fighting instrument, yet it lacks instruments for broader macroeconomic stabilisation that can be mobilised quickly and prevent deeper downturns. Its fiscal rules are too procyclical and don't allow governments to be more effective in recessions.

Completing EMU and transforming the euro into a truly global currency is thus not a luxury, as some seem to believe, but essential both for protecting European interests in a nationalistic global environment and for protecting Europe against financial instability and crises. The primary responsibility for doing so does not lie with the ECB, but with national and European politicians pursuing the necessary reforms. Capital markets union with a common safe asset, better rules for fiscal policy and debt sustainability and effective macroeconomic stabilisation are prerequisites that are ambitious yet achievable, if national governments muster the needed political will.

It is up to Europe's politicians to decide whether the global monetary system in the long-run will transform itself into a bipolar system of the US dollar and the Chinese renminbi or whether it will be a tripolar system in which the euro and thereby Europe will play a role. The rising nationalism in China and the US government using the US dollar as a political instrument should be a wake-up call for Europe to strengthen the international of the euro through smart and feasible reforms.

Importantly, transforming the euro into a leading global currency provides a positive narrative for the completion of monetary union. Governments are so resistant to euro area reforms because they fail to see the economic and political benefits from the euro as a global currency, they only see the threats to their national sovereignty from agreeing to reforms and the completion of EMU. It is important to remind them that these reforms are not ends by themselves, they are rather means to develop and tap Europe's full economic potential.

# The future of the EMU

By Gita Gopinath<sup>1</sup>

## Abstract

I will centre my remarks around three broad issues: (i) heterogeneity that remains within the EMU, how problems can be amplified by it and what can be done; (ii) the reforms that are still required which I will narrow down to a few specific prescriptions; and (iii) a very brief discussion on the international role of the euro.

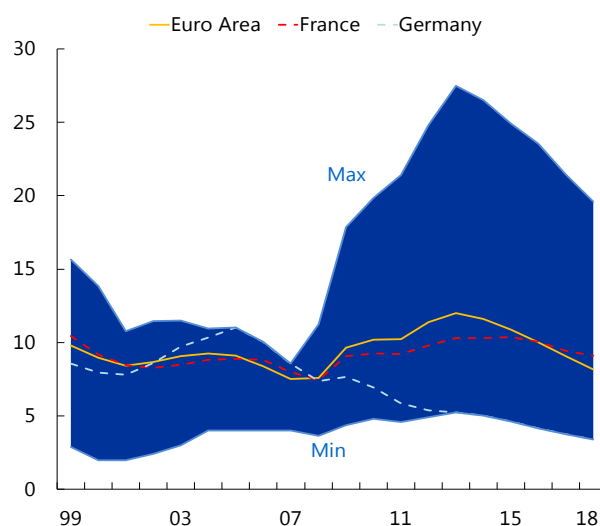
On the first issue, let me start with heterogeneity in macroeconomic variables which remains in the EMU. For example, Chart 1 shows that unemployment rates diverged in the aftermath of the global financial crisis. While the average rate is now back at the pre-crisis level, there is still significant heterogeneity in unemployment rates across the euro area countries, especially when compared to the US. In the US, the dispersion increased following the crisis, but has narrowed to the pre-crisis level.

### Chart 1

#### Heterogeneity in macroeconomic variables

##### Euro Area: Unemployment rates

(1999-2018, percent)



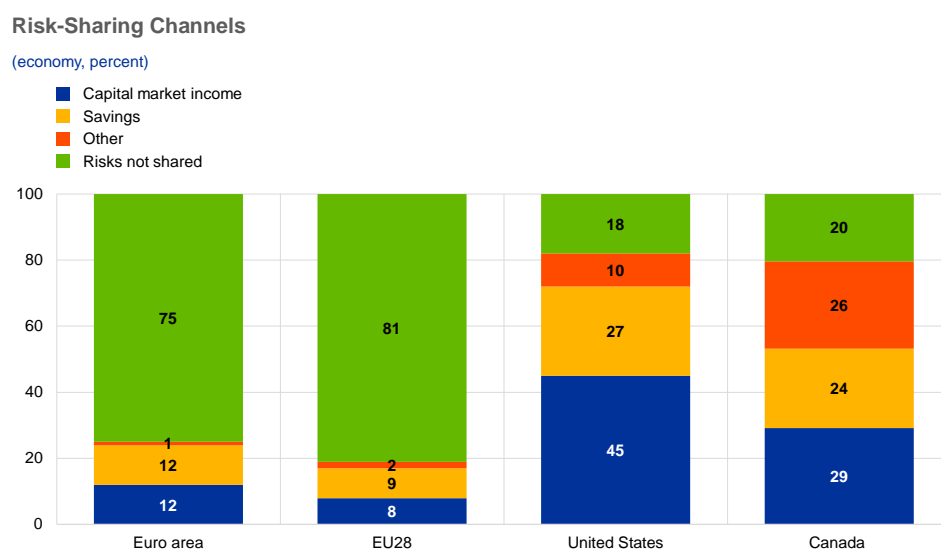
Sources: IMF, World Economic Outlook database

Notes: Only countries that were part of the Euro Zone in each given year are included.

<sup>1</sup> Economic Counsellor and Director of Research Department, International Monetary Fund.

The first lesson from such heterogeneity is that, in a monetary union, when you are hit with heterogeneous shocks, there is only so much that one unified interest rate policy can address. This is the textbook argument for why macroeconomic stabilization is challenging in a monetary union. The second lesson is that monetary policy cannot be the only solution because there are also structural reasons for such heterogeneity. These include structural differences across countries in the labour and product market. In the absence of structural reforms, the monetary union cannot function as smoothly. Alongside the heterogeneity, there is also low degree of risk sharing within the EMU. Chart 2 shows IMF and other estimates on the degree of risk sharing within the EMU, the US and Canada. The estimates show that there is more risk sharing through capital markets, savings, and, to a lesser extent, fiscal policy, in the US and Canada than in the euro area. What does this mean? If you live in a part in the euro area where unemployment rate is high, you will also live with low consumption, due to the low level of risk sharing across the monetary union.

**Chart 2**  
Low degree of risk sharing



Sources: Mitra et al. (forthcoming)

The second form of heterogeneity is in monetary policy transmission. Chart 3 shows that lending rates in different parts of the euro area diverged, starting around the time of the European crisis. That is, the problem may not only be about a single interest rate for heterogeneous countries but also that the transmission of this interest rate may be weaker for countries that need the stimulus the most. This problem was solved by the ECB's introduction of TLTRO, which helped to narrow the gap in rates. The third form of heterogeneity is about debt levels and the need for a lender of last resort. Debt crisis many a time is a consequence of poor fiscal management or weak economic activity, but sometimes it is about market failures and self-fulfilling crisis. In the latter case, there is a need for a lender of last resort within the monetary union. Chart 4 speaks to this necessity showing the reduction in sovereign spreads following President Draghi's "whatever it takes" speech, despite

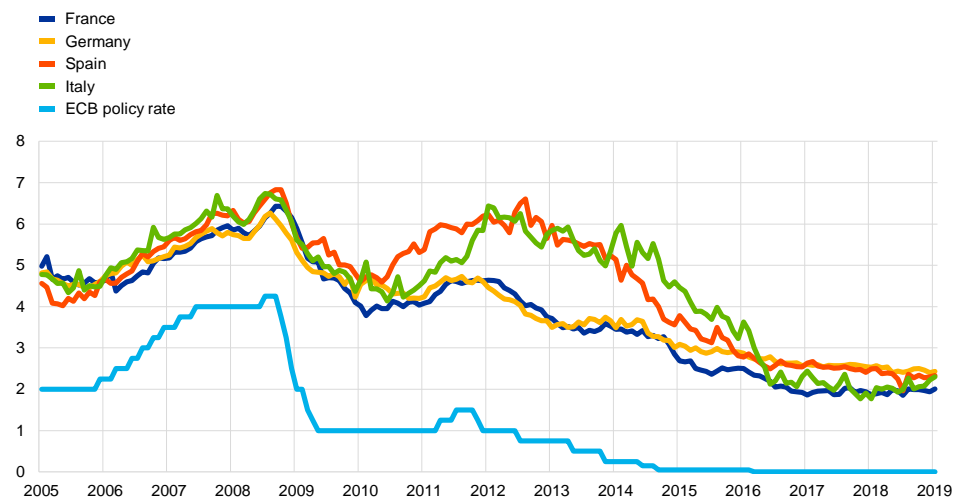
no change in fundamentals. This highlights how important it is for the central bank to step in to be the lender of last resort.

### Chart 3

#### Heterogeneity in monetary policy transmission

##### NFC lending rates and ECB policy rate

(2005-2019, percent)



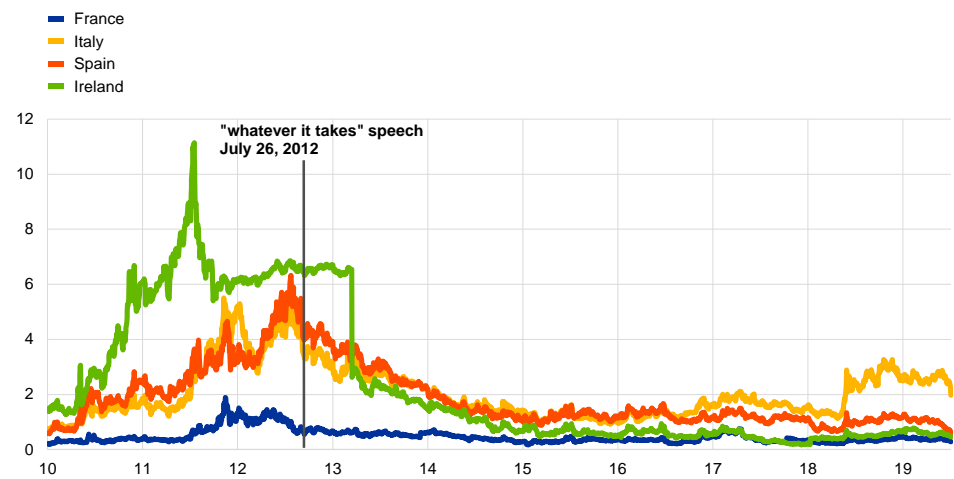
Sources: Haver.

### Chart 4

#### A need for a lender of last resort

##### European sovereign yields

(2010-2019, percent)



Sources: Bloomberg.

Let me move onto the second part of my remarks on reforms. What needs to be done? Let's start with the area where progress has already been made, which is the banking union. For a well-functioning banking union, it is important to have common deposit insurance. Such common deposit insurance scheme needs to have a credible backstop with sufficient fund which could be deployed quickly. On the capital market union, less has been achieved so far, although this area is very important.

What are the main hurdles to achieving a common capital market in the euro area? In our recent work at the IMF, we highlight three. One important obstacle is insufficient transparency. Firms' disclosures are not uniform or comparable across countries, so there is a need for at least minimum disclosure requirements. Second, on the insolvency regime, there is a great deal of heterogeneity across countries, so we need a minimum standard. Third is a need for a centralized supervisor of nonbank financial institutions, which again can generate a certain level of uniformity. Developing union-wide capital markets is important also because of a need for firms to diversify away from bank financing to other forms of financing. This will also help create more AAA assets; there is certainly a need for more safe assets in the euro area.

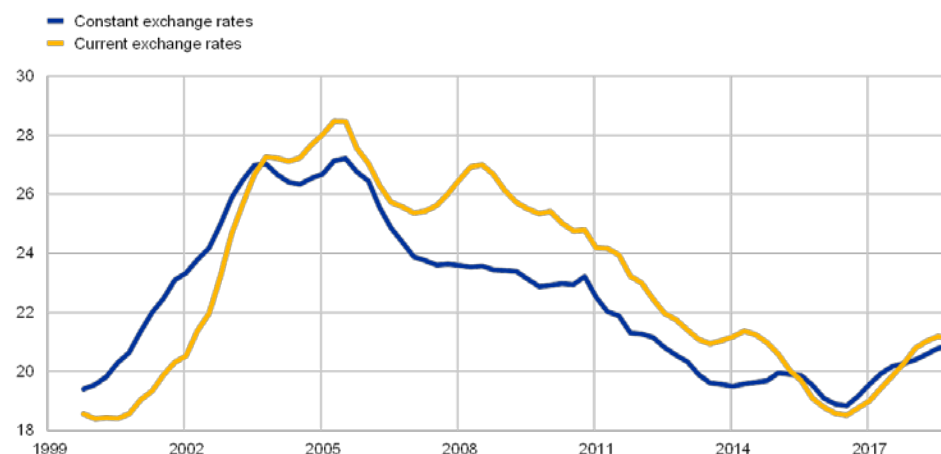
Third is the need for a central fiscal capacity. We are living in a world where the outlook remains precarious. A union-level macroeconomic stabilization tool is needed to address an eventual downturn. A central fiscal capacity is one such important tool for the euro area.

Alongside union wide reforms it is important for countries to undertake reforms at the national level. Our recent work on the euro area at the IMF points out that countries that reform their product and labour markets are indeed more resilient to shocks. This is not to say that reform is "one size fits all." There are, for instance, many models for the labour market. The Nordic model is one example with generous unemployment benefit and assistance to find jobs, and yet at the same time the labour market is able to reallocate resources with great efficiency.

### Chart 5 The international role of the euro

Composite index of the international role of the euro

(1999-2018, percent)



Sources: ECB (2019).

This brings me to my last remark, which is the international role of the euro. Chart 5 from the ECB's latest publication shows a decline in the international role of the euro over the last decade with an uptick most recently. It is a little early to infer if this uptick is the beginning of a reversion of the earlier downward trend. For instance, the increase in the euro's share in international reserves is partly a result of certain



central banks in emerging markets using their dollar reserves to defend their currency in 2018, a point made in the ECB publication.

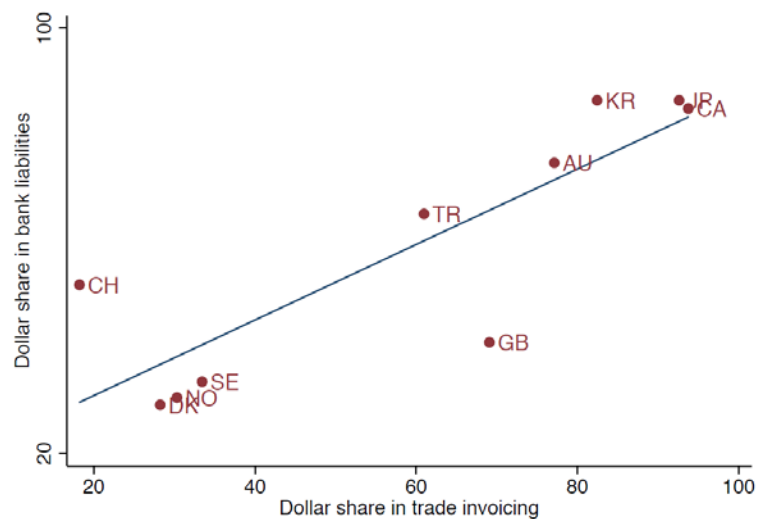
There is the question of what enables a currency to become a dominant currency. In my work with Jeremy Stein, we show that a currency's role in trade, finance and reserve assets complement each other. This is seen in Chart 6. Countries that rely heavily on dollar invoicing in trade are those that also have a greater share of banking liabilities in dollar. The argument goes as follows: with a significant share of spending on dollar invoiced goods there is a demand for dollar safe assets to insulate consumption from exchange rate movements. This high demand attracts banks to create these dollar safe assets. Once the banking sector has large dollar liabilities, it is not surprising that central banks would also keep large dollar reserves so as to effectively intervene in a crisis. Lastly, with low interest rates associated with high demand for dollar safe assets, firms are tempted to invoice in dollars so as to generate the collateral to borrow at dollar interest rates. These elements reinforce each other giving rise to a dominant currency. What this means is that it can be difficult to dislodge a dominant currency. It also means that a currency's prominence has to grow both as an invoicing currency and a financing currency, and the two are intricately linked. It would be welcome to have the euro as a global currency on par with the dollar, but this may take a while.

### Chart 6

A currency's role in trade, finance and reserve assets complement each other

Dollar share in trade invoicing and bank foreign currency liabilities

(percent)



Sources: Gopinath and Stein (2018).

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# Banks, politics and European Monetary Union

By Martin Hellwig<sup>1</sup>

## Abstract

This contribution to the panel on the future to EMU discusses the tensions that arise from the fact that banks are, on the one hand, an essential element of the monetary transmission mechanism and, on the other hand, an integral part of local, regional or national polities. Banking union can eliminate or at least reduce some of the procrastination that has allowed maintained bank weaknesses to persist and harmed the transmission of monetary policy but, whereas the SSM has been fairly successful, resolution is still not working properly and needs further reforms. At the same time, banking union suffers from the problem that interventions from Brussels or Frankfurt are seen as infringements of national sovereignty that lack political legitimacy. The conflict between supranational and national interests is ultimately irresolvable but, if EMU is to survive, measures must be taken to limit its impact.

## 1 Introduction

Any discussion of the future of EMU must consider the question whether this monetary union will survive. On this question, political developments of the past ten years must give us pause. In some member states, we have seen the rise of populism with strong anti-EU and anti-EMU leanings. If this development continues, the very existence of EMU and perhaps the EU as a whole will be challenged.

The challenge to EMU is political rather than economic. Money is a source of power. Central banking is political even though we like to think of it as technical. Therefore the central bank needs political legitimacy. Political legitimacy is based on public trust and public discourse, not just on the legal norms that empower the central bank. Thus, in the past, the Bundesbank's independence rested on its power to mobilize public opinion, rather than the law, which could have been changed at any time by a simple majority of the Bundestag; mobilization of public opinion made such a change prohibitively costly.<sup>2</sup> For a supranational institution like the ECB, the task of maintaining political legitimacy is even more challenging because public political discourse in the euro area is mostly national.

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<sup>1</sup> Max Planck Institute for Research on Collective Goods Bonn

<sup>2</sup> Thus Chancellor Adenauer's 1956 attempt to prevent an increase in central-bank interest rates and Finance Minister Waigel's 1997 initiative to revalue the Bundesbank's gold reserves in order to warrant an extra payout to the government triggered public outcries and were quickly withdrawn.

In the first decade of EMU, the problem hardly arose. This decade saw what may be called a depolitization of monetary policy. Whereas before EMU monetary policy and its relation to fiscal policy and wage setting had persistently been a matter of public debate, in the first decade of EMU, monetary policy disappeared from the headlines. Media discussion of monetary policy concerned exchange rate movements, the appropriate level of transparency, or the two-pillar approach – nothing to raise political emotions.<sup>3</sup>

All this changed with the financial crisis of 2007-2009 and the “euro crisis” since 2010. The difference between the second and the first decade of EMU is not just the difference between monetary policy in normal times and in a time of crisis. In the second decade of EMU there also was a repolitization of monetary policy, a return of monetary policy to the headlines, the focus of public discussion. Initially, in the financial crisis, this repolitization concerned the support that central banks and governments brought to financial institutions. Subsequently, the repolitization concerned the measures taken to contain the “euro crisis”, with a fragmentation of public discourse along national lines, involving discussions about bailouts in some countries and about austerity in others.

In this context, the supranational character of EU institutions is a source of weakness rather than strength, for the ECB as well as the European Commission. To be sure, political discourse in the member states cannot directly affect them, but since they are not a part of this discourse, they are also not in a position to defuse the criticisms that are raised. Participation in discourse however is important for mobilizing political support and defending against national populism that aims at undermining the basis for European integration.

The problem is not just a by-product of the crises but is endemic to EMU. Whereas monetary policy is supranational, its effects are felt by people and by institutions that operate in political spheres of discourse that are national.

The tension is particularly strong in the area of banking. On the one hand, banks are an essential part of the monetary system. The payments system depends on banks and the central bank relies on banks for the transmission of monetary policy measures to the overall economy. On the other hand, banks are also an essential part of their respective national or even regional economies and polities. A lot of banking is national, or even local – and it is political because funding by banks plays a key role in the communities where they are located.

The role of banks in EMU, their position between supranational and national authorities, poses a major conundrum. In the following, I will discuss this conundrum and its significance for the future of EMU.

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<sup>3</sup> See Hellwig (2007).

## 2 Banking union is essential for European Monetary Union

When EMU was founded, the role of banks in the monetary system was given little consideration. The Treaty asks the ECB to “contribute to the smooth conduct of policies pursued by the competent authorities relating to the prudential supervision of credit institutions and the stability of the financial system” (Art 127 (5) TFEU). The Treaty also gives the Council the power to introduce special legislation to “confer specific tasks upon the European Central Bank concerning policies relating to the prudential supervision of credit institutions and other financial institutions with the exception of insurance undertakings” (Art. 127 (6) TFEU). Both formulations seem concerned with the assistance that the ECB can provide to competent supervisory authorities, rather than the functioning of monetary policy. Before the advent of banking union, of course, competent supervisory authorities were institutions of the member states.

At the time, the lender-of-the-last-resort role of central banks was also given little consideration. Subsequent memoranda of understanding minimized such a role, stipulating that solvency problems were to be dealt with by member state governments, liquidity problems of individual banks by national central banks’ provision of emergency liquidity assistance (ELA), and liquidity problems of the entire system by the ECB through appropriate market interventions.<sup>4</sup> The possibility that member state governments might be unable or unwilling to deal with solvency problems was not considered. Neither was the possibility that some markets might break down and that market interventions might not be sufficient for liquidity provision to the system.

During the first decade of EMU, these omissions did not matter. Concerns about bank solvency did not play any role, and liquidity was always available through wholesale markets. Interbank markets contributed to an integration of monetary systems that went much farther than the fragmentation of banking systems along national lines might have led one to expect.

With the financial crisis of 2007-2009, however, concerns about bank solvency became prominent, and wholesale markets froze. Interbank lending, including cross-border interbank lending, broke down, and liquidity became a major issue for banks. Even after the interventions of governments and central banks had stopped the crisis, the system did not return to its previous mode of functioning. As the “euro crisis” developed, in 2009-2012, capital flows were even reversed as interbank loans were recalled or not renewed and securities from periphery countries were sold.

For monetary policy, these developments created serious challenges: First, how to deal with the liquidity crises; second, how to implement a unified monetary policy with fragmented banking systems when interbank markets could not be relied upon to link the economies of different countries. Third, how to make monetary policy effective when transmission to the real economy was hampered by the fact that large parts of banking systems were on the brink of insolvency. Of these challenges, the

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<sup>4</sup> Hellwig (2007).

first one was met by radical action, with large injections of liquidity in 2007/08 and again in 2011/12. The second one was met by moving to a full allotment rule allocating central bank loans to commercial banks on the basis of expressed demand. The third challenge, however, lay outside the domain of central-bank power.

A paradigmatic example is given by the finding of Acharya and Steffen (2013) that loans provided under the Eurosystem's Long Term Refinancing Operation (LTRO) of 2011/12 were most attractive to weak banks and that these banks were more likely than others to use the money for lending to their own governments rather than the real economy. The LTRO was very successful in stopping the financial turmoil that had started in the summer and fall of 2011, but the ECB's assured funding of commercial banks only partly resulted in additional lending to the real economy.

In this context, national and supranational institutions, governments and central banks may have different interests and incentives. Whereas the central bank needs healthy commercial banks for an effective transmission of monetary policy, national authorities sometimes find it convenient to procrastinate when "their" banks are in trouble.<sup>5</sup> Supervisors may want to procrastinate because they want to avoid a public discussion about the causes of the difficulties. Governments may want to procrastinate because they fear the need to use public money to recapitalize banks; the LTRO experience suggests that they may also see the weakness of commercial banks as a way to get indirect access to the printing press. Central banks themselves may want to procrastinate because they fear that the turmoil associated with an intervention might cause further systemic damage.

However, kicking the can down the road rarely has the consequence that the problems disappear on their own. Most of the times, delays aggravate the problems and make subsequent resolution even costlier.<sup>6</sup> Moreover, timely recognition and resolution of banking problems are essential for the implementation and transmission of monetary policy when the central bank uses commercial banks to bring central bank money into the economy.

Banking union can be understood as an attempt to address this issue. The Single Supervisory Mechanism (SSM) takes banking supervision out of the national domain and gives the ECB the power to oversee systemically important institutions in the euro area, to ask for corrective measures if they see problems, and to ask for resolution by competent authorities if other measures are not available. In this work, the ECB-supervisors cooperate with the national supervisors and may depend on the national supervisors' information about "their" financial institutions, but, in matters concerning the application of European legal norms, the national supervisors themselves are acting as part of the SSM and are independent of their governments, most importantly, their finance ministers.

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<sup>5</sup> Hellwig (2014 a, b).

<sup>6</sup> ASC (2012).

In my view, the SSM has been remarkably successful. Beginning with the comprehensive assessment and stress test in 2014, the SSM has contributed a lot to making banks recognize losses on problem loans that the national supervisors had long overlooked, for example, losses on loans to the shipping industry.<sup>7</sup> The SSM also contributed to making banks raise new equity, some of it in anticipation of asset assessments and stress tests, some of it in response to the shortfalls that the assessments and stress tests uncovered.

Even so, important parts of euro area banking systems remain weak. The weakness reflects the extent and the depth of the financial crises since 2007. It also reflects the fact that, in the area of resolution, banking union has not been very successful. The Bank Recovery and Resolution Directive (BRRD) and the Single Resolution Mechanism Regulation (SRM) have moved bank resolution partly to the supranational level, but only partly, and the new arrangements are not working well.

When the BRRD and the SRM Regulation were drawn up, no attention seems to have been paid to the fact that, even in resolution, some provisions must be made to ensure that the bank remains liquid. In the case of the Spanish bank Banco Popular Español (BPE), resolution had to take place overnight, through a shotgun sale to Banco Santander, because otherwise the bank would have run out of cash and defaulted the next day. The BRRD recognizes the importance of short-term funding of banks and exempts some of it from bail-in, but neither the BRRD nor the SRM Regulation say anything about what is to happen if there is a run by short-term financiers, depositors or money market funds.<sup>8</sup> The legislators seem to have thought that the resolution procedure does not require much time, but if investors are afraid and run, there may be no time at all before the bank runs out of cash. In the case of BPE, there was a run by depositors, and the authorities did not even have the time for a proper valuation in support of the bail-in they imposed on the holders of equity and subordinated debt.<sup>9</sup>

National authorities have tried to avoid the SRM as much as possible. In the case of the Italian banks, Monte dei Paschi di Siena as well as Banca Popolare di Vicenza and Veneto Banca, intervention was much delayed by protracted negotiations between the Italian government and the European Commission's state aid control unit over the question whether precautionary recapitalizations proposed by the

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<sup>7</sup> Ever since 2008, excess capacity has made it difficult for shipping companies to earn the margins above variable costs that they need to service their debt, let alone earn a return on equity. As construction orders from before the crisis were being completed, capacity growth continued long after 2008, so excess capacity persisted even after world trade had recovered from its 2008 collapse. For a detailed discussion, see Hellwig (2018b).

<sup>8</sup> In ordinary insolvency law, the problem is much less acute and can be handled by freezing old debt and giving priority to new debt when a company goes into bankruptcy. With banks, such a rule is problematic: If the short-term debt is frozen, the systemic implications for, e.g. money market funds can be disastrous, as in the case of the Lehman Brothers bankruptcy inducing the Reserve Primary Fund to break the buck, triggering a dramatic run of investors on money market funds, and causing the subsequent freeze of money markets. If the short-term debt is not frozen, funding needs are likely to be so large that merely giving the new (or renewed) claims priority over frozen old debt may not be enough to fill these needs. For a detailed discussion, see Hellwig (2014b).

<sup>9</sup> The bank was declared failing or likely to fail on June 6, 2017 and resolved on June 7. The resolution decision relied on an independent valuation that the Single Resolution Board (SRB) had ordered on May 23, 2017. However, the valuation report noted that the time span of 13 days had been too short to provide more than a provisional valuation. For a detailed discussion, see Hellwig (2018a).

government were compatible with the European rules on state aid. Eventually, Monte dei Paschi was recapitalized and the other two banks were wound down under national law.<sup>10</sup> In the case of HSH Nordbank, the regional governments of Hamburg and Schleswig-Holstein as owners of the bank accepted additional costs to taxpayers of over two billion euros in order to avoid a winding down of the bank. In the political deliberations in Hamburg, the government suggested that yielding control to the SRM would induce additional losses as there was no viable regime for an orderly winding down of the bank. This case also had dragged on for a long time.<sup>11</sup>

The persistence of high levels of non-performing loans must also be seen in this context. Over the past two years, these levels have been reduced, but they remain very high, in some countries dangerously so. Industry resistance against a further cleanup is strong: such a cleanup might require substantial recapitalizations or even closures, which would impose losses on incumbent shareholders, perhaps even debtholders.<sup>12</sup> Last year's dispute about the SSM's proposal to enhance provisioning against losses on non-performing loans has shown that, in its resistance, the industry enjoys strong support from political forces. Resistance against bank cleanups also comes from stakeholders such as borrowers and political authorities that have become used to benefiting from the presence and conduct of the banks in question.

In summary, we do not yet have a viable system for dealing with banks in difficulties. In part, the problem is technical, for example in the lack of viable arrangements for funding banks during the resolution process (also during the process of winding them down if that is the preferred option)<sup>13</sup>. In part, the problem is political, for example in the distributive conflicts involved in the recognition and attribution of losses to different parties. However, the resulting delays in bank cleanups cause the weaknesses of banking systems to persist. To the extent that these weaknesses are due to excess capacity and low profitability, the delays also contribute to maintaining the excess capacities and to preventing a restoration of bank profitability that might help the industry to recapitalize by retaining earnings.

From the perspective of monetary union, it is essential to have a reform of banking union that makes resolution viable, enabling a clean-up of the industry that reduces the frictions in the transmission of monetary policy. As a contribution to the much vaunted "completion of banking union", a reform of bank resolution is even more important than the introduction of a European deposits insurance system. Deposit

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<sup>10</sup> The Single Resolution Board decided that Banca Popolare di Vicenza and Veneto Banca were not important enough to warrant application of the SRM and entrusted the Italian authorities with the task of winding them down.

<sup>11</sup> In the summer of 2013, the regional governments applied to the European Commission for permission to increase their second-loss guarantee to the bank from seven to ten billion euros. In 2015, the Commission agreed, but insisted on the bank being sold to private investors by 2018, or else wound down.

<sup>12</sup> For an account of incentive distortions causing incumbent shareholders to resist recapitalizations even if they would be efficient, see Admati et al. (2018).

<sup>13</sup> In the case of Banca Popolare di Vicenza and Veneto Banca, the Italian authorities had to rely on a special procedure outside of standard insolvency law, relying on Intesa Sanpaolo for funding the winding down of bad loans.



insurance may actually be irrelevant if the arrangements for resolution are not trustworthy and resolution is never entered into.

### 3 Banking union lacks political legitimacy

Whereas banking union is needed to provide monetary union with a financial-sector infrastructure that permits smooth transmission of monetary policy, at the same time, banking union lacks political legitimacy. The resistance against viable and speedy bank resolution is only one symptom of a deep-seated feeling that banks are an important part of local, regional, and national polities with which supranational authorities should not meddle.

There are several reasons why banks are political.<sup>14</sup> First, banks are a source of money, and everyone in the polity has an idea of what the money should do. Politicians know that “their” banks should fund “worthy” purposes. For example, the German Landesbanken, public-sector banks that are owned by the Länder, have a tradition of providing funding for favoured projects of the heads of “their” regional governments.<sup>15</sup> Providing loans to politically important clienteles, such as (prospective) homeowners and small and medium entrepreneurs, is also an activity that has a political dimension. Homeowners are sufficiently numerous so their vote matters. Entrepreneurs are less numerous but the multiplier effects of their attitudes and activities can be very significant.

Second, many governments regard banking itself as a suitable domain for industrial policy. Before the financial crisis of 2008, the ease of attracting funds on a large scale tempted the governments of several countries, among them Cyprus, Iceland, and Ireland, to promote the growth of the financial sector as a fast route to economic development. In other countries, governments wanted to see “their” major banks as “champions” in global markets. Recent efforts of the German Finance ministry to promote a merger of Deutsche Bank and Commerzbank must be seen in this light.<sup>16</sup> One may also remember that the 2000 merger of Banque Nationale de Paris and Banque Paribas was very much welcomed by the French authorities; they actually would have liked to see Société Générale to join as well.

Third, investors in banks are often important players in national political systems. Depositors in banks are even more numerous than homeowners so their vote is also important. Institutional investors with larger stakes may matter because of their importance in public discourse. In the case of the German bank Hypo Real Estate,

<sup>14</sup> For an extensive discussion of the politics of banking, see Chapter 12 in Admati and Hellwig (2013).

<sup>15</sup> Thus, as part of the Bavarian government’s strategy to turn Munich into a centre of the media industry, in the 1990s, BayernLB provided substantial funding for the expansion of the Kirch media empire. In 2008, HSH Nordbank supported the Hamburg government’s takeover of a substantial share in the shipping company Hapag Lloyd by purchasing a significant share, thus reducing the part of the acquisition cost that had to go through the government budget. Both investments caused significant losses as Kirch became insolvent in 2002 and Hapag Lloyd made losses due to the worldwide shipping crisis.

<sup>16</sup> In 2004 already, Chancellor Schröder called upon German banks to create a national champion; one may also assume that the 2008 takeover/rescue of Dresdner by Commerzbank was undertaken with an understanding that government support would be available if needed as indeed it was later in the year.

the bailout of all creditors by the German government benefited not only institutions like the insurer Allianz and Deutsche Bank, but also the established churches, public television organizations, municipalities, social retirement institutions.<sup>17</sup> Banco Popular Español (BPE) had significant deposit funding from regional entities, such as cities and districts, whose deposits exceeded the statutory limit of € 100,000 for deposit insurance, which is why these investors were anxious to run when an insolvency of BPE became likely. In the cases of Monte dei Paschi di Siena and the two Venetian banks, the bail-in of CET 1 and CET 2 titles affected non-financial private investors such as small entrepreneurs who had been told that, because of an insufficiency of equity, their bank had to restrict their loans, but if they were to invest their private wealth in preferred stock of the bank, the resulting increase in the bank's equity would permit continued lending.

Given these concerns, the members of national polities consider banking union to be an intrusion into their territory. BRRD, SSM, SRM, and the Commission's state-aid control are seen as illegitimate infringements of national sovereignty. Thus, in Italy, the bail-in imposed on investors was a major cause of the political discontent that led to the change of government after the 2018 election.

From the perspective of Sunday school teaching, many of the political concerns that I sketched are problematic. Using political power to obtain privileged funding for the government's preferred projects or clienteles amounts to a subversion of the parliament's budget authority. To be sure, at first sight, there is no cost to the government, but if things go wrong for the banks, the government will have to step in, as the national and regional governments did in Germany in 2008 and as the Italian government did in the case of Monte dei Paschi. Industrial-policy promotion of banks at the expense of their safety imposes risks on the polity and on others; for example, in the years before 2008, the toleration of special-purpose vehicles as a means of holding mortgage-backed securities without equity backing was motivated by national-champions objectives and contributed a lot to the damage from the crisis.<sup>18</sup> And the use of bailouts to protect creditors from sharing in banks' losses is a subversion of the principle that everyone is liable for the consequences of their own actions, a principle which is fundamental to people's being free to do what they want in a market economy. To the extent that investments in preferred stock or subordinated debt were induced by misrepresentations from the sellers, such misrepresentations and the toleration of such practices by the authorities were scandalous.

However, legitimacy from the perspective of Sunday school teaching is not the same as political legitimacy. Political legitimacy is a result of public discourse in a given polity and, ultimately, of elections. In the European Union as currently constructed, public political discourse as a source of political legitimacy works at the local, regional, or national level, but not at the supranational level. Public discourse about supranational actions is fragmented between the different national polities. Within

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<sup>17</sup> Thus, Hannes Rehm, the CEO of the German bailout fund SoFFin, in an interview given to *Frankfurter Allgemeine Zeitung* in March 2009.

<sup>18</sup> For details, see Thiemann (2012).

any one polity, interference from Brussels or Frankfurt is treated as illegitimate regardless of what its actual merits may be. The supranational actors themselves are not much present in this discourse, and anyone taking their side must fear being treated as an outsider.

The conflict is reinforced if the ECB uses the power it has to influence national policies, as it did in Ireland in 2010, Italy in 2011, and Greece in 2015. Since banks depend on the ECB for liquidity, the ECB has significant power over them and, indirectly, over national payment systems and national economies. The use of this power, actually or by threats, to influence national governments adds to the supranational interference that national polities resent.

One must also take account of the fact the Sunday school teaching is not always “right”. Economists do not really have much to say about appropriate policies towards asymmetric shocks that stem from the uncertainties of the capitalist system. Whereas some asymmetric shocks are due to moral hazard, in real-estate bubbles or excessive sovereign borrowing, others are due to changes in comparative advantage in global markets. For example, Northern Italy has been much affected by competition from transition/accession countries and from China. With regional specialization, such shocks affect entire regional economies, including regional banks; the Venetian banks provide an example.

How to deal with such asymmetric shocks is an open question, a challenge for supervision, resolution, and regional policy, at the level of the EU as well as the national or regional level. In the United States, Federal spending and Federal unemployment insurance serve as stabilizers. In the EU, we have no analogue of these devices; nor do people find it as easy to move between regions as in the United States. As for the proper levels at which to deal with the problems caused by asymmetric shocks, it is worth observing that the decline of coal and steel industries seems to have induced much greater discontent and susceptibility to populism in Northern England and Northern France than in the Ruhr area in Germany; I suspect the difference has a lot to do with policy centralization in the United Kingdom and France versus federal decentralization in Germany. The success of nationalist populism in the area of the former GDR fits the pattern because economic policy there was in large part determined by politicians and experts from West Germany.

## 4 The bank-sovereign nexus and the future of EMU

The conflict between supranational and national concerns in the area of banking is ultimately irresolvable. In discussions about banking union, one often hears about the need to “cut the bank-sovereign nexus”. The formulation was used by the June 2012 Summit to explain the creation of banking union,<sup>19</sup> but it has never been clear what precisely it meant. In current discussions, it is often used to justify the need for

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<sup>19</sup> At the time, Spain had asked for direct ESM contributions to the recapitalization of Spanish banks; the SSM was ostensibly introduced to preclude any moral hazard from such an arrangement. However, the legislation took so long that the recapitalization of Spanish banks was funded by the government anyway, with ESM support for the Spanish government.

a European Deposit Insurance Scheme (EDIS), in the sense that the conditions at which banks obtain deposits and therefore the credibility of guarantee schemes should not depend on the sovereign.

Such discussions however do not go to the heart of the matter. As long as member states are sovereign, there will always be a bank-sovereign nexus that cannot be cut. Any bank is located in some member state and is subject to the law of that state. Supervision, resolution, and deposit insurance are not the only links between the state and the bank. Employment law and tax law also play a role, and the sovereign has threats that can affect the way banks behave. The ultimate threat is that of nationalization, an admittedly very extreme assertion of sovereignty, which had however been planned by the Greek Finance Minister as part of an exit strategy in 2015.

I do not believe that transnational banks will solve the problem. On the one hand, such banks will still be subject to the political will of the sovereign in the country where they have their headquarters. I cannot imagine Monsieur le Président de la République Française accepting a limit on the exercise of sovereign power towards BNP Paribas on the grounds that BNP Paribas is a European bank. On the other hand, such banks may exacerbate the problem of asymmetric shocks in those areas where they do not have their headquarters. Headquarters may not have much understanding for the needs of such “outlying areas”.<sup>20</sup>

In terms of political institutions, it would be desirable to have more of a supranational source of political legitimacy, at the level of the executive and of the legislature. Just a finance minister with a budget is not sufficient for this purpose. We need political powers of the executive and legislature whose exercise induces public discussion that links up across national borders.

We should also think again about the principles underlying the BRRD and the Commission's state aid control. I am all in favour of bail-in, rather than bailout. However in some instances, precautionary recapitalizations may be called for to avoid negative repercussions of resolution and closures. For those circumstances, we need to rethink the role of state aid control. In 2008, the Commission's state aid control was adapted to the emergency of the crisis. Since then, it has provided almost the only limit to bank bailouts. Such a limit is necessary because, if all banks are bailed out, excess capacities will be maintained forever, banks may never again become sustainably profitable, and monetary policy will never get out of the lurch in which it has been since 2008.

As currently conceived, state aid control is a device to protect competition in the internal market. I often have a sense that the rules developed in that context may not quite fit in the context of bank bailouts (precautionary recapitalizations). Can we really think of bail-ins as an instance of the private-investor rule? And how much

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<sup>20</sup> In this context, it is worth noting that, in Germany in 2009, the dissociation of the local savings banks and cooperative banks from developments in the global financial system contributed a lot to limiting the credit crunch that the crisis induced. The credit crunch affected mainly the clients of large private banks and Landesbanken that had been involved in global markets. For details, see Hellwig (2018b).

attention should we pay to the information capital of banks that know their local customers - as well as the lack of information capital at potential new entrants that might replace the banks that are closed?

Ever since European integration started with the Schuman Plan, academics have had a tradition of being pessimistic. First the European Communities, then the European Union, did not fit into our categories for the dealings of different countries with each other. In a sense, Europe has been like the proverbial bumble bee: every specialist in aerodynamics "knows" that the bumble bee cannot fly; its body is too heavy, and its wings are too small. But bumble bees do fly and refute the wisdom of the theorists. Unlike the bumble bee, the European Communities and the European Union have not stuck to the same design, but have improved their design over time as problems arose. These improvements have been essential to the survival and the success of the European project. I very much hope that such improvements will happen in the area of banking union, not only to make it work better, but also to reduce the potential for damage from the underlying conflict between national sovereignty and supranational monetary policy.

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# Future of EMU

By H el ene Rey<sup>1</sup>

## Abstract

This year we celebrate the first 20 years of the euro. We also reflect on a number of challenges and policy issues that face the euro area. I will discuss two of those challenges in more details: the extent of macroeconomic imbalances in the euro area and the lack of adequate macroeconomic stabilization tools. Looking forward, these two key issues have to be solved in order for the euro area to increase its monetary sovereignty and improve the welfare of its citizens.

## 1 Macroeconomic imbalances

Macroeconomic imbalances resulting in large current account surpluses and deficits constitute existential threats for the euro area. The first phase of severe imbalances occurred during the 2003-2008 pre-crisis period. This period saw large capital inflows into the periphery of the euro area and important build-up of risk due to sizable overvaluation of assets - in particular real estate markets in Spain and Ireland. As risk premia went up in world markets and the euro crisis unfolded, the doom-loop between banks and sovereigns started its vicious dynamics. The repricing of risk and plunge in asset prices led to failures of the banking systems which were too big to fail given the size of their sovereign fiscal capacity. Conversely, risk premia on sovereign debt triggered difficulties for the banking systems which were thinly capitalized and overexposed to their own government bonds. Only the decisive intervention of the ECB in 2012 prevented the euro crisis to become full blown. The second phase of imbalances is happening now. Deficit countries have been forced to adjust and had to cut massively domestic absorption in an environment of low inflation and with monetary policy at the effective lower bound. In contrast core countries have kept on running large current account surpluses. Germany had a current account surplus of above 7% of GDP in 2017 and 2018 and the Netherlands of above 10% of GDP in the same period (Source: AMECO). From these two phases of imbalances results a widening of the difference between the net foreign asset positions of some core countries who are creditors versus some periphery countries who are debtors. In 2018, the net international positions expressed as % of GDP were -138% for Greece, -101% for Portugal, -77% for Spain, -168% for Ireland versus +61% for Germany and +71% for the Netherlands. For external adjustment to take place in the euro area, one needs an adjustment in

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<sup>1</sup> Lord Bagri Professor of Economics, London Business School, CEPR and NBER and member of the Haut Conseil de Stabilit e Financi re. The views expressed here are my own and do not represent the views of the Haut Conseil de Stabilit e Financi re.

relative prices or large valuation losses on the net foreign asset positions of the core. As shown in Gourinchas and Rey (2016), the external asset position of Germany is however dominated by bank loans and debt both on the liability side and the asset side, which makes it very different from the external balance sheet of the US and tends to mute valuation changes. Thus, a sizable part of the adjustment has to occur through relative price changes, which means that one should see large real appreciations in the Netherlands and Germany. For this to happen one needs a higher inflation in Germany and the Netherlands than in the periphery for a few years (perhaps 3.5% inflation in the core versus 1.5% in the periphery). This is how the euro area is supposed to work and therefore what should be communicated to citizens of euro area countries.

The current large current account surpluses come with negative externalities. They impose deflationary pressures on the periphery by depressing aggregate demand. Importantly they also have a negative effect on debt sustainability. Some countries of the periphery have high levels of nominal debt following the crisis. By contributing to keep inflation low in aggregate in the euro area and forcing even lower inflation on the periphery due to the relative price adjustment mechanism, this deflationary force increases the real burden of debt in the periphery. By slowing the external adjustment mechanism, it makes the euro area more fragile to shocks for longer. Furthermore, because current account surpluses are the symptom of excess savings, they contribute to put some downward pressure on the real rate of interest in an environment in which monetary policy is already at the effective lower bound. Finally, given the current US administration, large current account surpluses increase the probability of a trade war between the EU and the US.

## 2 Stabilization tools

In the absence of new macroeconomic stabilization tools, such as a sizable euro area budget, adjustment should come from an expansion of aggregate demand in the core countries (in particular Germany and the Netherlands). It is often claimed that such an expansion may be optimal from the point of view of the euro area but not from the point of view of individual countries as aging populations in the core need savings. Hence, for these countries, it is prudent to save. I argue that on the contrary, as one is faced with climate change and a commitment to decarbonize economies by 2050 saving now is not prudent. Investing now is prudent. A prudent policy is to increase public (and private) investment in energy transition and decarbonisation now otherwise the bill will be higher later precisely when the population gets older. Climate debt builds up and it is very likely that the build-up is non-linear. Similar arguments can be made for repairing and building key infrastructures now rather than later as costs climb. On top of this, real rates are currently extremely low (smaller than growth rates) and core countries are able to borrow very cheaply (even negative rates) for long maturities (see Blanchard (2019)). German gross public investment has oscillated between 3 and 2% of GDP since 1991 (and has recently been closer to 2% when during the same period the 10 year yield has gone from 9% to about 0%!



The current macroeconomic framework in the euro area can be described as an asymmetric game where the ECB has a euro area wide objective while fiscal policy is determined by perceived national interests. If countries with fiscal space do not expand enough, monetary policy is the only game in town -and, in the current circumstances, is more likely to be at the Effective Lower Bound. Loose monetary policy implies countries with fiscal space perceive even less need to expand using their budget capacity. Hence excess burden is placed on the ECB and core countries have a wrong macro policy mix (their fiscal policy is too tight and the compensating monetary policy is too loose). Excess risk taking may also result of this mix and this may have consequences for financial stability in the euro area.

### 3 Reform of fiscal rules and need for additional tools

We still have no euro area budget for stabilization purposes in order to strike a better macroeconomic policy mix. Instead, we currently have a set of ill-suited fiscal rules that both lack flexibility in bad times and teeth in good times. They are also complex and hard to enforce. We need a set of more transparent, less procyclical fiscal rules as explained in the CEPR 7&7 Report (2018). The current rules should be replaced by the principle that government expenditures must not grow faster than long-term nominal output, and should grow at a slower pace in countries that need to reduce their debt-to-GDP ratios. Rules of this type are less error-prone than the present ones and they are more stabilising as cyclical changes in revenue do not need to be offset by changes in expenditure. At the very least, we should have a sizable investment budget for decarbonisation, Artificial Intelligence, fundamental research, and we should finance these investments using cyclical revenues -such as a share of corporate taxes. This would provide some stabilization and this would constitute a prudent policy.

### 4 Macroprudential policy

Given the constraints currently placed on fiscal policy, the lack of fiscal space in some countries and the fact that monetary policy is already close to the effective lower bound, one may worry about the lack of ammunition come the next downturn. In this context, macroprudential policies, geared at systemic stability, are potentially important new economic tools available in the euro area. They are country specific so they can help modulate the effect of the monetary policy of the ECB. For example, macro prudential authorities may put up the countercyclical buffer during economic expansions. The gradual build-up of such buffers seems to have little effect on lending and economic activity. Additional and more targeted tools macroprudential tools may instead be used to prevent excess risk-taking in specific markets. Those countercyclical buffers can however be released quickly if credit conditions tighten in a downturn and when marginal borrowers tend to be squeezed out of the market. Releasing the countercyclical buffers can reinforce the effect of monetary policy easing. Looking forward, macro prudential policies can thus provide

further ammunitions to manage downturns if, of course, countercyclical buffers have been raised enough in good times.

## 5 Sovereignty

Mario Draghi discussed in general terms sovereignty in a globalised world in his speech at the Università degli Studi di Bologna on 22 February 2019. I quote him: “True sovereignty is reflected not in the power of making laws – as a legal definition would have it – but in the ability to control outcomes and respond to the fundamental needs of the people.”

Macroeconomic imbalances and the current lack of enough powerful macroeconomic stabilization tools make the euro area more fragile and less able to react and adjust to external shocks to protect its citizens. In other words, in the world economy, the euro area is less sovereign than it could be.

In the monetary realm, sovereignty is constrained by a number of factors: the Global Financial Cycle, driven in part by the US Federal Reserve (Rey (2013)), the status of the Dollar as a dominant currency reflected in the very large share of world imports and imports invoiced in dollars, the importance of the dollar in the payment system with the extra territoriality of US law. Furthermore, the incomplete financial architecture of the euro area with an unfinished banking union, the absence of a capital market union and the non-existence of a euro area wide safe asset means that the dangerous “doom-loops” between banks and sovereigns are still very much alive. Shocks, whether internal or external, get amplified and, when large enough, may destabilize the whole area. As long as these structural vulnerabilities are not addressed it seems unlikely that the euro can aspire to the status of major reserve currency. Such currencies have to be especially robust in times of global turmoil; those times have proved very destabilizing for the euro area given its current fiscal and financial architecture. This needs to be fixed.

## 6 Conclusions

The euro has come a long way since 1999. There are lots of important issues for the EU now -climate change and energy policy, defence, migration, trade and technology wars, Brexit, .... But the reforms of the euro area should not be forgotten: dealing with imbalances, reforming the fiscal rules, adding macroeconomic stabilization tools and building further the monetary sovereignty of the euro area (banking and capital unions, euro area safe asset) are essential elements to increase the sovereignty of the euro area defined as the “ability to control outcomes and respond to the fundamental needs of the people.”

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Postal address                    60640 Frankfurt am Main, Germany  
Telephone                        +49 69 1344 0  
Website                            [www.ecb.europa.eu](http://www.ecb.europa.eu)

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