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The implications of globalisation for
the ECB monetary policy strategy

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Set of Occasional Papers related to the ECB's Strategy review 2020-21

- No 263, "The implications of globalisation for the ECB monetary policy strategy".
- No 264, "Inflation expectations and their role in Eurosystem forecasting".
- No 265, "Inflation measurement and its assessment in the ECB's monetary policy strategy review".
- No 266, "Digitalisation: channels, impacts and implications for monetary policy in the euro area".
- No 267, "Review of macroeconomic modelling in the Eurosystem: current practices and scope for improvement".
- No 268, "Key factors behind productivity trends in EU countries".
- No 269, "The ECB's price stability framework: past experience, and current and future challenges".
- No 270, "Non-bank financial intermediation in the euro area: implications for monetary policy transmission and key vulnerabilities".
- No 271, "Climate change and monetary policy in the euro area".
- No 272, "The role of financial stability considerations in monetary policy and the interaction with macroprudential policy in the euro area".
- No 273, "Monetary-fiscal policy interactions in the euro area".
- No 274, "Clear, consistent and engaging: ECB monetary policy communication in a changing world".
- No 275, "Employment and the conduct of monetary policy in the euro area".
- No 276, "The mandate of the ECB: Legal considerations in the ECB's monetary policy strategy review".
- No 277, "Evolution of the ECB's analytical framework".
- No 278, "Assessing the efficacy, efficiency and potential side effects of the ECB's monetary policy instruments since 2014".
- No 279, "The need for an inflation buffer in the ECB's price stability objective – the role of nominal rigidities and inflation differentials".
- No 280, "Understanding low inflation in the euro area from 2013 to 2019: cyclical and structural drivers".

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Abstract

This paper assesses how globalisation has shaped the economic environment in which the ECB operates and discusses whether this warrants adjustments to the monetary policy strategy. The paper first looks at how trade and financial integration have evolved since the last strategy review in 2003. It then examines the effects of these developments on global productivity growth, the natural interest rate (r^*), inflation trends and monetary transmission. While trade globalisation initially boosted productivity growth, this effect may be waning as trade integration slows and market contestability promotes a winner-takes-all environment. The impact of globalisation on r^* has been ambiguous: downward pressures, fuelled by global demand for safe assets and an increase in the propensity to save against a background of rising inequality, are counteracted by upward pressures, from the boost to global productivity associated with greater trade integration. Headline inflation rates have become more synchronised globally, largely because commodity prices are increasingly determined by global factors. Meanwhile, core inflation rates show a lower degree of commonality. Globalisation has made a rather modest contribution to the synchronised fall in trend inflation across countries and contributed only moderately to the reduction in the responsiveness of inflation to changes in activity. Regarding monetary transmission, globalisation has made the role of the exchange rate more complex by introducing new mechanisms through which it affects financial conditions, real activity and price dynamics. Against the background of this discussion, the paper then examines the implications for the ECB's monetary policy strategy. In doing so, it asks two questions. How is the ECB's economic and monetary analysis affected by globalisation? And how does globalisation influence the choice of the ECB's monetary policy objective and instruments? The paper concludes that while globalisation has had profound effects on the world economy, it has not significantly impeded the ECB's ability to achieve price stability autonomously. Nonetheless, over shorter horizons, globalisation has changed monetary policy transmission and affected trade-offs between price stability and other goals, such as stabilising real activity and prices on the one hand and enhancing financial stability on the other. Large financial spillovers strengthen the case for more systematic recourse to additional instruments such as forward guidance and asset purchases. Spillovers may also imply a need for more active macroprudential policy to counter any unduly large effects that global factors may have on domestic financial conditions.

JEL Codes: E58, F42, F44, F62, F65.

Keywords: Globalisation, monetary policy strategy, r^* , inflation, productivity.

Executive summary

The process of growing integration and interdependence among the world's economies, known as globalisation, has changed the global economy since the last strategy review in 2003. Globalisation has benefited the world by lifting millions of people in emerging and developing countries out of poverty, increasing the variety of goods available to consumers and fostering the exchange of people and ideas. Along the way, globalisation has changed the interrelationships between economies and between sectors within economies. With the fall in the share of world GDP generated by advanced countries, economic developments in the rest of the world have assumed a greater significance as seen by greater trade integration through global value chains (GVCs), a larger role for emerging market economies (EMEs) and multinational enterprises (MNEs).

This report documents how globalisation has changed the landscape in which monetary policy operates. There are several potential reasons why this is the case:

1. **Trade globalisation has had a positive impact on global productivity trends by boosting allocative efficiency and external competition.**
However, the support to productivity growth may be waning, as trade integration slows, and the contestability of global markets shifts towards winner takes-all dynamics. The impact of globalisation on the natural interest rate in advanced economies is ambiguous on both theoretical and empirical grounds. Theoretically, financial integration may have reduced the natural rate by increasing global demand for safe assets. But trade integration is likely to have supported productivity growth which would raise the natural interest rate. The report presents empirical analysis that suggests that, overall, these and other factors might have compensated each other.
2. **Globalisation has had a rather modest impact on inflation trends and dynamics.** Headline inflation rates have become increasingly synchronised globally, while core inflation rates show a lower degree of commonality. At the same time, inflation has fallen across many countries and the sensitivity of inflation to activity has declined. Despite the commonality of experience across countries, the evidence shown in this report suggests that the effects of globalisation on inflation has been small. Globalisation in the form of GVC participation by euro area firms and import competition from EMEs in euro area markets provided only a modest headwind to euro area inflation in recent years and contributed only moderately to the reduction in the responsiveness of inflation to changes in activity.
3. **Globalisation implies an increase in the spillovers that underpin a global financial cycle.** While it is often argued that globalisation has facilitated global risk-sharing and diversification, there is also evidence that domestic financial conditions are driven, at least in part, by a “global financial cycle”, characterised by large common movements in asset prices, gross capital flows and leverage.

Globalisation may also have facilitated the build-up of financial imbalances through credit and asset price booms, increasing the exposure of the international monetary and financial system to tail events and contagion when risks materialise.

4. **Globalisation may have led to more extreme and synchronised global uncertainty shocks**, amplifying their effect on growth and inflation particularly via financial linkages.

This new landscape warrants an expansion of the ECB's economic and monetary analysis in several dimensions. Many of the insights discussed in this report have already been incorporated into the ECB's economic and monetary analysis. Nonetheless, in some cases, further adjustments to measurement, modelling and projections could be beneficial. Macroeconomic modelling and projection exercises need to account better for the global dimension, including the ability to anticipate and evaluate the impact of tail events that have a foreign origin; they also need to better explain large co-movements and encompass the role of spillovers and spillbacks. In this context, the report presents evidence that spillbacks from monetary policy – i.e. the effects that transmit out to the rest of the world and then back to the originating country – are likely to be important. In addition, the report highlights that further research is warranted in order to understand better the exchange rate channel in a globalised environment, including the relevance of valuation effects on external balance sheets, the magnitude of import-price pass-through in view of GVCs and changing invoicing currency patterns, and the different transmission of unconventional and conventional policy to the exchange rate. Equally important is the assessment of how globalisation influences the interest rate environment, evaluating the relative strength of domestic versus international factors and what drives the strong co-movement of natural rates across countries.

The report finally discusses the implications of globalisation for the ECB monetary policy strategy. Overall, while globalisation has had profound effects on the world economy, the main conclusion is that it has not significantly impeded central banks, at least in large economies such as the euro area, from achieving price stability. Nonetheless, over shorter horizons, global factors have changed monetary policy transmission, affecting trade-offs between price-stability and other goals such as stabilising activity and financial stability. Yet central banks have shown that they can resort to additional instruments such as asset purchases, forward guidance, macroprudential measures and the provision of foreign currency liquidity lines, which can compensate for the reduction in conventional policy space and preserve control over domestic financial conditions. The increase in financial spillovers, the emergence of a global financial cycle and increased asset price correlations strengthen the need for sound domestic policies and credible monetary policy, and may warrant a more systematic recourse to additional instruments such as forward guidance and asset purchases in pursuit of the ECB's inflation aim. Notably the international use of the euro has increased the benefits of emergency liquidity provision in view of potentially large spillover and spillback effects that can affect funding and macroeconomic conditions. Central bank liquidity lines hence provide a backstop to limit market dysfunctions in non-euro area jurisdictions, which

supports the smooth transmission of monetary policy in the euro area. Spillovers may also imply a need for more active macro-prudential policy to counter unduly large effects of global factors on domestic financial conditions.

1 Introduction

Globalisation describes the process of growing integration and interdependence among the world's economies resulting from flows of cross-border trade, finance and information.¹ Its rapid rise since the Second World War had its original foundations in a system of rules, shared principles and institutions that have progressively allowed for greater trade across goods and financial markets, as well as facilitated the flow of people and ideas. Underpinning much of the global economic system and cross-country interactions, globalisation has unleashed market forces of innovation and disruption, with a long-lasting impact on the economic environment in which monetary authorities operate. This report analyses the implications of such changes in the global environment for the ECB's monetary policy strategy and the set of instruments at its disposal.

The impact of globalisation has been multi-dimensional. Globalisation has benefited the world by lifting millions of people in emerging and developing countries out of poverty, increasing the variety of goods available to consumers and fostering the exchange of people and ideas. It has also changed the landscape in which monetary policy operates. Since the ECB's last monetary policy strategy review in 2003, globalisation has often been cited as one of the most plausible explanations for key underlying structural economic trends, such as persistently low inflation and interest rates, along with weakening global productivity. There is also a wide consensus that globalisation has been an important factor affecting the properties of business cycle dynamics, the sensitivity of activity, inflation and financial conditions to external factors and the propagation of domestic and external shocks. To the extent that these phenomena are quantitatively important, globalisation plays a role in allowing a better understanding of the monetary policy transmission mechanism, the reaction function of the central bank and the monetary policy toolkit. The increased weight of the global economy in the euro area's external environment requires a continuous enhancement in the way economic and monetary analyses are conducted so as to take better account of the role played by external factors.

This report assesses how globalisation has shaped the economic environment in which monetary policy operates and outlines the possible implications for the ECB's monetary policy strategy. Section 2 sets the scene by assessing how global trade and financial integration have evolved since the last strategy review in 2003. Sections 3 to 5 then examine the implications of these globalisation developments for macro-financial dynamics and the monetary transmission mechanism. Section 3 assesses the role of globalisation in driving two key trends that form an important backdrop to the 2020 strategy review, namely the low global productivity environment and the decline in the natural interest rate. Section 4 turns to the role of global factors in inflation dynamics, analysing the way in which deeper

¹ Globalisation has many additional dimensions, but this report will focus on the features that are particularly relevant for the ECB's monetary policy strategy, namely (i) the quantitative formulation of price stability, (ii) the monetary policy toolkit, (iii) economic and monetary analyses, and (iv) communication practices.

integration has shaped inflation trends and the responsiveness of cyclical inflation to shocks. Section 5 discusses how monetary transmission is influenced by the globalisation process. Section 6 then seeks to draw conclusions on (i) the effect globalisation has had on the economic landscape in which monetary policy operates, and (ii) the implications for the ECB's strategy. In doing so, it focuses on two questions. How is the ECB's economic and monetary analysis affected by globalisation? And might the forces of change introduced by globalisation influence decisions about the ECB's monetary policy objective and instruments?

2 The evolution of globalisation since the last strategy review

Globalisation has evolved remarkably since the 2003 strategy review. This section explores key changes in trade (Section 2.1) and financial integration (Section 2.2). The main finding is that euro area countries are now more closely integrated among themselves and with the rest of the world, which has important implications for the conduct of monetary policy.

2.1 The evolution of trade globalisation since the 2003 strategy review

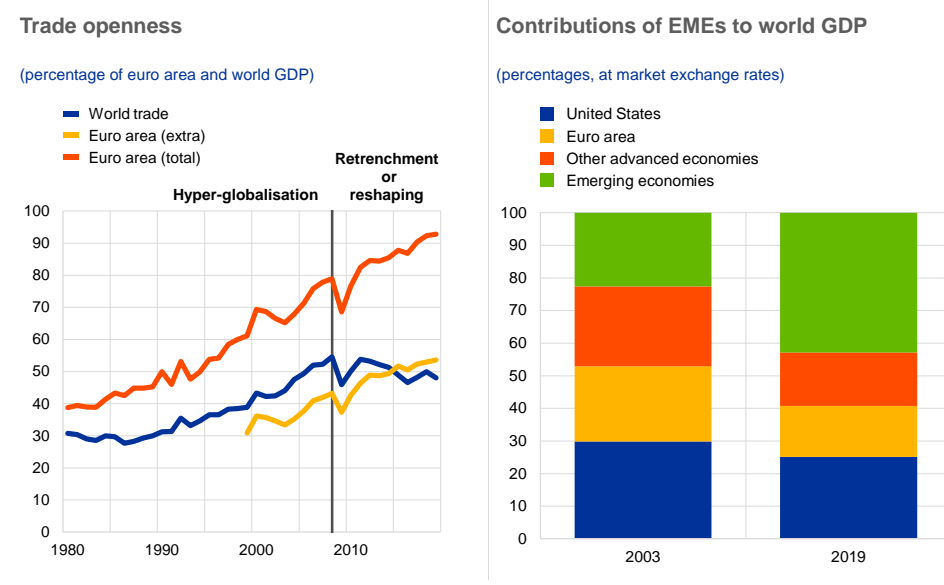
Since the 2003 strategy review there have been two distinct phases in the evolution of global trade: a phase of rapid expansion followed by one of slowing integration. The first phase, which lasted until the global financial crisis (GFC), saw the culmination of “hyper-globalisation” (Rodrik, 2011) characterised by an unprecedented and rapid increase in trade and financial integration which progressively changed the global economy from the 1980s onwards. By 2008, world imports and exports had reached more than 50% of global GDP, up from 30% in 1980 (Chart 1, left panel). Euro area countries, already historically more open to trade than the world average, also expanded trade rapidly: including flows among Member States, euro area trade had reached 80% of GDP by the end of 2008. Excluding intra-euro area flows, trade had still reached 40% of euro area output, compared with 14% in case of the United States.

The “hyper-globalisation” phase was not just a phenomenon of fast-rising integration but also one of profound structural change. One fundamental shift in the global economy since the 2003 strategy review² has been the increasing share of emerging market economies (EMEs) in world GDP (Chart 2, right panel). Globalisation has proven to be an important catalyst for these economies to close the technology gap, improve institutional capacity and foster the accumulation of physical and human capital. The share of world GDP generated by the euro area has hence fallen over time, with the direct consequence that economic developments in the rest of the world have assumed greater significance (Lane, 2019).

² For an overview of the main issues addressed in the 2003 strategy review, see European Central Bank (2003a, 2003b).

Chart 1

Key globalisation trends



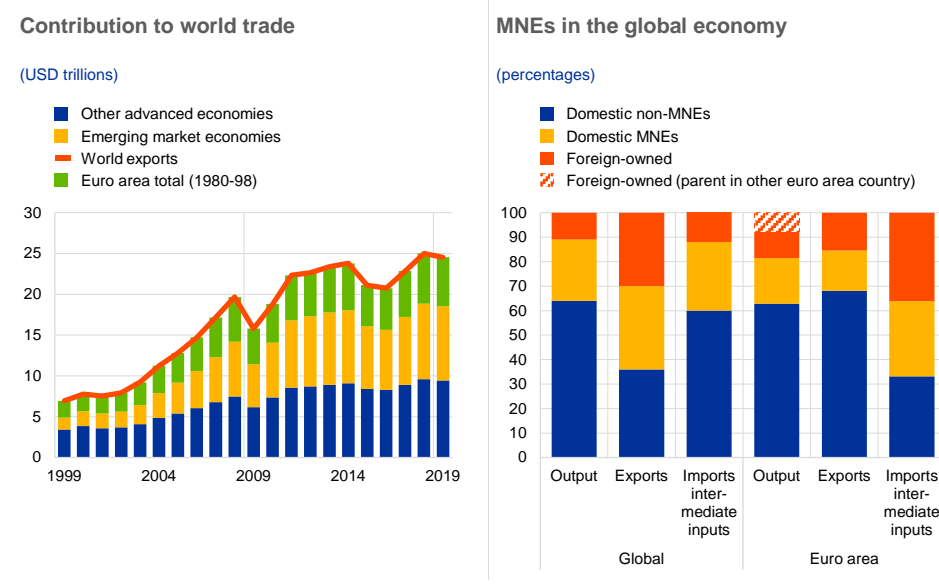
Sources: World Penn Tables, World Bank, Eurostat, World Bank World Development Indicators (WDI) and IMF World Economic Outlook.

Notes: The black line indicates the global financial crisis. Trade openness is defined as the sum of imports and exports divided by GDP. Euro area total series include extra and intra-euro area trade. In the right panel world GDP is taken as the total for all the countries included in the WDI database. The latest observation is for 2019.

The global economy also became increasingly characterised by greater international fragmentation of production and the increased footprint of multinational enterprises (MNEs). Advances in information and transportation technologies, as well as fading trade barriers, enabled firms to unbundle production into tasks performed at different locations along the supply chain. Falling transport costs and technological advances enabled firms to move production to EMEs, taking advantage of labour cost differentials. As a result, EMEs played an important role in the expansion of global trade from the turn of the millennium onwards (Chart 2, left panel). A further feature of the hyper-globalisation phase was the growing dominance of MNEs, which in 2016 accounted for more than one-third of both global and euro area production (Chart 2, right panel) and two-thirds of global exports. This has significantly complicated statistical measurement of key macroeconomic indicators (see Box 2).

Chart 2

Increasing role of emerging market economies and multinational enterprises



Sources: OECD, IMF and ECB calculations.

Notes: For the euro area aggregate (extra -euro area trade), data before 1999 have been backdated using the changes in trade of countries for which data are available. The latest observations are for 2019 (left panel) and 2016 (right panel).

The second phase of integration, in place since the GFC, has seen a moderation in the pace of trade integration. Average annual nominal world trade growth has fallen from 6% prior to the GFC to about 3% since then. This partly reflects lower global economic growth. However, the income elasticity of global trade – typically measured as the ratio of world trade growth to global activity growth – has declined as well. The slowdown can be attributed to the compositional effects related to (i) a shift in the growth of trade and economic activity towards EMEs, which typically have lower trade intensity than advanced economies (AEs); (ii) a moderation in the expansion of global value chains (GVCs) that partly pre-dates the GFC; and (iii) diminishing support from trade finance (ECB, 2016b).

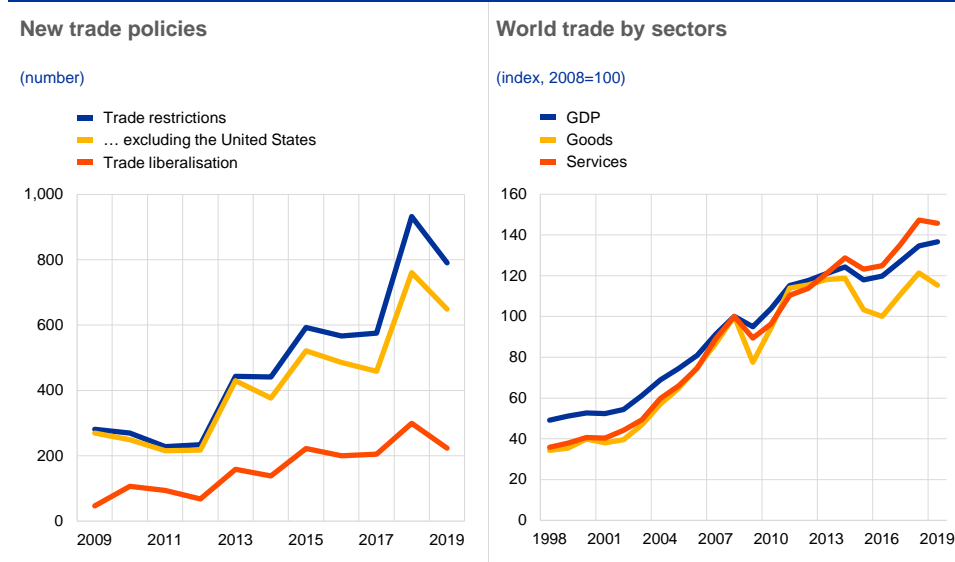
Looking ahead, trade integration is at a crucial inflection point. Trade is threatened by rising protectionism and the growing inward orientation of some EMEs. However, increasing digitalisation and services trade are also providing new impetus, shifting and reshaping the path that globalisation will take in the coming years. Moreover, while global integration may be waning, regional trade integration appears to have been deepening both for economic and geopolitical reasons (see Box 1 for a euro area perspective).

On the one hand, protectionist tendencies have been on the rise, and there are signs that the pace of GVC expansion has slowed. According to the Global Trade Alert database, which records a broad spectrum of trade policy measures, the number of newly implemented restrictive measures increased in recent years (Chart 3, left panel). The trade war between the United States and China and the decision by the United Kingdom to exit from the EU have also increased trade frictions. New protectionist hurdles, such as local content requirements, likewise appear to have reduced the attractiveness of GVCs (World Bank, 2020). Indeed, there are signs that

the pace of GVC expansion is decelerating as firms reassess the rising labour costs in key EMEs and the risks associated with complex cross-border supply chains (World Bank, 2020).³

Chart 3

Global trade policies and trade by sector



Sources: Global Trade Alert, World Bank and ECB calculations.
Note: The latest observation is for 2019.

On the other hand, growing digital integration and rising services trade are providing new impetus, while there is a greater drive towards stronger forms of regional integration. First, new digital technologies and automation are unlocking new labour-saving technologies, prompting firms to reshore production closer to final customers, while driving down the cost of cross-border communication and transactions, thus reducing the minimum scale needed for firms to go global. Second, digitalisation allows the unbundling of services across countries, which is a vibrant area of global trade growth (Chart 3, right panel).⁴ Services are also increasingly traded indirectly in the form of intermediate consumption of traded goods within GVCs (Fontagné and Harrison, 2017) and now represent one-half of world trade in value added terms.⁵ Third, while global trade integration may have slowed, there is a growing appetite for regional forms of GVC integration, as recently confirmed for euro area firms (see Box 1).

The potential long-term effects of the COVID-19 pandemic add to the uncertainty about the outlook. The immediate impact has been a collapse in international trade flows. On the one hand, a long-term consequence could be reduced global connectivity in terms of travel, trade and financial flows, as the

³ For a discussion of the extent to which the rise in protectionism and the shift towards regional integration represent deep-rooted socio-economic phenomena pre-dating recent trends, see van der Heijden et al. (2021) and European Central Bank (2016, 2019b).

⁴ The World Development Report 2020 presents industry-level evidence suggesting that automation in industrial countries appears to have boosted imports from developing countries (World Bank, 2020).

⁵ Estimates based on World Trade Organization and World Bank data for 2015. See Heuser and Mattoo (2017) for a conceptual discussion of data measurement issues related to services.

demand for these services might fall permanently. In addition, global firms may reassess the cost of production disruptions, which could entail some reshoring. On the other hand, the pandemic may foster the adoption of e-commerce, videoconferencing, robots and digital connectivity, which may revive trade flows and structurally change their composition. Demand for greater international cooperation could also emerge on the back of efforts to enhance prevention and containment of new diseases at the global level.

Box 1

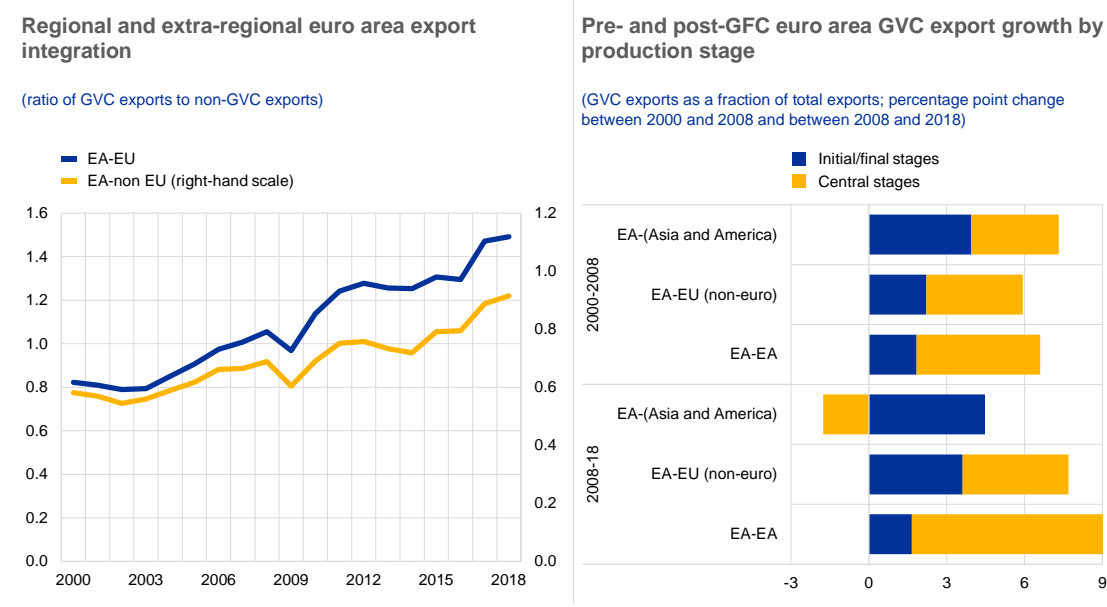
Trade globalisation in the euro area and its implications for shock transmission

Despite the moderation in the pace of global trade integration since the GFC, trade has assumed an even more prominent role for the euro area (Chart A, left panel). Trade linkages *within* Europe have increased through the reorganisation of production into dense European networks. At the same time, trade relationships with EMEs have been enhanced. The ability to build a production system rooted in both regional and global integration dimensions has given the euro area an extra advantage relative to other AEs, enhancing country specialisation and input sourcing possibilities. This has helped to preserve competitiveness and has propped up euro area export market shares compared with those of other AEs.

Since the 2003 strategy review, euro area firms have become deeply enmeshed in GVC activity, albeit playing different roles within European and non-European networks. More than half of euro area exports consist of production that is processed across several borders, a share far greater than that of China or the United States. However, euro area firms' engagement in GVCs takes different forms depending on whether it is outside or within the EU. Trade with extra-EU value chains occurs mostly at early or late production stages – i.e. euro area firms either supply raw materials (or components) to be assembled abroad or assemble the inputs for finished products themselves. By contrast, within regional intra-EU networks, euro area firms are typically located in central nodes, thereby holding those positions that, in a value chain, empower the propagation of shocks. This dichotomy in the way euro area firms participate in GVCs has become even more pronounced since the GFC. Between 2008 and 2018, the role of euro area firms in central production stages (measured by the share of intermediates exported for further processing through at least two other regional locations) has fallen with respect to Asia and remained broadly constant with respect to the Americas (see blue bars in Chart A, right panel). By contrast, GVC integration in central production stages increased markedly within the euro area and EU.

Chart A

The evolution of euro area export integration by main destination market



Sources: World Input-Output Database, Asian Development Bank Multiregion Input-Output tables and authors' calculations.

Notes: GVC trade is defined as trade that crosses at least two borders before reaching its ultimate destination, expressed as a share of total trade. It is further broken down between GVC trade at the central production stage (measured by the share of intermediate exports that requires further processing through at least two more regional locations, yellow bars) and at the final production stage (measured by the share of final/intermediate exports to final absorbing countries, blue bars). The bars show the changes in GVC exports as a share of euro area total exports to the region. EA stands for euro area. The latest observation is for 2018.

The increasingly dense network of euro area trade linkages has substantially changed the transmission of economic shocks. Positive and negative shocks, originating within or outside the euro area, are propagated across national euro area borders through supply chain linkages. Spillover effects are also amplified as the perturbations move up and downstream along the regional production chain, affecting first-tier trade partners but also those located further away in the value chain. An example of the implications of this structural change has been seen during the COVID-19 pandemic. A recent study of the effects of perturbations generated by pandemic containment measures in the five largest euro area economies estimates the amplification effects of the original shock to the rest of the euro area to be in a range between 15% and 28% (Di Nino and Veltri, 2020). The same study concludes that the containment measures introduced in non-EU countries are amplified by approximately 30% via the regional supply network. Key determinants of the amplification mechanism are the degree of interconnectedness and the positioning within the euro area supply network, with shocks hitting central nodes or high-participation countries having the strongest effects on the rest of the network.

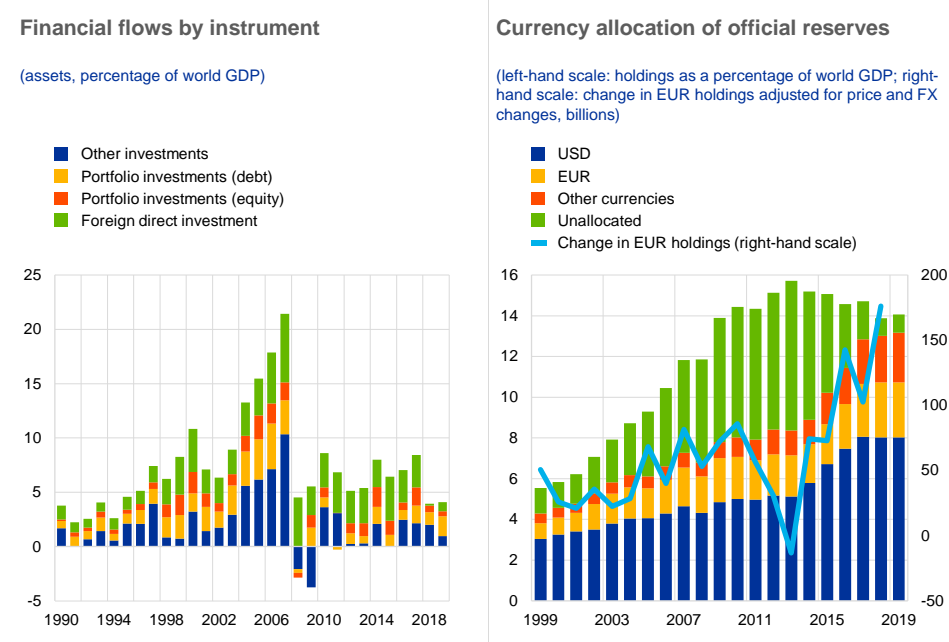
2.2 Trends in financial globalisation

The evolution of cross-border financial and banking flows has also been characterised by a phase of expansion ahead of the GFC and retrenchment thereafter. Following an unprecedented rise before the GFC, global financial flows experienced a sharp drop in 2008-09 and have remained more contained ever since (Chart 4, left panel). The largest reductions were observed in more volatile

components – portfolio investment in debt securities and other investment (largely composed of bank loans). In contrast, equity flows (foreign direct investment (FDI) and portfolio investment) were more stable during that period and since then have generally accounted for a higher proportion of overall flows (McQuade and Schmitz, 2017; Bussière et al., 2016).⁶ Only in the last two years have in our sample debt portfolio flows picked up, overtaking equity flows.

Chart 4

Global financial flows and official reserve accumulation



Sources: IMF Balance of Payments (BOP), IMF Currency Composition of Official Foreign Exchange Reserves (COFER) and ECB calculations.

Notes: Official reserves are liquid foreign exchange assets held by monetary authorities. The unallocated amounts in the right panel pertain to countries which do not disclose the currency composition of their reserves, most notably China. The latest observation is for 2019 (2018 for the change in EUR holdings).

The rapid accumulation of reserve assets by EMEs has also moderated. The increase in the stock of official reserves – driven in part by large, sustained trade surpluses in some EMEs – continued until 2013 but has since fallen. However, reserve flows into euro-denominated assets have continued to increase (Chart 4, right panel). These flows are judged to have exerted a significant downward pressure on euro area interest rates (See Section 3; also, Carvalho and Fidora, 2015).

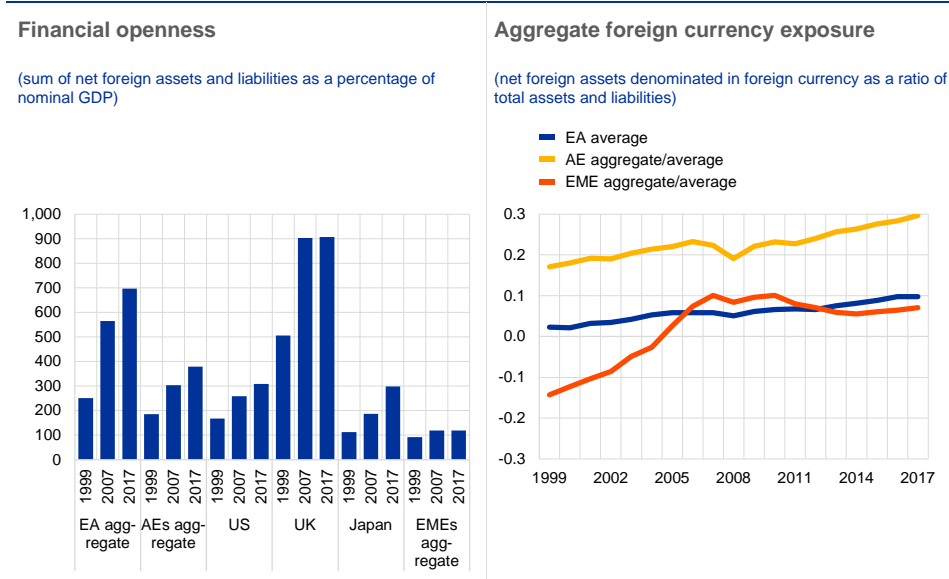
While the pace of global financial integration has slowed, within the euro area financial integration has continued to strengthen, also explaining why net foreign currency exposures have remained low compared with other AEs. Financial openness levels across euro area countries increased dramatically from

⁶ According to the data in Lane and Milesi-Ferretti (2018), global FDI positions increased from roughly 25% in 1995 to over 51% in 2015. The resilience of FDI is partly explained by the enhanced role of MNEs in the world economy. However, FDI figures should be interpreted cautiously, since an increased proportion of these flows involve financial centres, which often merely reflects complex intra-company financial operations (Lane and Milesi-Ferretti, 2018) and may distort upwards the measurement of financial globalisation (see Box 2).

the inception of the euro until the GFC, vastly outpacing those of other AEs (Chart 5, left panel). This increase in external assets and liabilities of euro area countries has, to a large extent, reflected the growing financial integration among euro area economies, which has led to an increase in the proportion of euro-denominated cross-border exposures (Lane, 2006). Accordingly, euro area countries have substantially lower net foreign currency exposures on average than other AEs (Chart 5, right panel). On both the foreign asset and the foreign liability side, by far the most foreign currency positions remain denominated in US dollars.⁷

Chart 5

Financial openness and foreign currency exposure



Sources: Bénétrix et al. (2020) and authors' calculations.

Notes: The indicator of aggregate foreign currency exposure is defined as $FX_{i,t}^{AGG} = \omega_{A_{i,t}}^F S_{i,t}^A - \omega_{L_{i,t}}^F S_{i,t}^L$ where $\omega_{A_{i,t}}^F$ and $\omega_{L_{i,t}}^F$ are, respectively, the proportions of assets and liabilities denominated in foreign currency of country i , and $S_{i,t}^A$ and $S_{i,t}^L$ are the shares of assets and liabilities in country i 's external balance sheet. EA stands for euro area and includes the following countries: Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain. AEs includes the following countries (following the IMF country group classification): Australia, Canada, Czech Republic, Denmark, Hong Kong, Israel, Japan, Korea, New Zealand, Norway, Singapore, Sweden, Switzerland, United States and United Kingdom. EMEs includes the following countries (following the IMF country group classification): Argentina, Brazil, Chile, China, Colombia, Egypt, Guatemala, Hungary, India, Indonesia, Malaysia, Mexico, Morocco, Pakistan, Peru, Philippines, Poland, Russia, South Africa, Sri Lanka, Thailand, Tunisia, Turkey and Uruguay. The latest observation is for 2017.

Despite the moderation in cross-border financial flows, global risky asset prices continue to show a high degree of co-movement, with the US dollar playing a dominant role in determining global financial conditions.

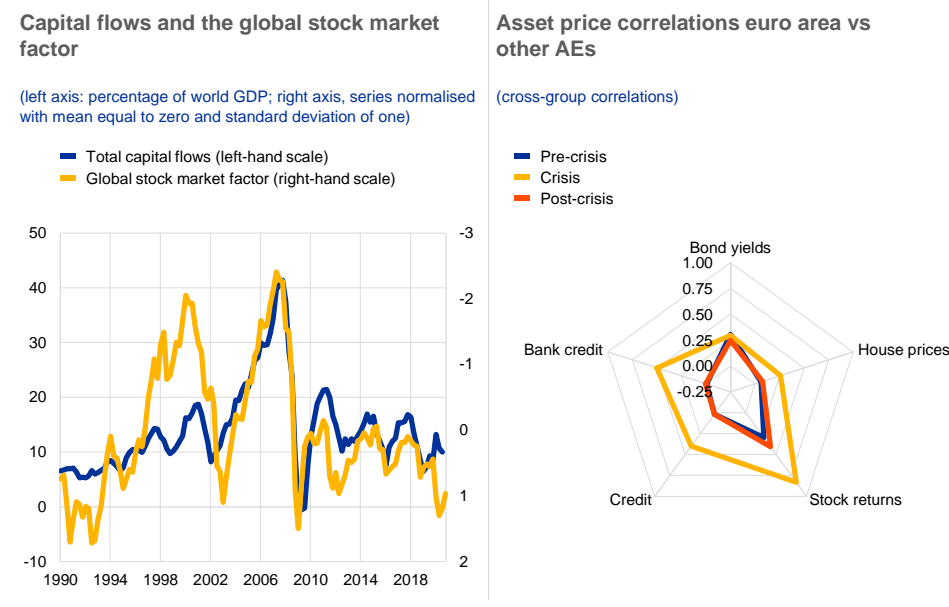
Global financial flows correlate strongly with an aggregate measure of stock market co-movement (Chart 6, left panel). Across AEs, bilateral correlations of credit aggregates and asset price measures have been high (Chart 6, right panel), rising particularly during periods of financial turmoil – which is consistent with the idea of a global financial cycle (Rey, 2016). The literature suggests the global financial cycle is driven in part by US monetary policy (Miranda-Agrippino and Rey, 2020) and partially transmitted via fluctuations in the US dollar exchange rate. Bruno and Shin (2015) also show that an appreciation of the US dollar is associated with tighter US

⁷ Data on the extent to which these cross-border positions are hedged are not available.

dollar-denominated cross-border bank credit as banks adjust their leverage in response to exchange rate movements.

Chart 6

The global financial cycle



Sources: Habib and Venditti (2019), IMF International Financial Statistics, OECD Main Economic Indicators, Haver Analytics, Refinitiv and ECB staff calculations.

Notes: Capital flows are a four-quarter moving average of total "gross capital inflows" aggregated over 50 economies and reported as a percentage of total GDP (left-hand scale). The global stock market factor is constructed from a dynamic factor model for stock returns in 63 countries (right-hand scale, inverted). Averages (unweighted) of bilateral correlations are based on annual data for 53 countries; bond yields refer to long-term yields; house prices are expressed in real terms, while credit measures are nominal. "Pre-crisis" refers to the period 1990-2004, "crisis" to 2005-09 and "post-crisis" to 2010-Q4 2020. The latest observation is for Q4 2020.

While cross-border banking flows have diminished since the GFC, US dollar funding remains central to the global banking system, and euro area banks have not been immune to US dollar funding stress triggered by the pandemic.

Prior to the GFC, European global banks were particularly active in US wholesale funding markets via their US-based affiliates, providing relatively cheap funding to regional and domestic banks (Bruno and Shin, 2015) and increasing local credit market growth (Everett, 2015). As a result, global banks were instrumental in the transmission of US monetary policy and US financing conditions internationally (Cetorelli and Goldberg, 2012). The combination of the GFC shock and tighter prudential regulation encouraged banks to deleverage, with European banks reducing their cross-border claims particularly sharply (Chart 7).⁸ However, while banks have increasingly raised US dollar liabilities locally (Aldasoro and Ehlers, 2018), most of euro area banks' US dollar funding remains in the form of cross-border exposures (Chart 8). Indeed, euro area banks have not been immune to US dollar funding stress triggered by the pandemic, which necessitated the reactivation of US dollar central bank swap lines.

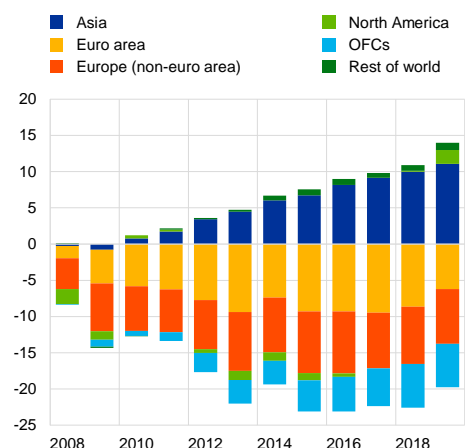
⁸ The initial strong deleveraging process by European banks was further exacerbated by the decline in intra-euro area claims during the European sovereign debt crisis (Emter et al., 2019; McCauley et al., 2019).

Chart 7

Retrenchment by European banks

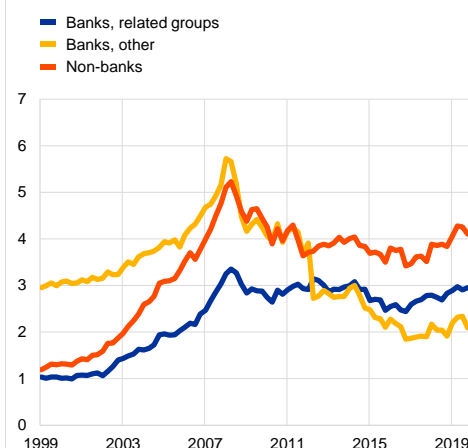
Cumulative contribution to growth of cross-border bank claims

(cumulative contribution to growth rate, percentage)



Cross-border bank claims of euro area banks

(USD trillions)



Source: BIS Locational Banking Statistics.

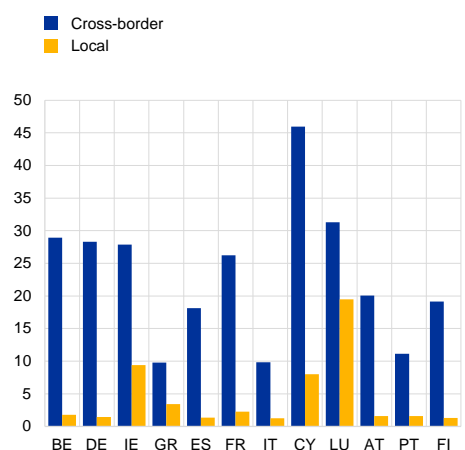
Notes: Left panel: Cumulative contributions since the second quarter of 2008 based on outstanding amounts of total cross-border claims (corrected for FX and break-adjusted changes), disaggregated by region. Non-EA = non-euro area. OFCs = offshore financial centres. Right panel: Outstanding amounts of total cross-border claims by European reporting banks (euro area: BE, DE, IE, GR, ES, FR, IT, CY, LU, NL, AT, PT, FI; non-euro area: CH, DK, NO, SE, UK), disaggregated by counterparty sector. "Banks, other" is calculated as the difference between "Banks" and "Banks, related offices". The latest observation is for 2019.

Chart 8

US dollar funding reliance

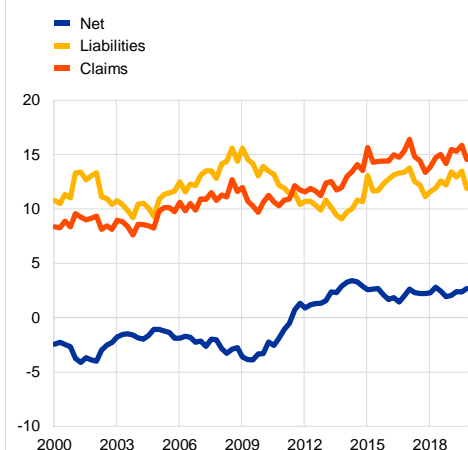
US dollar funding share of euro area banking systems

(percentages)



Euro area banks' cross-border US dollar positions

(percentage of GDP)



Source: BIS Locational Banking Statistics.

Notes: Numbers based on outstanding amounts of total cross-border and domestic liabilities. The left panel shows figures for the fourth quarter of 2019. In the right panel, claims are defined as all BIS reporting countries' liabilities vis-à-vis euro area banks, whereas liabilities are defined as all BIS reporting countries' claims on euro area banks. The sample of countries is based on data availability. The latest observation is for 2019.

Alongside the retrenchment in cross-border banking since the GFC, there has been a rapid rise in market-based finance.⁹ In the euro area, non-bank funding, including cross-border funding, has expanded sizeably since the GFC, driven partly by the growth of the investment fund sector (Deutsche Bundesbank, 2014). Shin (2013) has termed the rise in market-based finance “the second phase of global liquidity”. The shift has been partly driven by the migration of some banking services to the non-bank sector due to post-GFC regulation. However, a fundamental role can also be ascribed to the search for yield by investors in a low interest rate environment and to central banks’ asset purchases, which have reduced market-based financing costs.¹⁰ Such shifts have changed financial investment dynamics. On the one hand, the broadening of the investor base can improve the liquidity of international capital markets; on the other hand, some actors, such as investment funds, can destabilise the system due to redemption pressures, momentum trading and herd behaviour. At the same time, the rise in market-based finance has been accompanied by a process of financial innovation and increased complexity. In addition, the interconnectedness between banks and market-based finance has grown rapidly, as shown by the 63% increase in cross-border bank claims on non-bank financial institutions over five years to reach USD 7.5 trillion in the first quarter of 2020 (Aldasoro et al., 2020). These linkages may generate and transmit global system risk via “flight home” effects (where banks withdraw funds from foreign markets) and wholesale runs in times of liquidity shortage and financial stress (European Systemic Risk Board, 2020).

By broadening access to international markets and widening the investor base, financial globalisation has also increased the “excess elasticity” of the international monetary and financial system, i.e. it has weakened its ability to withstand the formation of unsustainable credit and asset price booms (Borio and Disyatat, 2011). While the link between excessive domestic credit growth and episodes of banking crises is well understood, the recent academic literature has also shown how excessively strong credit growth may similarly foster banking crises abroad (Cesa-Bianchi et al., 2019), which can be partly mitigated by appropriate macroprudential policies (Beck et al., 2021).¹¹ There is also a stronger recognition that the domestic financial cycle is to some extent driven by global forces over which national authorities have only limited control (European Systemic Risk Board, 2020). The build-up of large external imbalances, which is facilitated by easier access to international capital markets, may also increase the probability of financial crises in countries with weak economic fundamentals (Gourinchas and Obstfeld, 2012; Catão and Milesi-Ferretti, 2014).

When such tail risks materialise, they can have global ramifications, not only in neighbouring countries but also through banking and financial linkages,

⁹ At the aggregate level, the rise in market-based finance is mirrored by the higher proportion of portfolio debt vis-à-vis other investment flows.

¹⁰ McCauley et al. (2015) estimate that asset purchases by the Federal Reserve System compressed yields of US assets to such an extent that they spilled over to other markets, which was reflected in global investors’ increased demand for US dollar bond issuance by non-US borrowers.

¹¹ To the extent that trade globalisation has increased greenhouse gas emissions (Shahbaz et al., 2018), it may have contributed to the upward trend in the frequency and magnitude of extreme weather and climate events (IPCC, 2018).

which in turn reinforce the degree of international synchronisation of business cycles (see Box 3; also Kalemli-Ozcan et al., 2013; Cesa-Bianchi et al., 2019 and Fujita and Hamaguchi, 2020 in the context of the COVID-19 pandemic). The increasing interconnectedness of market-based finance and the presence of global banks may generate or transmit global system risk in times of liquidity shortages and financial stress.

Looking ahead, structural factors such as regulatory changes, the rise of market-based finance and rising trade barriers may exert long-term influence on financial integration, while the impact of the COVID-19 pandemic remains uncertain. Continued regulatory reforms, structural developments such as the rise of market-based finance or further financial integration efforts (such as the capital markets union) are likely to determine future financial flows. To the extent that trade relations are a determinant of bilateral portfolios, rising protectionist measures, together with potential reshoring of global firms, could lead to a concomitant reduction in investors' cross-border portfolios. In addition to such structural factors, global capital flows remain subject to high levels of volatility in response to major shocks: the recent financial market tensions brought about by the COVID-19 shock triggered strong retrenchment flows at the global level, fuelled by home bias and a flight to safety. Specifically, in the case of the euro area, investors increased their exposure to domestic securities at the expense of non-euro area securities. However, this movement came to a halt in the second quarter of 2020 as financial markets stabilised and tensions abated (Carvalho and Schmitz, 2021).

2.3 Summary

Since the 2003 strategy review, global and euro area economic and financial integration has grown both quantitatively and qualitatively. We have seen more integration through GVCs, a growing role for EMEs in the global economy, a high degree of global co-movement in risky asset prices, an important role for the US dollar in determining global financial conditions, an overall increase in foreign currency exposures (with the notable exception of euro area countries) and a rapid rise in market-based finance that has further sustained global liquidity. These transformations have implications both for global macro-financial dynamics and for the monetary transmission mechanism.

However, this process has been characterised by two distinct phases. The first preceded the GFC and saw deepening trade and financial integration, greater international fragmentation of production and a rising role for EMEs and MNEs. The second, in place since the GFC, has been characterised by a slowdown in trade and financial flows, signs of waning integration through GVCs and protectionist tendencies. At the same time, notwithstanding the initial impact of the COVID-19 pandemic, there is limited evidence so far that the world economy has entered an era of outright deglobalisation, while new trends are emerging, spurred by digital innovation and a stronger drive towards greater regional integration. Moreover, the legacy of past globalisation for global economic and financial dynamics is enduring, as shown by the strong co-movement in asset prices.

Box 2

Globalisation-related measurement challenges in euro area macroeconomic statistics

Globalisation poses significant measurement challenges in the field of euro area

macroeconomic statistics. Indeed, these measurement challenges have increased considerably over the past two decades. They are often related to the presence of MNEs, especially in international financial centres (Di Nino et al., 2020) and frequently involve special-purpose entities (SPEs). The challenges are exacerbated by the rising importance of intellectual property products, including patents and copyrights, that allow profits and headquarters to be moved easily across borders (Avdjiev et al., 2018). As macroeconomic statistics are compiled on a residency basis, such phenomena can have significant effects on the magnitude and volatility of key euro area macroeconomic indicators, including the current account balance and domestic demand (Deutsche Bundesbank, 2018; Lane, 2020b).

Interpreting data on cross-border investment has become especially difficult due to the operations of MNEs and complex chains of financial intermediation. FDI data are heavily affected by intra-company financial transactions, frequently involving SPEs across several countries, which can also be a source of asymmetries in the measurement of bilateral cross-border transactions (Pastoris and Schmitz, 2020). Such asymmetries arise as statisticians in two jurisdictions with a heavy presence of MNEs – e.g. the euro area and the United States – record complex transactions based on different data sources and compilation practices. In portfolio investment, it has become more challenging to identify the linkages between ultimate investors and issuers of financial instruments; research has shown the importance of “looking through” several dimensions of financial intermediation (such as offshore issuance and investment fund holdings) using large-scale security-level datasets (e.g. Bertaut et al., 2019). A further important element in measuring the transmission of financial shocks is related to foreign currency exposures in international balance sheets. Official data on these exposures are still sparse,¹² and there is an even greater lack of data on the extent to which such positions are hedged via financial derivatives.

The measurement challenges posed by globalisation suggest that more granular and enhanced data on SPEs and MNEs are needed, not only for the euro area but globally. It is important to look beyond headline macroeconomic indicators, in particular for the economies most affected by MNEs’ operations and cross-border financial intermediation.¹³ To enhance the data available for economic analysis, it is of the utmost importance to provide comprehensive, harmonised statistics on SPEs, enabling MNEs’ activities to be recorded consistently across countries and facilitating the use of granular data so that look-through approaches can be used to measure cross-border exposures.¹⁴ Such efforts should be supported by close international cooperation between statistical compilers and an appropriate legal framework.

¹² The lack of official statistics on the currency dimension of the international balance sheet has led to the assembly of research-based datasets, for instance by Bénétrix et al. (2020).

¹³ An example is Ireland, which publishes complementary economic indicators (such as the Modified Gross National Income, or GNI*, and Modified Current Account, or CA*) providing a more focused view of domestic economic developments.

¹⁴ The definition of and guidance on SPEs provided by the IMF Committee on Balance of Payments Statistics in 2020 will be helpful in ensuring the availability of internationally consistent cross-border statistics with a separate breakdown for SPEs.

Box 3

Globalisation and uncertainty

Uncertainty has received considerable attention in global policy debates. In the economic literature, it is typically defined in a broad sense to mean a relatively low level of confidence in the assessment of the outlook. The definition thus encompasses volatility, tail risks and Knightian uncertainty.¹⁵ This box, based on the findings in de Bandt et al. (2021) and Lastauskas and Nguyen (2021), explores the global dimension of uncertainty, focusing on whether globalisation exposes an economy to greater uncertainty and on whether globalisation affects the transmission of uncertainty shocks to the real economy.

There is growing evidence that the increase in globalisation is associated with the more extreme and synchronised nature of uncertainty shocks. The measures based on textual analysis proposed by Ahir et al. (2018) suggest that uncertainty has generally been increasing both in the euro area and at the world level since 2012. Uncertainty spikes also appear to be synchronised in AEs, suggesting that uncertainty has a global dimension. Indeed, there is evidence of increased correlation of uncertainty indicators across countries, with uncertainty spikes increasing significantly after 2010, particularly around events such as the euro area sovereign debt crisis, the Brexit referendum, the trade tensions between the United States and China, and the COVID-19 pandemic (see the left panel in Chart A).¹⁶ This feature is also confirmed in Lastauskas and Nguyen (2021) based on a global vector autoregressive (VAR) model with stochastic volatility.

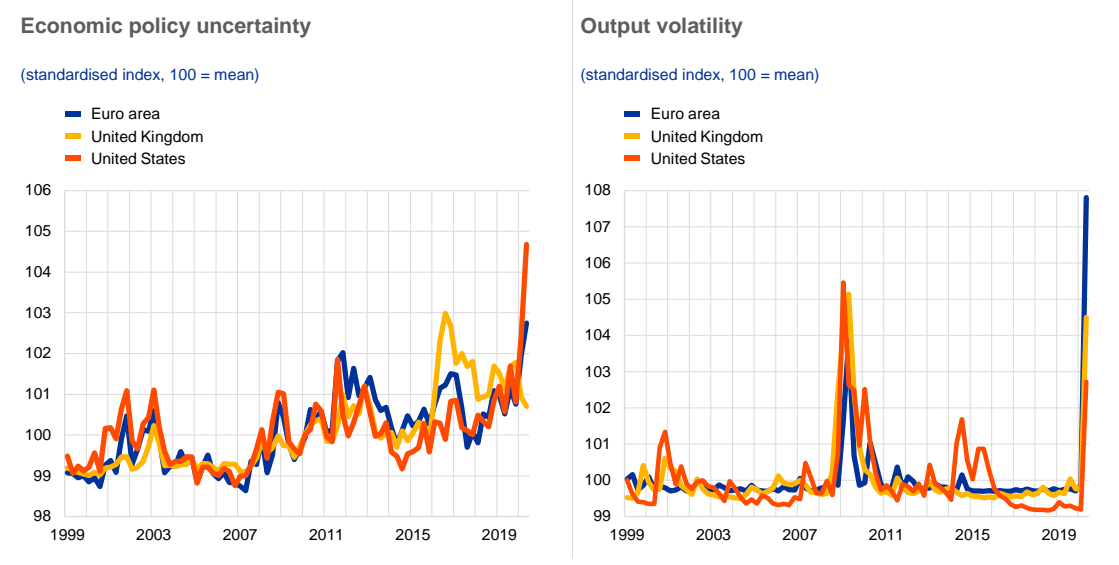
Globalisation may have affected the transmission of uncertainty shocks. On the one hand, international interconnectedness may smooth the adjustment to some shocks, for example when bank credit is redistributed internationally by way of trade credit from more to less financially resilient countries (Love et al., 2007). On the other hand, beyond a certain threshold, interconnectedness might imply greater systemic risk (Battiston et al., 2012). For example, complex GVCs accentuate the vulnerability of specialist supplier networks to shocks (Boehm et al., 2019; Barrot et al., 2019; Huneus, 2018). Indeed, the right panel of Chart A suggests that output volatilities in major AEs have been strongly positively correlated when facing uncertainty spikes. This evidence points to feedback loops from synchronised uncertainty shocks, leading to macroeconomic tail risks and the fragility of global economy. Importantly, unlike standard shocks, uncertainty shocks are related to extreme event risk. Gourio (2012) demonstrates that shocks to aggregate tail risk induce business cycle fluctuations in the same way as the volatility uncertainty covered by Bloom et al. (2007). Furthermore, the realisation of global tail risks may also increase perceived uncertainty. As argued by Ludvigson et al. (2021), negative shocks to economic activity lead to increases in both macroeconomic and policy uncertainty.

¹⁵ In his 1921 book on this subject, Frank Knight stressed that uncertainty pertains to the lack of any quantifiable knowledge about some possible occurrence, as opposed to the presence of quantifiable risks, which applies to situations where we do not know the outcome of a given situation, but can accurately measure the odds.

¹⁶ See also the indicators presented in the ECB's [Economic Bulletin, Issue 1/2020](#), which are based on output volatility and forecast error variance and clearly point to a sharp increase in uncertainty during crisis periods in particular.

Chart A

Economic policy uncertainty and output volatility



Sources: Baker et al. (2016) (economic policy uncertainty index) and own calculations. Output volatility is based on the GARCH model proposed by Lastauskas and Nguyen (2021).

Notes: All series are normalised with mean 100 and unit standard deviation. Euro area uncertainty is calculated as the GDP-weighted average of the available individual uncertainty indices in the euro area countries. The latest observation is for Q2 2020.

Globalisation also increases the macroeconomic impact of external uncertainty on the real economy. A rise in uncertainty leads consumers to increase precautionary savings and investors to adopt a wait-and-see approach (Bloom et al., 2007). Uncertainty also raises risk premia and the cost of funding (Gilchrist et al., 2014; Nguyen, 2015). Through these channels, uncertainty shocks have a negative impact on the real economy. Globalisation can facilitate the transmission of external uncertainty shocks and their propagation to the real economy. Kozłowski et al. (2020) show that, through a persistent revision of the perceived probability of an extreme, negative shock in the future, triggered by a large uncertainty shock such as the COVID-19 pandemic, the long-run costs for the US economy are many times higher than the estimates of the short-run losses in output. Crespo Cuaresma et al. (2020) show that international uncertainty shocks lead to large declines in output, prices and interest rates. Balcilar et al. (2017) confirm that external uncertainty, particularly regarding US economic policy, weakens the response of prices and output to monetary tightening in the euro area. Lastauskas and Nguyen (2021) document how external uncertainty, captured by an increase in US monetary policy uncertainty, dampens euro area growth and inflation. The authors also report that uncertainty has strong spillover and spillback effects, making international business cycles move more synchronously. Importantly, the type of linkage matters: financial linkages lead to a more negative GDP impact from the external uncertainty shock in the euro area than trade linkages. These macro level findings are consistent with micro evidence. In the case of France, using customs and fiscal data matched with product-level bilateral trade data to build an exogenous firm-level measure of uncertainty, Bricongne and Gigout (2020) find that external uncertainty shocks have a negative and persistent impact on the growth of exposed firms.

3 The impact of globalisation on productivity growth and the natural interest rate

The low interest rate environment forms an important backdrop to the 2020 strategy review.

This section investigates the role of globalisation in driving two key trends: the slowdown in global productivity growth and the decline in the natural interest rate.

3.1 Globalisation and productivity growth in advanced economies

Understanding the drivers of productivity growth is crucial for monetary policy.

Productivity is a key driver of long-run economic growth. As it shapes an economy's potential supply capacity, it is critical for real interest rates given its implications for firms' investment and households' savings decisions (see Section 3.2). In addition, changes in productivity have repercussions for firms' prices and mark-ups (as discussed further in Section 4). The productivity growth slowdown observed since the 2003 strategy review in many AEs, including the euro area, is well documented.¹⁷ While in some countries both labour productivity and total factor productivity (TFP) growth started to decelerate well before the GFC, in several cases productivity growth declined further in 2008/09 and subsequently never recovered to the pre-GFC rates (Chart 9, left panel). Besides the smaller post-crisis contribution of TFP to labour productivity growth, another common factor across AEs is the reduced contribution to growth stemming from capital deepening. One factor in this has been the weakening contribution of information and communication technology (ICT) and intangible capital to labour productivity growth, also reflected in subdued growth in investment in these assets during the GFC and some post-crisis years (Chart 9, right panel).¹⁸

¹⁷ For a detailed assessment of the slowdown in euro area productivity growth compared with other economies, see European Central Bank (2017).

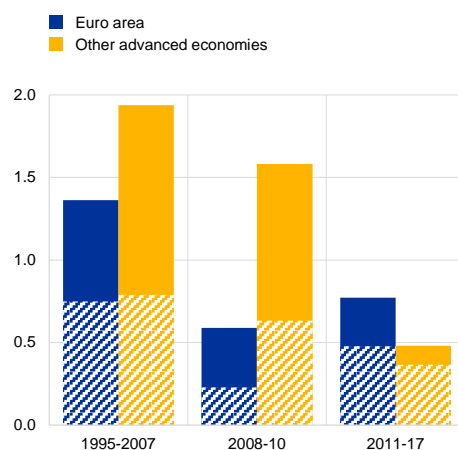
¹⁸ These assets were key drivers of labour productivity growth before the GFC (via capital deepening) and, importantly, also exhibited significant positive spillover effects on TFP dynamics. Corrado et al. (2017) present evidence for positive spillover effects of intangible investment on TFP growth and also highlight complementarities between ICT and intangible capital. In addition, Corrado and Hulten (2010) find that intangible capital has overtaken tangible capital to become the largest systematic (i.e. non-TFP) source of growth in the United States.

Chart 9

ICT and intangible capital investment and productivity development

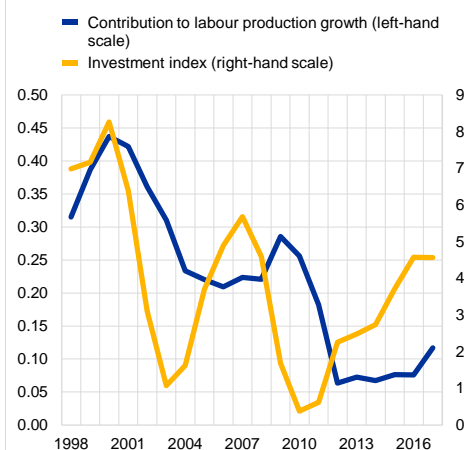
Labour productivity growth and TFP contribution (shaded areas) in AEs between 1995 and 2017

(percentages)



Contribution of ICT and intangible capital to labour productivity growth and growth of investment in these assets

(left-hand scale: percentage points; right-hand scale: percentages)



Sources: KLEMS, IMF and ECB calculations.

Notes: Labour productivity is defined as value added per hours worked. Left panel: Labour productivity growth can be decomposed into growth contributions from higher labour efficiency, capital deepening and TFP. Country groups are formed using GDP purchasing power parity (PPP) weights. Other AEs include Denmark, Japan, Sweden, the United Kingdom and the United States. Euro area includes Austria, Germany, Finland, France, Italy and the Netherlands. Data are missing for 1996 and 1997 in the case of the United States, for 2016 and 2017 in the case of Japan and for 2017 in the case of Sweden. Right panel: Data refer to the euro area and other AEs. ICT and intangible assets include information and communication equipment, software and databases, research and development and other intellectual property products. Data are presented as three-year moving averages. The latest observation is for 2017.

According to the literature, no single factor can explain the productivity growth slowdown by itself, but the commonality of experience across AEs indicates that global factors play a role.¹⁹ This raises the question of whether certain features of globalisation may have been underpinning the decline in productivity growth in AEs.

Trade integration tends to be positively related to productivity. Box 4 discusses the various channels through which international trade can positively affect productivity and provides corresponding evidence for some euro area countries. The slowdown in trade globalisation observed since the GFC (see Section 2) may thus have implied less support for productivity developments from international trade during the post-crisis period.

Box 4

The impact of trade integration on productivity

Trade liberalisation can raise aggregate productivity by causing both within-firm adjustments and between-firm reallocation of market shares. The most prominent channels in this regard relate to export opportunities, sourcing of intermediate goods and import competition. First, enhanced export opportunities may lead to within-firm productivity gains (i) by raising incentives to engage in technology upgrading and innovation (Bustos, 2011); and (ii) through

¹⁹ See Goldin et al. (2020) for a recent survey of the literature on the global productivity growth slowdown.

“learning by exporting”, meaning that the firm’s efficiency may benefit from knowledge gained through its presence in foreign markets (De Loecker, 2013). Second, foreign sourcing of intermediate goods (e.g. in the context of GVCs) may provide firms with cheaper or higher-quality inputs, as well as inputs that have a better fit in the production function (Halpern et al., 2015), which can enhance production efficiency and quality of output. Third, the impact of import competition on firm productivity is necessarily ambiguous, since, on the one hand, enhanced competition reduces the returns from productivity-enhancing investment (such as research and development), while on the other hand it reduces the profits a firm can capture without innovation. Aghion et al. (2005) show that the former effect dominates in the case of a large technology gap between frontier and laggard firms, which discourages laggard firms from innovating, while the latter dominates in the case of closer competition, providing firms with incentives to innovate in order to gain market shares. In addition, pro-competitive effects from imports may enhance productivity by lowering certain inefficiencies, e.g. by cutting managerial slack. Bloom et al. (2016) provide evidence suggesting that import competition from China has strong positive effects on productivity and innovation for a sample of European firms, while the evidence for US firms is generally more mixed (Shu and Steinwerder, 2018).

The channels discussed above may also increase aggregate productivity by affecting allocative efficiency, as trade integration tends to relocate market shares towards exporters and importers, and typically towards the most productive firms, which can bear the sunk costs associated with these activities (Melitz, 2003). In addition, import competition may force the least efficient firms to exit the market, also raising aggregate productivity, although the effectiveness of this mechanism has recently been challenged (e.g. Hsieh et al., 2020; Berthou et al., 2020).

For illustrative purposes, Chart A provides some suggestive evidence on the role played by extra-euro area exports and imports in the productivity of manufacturing industries in euro area economies.²⁰ We consider three distinct productivity variables in order to better understand the mechanisms at play: (i) an industry’s aggregate TFP computed as the weighted average of firm-level TFP; (ii) the decomposition of this variable into mean industry productivity, which provides an indication of within-firm productivity adjustments; and (iii) a measure of allocative efficiency based on between-firm differences.²¹ The estimation results suggest that extra-euro area exports and imports have a positive effect on total industry productivity.²² Interestingly, the results indicate that exports affect productivity mostly by raising allocative efficiency, while imports generate within-firm productivity adjustments. Quantitatively, the estimated effects of trade globalisation on productivity are non-negligible. A back-of-the-envelope calculation based on this partial equilibrium analysis

²⁰ We obtain a measure of productivity at the firm level by estimating a gross output Cobb-Douglas production function following the approach of Gandhi et al. (2020). Due to missing firm-level price information, the firm-level TFP measures correspond to revenue productivity, which also includes aspects related to the quality of the firms’ output and is not a measure of pure technical efficiency.

²¹ Total industry TFP is calculated by weighting firm productivity based on firms’ revenue shares. The decomposition goes back to the work of Olley and Pakes (1996).

²² Note that we consider the effect of total imports on productivity due to difficulties in separating the effects of intermediate goods sourcing and import competition at the detailed four-digit industry level. Besides ordinary least squares (OLS), we employ an instrumental variables approach in the spirit of Autor et al. (2013) and Hummels et al. (2014) to account for endogeneity in the trade variables. In particular, we instrument trade flows of the five euro area countries available in iBACH (Belgium, Spain, France, Italy and Portugal) using information on trade flows for four other euro area economies (Cyprus, Germany, Greece and the Netherlands) and four non-euro area economies (Denmark, Sweden, the United Kingdom and the United States).

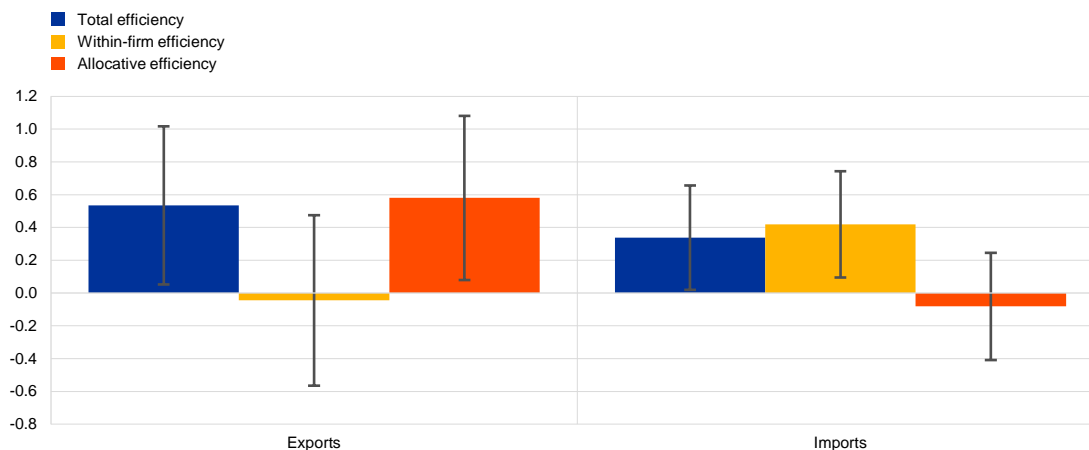
suggests that during the period under investigation, exogenous increases in exports and imports may account for around 8% of the TFP growth observed for the average industry in the sample.²³

Chart A

Impact of export and import growth on TFP growth in euro area manufacturing industries

The effect on total industry TFP growth can be decomposed into a within-firm component and a between-firm (allocative efficiency) component. The coefficients and 95% confidence bands displayed correspond to responses to 10 percentage point higher export and import growth

(percentage points)



Sources: iBACH (microdata from the Bank for the Accounts of Companies Harmonized (BACH) database), European Committee of Central Balance Sheet Data Offices (ECCBSO), BACI (disaggregated data on bilateral trade flows obtained from CEPII) and ECB calculations.

Notes: The chart presents coefficients estimates of instrumental variables regressions based on the following specification: $[\Delta \ln y]_{i,c,t} = [\beta_1 \Delta \ln X]_{i,c,t} + [\beta_2 \Delta \ln M]_{i,c,t} + [\phi]_{i,c,t} + \epsilon_{i,c,t}$, where $y_{i,c,t}$ is TFP or its decomposition into the within-firm and allocative efficiency components of four-digit industry i in country c and year t ; $X_{i,c,t}$ and $M_{i,c,t}$ refer to exports and imports; $\phi_{i,c,t}$ is a vector of one-year lagged control variables (number of employees, leverage and output growth), $y_{i,c,t}$ are country-year fixed effects and $\epsilon_{i,c,t}$ is an error term. Standard errors are clustered at the country/industry level. The results imply that a 10 percentage point rise in annual export growth increases total industry productivity growth by around 0.53 percentage points, while a 10 percentage point rise in annual import growth would generate 0.34 percentage point higher total TFP growth. The estimation sample contains data from Belgium, France, Italy, Portugal and Spain for manufacturing firms with turnover of at least €750,000 and runs from 2008 to 2018 (with the sample starting in later years for some countries). The Sanderson-Windmeijer multivariate F-test of excluded instruments exceeds 40 for either instrument.

A caveat to keep in mind is that globalisation has also worsened productivity measurement problems because of firms' global profit-shifting activities (see Box 2). Profit-shifting through transfer pricing and offshoring of intangible assets understates firms' measured output outside tax havens. Recent evidence shows that such profit-shifting activities have increased over time and are sizeable, suggesting that, in 2015, close to 40% of MNEs' profits were shifted to low-tax countries (Tørsløv et al., 2020). Moreover, Bricongne et al. (2020) provide evidence of French firms recording productivity declines following the establishment of a presence in a tax-haven country. Overall, the literature therefore suggests that measurement problems caused by globalisation are quantitatively meaningful and may be severe. But there also seems to be a consensus that they fail to explain the bulk of the slowdown in productivity growth (Syverson, 2017).

The GFC might have contributed to the productivity growth slowdown through its dampening effect on investments in intangibles and technology adoption.

²³ Note that total TFP, exports and imports for the average country/industry in the sample grew (cumulatively) by 3.3%, 40% and 27% during the sample period. 7% of the increase in exports can be attributed to exogenous foreign demand shocks and 13% to exogenous foreign supply shocks (see variance decomposition by Autor et al., 2013). Applying the estimated coefficients then leads to a contribution of trade to average TFP growth of 0.27 percentage points (or 8% in relative terms) during the sample period ($0.27 = 40 \times 0.07 \times 0.053 + 27 \times 0.13 \times 0.034$).

Financial globalisation played an important role not only in the international propagation of the GFC, but also in the excess credit growth that was at the centre of the initial phase of the crisis (Lane, 2013). The GFC was marked by a large drop in demand, a tightening in financial conditions and a spike in uncertainty. In such an environment, firms tend to hold back on investment – particularly for riskier assets such as intangibles that cannot be pledged as collateral. This in turn weighs on productivity dynamics. Indeed, recent studies investigating the productivity effects of the GFC conclude that it contributed to the growth slowdown mostly via reduced investment in intangibles and sluggish adoption of new technologies (e.g. Ahn et al., 2020; Anzoategui et al., 2019; Duval et al., 2020). Importantly, cyclical factors of this kind can have quite persistent effects on productivity growth, since it takes time for new technologies and innovations to be implemented in production.²⁴

There are additional structural factors related to changing market dynamics and connected to globalisation that could have contributed to the productivity growth slowdown. Recent evidence supports the view that the interplay between globalisation and the increasing reluctance of firms to invest in relatively risky intangible assets and digital technologies favours “winner-takes-all” markets. Such assets and technologies, which often require high upfront investments, allow firms to increase their scale at very low marginal cost, enabling a few high-quality producers or first movers to capture most of the market. Globalisation tends to reinforce this mechanism by raising the returns on investment in these assets via increased market size (Acemoğlu and Linn, 2004), thereby fostering the emergence of “superstar” firms, which are usually considered to be large, globally active and intangible assets-intensive and have high levels of sales per employee. Indeed, this conjecture seems consistent with the fact that only a relatively small set of firms tend to be highly intangible assets-intensive and heavily engaged in exports (Chart 10, left panel). Moreover, it fits with an increasing dispersion in productivity between a few highly productive global frontier firms and a much larger number of laggard firms (Chart 10, right panel). Increasing dispersion in productivity driven by a fast-expanding global technological frontier is not necessarily an issue in itself. However, a productivity slowdown in firms at the frontier and/or laggards could be responsible for an aggregate productivity growth slowdown.²⁵

²⁴ Gopinath et al. (2017) further find that rising capital misallocation already weighed on productivity growth in Spain before the GFC, which may be related to an inefficient allocation of large capital inflows.

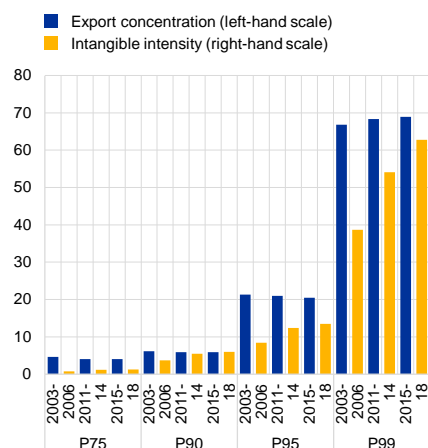
²⁵ Andrews et al. (2019) find that industries with weaker productivity growth display greater divergence in efficiency between global frontier and laggard firms. This may be related to reduced technological diffusion from frontier to laggard firms due to the changing nature of technologies and the increasing importance of intangible assets employed by the leading firms, e.g. big and proprietary data (Akcigit and Ates, 2021). In addition, a large productivity gap may discourage laggard firms from productivity-enhancing investment and new firms from entering the market (e.g. Akcigit and Ates, 2019). Moreover, frontier firms may take strategic advantage of their leading position in order to become entrenched (Liu et al., 2019; Covarrubias et al., 2019). Note that it is still being debated whether the emergence of superstar firms has already slowed down productivity growth (e.g. Autor et al., 2020; Covarrubias et al., 2019).

Chart 10

Role of a few top firms in exports, intangible assets and productivity developments

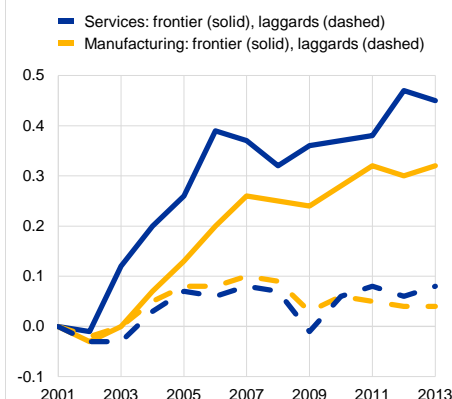
Skewness of intangible asset intensity and concentration of exports in French manufacturing

(percentages)



Divergence in labour productivity between the frontier and the rest

(log-point differences relative to 2001)



Sources: iBACH, ECCBSO and ECB calculations.

Notes: The left panel is based on French manufacturing firms with annual turnover exceeding €750,000 and presents yearly averages of indicated time periods. Export concentration refers to the share of total exports accounted for by any given percentile in the distribution of total manufacturing export sales; p99 refers to the top percentile, p95 to the next four percentiles, i.e. 95-99, etc. p99 of intangible assets intensity shows the ratio of intangible to tangible assets for firms at the 99th percentile of the variable's distributions. The right panel is obtained from Andrews et al. (2019), who employ ORBIS data for the non-farm, non-financial business sector in 24 OECD countries. The global frontier is measured by the average of the logarithm of labour productivity for the top 5% of companies with the highest productivity levels within each two-digit industry. Firms below the frontier capture the average log productivity of all the other firms. Unweighted averages across two-digit industries are shown for manufacturing and services, normalised to 0 in the starting year. The time period is 2001-13. Services refer to non-financial business sector services. The latest observations are for 2018 (left panel) and 2013 (right panel).

The discussion about how globalisation may have influenced cyclical and structural factors that underpin the productivity growth slowdown has implications for the assessment of future productivity developments and related policy challenges. Regarding cyclical factors, the experience with the GFC may indicate that the medium-term outlook for productivity growth is subject to downside risks arising from the potentially persistent effects of large global downturns. Moreover, there are some threats to the trade outlook, for instance due to the possible restructuring of GVCs after the pandemic and a further rise in trade barriers (see Section 1.1). In the light of the discussion in Box 4, a reversal of trade integration may have adverse consequences for future productivity developments. Regarding structural factors, a key challenge will be to keep markets contestable globally, to foster the diffusion of technologies and to provide incentives for both frontier and laggard firms to invest in new technologies and in research and development. Continued weakness in productivity growth would threaten both the sustainability of private and public debt and the room for manoeuvre in monetary and fiscal policy (see Section 6).

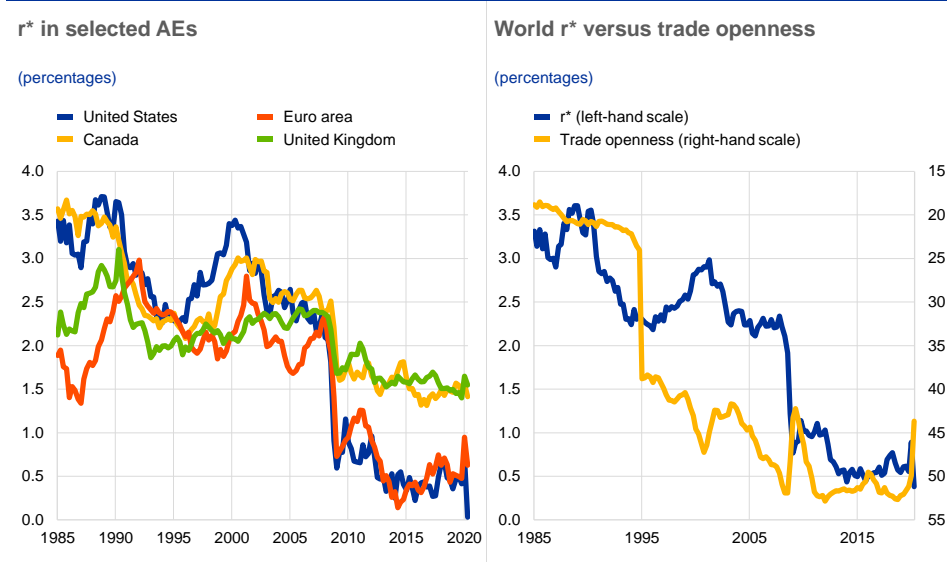
3.2 Globalisation and the natural rate

Real interest rates have declined across a wide set of AEs. It is widely recognised in the literature that the decline in the natural rate (Chart 11, left panel) – the real interest rate consistent with output at its potential and stable inflation – features a common component across countries (Holston et al., 2017; Neri and Gerali, 2019; Del Negro et al., 2017; Rachel and Smith, 2017; King and Low, 2014).

There are several hypotheses about the drivers of this common downward trend in the natural rate – with the role of globalisation in the process being debated. Some authors suggest the common decline in the natural rate is rooted in similar country-specific experiences that reflect demographic or technological developments and are not related to globalisation (Rachel and Smith, 2015). Others point to the role of global drivers, which has broadly coincided with the fall in the natural rate.

Chart 11

Natural rates across AEs and at the global level



Sources: Holston-Laubach-Williams, IMF World Economic Outlook and ECB calculations.

Notes: World r^* estimated as a GDP-weighted average using four AEs (United States, euro area, United Kingdom and Canada). The latest observations are for Q2 2020 (left panel) and Q4 2019 (right panel).

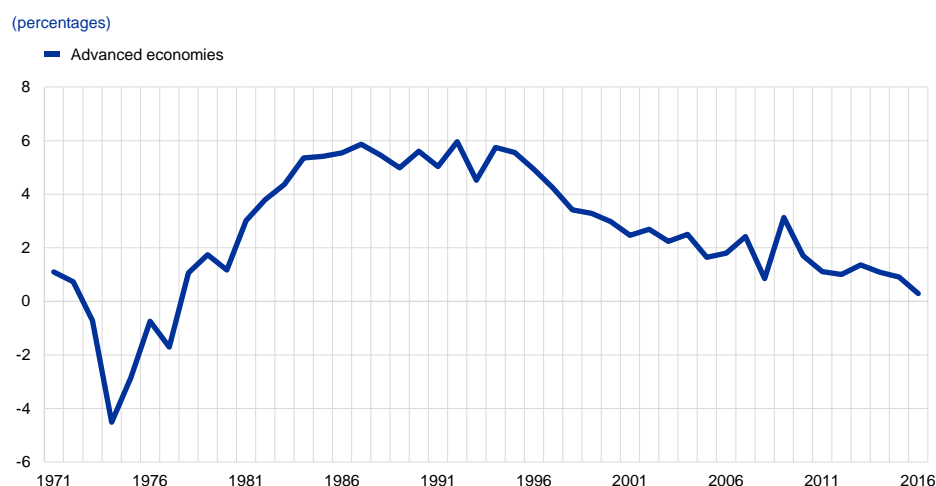
Most of the literature has linked globalisation and the natural rate by highlighting the role of financial integration. The line of reasoning is that as the world becomes more financially integrated, the pool of savings that demands safe assets as a store of value (and insurance) multiplies, while the supply of safe assets does not multiply commensurately. Over the past three decades, the strong growth of EMEs coupled with high savings demand has led to rising scarcity of safe assets, which has put downward pressure on equilibrium interest rates (Bernanke, 2005; Caballero et al., 2016; Caballero et al., 2017; Del Negro et al., 2017).²⁶

²⁶ Foreign bond purchases and the downward pressure on long-term interest rates are also relevant for the euro area, despite it running a current account surplus (Carvalho and Fidora, 2015).

Another strand of the literature has instead emphasised the role of trade globalisation (Comin and Johnson, 2020; Natal and Stoffels, 2019). A visual inspection of the data suggests that over the past three decades a rise in trade openness has been generally matched by a fall in the world natural rate (Chart 11, right panel). Yet from a theoretical perspective, the impact of greater trade openness is ambiguous. As discussed in Section 3.1, in the early phase of globalisation, increased trade integration may have accentuated competition among companies, reducing firms' market power and bolstering productivity. This should have exerted upward pressure on the natural rate. As globalisation matured, however, the opposite mechanism could have played out, with a rise in market power putting more downward pressure on the natural rate (Autor et al., 2020; Gutiérrez and Philippon, 2019). The sequence of these opposing effects on productivity has been described by Natal and Stoffels (2019) as the main explanation for the hump-shaped pattern of long-term real rates (Chart 12), i.e. the rise in rates until the 1970s and the subsequent decline.

Chart 12

Hump-shaped pattern of the natural rate in advanced economies



Source: Jordá-Schularick-Taylor Macrohistory Database.
Note: The latest observation is for 2016.

There are also indirect ways in which globalisation can affect the natural rate of interest. Globalisation may have contributed to the rise of inequality “within” countries, which may have put downward pressure on the natural rate because a higher proportion of income and wealth accrued to richer households with a higher propensity to save (see Box 5). Globalisation may have also contributed to climate change by enabling pollution-intensive industries to relocate to countries with looser environmental regulatory standards (Bu et al., 2016). In turn, greater incidence of extreme weather events could increase demand for safe assets, which would weigh negatively on the natural rate of interest (NGFS, 2020; Benmir et al., 2020).

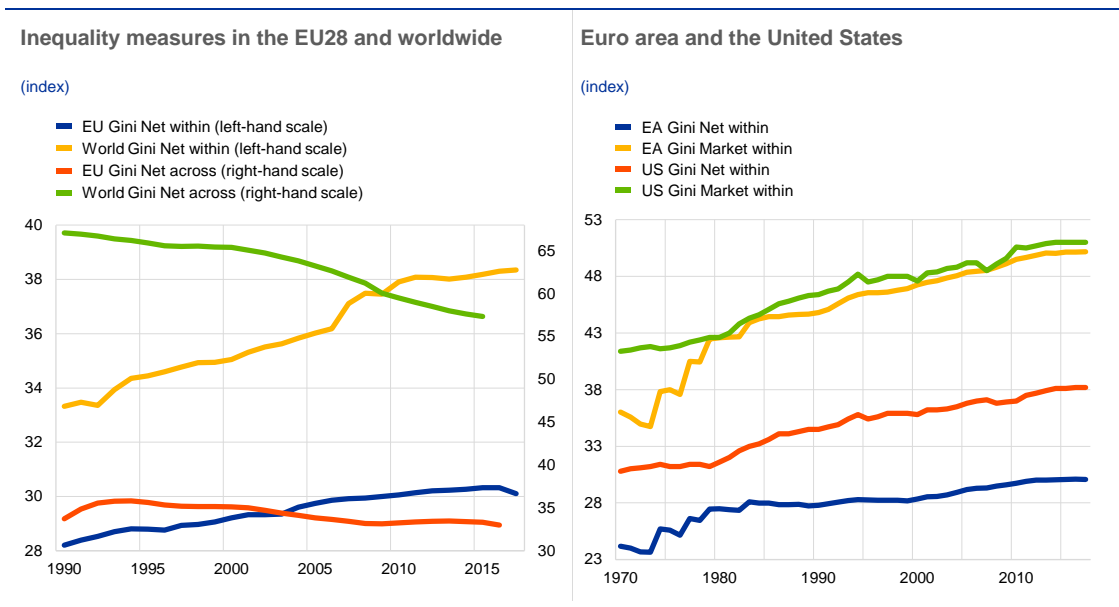
Box 5

Globalisation and inequality

Inequality has increased in many AEs in the past three decades. Although there has been a steady fall in inequality *across* countries over this period, inequality *within* countries has increased sizeably. A similar pattern has also emerged within the EU, with evidence that inequality has fallen among Member States, at least up until the GFC, but has increased within countries (Chart A, left panel), which is reflected in stagnating incomes among lower and middle-income individuals. Inequality has also increased in the euro area, although it remains well below that in the United States, at least after accounting for redistribution (Chart A, right panel). In Europe and most other countries, the 2020 pandemic-induced recession will very probably worsen inequality both across and within countries (Darvas, 2021). The strength of these effects will depend not least on how flexibly individual countries and regions adjust to external disruptions and the solutions they find for enhancing economic resilience.

Chart A

Inequality within and across countries



Sources: Darvas (2019) and World Bank.

Notes: The within-countries index is computed as a weighted average of country-level Gini coefficients using GDP PPP shares as weights. The across-country Gini index is taken from Darvas (2019): a world income distribution is calculated using country-level income distributions which are estimated based on two parameters assuming log-normal income distributions at the country level across the world. Gini Market is pre-tax, while Gini Net is post-tax. The latest observation is for 2017 (2016 for World Gini).

Globalisation is often seen as one of the key forces driving the rise in inequality in AEs. The rise of EMEs has enhanced the competitive pressures on low-skilled workers and their wages in AEs (Freeman, 2011). This is consistent with traditional trade theory, which predicts that trade integration with low-wage economies weakens the relative demand and wages for unskilled workers in high-wage economies (as in the original Stolper-Samuelson theorem). In recent decades, such forces have manifested themselves via the enhanced role of offshoring and the resulting trade in intermediate inputs, which has caused an increase in wage inequality through a rise in demand for skill-intensive intermediate inputs in AEs (Carluccio et al., 2019). While the impact on wages might well be positive for those jobs that cannot be offshored (Grossman and Rossi-Hansberg, 2008), greater inequality might still arise in AEs through higher long-term unemployment and trade-induced reallocations of displaced workers across sectors and into different occupations (Ebenstein et al.,

2014). A problem with this narrative is that the impact of globalisation cannot easily be disentangled from the effects of technological progress (Ravallion, 2018). Moreover, there are countries which have faced similar trends in international competition and technological change but exhibited different trends in inequality. One explanation could be that policy choices play an important role as well: Bourguignon (2016) emphasises that in response to increased financial globalisation, tax policy has tended to favour capital relative to labour. Egger et al. (2019) show that since the mid-1990s, globalisation has induced shifts in labour taxation to the benefit of the top income share and to the detriment of the middle class. There is evidence that financial openness is also positively associated with rising macroeconomic and financial volatility, both of which tend to have adverse distributional consequences that may further accentuate inequality (Eichengreen et al., 2021). Another strand of the literature concentrates on the rise of global “superstar firms” as a consequence of increased financial globalisation (see Section 3.1) and the associated rise in executive remuneration as key drivers of inequality in AEs (see Atkinson, 2003; Autor et al., 2020; Bakija et al., 2012; Piketty and Saez, 2006). Additionally, to the extent that globalisation has contributed to rising inequality in the permanent component of labour income, it may have contributed to rising wealth inequality (Kaymak and Poschke, 2016; Straub, 2019). Finally, by fattening the tails of income and wealth distributions, globalisation has affected the transmission mechanisms of monetary policy, such as the interest rate channel and the wealth channel (see Section 5).²⁷

Given the ambiguous theoretical predictions, whether globalisation pushes the natural rate up or down becomes mainly an empirical question. Most empirical studies have either ignored the global dimension altogether or focused only on how financial globalisation impacts the natural rate. For example, recent contributions have documented a negative relationship between the accumulation of reserves in EMEs and long-run interest rates (Gräb et al., 2019; Busetti and Caivano, 2019) and a positive relationship between the supply of safe assets and global rates (Caballero et al., 2016; Glick, 2020; Ferreira and Shousha, 2020). Less explored empirically is the nexus between changes in trade globalisation and long-run interest rates, with the limited literature finding ambiguous effects (Busetti and Caivano, 2019).

New empirical evidence is warranted to establish the role of both trade and financial globalisation in shaping trends in natural rates. A way forward has recently been suggested by Kataryniuk (2021). As a first step, the author identifies the long-run relationship between real interest rates and a set of competing determinants as in Brand et al. (2018) and Fiorentini et al. (2018), while ignoring the role of globalisation.²⁸ According to this exercise, the hump shape of real rates since the 1970s is mainly explained by demographic factors (measured by the evolution of the share of young cohorts) and by rising risk aversion (measured by the spread between long and short-term interest rates). Such a perspective suggests that the higher share of the old-age population and higher risk aversion have driven down the

²⁷ This report does not discuss the political dimensions of globalisation. However, it should be noted that the rise in inequality may have played a role in the anti-globalisation backlash, which could challenge monetary authorities’ independence (Goodhart and Lastra, 2018; Agur, 2018).

²⁸ The sample encompasses 17 countries (Australia, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom and United States) from 1970 to 2015. For details see Kataryniuk (2021).

natural rate by increasing the aggregate propensity to save of an economy. As a second step, this specification is augmented with measures of trade openness (exports and imports divided by GDP) and excess savings (to account for the demand for safe assets by EMEs).²⁹

Table 1
Drivers of natural rates in 1970-2015

| Variable | Theoretical effect | Empirical effect |
|-----------------------------------|--------------------|------------------|
| Young age share in the population | Positive | Positive |
| Term spread | Negative | Negative |
| Excess saving in Asian EMEs | Negative | Negative |
| Trade openness | Ambiguous | Positive |

Sources: World Bank (young age share in the population), Jordá-Schularick-Taylor Macroeconomy Database (trade openness and term spread) and External Wealth of Nations database (Lane and Milesi-Ferretti, 2018) (excess saving in Asian EMEs).
Note: We include only the significant variables in Fiorentini et al. (2018) and potential determinants related to globalisation.

The analysis confirms that the decline in the natural rate has been mainly due to demographic factors and risk aversion but underlines the role of international factors (Table 1).³⁰ The findings in this study suggest that the positive effects of trade globalisation on productivity outweigh the potentially negative effects, and as a result trade globalisation has exerted positive upward pressure on natural rates. At the same time, this effect is partly offset, particularly in the more recent period, by the impact of higher excess savings in EMEs (Chart 13). Looking ahead, further empirical analyses are warranted to disentangle the contributions of the different global factors in accounting for the downward trend in the natural rates and to help explain their strong co-movement across countries.

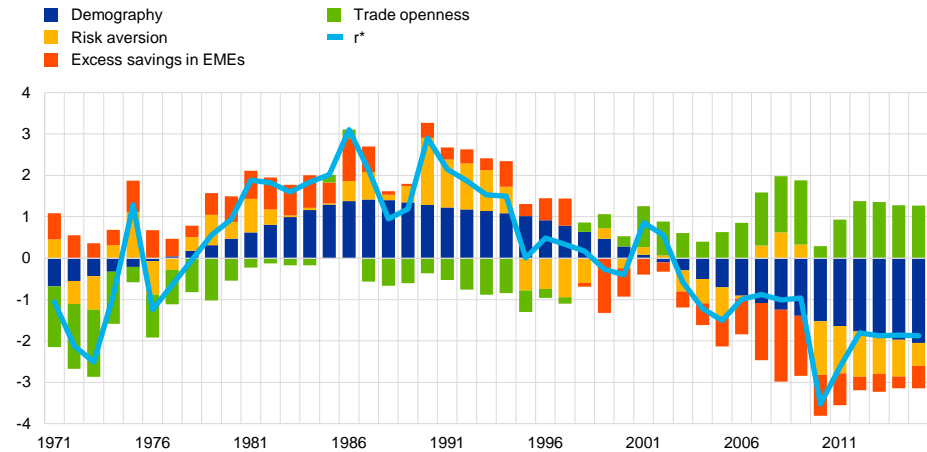
²⁹ As a measure of excess savings, we used the current account surplus of seven Asian EMEs, as in Buseti and Caivano (2019). Econometrically, we first tested for the panel co-integration relationship, and then employed estimated error-correction models, using dynamic fixed effects and pooled mean group estimators (Pesaran et al., 1999). The specification includes only the statistically significant variables reported by the ECB (European Central Bank, 2018).

³⁰ See Kataryniuk (2021) for further details.

Chart 13

Contributions of the long-run drivers of natural rates in 17 AEs

(contributions)



Source: Kataryniuk (2021).

Notes: The model is based on the significant variables in Fiorentini et al. (2018) and potential determinants related to globalisation. The chart shows the (demeaned) natural rate estimated by the panel cointegration model and the contributions of the long-run drivers to the natural rate. Excess savings in EMEs is proxied by the current account surplus in EMEs, while risk aversion is proxied by the term spread. The role of demographic factors is proxied by the share of young population. The latest observation is for 2015.

Looking ahead, changing globalisation trends may continue to have a relevant impact on the evolution of the natural rate. A number of authors have highlighted how financial deglobalisation could ultimately have a positive impact on long-term rates, e.g. if it tempers EMEs' savings (Rogoff, 2003; Fisher, 2006). On the other hand, the consolidation of trade deglobalisation trends would dampen productivity and long-run growth, and hence put downward pressure on the natural rate.

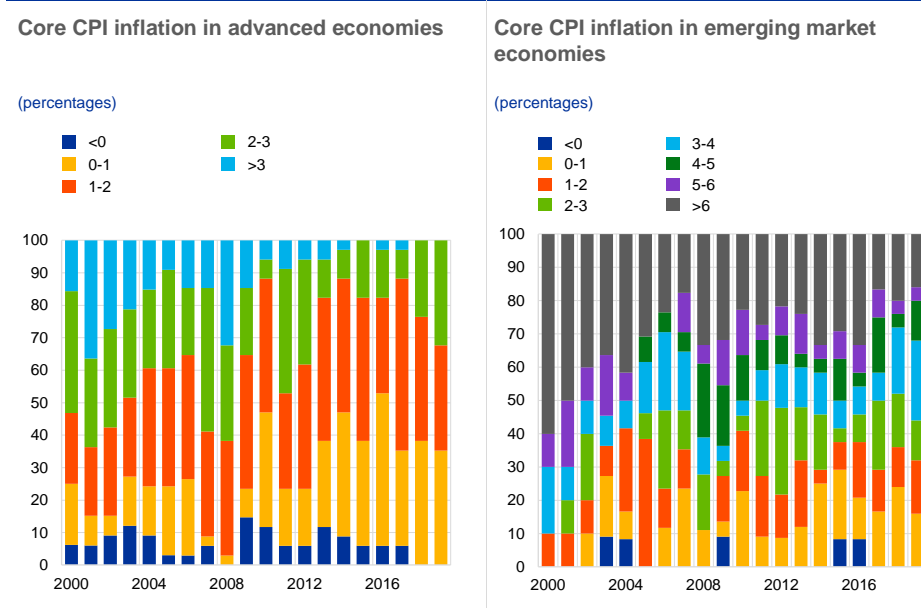
4 How globalisation has affected inflation

4.1 Stylised facts on synchronisation of inflation rates and volatility

Over the past two decades, inflation rates have fallen significantly in advanced and emerging market economies. An increasing number of AEs have registered both headline and core inflation rates below 2% (Chart 14). In addition, the decrease in the level of inflation rates coincided with a significant fall in volatilities (Chart 15). In emerging markets, the effect of the low inflation environment has been most apparent in core inflation. At the same time, the global economy has become more interconnected, while domestic economic and financial cycles have become increasingly synchronised worldwide.³¹

Chart 14

The international low inflation environment



Sources: World Bank and Haver Analytics.
Note: The latest observation is for 2019.

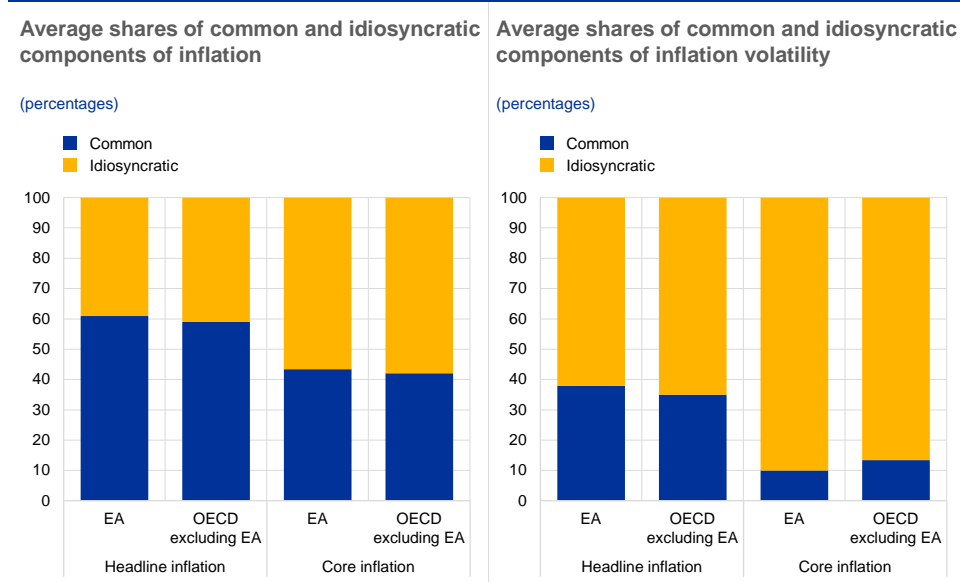
Headline inflation rates and their volatility have become increasingly synchronised. Delle Monache et al. (2016), Correa et al. (2019), Carriero et al.

³¹ The low-inflation phenomenon is also closely intertwined with the ongoing process of integration and convergence in the euro area (López and Papell, 2012; Brož and Kočenda, 2018). In the past two decades, some alignment in cross-country price levels and inflation rates has taken place. The creation of the Single Market, the reduction in transaction costs and the disappearance of exchange rate risk would help explain this process. Convergence in prices would in turn limit the divergences among inflation rates derived from catch-up developments in price levels (Estrada et al., 2013). In fact, inflation rates in countries with traditionally more sustained price dynamics (such as Spain and Italy) have converged to levels more in line with those of low inflation countries (such as Germany and the Netherlands), even standing below these levels in some cases. Thus, the convergence of inflation rates has resulted not only in a reduction in the dispersion of rates, but also a reduction in the average level of inflation for the euro area.

(2018), Mumtaz and Surico (2009) and Forbes (2019a, 2019b), for instance, find that common factors explain a large part of inflation dynamics in the euro area and other AEs, in terms of both level and volatility (Charts 15 and 16).

Chart 15

Common and idiosyncratic factors in inflation and inflation volatility

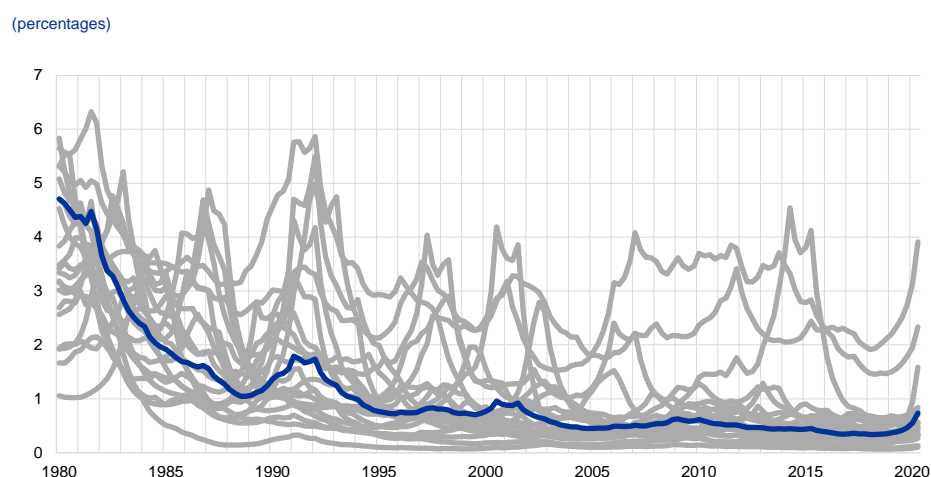


Source: Carriero et al. (2018).

Notes: Multivariate-autoregressive-stochastic volatility (MAI-AR-SV) model estimates of the contribution of the common and idiosyncratic components of inflation and residuals volatility. Average for Australia, Austria, Belgium, Canada, Finland, France, Germany, Greece, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States over the period from Q3 1987 to Q2 2020. EA stands for euro area.

Chart 16

Stochastic volatilities of core CPI inflation rates in selected countries and their principal component



Source: Carriero et al. (2018).

Notes: Autoregressive-stochastic volatility (AR-SV) model estimates. The thick blue line represents a global measure of inflation volatility. Countries include Australia, Austria, Belgium, Canada, Finland, France, Germany, Greece, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States. The latest observation is for Q2 2020.

However, the commonality among core inflation rates and volatilities is substantially smaller. Carriero et al. (2018), for instance, estimate that the predominance of idiosyncratic factors in core inflation has increased over time, which suggests that central banks have maintained their monetary sovereignty despite an increasingly globalised economy (Carney, 2017). The compositional difference between headline and core inflation suggests that large swings in volatile inflation components tightly linked to commodity prices (i.e. oil and food prices) are a key driver of the increased interconnectedness of headline inflation rates (Choi et al., 2018; Álvarez et al., 2011; Peersman, 2018).

The moderation in inflation trends comes against the background of secular developments linked to demographics, new technologies and globalisation.

Globalisation might have contributed to the low inflation trends through higher competition, higher labour supply and GVC participation. Yet a number of factors besides globalisation have also provided persistent headwinds for inflation, and disentangling the effects of all these different forces remains a challenging task.³² While it is difficult to paint a fully consistent picture, the analyses in this report confirm that globalisation has probably contributed to lowering inflation through various channels, but that its impact has been quantitatively limited. Section 4.2 links cross-sectional differences in the behaviour of trend inflation to measures of globalisation.

Globalisation can also alter the relationship between inflation and the business cycle by changing the competitive environment in which firms operate. The effect of globalisation on the slope of the Phillips curve in economic models is controversial. While some aspects of globalisation weaken the relationship between inflation and the business cycle, others work in the opposite direction. Section 4.3 discusses the various channels. It also presents some empirical evidence that higher openness and greater strategic complementarities could have contributed to flattening the Phillips curve in small open economies but that the effects are more muted in large economies such as the euro area. The role of GVC participation in gearing the responsiveness of domestic prices to economic activity is also explored (Box 7).

4.2 Globalisation and trend inflation

Globalisation affects prices in AEs through higher competition, higher labour supply, GVC participation and cheaper imports. First, imports have a direct effect on inflation. This is because a higher share of imports implies a larger impact from imported inflation on the Harmonised Index of Consumer Prices (HICP). Second, the gradual opening of trade and financial flows allows for greater foreign competition. Greater availability of cheap foreign goods induces domestic firms to lower their desired mark-ups in order to maintain a competitive price. As a result, less productive firms might exit the market, further lowering cost pressures (Guerrieri et

³² For instance, similar strategic frameworks of monetary policy across AEs might have contributed to the concurrent fall in inflation rates across AEs, while persistent global downward pressure on consumer prices increases the risk of de-anchoring inflation expectations.

al., 2010; Amiti et al., 2019). Third, the opening up of China and the integration of central, eastern and south-eastern European (CESEE) countries into the global economy after 1990 have raised labour supply, eroding the bargaining power of workers in AEs and further moderating production costs (see Box 6 for insights on the direct and indirect effects – through competition – of imports from low-wage countries on EA inflation). Fourth, stronger participation in GVCs can reduce cost pressures for multinationals and raise productivity, providing a further disinflationary impulse.

Such trends have potential implications for monetary policy. The fact that globalisation has proceeded slowly as a continuous trend, rather than as a one-off shock, suggests that inflation in AEs could have been dampened by globalisation. It can be argued that globalisation only affects prices between markets (e.g. tradables and non-tradables), rather than the average inflation rate, and therefore should not be considered when setting the monetary policy strategy. Yet, to the extent that it also affects market structure, for example by increasing competition within many markets, it triggers strategic complementarities. Through the effects of strategic complementarities on the slope of the Phillips curve, monetary policy transmission can be influenced. Owing to this channel, a higher degree of international interconnectedness can alter price setting and influence inflation.

Digitalisation-driven integration has also changed the pricing behaviour of large retailers globally.³³ Technological advances have enabled a faster pace of globalisation. The advent of algorithmic pricing technologies, easily transferable across nations and firms, along with the transparency of the internet, has enlarged the geographical horizons of consumers and reinforced globalisation trends via lower search costs for consumers and improved efficiency and productivity for producers. The enhanced competitive behaviour of firms increases the geographical correlation of price changes and tends to dampen price increases (Cavallo, 2018). Firms update their prices much more frequently than in previous decades, although the extent to which dynamic pricing affects the flexibility of reference prices, which in turn affect the slope of the Phillips curve, remains unclear. It has been documented that in the United States, goods prices have become significantly more uniform across retailers, suggesting greater strategic complementarities (Belz et al., 2020). However, early evidence for some euro area countries suggests that pricing may be less uniform than in the United States.

The rise of “superstar firms”, many of which operate in the technology sector, has accompanied globalisation and resulted in higher product market concentration, with an impact on price setting. Highly productive “superstar firms” boasting superior quality, lower costs or greater innovation ability have rapidly increased their market share, allowing them to reap disproportionate rewards relative to previous eras (Autor et al., 2020). This trend is likely to have influenced the evolution of prices over time, but the direction of the impact remains ambiguous. On the one hand, such firms can leverage their higher productivity to lower prices and maximise their market share, and if this were to result in an increasing degree of

³³ See also Chapter 5, “Digitalisation and inflation” of the Work stream on digitalisation (2021) for a detailed discussion of the impact of e-commerce, mark-ups and concentration on inflation.

competition, mark-ups and prices would be dampened further, flattening the inflation trend. On the other hand, if globalisation were to channel sales towards the most productive firms in each industry, product market concentration would rise and competition fall. Depending on the contestability of the market, monopolistic/oligopolistic market power would allow firms to increase mark-ups with a consequent impact on price setting.

While much of the literature focuses on the link between trade integration and goods trade prices, globalisation may also have affected services inflation, as services have also become more tradable. Assessing the effect of globalisation on services prices can shed some light on the future role of foreign and domestic factors for inflation dynamics. As the role of services in high-income economies increases, the question of whether this will strengthen the link between inflation and domestic economic developments also arises, given that changes in services prices are commonly attributed to domestic rather than foreign factors (Lane, 2020a). Breaking down inflation between goods and services can improve the understanding of overall inflation dynamics as argued by Linder et al. (2013). Their unique characteristics also imply a different exposure to globalisation factors (e.g. trade integration due to the higher tradability) and are exploited in the analysis to better pin down the influence of globalisation on inflation. While the trend inflation rate of goods in AEs has dropped from 3% in the early 1990s to around 0.5% in 2020, the fall in services inflation has been even stronger, from around 5% to around 1.5% between 1994 and 2000 (Chart 17).³⁴ The sharp, simultaneous fall in trend inflation rates in the services sector across all AEs in the 1990s raises the question of whether globalisation might have played a role in dampening price growth in this sector.³⁵ Among other reasons, this could have happened because the integration between services and manufacturing (and therefore tradable goods) has increased over time, or because services themselves have become more tradable, or because technological changes such as logistics or other processes have favoured both the integration of goods trade and the production of domestic services.

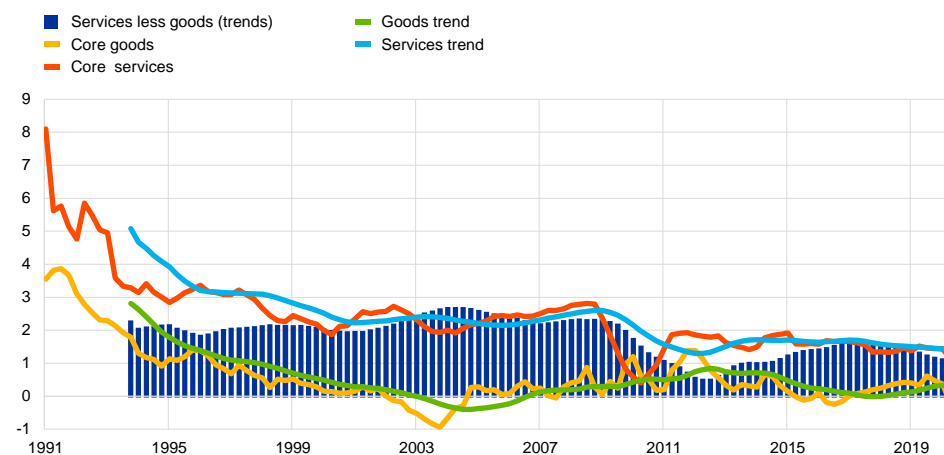
³⁴ For an analysis of the gap in the euro area see Ferrara (2019).

³⁵ The trends are estimated three-year moving averages of year-on-year inflation rates of core goods, services and overall inflation in six major economies.

Chart 17

Trend inflation in goods and services in advanced economies

(percentages and percentage points)



Sources: ECB calculations and national sources.

Notes: Inflation trends are computed based on 12-quarter moving averages of core goods and services inflation in advanced economies, computed in turn as weighted average (GDP PPP weights) of six advanced economies (Australia, Canada, the euro area, Japan, the United Kingdom and the United States). The latest observation is for Q2 2020.

Empirical analysis indicates that, over the last 25 years, globalisation has exerted downward pressure on inflation trends of AEs, mainly through goods inflation, but that the overall effect has been economically small. The estimates of inflation trends shown in Chart 17 are used as the dependent variable in panel regressions and regressed against measures of globalisation. The specification, which follows that in Forbes (2019a), is augmented by various indicators of globalisation trade integration (trade barriers), informational globalisation (digitalisation-driven integration) and GVC participation.³⁶ For a more thorough analysis of a particular aspect of trade integration, namely imports from low-wage countries, see Box 6.

Table 2

Panel estimates – summary of impact of globalisation indicators on inflation trends

| Variable | Overall | Goods | Services |
|-----------------------------|-----------------|-------|----------|
| Trade integration | - | - | - |
| Informational globalisation | Not significant | - | + |
| GVC participation | - | - | + |

³⁶ In order to investigate the influence of globalisation on non-cyclical inflation, we exploit the cross-country heterogeneity of inflation trends and estimate a dynamic panel Phillips curve-style equation using the generalised method of moments (GMM). It is worth noting that this is not a Phillips curve, as the dependent variable is the inflation trend (computed as a 12-quarter moving average) and not headline inflation. We follow a specification similar to that in Forbes (2019), in which trend inflation is determined by real exchange rate movements and is augmented by various indicators of de jure and de facto globalisation. The equation is estimated using a standard GMM approach to allow for the inclusion of a lagged dependent variable and a lag of the independent variables. We adopt an Arellano-Bond procedure, also using lags in the difference equation, and additionally include the consensus forecast of inflation expectations in the level equation for the instrumented variable. The equation is estimated over the period from the fourth quarter of 1996 to the first quarter of 2018 using quarterly data for six AEs (Australia, Canada, the euro area, Japan, the United Kingdom and the United States), while the panel is strongly balanced.

Table 2 shows that indicators of globalisation are significantly correlated with overall trend inflation, mainly through the goods component. Three elements of globalisation are linked to a lower trend in overall inflation and goods inflation in AEs: trade integration, informational globalisation and GVC participation. By contrast, the results suggest that different globalisation measures have had an offsetting impact on services trend inflation, thereby reducing the total effect. Taking all the findings together, the analysis indicates that the role of globalisation in the sharpest movements in inflation, which took place in the 1990s and then again after the GFC, is relatively limited. A quantification of the overall impact, subject to non-negligible uncertainty, finds that the effect of globalisation on inflation trends has been small.³⁷ The findings are in line with Linder et al. (2013) and Forbes (2019b) and hold for the cross-section of AEs analysed as well as for the euro area. Forbes (2019b) finds that “global variables [...] have limited ability to improve our understanding of the dynamics of the underlying, slow-moving trend in inflation, and they do not appear to have become more important over the last decade”. At the same time, the fact that the coefficients of tested domestic variables (e.g. output gap and labour cost) are robustly significant suggests that domestic factors continue to play an important role in driving price dynamics. Overall, the analysis suggests that the major plunge in inflation trends occurred in the early 1990s, when globalisation was still latent, digitalisation was low, and China had not yet joined the World Trade Organization (as it did not do so until 2001). This early fall was also synchronised across goods and services, which should not be expected to respond homogeneously to cross-border integration. Therefore, while globalisation is likely to have pushed down trend inflation a little further, it seems unlikely to have been the main force behind these changes. Box 6 delves into the impact of import prices and reaches similar conclusions.

The analysis suggests that a partial reversal of globalisation poses limited risks to inflation trends. Increasing appetite for trade protectionism, higher costs due to tariff and non-tariff trade barriers, retrenchment from GVC participation, reshoring of production triggered by COVID-19, reduced international competition and increasing mark-ups of superstar firms could provide potential tailwinds for inflation. However, the results of this analysis suggest that, should these tailwinds materialise, their effect is likely to be quite limited.

Box 6

The contribution of imports from low-wage countries to euro area inflation

Globalisation may affect inflation through many different channels. Section 4.2 assesses the overall effect of globalisation on inflation trends and finds that the effect is negative and quantitatively small, albeit with some uncertainty. This box focuses on one of the most prominent channels through which globalisation may affect consumer price index (CPI) inflation, namely imports of consumption goods from low-wage countries (LWCs). The key message from this analysis is in line with the main text: we find that LWC imports have a quantitatively small, negative effect on euro area HICP inflation.

³⁷ A so-called Yellen decomposition implies a total impact of around 0.01 percentage points on the trend of overall inflation since 2003.

Over the past two decades, the euro area has experienced a large increase in the proportion of imports from LWCs. The share of euro area imports in consumption expenditure of tradable goods increased by 6 percentage points during the period from 2000 to 2016, with LWCs accounting for the entire increase (Chart A, left panel).³⁸

How much higher would euro area CPI inflation have been on average had the share of imports of consumption goods from LWCs remained at their 2000 level? Relying on annual micro data on imports at the product level, we consider two channels through which LWC import penetration may affect euro area inflation: imported inflation, which has a direct effect, and greater competition for domestic producers, which has an indirect effect.³⁹ In addition, the box points out some of the challenges that such changes in the structure of consumption imply for inflation measurement.

We start by expressing euro area inflation as the weighted average of inflation in the prices of domestically produced goods (DOM), as well as in the prices of goods imported from high-wage countries (HWCs) and LWCs. As in the calculations for the HICP, expenditure weights (γ) sum to one and are lagged by one period,

$$\pi_t^{EA} = \gamma_{t-1}^{DOM} \pi_t^{DOM} + \gamma_{t-1}^{HWC} \pi_t^{HWC} + \gamma_{t-1}^{LWC} \pi_t^{LWC} \quad (1)$$

Euro area inflation is affected directly by imported inflation and indirectly through greater competition for domestic producers. We measure the effect of the rise in the LWC share in inflation as the sum of the two effects:⁴⁰

$$LWC_{Contribution} = \Delta \gamma_{t-1}^{LWC} (\pi_t^{LWC} - \pi_t^{DOM}) + \gamma_{t-1}^{DOM} \Delta \pi_t^{DOM} \quad (2)$$

The rise in the share of expenditure on imports from LWCs was largely mirrored by a decline in the share of expenditure on domestically produced goods, while the share spent on goods from HWCs remained constant (Chart A). This change in expenditure patterns affects the inflation rate of the euro area directly: the more imported goods the consumption basket includes, the more the inflation rates of these goods will matter for the determination of inflation. Therefore, what affects the HICP is the inflation differential between goods imported from LWCs and domestic goods: if their inflation rates are similar, the evolution of the HICP remains unchanged, even when the share of each

³⁸ Low-wage countries are defined as countries for which GDP per capita is less than 75% of French GDP per capita, in line with Carluccio et al. (2018), taking the average over the period 1994-2014. The composition of groups is fixed over time. Notice that consumption goods account for around 20% of total imports.

³⁹ There are also more indirect ways through which increased imports can affect CPI inflation that are not discussed here, including (i) productivity gains from accessing cheaper intermediate inputs via offshoring, (ii) income effects that might raise the demand for services and their prices, and (iii) changes in wages. Furthermore, prices of imports are taken as given, although there is evidence that the rise of low-wage countries might have had an effect on commodity prices (see, for example, Roache, 2012).

⁴⁰ In the derivation of this expression, we assume that the rise in the expenditure share of LWCs is mirrored by a decline in the domestic expenditure share (consistent with the data), that the initial expenditure share of LWCs is close to zero and that there are no pro-competitive effects on HWC producers.

goods is changing.⁴¹ We call this direct effect the “imported inflation” effect of imports from LWCs. It is measured as $\Delta\gamma_{t-1}^{LWC}(\pi_t^{LWC} - \pi_t^{DOM})$, where $\Delta\gamma_{t-1}^{LWC}$ is the change in the expenditure share on goods produced in LWCs and $(\pi_t^{LWC} - \pi_t^{DOM})$ is the differential of inflation rates between LWC and domestic goods. In addition to the direct effect of imported inflation, a rise in LWC import penetration can have an indirect effect because it raises competitive pressures on domestic producers, potentially affecting their price-setting decisions and causing a reduction in the inflation rate of domestically produced goods.

The empirical investigation suggests that average yearly CPI inflation would have been 0.16 percentage points higher had the share of LWC stayed at the level recorded in 2000, mostly through competitive effects.⁴² The imported inflation effects are very limited. The right panel of Chart A shows that, although average prices from LWCs are substantially lower than euro area prices, differences in inflation rates are relatively stable over time, pointing to a small imported inflation effect.⁴³ Indeed, since 2000, the imported inflation effect is close to zero on average. However, the competitive effects of imports from LWCs are more significant. Recent papers have used instrumental variable techniques to show that imports from LWCs have a causal effect on domestic inflation rates in euro area countries. These techniques allow the elasticity of domestic producer price index (PPI) inflation to LWC import penetration to be estimated. This is specifically a measure of the percentage change in PPI inflation that can be attributed to changes in imports from LWCs (Auer et al., 2013; Carluccio et al., 2018). Carluccio et al. (2018) estimate an elasticity of domestic PPI inflation to LWC import penetration for France of 1.21.⁴⁴ Using this elasticity to estimate the competition effects as measured in the second term of equation (1), imports of goods from LWCs reduced euro area CPI inflation by 0.16 percentage points per year on average during the period under review.⁴⁵

Finally, it is worth pointing out that the implied effects may differ if we use alternative measures of inflation, especially cost-of-living inflation (COLI). This alternative measure of inflation is rooted in economic theory and represents the change in the minimum expenditure required to obtain the same consumer utility across two periods, whereas the HICP measures the change in the cost of purchasing the same consumption basket across any given two periods. Therefore, a COLI index captures consumer welfare changes, and its form depends on the underlying utility function. In the case of constant elasticity of substitution (CES) preferences, which

⁴¹ The HICP is a fixed-basket index constructed using price indices for each individual good, calculated as the ratio of the price observed at one period with respect to the level of the price at the previous period. It does not take into account new goods until they are brought into the index by waiting until the index is rebased, or by waiting for at least two successive periods of available prices and linking the new price comparison to the old index. Differences in price levels are one important determinant of the changes in expenditure levels documented in Chart A and have potentially strong impacts on welfare-based indices as discussed at the end of the box. See IWGPS (2020). Please refer to Carluccio et al. (2018) for details.

⁴² The impact is first computed at the sector level, and then aggregated using sectoral expenditure weights to obtain the macro effect. The import data are aggregated at the eight-digit level of the European Combined Nomenclature (CN, around 10,000 products) obtained from the Trade Data Monitor. The expenditure data come from EUROSTAT and are aggregated at the three-digit level of the Classification of Individual Consumption by Purpose (COICOP, 47 sectors). We use a table of concordance between the two classifications as detailed in Carluccio et al. (2018).

⁴³ The average annual inflation differential between LWC imported goods and domestic goods is 0.18 percentage points. Note that this differential is based on unit values and accounts for quality differences only in a crude manner. Therefore, it might result in a distorted estimate of the true price differential.

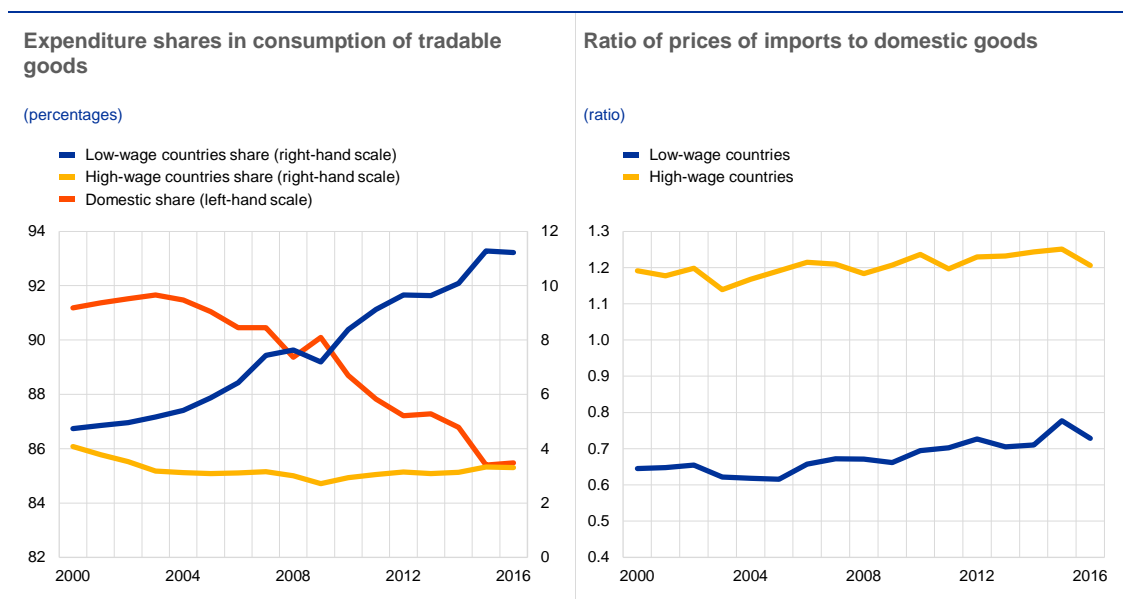
⁴⁴ We assume full pass-through from producer prices into consumer prices, which implies that the elasticity of domestic producers' consumer prices to LWC import penetration also equals 1.21.

⁴⁵ This estimate hinges on the assumption of a complete the pass-through from PPI to CPI prices, so it can be seen as an upper bound of the actual effect.

are the most common preferences in trade and open economy macro models, COLI inflation differs from CPI inflation because it accounts for substitution effects (through price changes or preference shifts) and gains from new product varieties (Redding and Weinstein, 2020). Substitution effects arise if, between two consecutive periods, either inflation rates differ across products or consumer tastes change. In both of these cases, consumers reallocate their expenditure across products. Such reallocations reduce the cost of living and are captured in the COLI, but not in the HICP. Additionally, the COLI differs from the HICP because it accounts for variety gains. Variety gains refer to the change in the cost of living that arises from a change in the set of products available for consumption. They contribute to a lower cost of living either if consumers can choose among more products or if the new products are more competitive (i.e. have a lower taste-adjusted price) than the products that exit the market. The increases in the share of LWC goods in euro area consumption coupled with the large differences in price levels (around 50% on average) point to important substitution effects. For example, Carluccio et al. (2018) estimate a reduction in COLI inflation due to imported goods from LWCs that is three times higher than for CPI inflation in France. Based on the US experience, variety gains are likely to be large. Bai and Stumpner (2019) estimate that variety gains from US openness to China accounted for a third of the total reduction in the COLI index. This analysis using an alternative measure of inflation suggests that the fall in inflation perceived by consumers in terms of their purchasing power of welfare “units” may have been larger than in terms of monetary expenditure.

Chart A

Expenditure shares and price ratios by origin



Sources: Eurostat and authors' calculation based on data from the Trade Data Monitor.
 Note: The latest observation is for 2016.

4.3 The relationship between inflation and the business cycle under the impact of globalisation

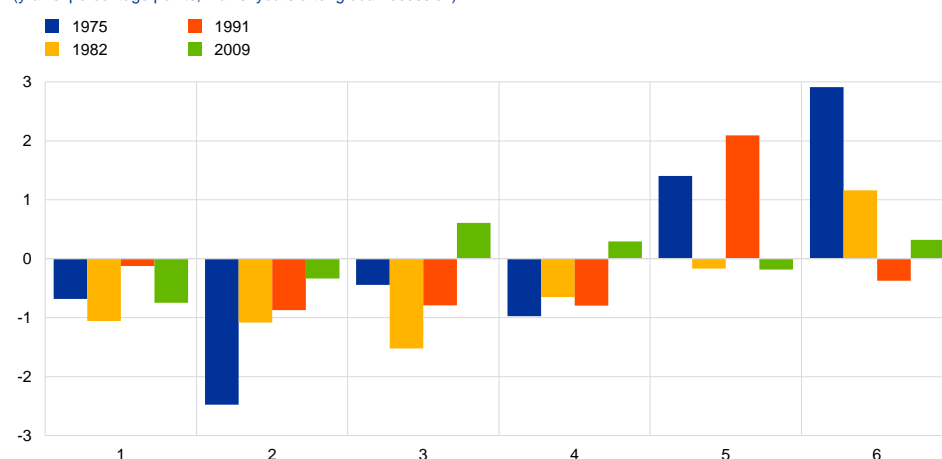
The correlation between consumer price inflation and the business cycle has fallen in AEs since the 1990s at least (Kuttner and Robinson, 2010;

International Monetary Fund, 2013; Stock and Watson, 2019). While the bulk of this drop occurred before the mid-1990s, i.e. before globalisation really took off (see, for instance, Lombardi et al., 2020 and BIS, 2017), a mild further reduction also took place during the globalisation phase, suggesting a link between the two. The relationship between inflation and the business cycle lies at the heart of the transmission of monetary policy to inflation. In modern macroeconomic models, real and nominal rigidities limit the adjustment of consumer prices to marginal costs, giving monetary policy the ability to generate real economic effects. Essentially, there are two candidate explanations for the weakening of this relationship. The first is a change in the pricing behaviour of firms due (among other things) to increased globalisation (Del Negro et al., 2020). The second is a change in the conduct of monetary policy that has reduced the adjustment of current inflation to shocks by better anchoring inflation expectations (Barnichon and Mesters, 2021; Hazell et al., 2020). The issue has gained traction since the GFC. Compared with other global recessions, the GFC induced both a milder fall in inflation and a weaker rebound thereafter (Chart 18), leading some observers to argue that increased globalisation could be responsible for this diminished responsiveness of prices to domestic economic slack. Related literature has explored whether, in a more interconnected world, global rather than domestic slack has become a more important determinant of inflation (Borio and Filardo, 2007; Eickmeier and Moll, 2009; Martínez-García and Wynne, 2012; Mikolajun and Lodge, 2016; Forbes, 2019a, 2019b). While some global factors (chiefly commodity prices) seem to have become relatively more important for CPI inflation, most papers conclude that core inflation and wage growth are still mainly determined by domestic economic conditions.

Chart 18

Changes in core inflation following recessions

(y-axis: percentage points; x-axis: years after global recession)



Sources: World Bank, OECD Main Economic Indicators and ECB calculations.

Note: Global core inflation estimated as a GDP-weighted average of 14 major economies (Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, South Korea, Turkey, United Kingdom and United States).

Globalisation could affect firms' price-setting decisions by changing the competitive environment in which firms operate and the composition of intermediate goods used in production. Sbordone (2007) argues that

globalisation amplifies strategic complementarities among competitors,⁴⁶ i.e. the extent to which a firm takes into consideration the behaviour of other firms in its own decisions, either via desired average mark-ups or via the elasticity of desired mark-ups with respect to the prices of other firms. On the one hand, since globalisation increases the variety of goods available for consumption, firms that compete internationally face demand curves that are more elastic with respect to competitors' prices.⁴⁷ This reduces desired average mark-ups and flattens the Phillips curve. On the other hand, a larger variety of goods can reduce the sensitivity of the desired mark-up to other firms' prices over the business cycle. This leads to a higher elasticity of prices to changes in marginal costs and steepens the Phillips curve. Therefore, in Sbordone's model, the overall effect of globalisation on the slope of the Phillips curve is ambiguous and depends on the relative strength of these two channels. A different view, however, holds that globalisation also affects the market structure of competing firms, favouring large, more productive firms at the expense of smaller, less productive competitors in what is called a "concentration channel". Large firms with more market power could, on the one hand, be less inclined to shave mark-ups when costs rise (Obstfeld, 2020 – steeper Phillips curve) or, on the other hand, could be acting strategically, making their price adjustments respond less to cyclical fluctuations in the real marginal cost (Guilloux-Nefussi, 2020 – flatter Phillips curve). Finally, in open economies, imports are used in production and not only in consumption. Monacelli (2007) shows that both a high share of imported inputs in production and a low pass-through of exchange rate movements to prices of imported goods are sources of real rigidity and contribute to flattening the Phillips curve.⁴⁸

The overall effect of globalisation on the cyclical responsiveness of inflation is theoretically ambiguous and is ultimately an empirical question. To shed some light on this issue, the framework of Guerrieri et al. (2010), a microfounded open economy dynamic stochastic general equilibrium (DSGE) model including strategic complementarities and international trade, is used to assess the sensitivity of the slope of the theoretical New Keynesian Phillips curve (NKPC) to parameters connected to globalisation. The analytical derivation of this model shows that, subject to some other estimated and calibrated parameters,⁴⁹ the slope of the Phillips curve depends directly on openness (ω) and demand elasticity to foreign

⁴⁶ According to economic theory (Woodford, 2003), the greater the strategic complementarity, the flatter the Phillips curve. For this reason, strategic complementarity is also referred to as "real rigidity".

⁴⁷ Intuitively, a small increase in prices generates a larger loss in market share for a firm when international competition is fierce.

⁴⁸ Besides real rigidity, globalisation could affect also "nominal rigidity", such as the frequency of price changes. This effect is also ambiguous in principle: on the one hand globalisation could have led to greater price flexibility (Rogoff, 2003) and therefore to a steeper Phillips curve; on the other hand, if globalisation has lowered the steady state level of inflation, the cost of not changing prices in response of a shock is lower, leading to less frequent price adjustments and to a flatter Phillips curve.

⁴⁹ These are the degree of strategic complementarity, capital shares, trade elasticities and import shares. The degree of strategic complementarity is estimated, while capital shares, trade elasticities and import shares are calibrated; see below for details.

competition (ϵ_A).⁵⁰ This latter parameter in particular, by interacting with the estimated strategic complementarities, will influence how foreign competition affects the slope of the Phillips curve (Sbordone, 2007). Both openness and the demand elasticity to foreign competition (ϵ_A) increase with the degree of globalisation.

$$\pi_t = \beta E_t \pi_{t-1} + \kappa_G(\epsilon_A, \omega) \tilde{m}c_t + \gamma_G(\epsilon_A, \omega) \tilde{p}m_t + \varepsilon_t$$

Taking this equation to the data can then shed some light on whether globalisation flattens or steepens the Phillips curve. Data are taken from four large economies (covering 45% of world GDP at market exchange rates), namely the United States, the United Kingdom, the euro area and Canada. Inflation (π_t) is measured by the growth rate of the GDP deflator,⁵¹ $\tilde{m}c_t$ is the present discounted value of real unit labour costs (deflated by the GDP deflator) and $\tilde{p}m_t$ is the present discounted value⁵² of the terms of trade.⁵³ It is clear from the expression above that the slope of the Phillips curve (κ_G) and the elasticity of inflation with respect to import prices (γ_G) depend on the demand elasticity to foreign competition (ϵ_A) and on the degree of openness to imported goods (ω), two parameters that increase with the degree of globalisation.⁵⁴ To evaluate the direction in which globalisation changes both the slope of the Phillips curve (κ_G) and the sensitivity of inflation to the terms of trade (γ_G), the demand elasticity to foreign competition and the import share are reduced by 1%, reflecting how a potential contraction in globalisation would affect the connection between the real economy and inflation.⁵⁵

⁵⁰ This structural relationship, derived by Guerrieri et al. (2010), comes from a standard small open economy framework in which a final good producer combines a continuum of intermediate goods produced at home and another continuum produced abroad. The model features preferences that make the price elasticity of demand a function of the quantity produced (Kimball, 1995), together with infrequent price adjustment as proposed by Calvo (1983). The NKPC is derived using the present-value approach of Sbordone (2005).

⁵¹ For robustness, different measures of inflation were also considered, namely CPI and core inflation measures.

⁵² Present values are obtained through a VAR model following an approach close to that taken in the empirical finance literature. Defining X_t as the vector containing the variables of interest, a reduced form VAR of the form $X_t = AX_{t-1} + u_t$ is estimated, where u_t is a vector of independently and identically distributed innovations. The present discounted value is computed using $E_t\{X_{t+k}\} = A^k X_t$.

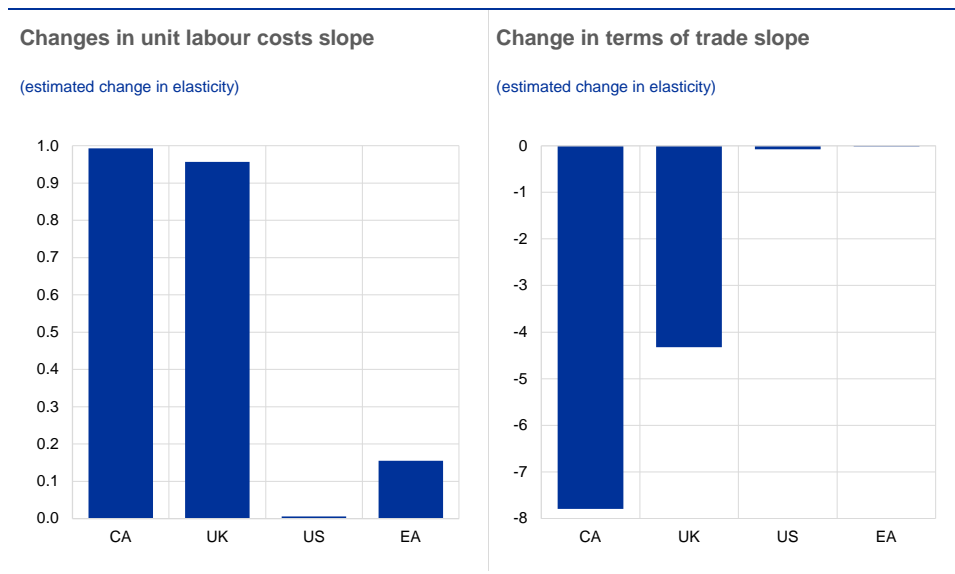
⁵³ The unbalanced panel goes from the first quarter of 1980 to the first quarter of 2020, and the NKPC is estimated using a non-linear ordinary least squares (OLS) regression. All data are made stationary using a Hodrick-Prescott filter. Results are also robust to a linear detrending procedure.

⁵⁴ To back out ϵ_A, ω from the estimated NKPC, the capital share is calibrated at 0.4, the trade elasticity at 1.4 and import shares at 31, 32, 27 and 15 respectively for Canada, the euro area, the United Kingdom and the United States.

⁵⁵ The model is symmetric, so an increase in globalisation would give the same results with inverted signs.

Chart 19

Elasticity of PC parameters with respect to a fall in the demand elasticity to foreign goods and the import share



Sources: World Bank, OECD and ECB calculations.

Notes: Elasticities of the Phillips curve to the fall in the elasticity of domestic demand to foreign goods and the import share are computed using an estimated structural model, as in Guerrieri et al. (2010). Results show the effect on the slope of the Phillips curve of a fall of 1 percentage point in both the demand elasticity to foreign goods and in the import share. Results are presented in percentage change.

Estimates from the structural model indicate that globalisation flattens the Phillips curve, especially in the United Kingdom and Canada, while the effect is much more limited for the United States and the euro area. This heterogeneity stems from the estimated elasticity of the strategic complementarity to foreign competition, which is derived from the reduced-form estimates of κ_G and γ_G , along with the calibrated parameters of the structural model. According to the results, shown in Chart 19, a slowdown in globalisation would imply a steepening of the Phillips curve and a reduced response by domestic inflation to terms of trade fluctuations. However, the steepening of the Phillips curve would be more intense for the United Kingdom and Canada than for the United States and the euro area. Box 7 provides further insights by analysing the relationship between trade integration and the correlation of domestic inflation with the unemployment rate, based on a large panel of countries. The findings in the box are consistent overall with the macro approach and confirm that greater involvement in international trade is associated with a somewhat more muted response by domestic prices to economic slack.

Estimates in the literature indicate that the overall economic impact of globalisation on the flattening of the Phillips curve over time has been small.

The analysis summarised in Chart 19 is informative on the direction of the causal effect of globalisation on the slope of the Phillips curve, but it is not able to quantify the contribution of globalisation to the flattening of the Phillips curve over time documented in the literature. Box 7 examines how much the correlation between consumer prices and domestic conditions is affected by two measures of trade globalisation, namely trade openness and GVC participation. Like the structural analysis, the estimates imply a flattening of the Phillips curve, albeit not a very

sizeable one in quantitative terms. Papers that attempt such quantification also fail to find strong evidence that the flattening of the Phillips curve can be ascribed to the effects of globalisation. Using micro data for Italian firms, Gaiotti (2010) finds that better anchoring of inflation expectations, rather than changes in the competitive environment of firms, is plausibly the dominant factor in explaining the flattening of the Phillips curve. Using a panel of countries, Bianchi and Civelli (2015) show that, although global slack has stronger effects on inflation in economies that are more open, the effect of globalisation on the slope of the Phillips curve for individual countries is quantitatively small. This apparent contradiction is explained by the fact that cross-sectional variation in trade openness is very large, while the increase in trade openness over time for individual countries is much more limited (at most 10 percentage points between 1980 and 2006, see Table 2 in their paper).⁵⁶ Hence, although cross-sectional variation provides the potential to uncover the effect of globalisation on the slope of the PC, effects over time for individual countries may turn out to be negligible.

Box 7

Trade integration and price Phillips curves

This box examines the responsiveness of consumer prices to domestic conditions and analyses whether their correlation is affected by two measures of globalisation: trade openness and participation in GVCs. In a panel of 30 countries (the 27 EU Member States, Japan, the United Kingdom and the United States), a standard representation of a hybrid New Keynesian Phillips curve is estimated, proxying marginal costs with economic slack and using quarterly data for the period 2001-19. The estimations are carried out by regressing underlying consumer price inflation on labour market slack (measured by the unemployment gap), past inflation and the two lags of the import deflator.⁵⁷ To investigate whether the intensity of trade integration affects the slope of Phillips curves, the coefficient of the unemployment gap is interacted with measures of trade openness (computed as gross exports as a percentage of GDP) and integration in cross-border supply chains.⁵⁸

Results indicate that higher dependence on export markets and GVC participation is associated with a lower correlation of inflation with domestic conditions (Chart A). For countries more exposed to export markets or more integrated into GVCs, core inflation is less correlated with the business cycle (Chart A). From a cross-country perspective, euro area economies are more involved in cross-border value chains than large countries such as the United States or Japan, but these channels appear to be especially relevant for the smaller euro area

⁵⁶ For instance, trade openness in the study by Bianchi and Civelli (2015) ranges from around 20% to over 100% across countries. For individual countries, however, openness rises by at most 10 percentage points between 1980 and 2006.

⁵⁷ The dependent variable is the annualised quarter-on-quarter growth rate of underlying inflation, while the import deflator is taken in year-on-year growth rates. Regressions also include a rich set of fixed effects accounting for a country's macroeconomic cycle and idiosyncratic shocks affecting all countries. Moreover, results are broadly robust to a number of changes in the measurement of variables (e.g. the number of lags) or using different ones (e.g. the output gap instead of the unemployment gap).

⁵⁸ Levels of GVC participation and openness are taken in deviation from their long-term averages. This is to account both for differences across countries and for their strong expansion from a historical perspective. Furthermore, to allow for better interpretation of interaction terms, these variables are expressed in the form of dummies equal to 1 if the underlying observation is higher than that of the panel median. Similar results for openness are obtained measuring trade as the average between exports and imports.

members, which are generally more open and embed a larger share of foreign inputs into their exports.⁵⁹ These findings resonate with the cross-sectional analysis in Bianchi and Civelli (2015). In particular, cross-country variation in GVC participation is very large and drives the coefficient estimates in Chart A, while changes over time in GVC participation for individual countries are much smaller. This suggests that the contribution of GVC participation in lowering the correlation between activity and prices for individual countries could plausibly have been small.

Certain aspects of digitalisation that enhance global trade integration could have also reduced the correlation between underlying inflation and domestic conditions. Adapting the previous analysis, similar results are obtained using measures of informational globalisation (e.g. use of the internet or e-commerce; Chart A, right-most panel). These variables capture technological developments fostering the cross-border flow of information or lowering entry costs into global markets that may affect business dynamism, competition and price transparency.

In the euro area, economic integration has a strong regional character, as a significant share of trade is exchanged within the monetary union, and euro area countries are on average more involved in regional than global production chains. This raises the question of whether both intra- and extra-euro area trade is associated with a lower correlation of core inflation with slack. This may have implications for the overall relationship between activity and inflation, since, as discussed in Section 2.1, the retrenchment in global trade has recently been partly offset by an acceleration in regional integration within the euro area. When running the analysis above only for the subsample of euro area countries, results suggest that both higher intra- and extra-euro area trade openness are correlated with lower sensitivity of prices to activity.

An analysis at the sectoral level further suggests that GVC integration channels are particularly relevant for manufacturing industries, which are the most integrated into GVCs, generally sell highly tradable goods and are less local in nature. This increases strategic complementarities and the dependence of producer price inflation on global economic conditions. In particular, the standard econometric approach is complemented with an estimation of a sectoral Phillips curve panel with sectoral labour costs driving sectoral output price inflation.⁶⁰ By interacting labour costs with GVC participation at the sectoral level, we find that the exposure to global competition lowers the pass-through from sectoral wages to producer prices. Thus, the composition of industries in an economy is an important aspect in assessing how global factors may influence the responsiveness of inflation to the business cycle, as GVCs are a sectoral phenomenon.

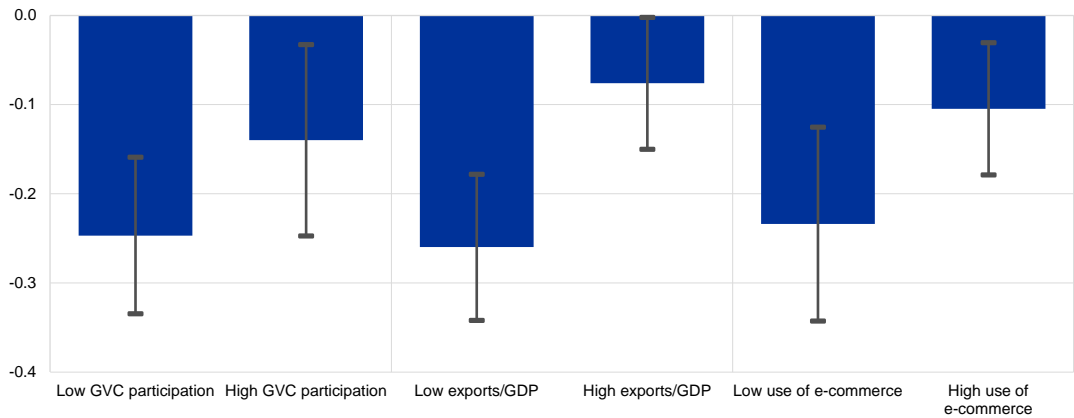
Overall, developments in global integration seem to affect firms' price-setting behaviour and the slope of the price Phillips curve. However, small quantitative estimates also imply that even if future structural transformations – such as changes in the way that production processes are organised – continued to shape price setting, they would have limited implications for aggregate inflation.

⁵⁹ The GVC participation of the euro area as an aggregate (i.e. excluding intra-euro area flows) is instead lower and comparable to that of the United States, which highlights the importance of regional supply chains (see ECB, 2019b).

⁶⁰ Data are sourced from CompNet (7th Vintage), where annual information is available for 18 countries and 56 2-digit sectors (according to NACE rev. 2) of the business economy, from 2005 to 2016.

Chart A
Global factors affecting the slope of price Phillips curves

(estimated coefficients of the unemployment gap)



Sources: Eurostat, WIOD, OECD, CBO, CAO and authors' calculation.
 Notes: Results from a reduced-form estimation of a Phillips curve in a panel of 30 countries over 2001-19, where the lagged unemployment gap is interacted with a dummy equal to 1 if the underlying value of GVC participation, exports of goods and services as a percentage of GDP, or the percentage of individuals buying online in the last 12 months, in deviation from its long-term average, is higher than that of the median. The dependent variable is the annualised quarter-on-quarter growth rate of underlying inflation. Other controls include lagged inflation, the two lags of the import deflator, as well as country-period and year fixed effects. Coefficients of interaction terms are statistically significant. The black lines depict 95% confidence intervals computed using the delta method. GVC participation is computed as the share of GVC-related trade in total gross exports (Borin and Mancini, 2017), where GVC-related trade is defined as the sum of exported domestic value added that is re-exported by a direct importer (forward GVC trade) and foreign value added embedded in own exports (backward GVC trade). The sample for GVC participation ends in 2016, with values for 2015 and 2016 based on authors' estimates. Data for e-commerce are broadly available from 2004. The vertical bars indicate the 95% confidence interval.

5 How globalisation affects the transmission of monetary policy

Globalisation may have profound implications for the transmission of monetary policy. As Section 2 outlines, the trade and financial connections of the with the rest of the world have increased along a number of dimensions – through greater trade openness, wider involvement in GVCs, an accumulation of foreign assets and liabilities, wider dependence on international funding sources and increased synchronisation of asset prices. Each of these dimensions has implications for monetary policy transmission. This section reviews how globalisation has affected the different channels of monetary transmission (namely the interest rate, exchange rate, wealth effect, credit and risk-taking channels). It concludes that globalisation affects the monetary transmission channels in diverse ways (see Table 3 for an overview). Globalisation has thus added a layer of complexity to the way monetary policy is transmitted to the real economy, expanding (at the very least) the information set, the analytical framework and the instruments that policymakers need to consider.

Table 3
Overview of how globalisation affects monetary policy transmission

| Channel | Attenuation | Amplification |
|----------------------|--|---|
| Interest rate | <p>Global financial cycle: Muted interest rate transmission</p> <p>Financial integration: International diversification of bank funding, increasing availability of non-bank funding</p> <p>Low interest rate environment: Reduced policy space</p> <p>Inequality: Credit-constrained households cannot borrow against future income</p> | <p>Inequality: Increased marginal propensity to consume out of current income</p> |
| Wealth effect | <p>Global financial cycle: Lower sensitivity of domestic asset prices to monetary policy</p> <p>Inequality: Lower aggregate marginal propensity to consume out of wealth</p> | |
| Exchange rate | <p>Trade integration: GVCs, invoicing patterns, strategic complementarities in price setting, and services trade lead to a reduction in exchange rate pass-through or muted sensitivity of trade flows to exchange rate changes</p> <p>Financial integration: International banks more sensitive to the US dollar exchange rate in particular</p> | <p>Trade integration: Larger share of consumption basket subject to exchange rate changes, services trade more sensitive to exchange rate changes</p> <p>Financial integration: Greater exchange rate sensitivity to monetary policy, greater exchange rate valuation effects</p> |
| Credit | <p>Financial integration: International diversification of bank funding, increasing availability of non-bank funding</p> | <p>Financial integration: Possibility of reallocating lending to foreign borrowers</p> |
| Risk-taking | <p>Financial integration: Possibility of shifting the search for yield abroad</p> | <p>Financial integration: Broadening of the funding sources for risk-taking activities</p> |

5.1 Interest rate channel

Globalisation has weakened the interest rate channel (IRC) by reducing the policy space and accentuating the effects of the global financial cycle. The IRC centres on monetary policy-induced changes in real interest rates that affect the intertemporal consumption and investment decisions of households and firms. Globalisation has entailed a weakening of the IRC by favouring a fall in the natural rate. This increases the likelihood of hitting the zero lower bound (ZLB), making monetary policy accommodation more challenging (see Section 3).⁶¹ In addition, in tightly interlinked financial markets, long-term interest rates and risky asset prices are increasingly affected by global factors. For example, based on a large panel of countries, Miranda-Agrippino and Rey (2020) find that over 20% of the variation in risky asset prices is accounted for by one global factor. Mehrotra et al. (2019) document large spillovers to AEs and EMEs from both the expectations and term premia components of US long-term rates.⁶² For interest rates in AEs in particular, these co-movements are rooted in the global demand for safe assets (see Section 3). Globally active banks may diversify their funding and thereby insulate interest rates charged on borrowers when domestic monetary policy is adjusted (Cetorelli and Goldberg, 2012). Georgiadis and Mehl (2016) find that such global financial cycle effects have indeed weakened the transmission of euro area monetary policy through the IRC.

Globalisation also tends to affect inequality, which has more ambiguous effects on the IRC (see Box 5). On the one hand, it may increase the proportion of credit-constrained households that are unable to smooth consumption by borrowing against future income when monetary policy is loosened, thereby attenuating the direct effects of interest rate reductions. On the other hand, it may amplify the IRC indirectly, because such credit-constrained households raise consumption more strongly when their overall incomes rise after a monetary policy loosening. Ampudia et al. (2018) study the effects of ECB monetary policy at the micro level and find that while the direct effects have opposite signs for borrowing-constrained and unconstrained households, all benefit from indirect, general equilibrium effects through higher wages and employment. They also find that at the aggregate level the indirect effects of the IRC are quantitatively somewhat more important than the direct effects, meaning that, ultimately, greater inequality does not have first-order effects on monetary policy effectiveness.⁶³

5.2 Wealth effect channel

As more wealth is held in foreign assets and concentrated among fewer agents, the wealth effect channel (WEC) may also have weakened. The WEC

⁶¹ However, empirical analyses so far suggest that, for the euro area at least, interest rate pass-through for non-financial firms and banks in a negative interest rate environment has not been impaired. See Altavilla et al. (2020) and Demiralp et al. (2019).

⁶² For a more sceptical view on the importance of the global financial cycle, see Cerutti et al. (2019).

⁶³ Auclert (2019) shows that distributional effects amplify the effectiveness of the IRC if agents with higher marginal propensity to consume are affected more strongly by monetary policy.

rests on the ability of monetary policy to affect consumption and investment via changes in asset prices and the value of outstanding debt directly through asset purchases or indirectly via changes in interest rates. The emergence of a global financial cycle, which – due to deepening financial integration – has led to higher cross-country asset price correlations on the back of falling transaction costs, may account for a decline in the sensitivity of domestic asset prices to monetary policy, and hence a weakening of the WEC.⁶⁴ Moreover, as monetary policy primarily affects domestic asset valuations, its impact on agents' wealth declines as a greater share of domestic portfolios are accounted for by foreign assets. Greater inequality also implies that aggregate demand becomes less sensitive to monetary policy through the WEC, as richer households have a lower marginal propensity to consume out of wealth.

5.3 Exchange rate channel

Globalisation has had mixed effects on the exchange rate channel (ERC) of monetary policy. From a theoretical perspective, the ERC rests on monetary policy impulses having an impact on international relative prices, thereby triggering expenditure switching effects. In the traditional ERC, monetary policy tightening induces an appreciation in the home currency, which lowers the price of foreign relative to domestic goods, entailing expenditure switching at home and abroad, which eventually reduces home net exports. Globalisation may affect all the links in this causal chain.

Financial globalisation may have increased the sensitivity of the exchange rate to monetary policy and thereby strengthened the ERC. Relative demand for domestic and foreign assets may become more sensitive to return differentials in tightly interlinked financial markets with lower transaction costs, amplifying the sensitivity of the exchange rate to monetary policy. Indeed, Jarociński (2020) estimates that the effect of ECB monetary policy on the euro exchange rate has strengthened significantly since 2005.⁶⁵

At the same time, rising foreign currency exposures on economies' external balance sheets have strengthened the ERC through exchange rate valuation effects. Georgiadis and Mehl (2016) find that, given the euro area's foreign currency

⁶⁴ The degree to which this mechanism undermines the effectiveness of monetary policy through the WEC depends on the structure of agents' portfolios: given the crucial role of transaction costs, cross-country correlations in asset prices should be higher for liquid assets than for illiquid assets. Consequently, with deepening financial integration, the role of the WEC should be attenuated, especially for households with a low share of illiquid assets – such as housing – in their wealth. See, for example, Scatigna et al. (2014), who find that house price co-movement varies over time and has declined since the turn of the millennium.

⁶⁵ This finding for the euro area is consistent with evidence for the United States. For example, Glick and Leduc (2015) and Ferrari et al. (2017) document that the US dollar exchange rate has become more responsive to Federal Reserve monetary policy announcements in the post-GFC period. A caveat is that the estimated strengthening of the effect of monetary policy on the exchange rate may not be entirely due to financial globalisation but may also reflect or be strengthened by the recourse to unconventional monetary policy measures. For example, focusing on the first unconventional measures after the GFC, Kamin (2010) surveys the literature for AEs, concluding that there is no compelling evidence for strengthening exchange rate effects of monetary policy. However, focusing on a longer period, Curcuru et al. (2018) find that the higher interest rate sensitivity of the US dollar cannot be ascribed to quantitative easing.

net long position (see Chart 5 in Section 2), such exchange rate valuation effects have strengthened the transmission of monetary policy through the ERC. Interestingly, they find that the strengthening of the ERC through such exchange rate valuation effects has more than offset the weakening of the IRC through global financial cycle effects (see Section 5.1).⁶⁶

Greater sensitivity of internationally active banks and cross-border credit to the US dollar exchange rate may have implications for euro area financing conditions. As discussed in Section 2, euro area banks play an important role in the global intermediation of US dollar liquidity, even after the deleveraging that has taken place following the GFC. While a large part of this intermediation through euro area banks may involve lending to non-euro area borrowers, variation in the US dollar exchange rate may still have repercussions for euro area financial conditions due to the exposure of banks to large foreign currency gross positions (Shin, 2012; Bruno and Shin, 2015). In turn, this may also have implications for financial stability.

Globalisation further strengthens the ERC, as a declining home bias in goods implies that expenditure switching becomes quantitatively more important. Declining home bias means that a larger share of the consumption basket is accounted for by imported goods; in the euro area, the share of tradable goods in the consumption basket increased by 6 percentage points between 2000 and 2016 (see Box 6). As a result, net export adjustments after an exchange rate change of a given size have become greater.⁶⁷

The increasing importance of services in trade may also increase the sensitivity of net exports to exchange rate changes (see Section 2). While the empirical evidence is limited, cross-country panel and non-euro area country-specific estimates suggest that prices for services imports are more responsive to exchange rates (Smith, 2004; Eichengreen and Gupta, 2013; Cheung and Sengupta, 2013; Cole and Nightingale, 2016). For the euro area, the share of services imports and exports in total trade has increased by 20%, from around 25% in 1999 to around 30% in 2019.

But globalisation may also weaken the ERC to the extent that it reduces exchange rate pass-through (ERPT) to import prices. Expenditure switching requires that exchange rate changes alter the destination currency price of exports. However, Ortega and Osbat (2020) find that ERPT to euro area import prices – i.e. the change in import prices associated with a 1% change in the effective euro exchange rate – declined from around 0.8% in 1999 to around 0.3% in 2008 and

⁶⁶ Similarly, Meier (2013) embeds exchange rate valuation effects and asset price correlations reflecting global financial cycle effects in a New Keynesian open economy model and comes to the conclusion that for plausible parameterisations, financial globalisation strengthens the ERC on balance.

⁶⁷ See Mishkin (2007) and Erceg et al. (2007) for a theoretical discussion. Cwik et al. (2011) propose a different mechanism through which globalisation amplifies the ERC: with strategic complementarities in price setting, an exchange rate appreciation that lowers the local currency price of imported goods also induces domestic producers to lower their prices.

thereafter.⁶⁸ Globalisation may have contributed to the decline in ERPT in several ways.

First, ERPT may have declined because of growing competitive pressures in export markets against the background of deepening trade integration (see Section 4).⁶⁹ Increasing strategic complementarities imply that exporters are more willing to vary mark-ups and keep their prices in destination currency terms stable.⁷⁰ One consequence of increasing strategic complementarities resulting in declining ERPT may also be the rise in euro trade invoicing (Boz et al., 2020). Moreover, globalisation may have induced a switch from producer to local currency pricing: when prices are invoiced (and sticky) in the currency of the importer, exchange rate variations imply only muted changes in local currency import prices.⁷¹

Second, deepening GVCs may also have contributed to the decline in ERPT (see Section 2).⁷² For example, as the exchange rate depreciates in response to monetary policy loosening, imported inputs used in the production of exports become more expensive, inducing exporters to raise their home currency price. From the perspective of the export destination, the rise in the home currency price is offset by the home currency's depreciation. As a result, despite the exchange rate change, the change in the destination currency price of exports is muted. Georgiadis et al. (2019) document that the rise in GVCs can account for about 50% of the decline in ERPT to import prices in AEs since the mid-1990s.⁷³ Deepening GVCs may also have contributed to the rise in euro invoicing in Europe.⁷⁴

5.4 Credit channel

Globalisation entails forces that both weaken and strengthen the credit channel (CC) of monetary policy. The CC is based on the amplification of monetary policy impulses via changes in the supply and demand of bank loans.⁷⁵ Financial globalisation may have strengthened the effect of monetary policy through the CC as banks can more easily rebalance their portfolios away from domestic borrowers when their net worth deteriorates, amplifying the tightening of domestic

⁶⁸ See also Cheikh and Rault (2016) for the euro area. The decline in ERPT to import prices is not specific to the euro area; see Campa and Goldberg (2005), Marazzi et al. (2005) and European Central Bank (2016a).

⁶⁹ See Gust et al. (2010) and Gopinath et al. (2020) for a theoretical discussion.

⁷⁰ Strategic complementarities arise when decisions of exporters are linked together in a context of imperfect competition. In the presence of strategic complementarities, firms lose market share significantly when their prices rise relative to competitors, while they do not gain much market share when their prices fall relative to competitors. Therefore, profit-maximising firms find it optimal to stabilise their prices relative to competitors. In this context, and given sticky prices, pricing in a vehicle currency is a means of stabilising export prices relative to competitors and thereby protecting market shares.

⁷¹ See Chung (2017) and Mukhin (2018) for theoretical discussions.

⁷² See Georgiadis et al. (2019) for a theoretical discussion.

⁷³ See also Ahmed et al. (2017), de Soyres et al. (2018) and Varela and Lovo (2016) for similar evidence, including on changes in the sensitivity of trade volumes to exchange rate changes.

⁷⁴ See Georgiadis et al. (2021).

⁷⁵ The former occurs via monetary policy-induced changes in banks' funding costs or balance sheet effects, while the latter depend on the effects of the monetary policy impulses on the value of the assets that non-financial corporations can post as collateral when asking for a loan from a bank.

financial conditions. Correa et al. (2018) study cross-border banking flows for a panel of countries and find that as tighter monetary policy erodes the net worth and collateral values of domestic borrowers, globally active banks rebalance claims towards safer foreign borrowers.

At the same time, by permitting cross-border liquidity management and the diversification of funding sources to non-bank sources, globalisation may have weakened the effect of monetary policy through the CC. Globally active banks may insulate domestic borrowers from liquidity shocks induced by a domestic monetary policy tightening by transferring liquidity from abroad within the banking group. Cetorelli and Goldberg (2012) find that US globally active banks' use of internal liquidity markets essentially neutralises the effect of changes in US monetary policy on their domestic loan supply.⁷⁶ Transmission of monetary policy impulses through the CC may also have been weakened due to an international bank lending channel, where foreign banks compensate for a reduction in lending by domestic banks (see Section 2). Financial globalisation may also have weakened the CC by facilitating access to non-bank funding, which insulates the economy from changes in bank funding conditions (see Section 2), although the quantitative importance of this mechanism is difficult to judge given limited empirical evidence.⁷⁷

5.5 Risk-taking channel

Financial globalisation may strengthen the risk-taking channel (RTC) of monetary policy by broadening the sources of funding that can be used to finance risk-taking activities. The RTC builds on the notion that monetary policy may influence banks' risk perceptions, thereby affecting liquidity and credit expansion. By allowing banks access to global funding sources, financial globalisation may have expanded the scope for monetary policy transmission via risk perceptions. Indeed, a contributory factor behind the vulnerabilities that shaped the European sovereign debt crisis was the use of cheap short-term US dollar funding sources by banks that financed lending in several euro area countries.⁷⁸ The growing availability of less regulated, non-bank financial funding may also strengthen the RTC. The International Monetary Fund (International Monetary Fund, 2016) finds that, for a cross-country panel, monetary policy transmission is stronger in economies with larger non-bank financial sectors. Moreover, non-banks tend to

⁷⁶ Similarly, Cao and Dinger (2018) document that Norwegian banks tap international funding markets to preserve domestic lending when domestic monetary policy is tightened. The CC may also be weakened as a larger share of domestic lending stems from local branches/subsidiaries of foreign banks (see the survey on cross-border banking spillovers of monetary policy in Buch et al., 2019). However, Temesvary et al. (2018) find that US bank affiliate claims respond mainly to host country rather than US monetary policy. And Avdjiev et al. (2019) find that the lending behaviour of global banks' subsidiaries throughout the world is more closely related to local macroeconomic conditions than to those of their owner-specific counterparts.

⁷⁷ Greater access to non-bank funding would imply that banks' role in financial intermediation declines, weakening the transmission of monetary policy through the CC. However, the overall effectiveness of monetary policy may be less affected since market-based variables – in particular asset prices – that are affected by monetary policy play an important role for non-bank funding. See Deutsche Bundesbank (2014).

⁷⁸ Bruno and Shin (2015) find that a contractionary shock to US monetary policy leads to a decrease in cross-border banking capital flows and a decline in the leverage of international banks.

contract their balance sheets even more than banks when monetary policy is tightened, owing at least in part to the effect of monetary policy on risk-taking (see Section 2).

At the same time, financial globalisation may also weaken the RTC by allowing financial intermediaries to direct their search for yield away from domestic towards foreign borrowers. Financial globalisation may allow banks to more easily rebalance their portfolios away from domestic borrowers.

6 Conclusions: globalisation and the implications for the ECB's monetary policy strategy

Globalisation has benefited the world by lifting millions of people in emerging and developing countries out of poverty, increasing the variety of goods available to consumers and fostering the exchange of people and ideas. Along the way, globalisation has changed the interrelationships between economies and between sectors within economies. For monetary policy, globalisation has altered the transmission mechanism, as explained in Section 5.

This section discusses the implications of globalisation for the ECB's monetary policy strategy review. First, it summarises the analysis of the preceding sections on the impact of globalisation on the landscape in which monetary policy operates (Section 6.1). It then presents the possible implications for the ECB's monetary policy strategy (Sections 6.2 and 6.3).

6.1 A new landscape for monetary policy

Globalisation modulates the landscape in which monetary policy operates through (i) the emergence of a global financial cycle and the increasing role of financial spillovers; (ii) greater portfolio diversification and higher trade integration, enhancing the role of GVCs and strategic complementarities; and (iii) increased trade and financial openness, which amplify countries' exposure to tail risks and affect the transmission of uncertainty shocks.

Globalisation implies an increase in the spillovers that underpin a global financial cycle. Domestic financial cycles have been driven, at least in part, by a global financial cycle, characterised by strong co-movements in asset prices, gross capital flows and leverage. Although this is particularly relevant for emerging and small open economies (Rey, 2016; Passari and Rey, 2016; Gerko and Rey, 2017; Miranda-Agrippino and Rey, 2020), the euro area may also be affected at times.⁷⁹ Owing to the dominant role of the US dollar in the global financial system, the Federal Reserve System plays a greater role in driving the global financial cycle than the ECB (Ca' Zorzi et al., 2020; Jarociński, 2020; Obstfeld, 2020).

Globalisation has made the role of the exchange rate in monetary policy more complex due to greater portfolio and funding diversification and greater trade integration. Globalisation has modified the role of the exchange rate in existing transmission channels and introduced new mechanisms through which the exchange

⁷⁹ Others contest the claim that the “trilemma” has morphed into a “dilemma”, meaning that whenever capital is freely mobile, the global financial cycle constrains national monetary policies regardless of the exchange rate regime (Klein and Shambaugh, 2015; Obstfeld et al., 2019).

rate affects financial conditions, real activity and prices. Shifts in the geographical distribution of production through GVCs and the composition of trade flows in terms of goods relative to services have made the pass-through of exchange rate changes to quantities and prices more complex. In addition, trade and financial integration have strengthened exchange rate valuation effects on countries' external balance sheets.

Globalisation has increased the exposure of economies to tail events and contagion. While financial integration has improved access to finance and facilitated risk sharing, it has also accentuated the exposure of economies to contagion from abroad and to volatile capital flows that can contribute to the build-up of systemic risk (European Systemic Risk Board, 2020). The more frequent build-up of large imbalances in a globalised world entails an increased probability of financial crises (Gourinchas and Obstfeld, 2012; Catão and Milesi-Ferretti, 2014). And when such tail risks materialise, they have greater and broader spatial ramifications in a globalised world due to close banking and financial linkages (see Box 3; Kalemli-Ozcan et al., 2013; Cesa-Bianchi et al., 2019; Fujita and Hamaguchi, 2020, in the context of the COVID-19 pandemic). The increasing role of market-based finance and the presence of global banks may generate and/or transmit global risk shocks via “flight home” effects and wholesale runs for liquidity. Against this background, global demand for safe assets such as dollar-denominated and potentially also euro-denominated securities rises, which may feed back into the persistence of the low interest rate environment (see Section 3).⁸⁰

While globalisation has had profound effects on the global financial system, the evidence in this report suggests that, quantitatively, the impact may have been less relevant in shaping the evolution of the natural rate and inflation developments. While financial globalisation may put downward pressure on the natural rate through global safe asset shortages, the empirical evidence indicates that trade globalisation has an offsetting impact. In addition, global factors do not seem to have contributed substantially to inflation trends or the sensitivity of inflation to economic activity (see Section 4). Despite the commonality of experience across countries in terms of the fall in, and synchronisation of, headline inflation rates and the sensitivity of inflation to real activity, the evidence suggests the role of globalisation has been relatively limited. GVC participation by euro area firms and import competition from EMEs in euro area markets have provided only a modest headwind to inflation in recent years and contributed only moderately to the reduction in the sensitivity of inflation to economic activity.

6.2 How is the ECB's economic and monetary analysis affected by globalisation?

The new landscape has implications for the ECB's economic and monetary analysis. Many of the insights discussed in Sections 1 to 5 of this report have

⁸⁰ In this context, it is worth noting the European Commission's recent communication on further fostering the international role of the euro, including in terms of increasing the attractiveness of trading in and pricing euro-denominated instruments (European Commission, 2018).

already been incorporated into the ECB's economic and monetary analysis to a large degree. Nonetheless, in some cases, further adjustments to measurement, modelling and projections could be beneficial. Additional research may be warranted in the areas described below.

1. **The need for macroeconomic modelling and projections to take greater account of the global dimension.** The structural and empirical models employed to produce macroeconomic projections need to account more for the implications of global factors for domestic variables and their transmission channels in order to understand which shocks are driving the economy and to determine the appropriate policy responses (see Justiniano and Preston, 2010; Ca' Zorzi et al., 2017; Georgiadis and Jančoková, 2020). As Box 8 discusses, by understanding the magnitude of spillovers and spillbacks, it is possible to gain insights into the transmission channels of monetary policy. In the same context, one could also examine the contribution of different trading partners to the overall magnitude of spillbacks. Models should also encompass the role of global uncertainty shocks (see Box 3) and tail risks (De Santis and Van der Veken, 2020; Gerlach and Wang, 2020; Carriero et al., 2020). Factors such as global credit booms affect the distribution of growth in a non-linear way (Adrian et al., 2019). Abstracting from such considerations can lead to underestimation of downside risks. For policy purposes, it might be desirable to further develop “growth-at-risk” measures that account for the entire distribution of expected growth and not just a single expected path. Such measures could also be used to analyse the joint effects of monetary and macroprudential policies on the distribution of projections (Adrian et al., 2019; Cecchetti and Schoenholtz, 2018).
2. **The contribution of globalisation to the low interest rate environment (see Sections 2 and 3).** More efforts should be devoted to quantifying the relative importance of different global forces that underpin the growing demand for safe assets, including greater tail risks, the rising sensitivity to uncertainty shocks (see Box 3), greater portfolio diversification, growing trade flows and the global financial cycle. The more prominent role of the euro as a vehicle currency in trade invoicing in Europe represents another potentially important phenomenon that needs to be examined further, as it may contribute to the low interest rate environment via an increase in the demand for safe euro-denominated assets. In addition, the impact of trade integration on both productivity growth and inequality, and hence on the natural rate, needs to be better understood (see Boxes 4 and 5).
3. **The role of globalisation in cross-country correlations and the level of inflation (see Section 4).** Common factors have played an important role in shaping headline inflation across countries. A large part of the cross-country correlation in headline inflation rates is accounted for by commodity prices. At the same time, global factors have played a much less important role in driving core inflation. Globalisation is also affecting market structures, for example by increasing competition within many markets, potentially triggering strategic

complementarities. More analysis is warranted given the central role of the relationship between slack and inflation in monetary policy.

4. **The complexity of the exchange rate channel in a globalised environment (see Section 5).** First, an improved understanding of the exchange rate channel is needed. This relates in particular to the relevance of valuation effects on external balance sheets and the sensitivity of domestic financial conditions to the exchange rate. Similarly, the magnitude and determinants of exchange rate pass-through also need to be better understood in the light of GVCs, changes in trade flow composition, invoicing currency patterns and competitive pressures in export markets. Finally, there is still no consensus about whether exchange rate changes associated with monetary policy impulses transmit differently in the cases of unconventional and conventional measures.
5. **The measurement challenges arising from globalisation in respect of key macroeconomic and financial indicators (see Section 1).** The complex operations of MNEs and chains of non-bank entities such as SPEs have made it more complicated to interpret euro area national and external statistics. For these reasons, monetary and economic analysis needs to look beyond headline macroeconomic indicators in order to assess the drivers of conjunctural developments and the evolution of financial vulnerabilities and interconnectedness (see Box 2). There are also measurement challenges associated with the need to expand the monitoring of non-banks, which have assumed a more significant role and have already affected the transmission of monetary policy.

Box 8

Spillbacks from euro area and US monetary policy

The literature provides ample evidence indicating that globalisation has been associated with large spillovers from euro area and, in particular, US monetary policy. What has not yet been systematically explored is whether these spillovers also entail large *spillbacks*. The latter can be thought of as the inward spillovers that result from the outward spillovers from euro area and US monetary policy actions. An understanding of spillbacks does not necessarily alter the assessment of the overall domestic effect of monetary policy. However, it informs the understanding of how the overall domestic effect of monetary policy comes about in terms of transmission channels. In addition, an understanding of spillbacks may also shed light on the usefulness of alternative monetary policy instruments. For example, if spillovers from euro area monetary policy to neighbouring countries exacerbate financial imbalances abroad, then providing emergency liquidity to foreign central banks may help to prevent adverse equilibria from materialising and spilling back to the euro area (see Box 9). This box provides some discussion and evidence on spillbacks from euro area and US monetary policy.

Conceptual framework

The analysis is based on counterfactual simulations in two-country vector autoregressive (VAR) models for the euro area or United States together with a second, spillover-receiving economy. The estimate of the spillback is obtained by comparing the estimated impulse responses of euro area

and US variables to a domestic monetary policy shock obtained from an unrestricted baseline with those from a counterfactual in which it is imposed that the spillovers of euro area and US monetary policy to output abroad are precluded over all horizons. The counterfactual is obtained by assuming that after a domestic monetary policy shock has occurred, additional shocks materialise which offset the baseline spillovers from euro area and US monetary policy.

Estimates of spillbacks from euro area monetary policy

Spillbacks from euro area monetary policy are estimated to be non-negligible, accounting for about 30% of the overall domestic output effect over a one-year horizon (Chart A). Spillbacks to euro area consumer price inflation are estimated to be much smaller than for output.

Chart A

Estimates of spillbacks from euro area monetary policy



Source: De Luigi and Feldkircher (2021).

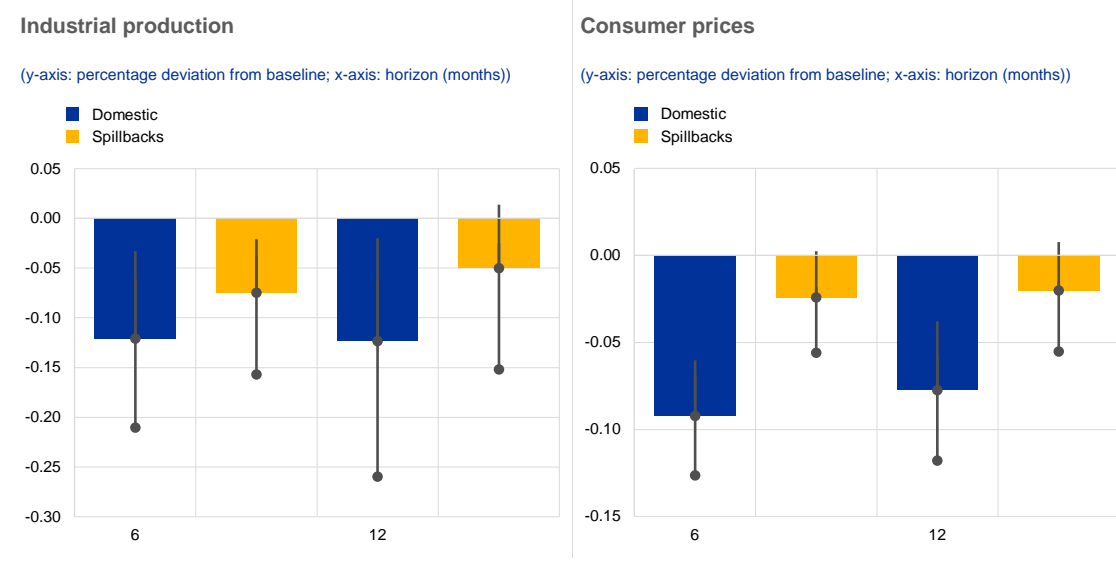
Notes: The chart shows the effects of a contractionary euro area monetary policy shock on industrial production and consumer prices in the euro area and the main trading partners after six and 12 months. The estimates are obtained from a Bayesian threshold time-varying parameter VAR model estimated over the period from 2002 to 2019. The VAR model includes the euro overnight index average (EONIA) rate, euro area ten-year government bond yields, euro area industrial production, euro area consumer prices, the composite indicator of systemic stress (CISS), the nominal exchange rate against the euro (trade-weighted) and foreign industrial production (PPP-weighted). The foreign economy includes all major euro area trading partners, namely the United States, China, CESEE (Bulgaria, the Czech Republic, Croatia, Hungary, Poland and Romania), Denmark, Sweden, and the United Kingdom. The ECB monetary policy target shock is identified using the high-frequency proxy variable of Altavilla et al. (2019) and is normalised to cause a peak effect on ten-year government bond yields of approximately 15 basis points. The counterfactual is constructed such that the shock on foreign industrial production is neutralised. The whiskers indicate the 68% percentiles of the corresponding posterior distributions.

Estimates of spillbacks from US monetary policy

Spillbacks from US monetary policy are estimated to be larger than for the euro area. About 40-60% of the overall domestic output effect of US monetary policy is estimated to be due to spillbacks. For US consumer price inflation, as in case of the euro area, spillbacks are estimated to be smaller than for output, but nevertheless still account for about 20% of the overall domestic effect. In general, larger spillbacks in the case of US monetary policy than in the case of euro area monetary policy may be due to greater spillovers, but further research is needed to corroborate this.

Chart B

Estimates of spillbacks from US monetary policy



Source: Breitenlechner et al. (2021).

Notes: The chart shows the effects of a contractionary US monetary policy shock on industrial production and consumer prices in the euro area and the main trading partners after six and 12 months. The estimates are obtained from a Bayesian proxy structural VAR model estimated over the period from 1990 to 2019. The VAR model includes the one-year US Treasury bill, US industrial production, US consumer prices, the excess bond premium, the US dollar nominal effective exchange rate, the Chicago Board Options Exchange's S&P 100 Volatility Index (VXO) and rest-of-the-world industrial production (aggregated using US trade weights). The US monetary policy shock is identified using high-frequency changes of asset prices on Federal Open Market Committee meetings as proxy variable. The US monetary policy shock is such that the one-year US Treasury bill rate rises by about 10 basis points on impact. The neutralising shocks are given by combinations of rest-of-the-world "appreciating" and "depreciating" shocks identified by zero, sign and magnitude restrictions and which capture a variety of structural rest-of-the-world shocks. The whiskers indicate the 68% percentiles of the corresponding posterior distributions.

6.3

Should the ECB's monetary policy objective, instruments and communication be adjusted?

The new landscape may have implications for the ECB's monetary policy strategy. While none of the globalisation phenomena discussed above should be evaluated in isolation for specific changes in the ECB's strategy, together they may nonetheless play an important role for understanding and weighing up the appropriate monetary policy strategy choices.

While globalisation has had profound effects on the world economy, the report concludes that none of these prevents central banks from achieving their objectives in the long term. As the central bank is the monopoly issuer of the numeraire in which domestic prices are measured, global factors need not undermine the central bank's ability to control the price level over the long term (Obstfeld, 2020). Nonetheless, over shorter horizons, global factors can affect monetary policy transmission and the trade-off policymakers face between price stability and other goals such as stabilising activity and financial stability. Yet central banks have shown that they can resort to additional instruments such as asset purchases, forward guidance, macroprudential measures and the provision of foreign currency liquidity lines. Such measures, which can compensate for the reduction in conventional policy space and preserve control over domestic financial conditions, have helped to ensure monetary policy autonomy. In practice, these instruments

have helped to preserve central banks' ability to achieve price stability even as globalisation has changed the landscape in which they operate.

Globalisation may have implications for the choice of monetary policy

instruments. In general, the increase in financial spillovers, the emergence of a global financial cycle and increased asset price correlations strengthen the need for sound domestic policies and credible monetary policy, and may warrant a more systematic recourse to additional instruments such as forward guidance and asset purchases in pursuit of the ECB's inflation aim. Greater spillovers may also imply a need for more active macroprudential policy to counter unduly large effects of global factors on domestic financial conditions.

The provision of emergency liquidity may limit adverse side effects of

globalisation. Excess elasticity and greater complexity of international financial markets increase the likelihood of tail events abroad that may adversely affect the euro area. Greater international integration of the euro area may also increase the euro area's sensitivity to events abroad. As a result, the benefit of instruments that prevent adverse equilibria from materialising because of tail events may rise with globalisation. The use of such monetary policy instruments requires careful consideration: it is important to balance the risk of moral hazard against the desire to rule out adverse, self-fulfilling equilibria that can adversely impact the smooth transmission of monetary policy. Nonetheless, experience since the 2020 pandemic has shown that the ECB's euro liquidity lines have been successful in reducing euro funding costs in foreign markets (see Box 9).

While cooperation through increased use of emergency liquidity lines has proved successful, the case for more extensive and binding forms of international monetary policy coordination (IMPC) does not seem compelling.

The theoretical literature suggests that IMPC may be beneficial as a way of maximising global welfare, although it traditionally concludes that the gains are small relative to an environment in which national policymakers pursue optimal domestic policies (Obstfeld and Rogoff, 2002). Work is being carried out to reassess these conclusions in models that account for the role of financial frictions and that are robust to a wide range of modelling specifications, but a consensus has yet to emerge (see Engel, 2016). While financial integration in theory amplifies the impact of foreign shocks on the domestic economy, it also improves diversification and insurance opportunities, and it is unclear which of these effects dominates. Practical obstacles to IMPC arise because central banks operate under domestic mandates (Coeuré, 2014) and because model uncertainties make it complicated to reach a common assessment of the nature of spillovers in terms of trade-offs. Moreover, the finding that monetary policy entails non-trivial spillbacks (see Box 8) suggests that central banks in systemic economies are likely to take increasing account of spillovers, further weakening the case for more extensive and binding forms of IMPC. A case in which IMPC is clearly beneficial relates to tail events, where coordination may reinforce monetary policy measures through a signalling channel (Coeuré, 2014).

The analysis in this report does not indicate a need to change the role of the exchange rate in the ECB's monetary policy strategy or the ECB's commitment

to market-determined exchange rates. Globalisation has modified the role of the exchange rate in existing transmission channels and introduced new mechanisms (Section 6.1). While empirical evidence suggests the exchange rate may be more sensitive to monetary policy in a low interest rate environment, a range of factors have made the pass-through of exchange rate changes to quantities and prices more complex. It is therefore unlikely that there could be any benefits to reconsidering the long-standing commitment to market-determined exchange rates that is the consensus in G7 and G20 bodies.

Finally, the analysis in this report is in line with the ECB's assessment of the benefits and costs of international currency status. In 2019, the Governing Council stressed that the international role of the euro is primarily supported by a deeper and more complete Economic and Monetary Union, including advancing the capital markets union, in the context of the pursuit of sound economic policies in the euro area. It also stressed that the Eurosystem supports these policies and emphasises the need for further efforts to complete Economic and Monetary Union (ECB, 2019). This assessment was reiterated in 2020 and 2021 (ECB, 2020, 2021). The analysis in this report confirms this earlier assessment of the benefits and costs of the international currency role of the euro. In principle, international currency issuers enjoy greater monetary autonomy but also emit greater spillovers that might represent externalities abroad. In addition, international currency status means that monetary policy impulses reverberate globally (see Section 2), thereby increasing the potential for spillbacks, which would in turn strengthen the domestic effectiveness of monetary policy (see Box 8). At the same time, the concept of “exorbitant duty”, i.e. the risk of a rapid deterioration in the international investment position as a result of the international currency status (and strength) of the US dollar in periods of heightened financial market tensions, has become more apparent since the GFC as the flip side of “exorbitant privilege” (Gourinchas et al., 2010; Caballero et al., 2015). Another consideration is that international currency issuers may face requests for emergency liquidity lines (McCauley and Schenk, 2020; Bahaj and Reis, 2021). Finally, international currency status entails lower exchange rate pass-through (Gopinath et al., 2010; ECB, 2015), so that the effect of monetary policy on import prices is more limited. A sizeable increase in the role of the euro would therefore have far-reaching implications for the conduct of the ECB's monetary policy.

Box 9

ECB euro liquidity lines

Central bank liquidity lines and globalisation

The use of central bank swap and repo lines has gained prominence since the GFC and has gone hand in hand with the increase in globalisation. However, the direction of causality is unclear (ECB, 2019a, Box 7). On the one hand, liquidity lines have been a by-product of globalisation since the rise of global banks; the currency mismatches in banks' and firms' balance sheets generate a feedback loop between bank funding and trade invoicing (Gopinath and Stein, 2018) and may call for liquidity provision in the source country's currency (Bahaj and Reis, 2021). Such foreign currency liquidity needs are exacerbated when large shocks occur, as during the GFC, potentially

leading to adverse spillovers. On the other hand, swap line activations increase the use of the currency for trade invoicing (for instance in the case of China, see Bahaj and Reis, 2020), which may spur further globalisation.

Since the degree of insurance enjoyed by the local central banks is limited by the size of their foreign exchange (FX) reserves, liquidity lines from the source country's central bank may bolster this insurance role. Swap and repo lines can be helpful monetary policy tools in a global environment, since by providing liquidity abroad they prevent episodes of liquidity shortages that might threaten financial stability at home, potentially hampering the fulfilment of the price stability objective of the source country's central bank (Panetta and Schnabel, 2020). In short, central bank liquidity lines work as a backstop facility. They can therefore, to some extent, perform the function of a lender of last resort, preventing negative spillbacks to the source country. Recent empirical evidence for the United States shows that swap lines provide a ceiling to deviations from covered interest parity (CIP), alleviating global funding strains (Cetorelli et al., 2020) and inducing higher demand and prices for US dollar-denominated corporate bonds (Bahaj and Reis, 2021). Based on the analysis in Albrizio et al. (2021), this box first provides a brief description of the ECB euro swap and repo lines and estimates their signalling effect on financing conditions in the euro funding market.

The main framework of the ECB liquidity lines

Since 2001 the ECB has signed more than 30 bilateral swap and repo agreements with 18 central banks.⁸¹ Most of the liquidity lines were opened temporarily between 2008 and 2013 and as of 2020, in line with the stated policy goal of using such swap lines as a backstop (rather than as an active policy to foster the international use of the euro). The initial agreements for unlimited US dollar liquidity provision via swap lines were, for the most part, signed with G10 central banks⁸² and later made permanent. In addition to US dollar liquidity, the ECB has provided renminbi, Swiss franc and pound sterling liquidity through swap lines with the People's Bank of China and the network with the Bank of Canada, the Bank of England, the Bank of Japan, the Federal Reserve System and the Swiss National Bank. Since October 2008, the ECB has established 18 swap and repo lines to provide euro liquidity to non-euro area central banks, particularly in EU countries outside the euro area and, since 20 March 2020, in non-EU countries. Most of these lines are repo facilities, which require adequate collateral in euro-denominated assets and feature a higher lending rate compared with swap lines.⁸³

The signalling effect of ECB euro liquidity lines

The mere existence of a liquidity line may instil confidence in markets and reduce the funding cost in the source country's currency even if it is not activated. To test whether this is the case empirically, Albrizio et al. (2021) consider ECB announcements of euro liquidity lines (rather than

⁸¹ Some of these lines have been extended and their terms have changed, generating 90 related press releases in the period considered in this Box (January 2001 - August 2020). Albrizio et al. (2021) do not consider the recently established Eurosystem repo facility for central banks (EUREP), since the respective country-specific announcements are not public.

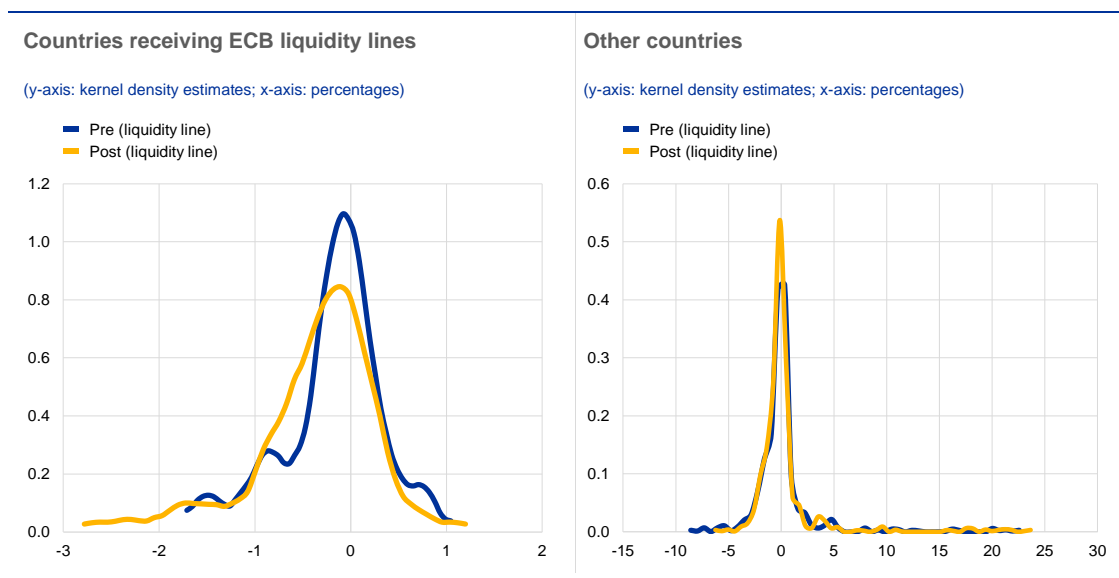
⁸² Namely the Federal Reserve System, the Bank of Canada, the Bank of England, the Bank of Japan and the Swiss National Bank.

⁸³ The lending rate is defined as a spread over the overnight index swap (OIS) reference rate with a minimum floor.

actual provision of foreign currency liquidity)⁸⁴ and assess their effects on euro funding conditions in foreign markets, proxied by CIP deviations. In a frictionless FX market, CIP holds, and the implied euro interest rate in the FX market equals the euro money market interest rate. If CIP does not hold, the FX swap basis spread provides a measure of the premium paid by foreign agents to borrow euros for a specified time period in the FX market compared with the euro money market. In other words, a positive basis represents relatively high costs for euro funding in the FX market. Albrizio et al. (2021) explore whether the announcements of ECB liquidity lines decrease this premium, at least in a narrow time window around the announcement, taking into account the euro liquidity lines provided to 13 countries between 6 October 2008 and 28 August 2020.⁸⁵ In the two-day period before and after the announcement, the right tail of the distribution of the basis shifts closer to zero (Chart A, left panel); such a shift in the distribution is not present for the non-targeted currencies (Chart A, right panel). This evidence thus points towards a reduction in the cost of euro funding in the FX market when ECB liquidity lines are announced. Albrizio et al. (2021) provide additional evidence based on diff-in-diff analysis considering treated and non-treated currency samples that confirms the conclusion that the announcement of ECB liquidity lines reduces the cost of euro funding in the FX market in Chart A. The findings in Chart A are consistent with those from event studies suggesting that the announcement of a liquidity arrangement during the pandemic reduced the cost of euro funding in foreign exchange markets in countries with which a liquidity line was agreed (ECB, 2021).

Chart A

FX swap basis spread density



Source: Refinitiv.

Notes: "Countries receiving ECB liquidity lines" refers to those directly covered by the announced swap or repo agreements. The period of impact was taken as a four-day window around the announcement. The blue line ("pre") refers to the density of the basis in the two days before the announcement. The yellow line ("post") refers to the density of the basis on the day of the announcement and in the following day.

⁸⁴ Announcements are taken from ECB press releases. Overall, there are over 80 ECB liquidity line announcements, which comprise information on new, extended and discontinued lines as well as changes in funding and auction conditions. Slightly less than half of these announcements regard liquidity provision in euro; the rest concern other currencies such as pound sterling, Swiss franc, US dollar and Chinese renminbi.

⁸⁵ These are Bulgarian lev, Canadian dollar, Swiss franc, Danish krone, Croatian kuna, Hungarian forint, Japanese yen, Polish zloty, Romanian leu, Serbian dinar, Swedish krona, pound sterling and US dollar. Countries that have an open line with the ECB but use the euro as main currency are excluded.

References

- Acemoğlu, D. and Linn, J. (2004), "Market Size in Innovation: Theory and Evidence from the Pharmaceutical Industry", *The Quarterly Journal of Economics*, Vol. 119, Issue 3, pp. 1049-1090.
- Adrian, T., Boyarchenko, N. and Giannone, D. (2019), "Vulnerable Growth", *American Economic Review*, Vol. 109, No 4.
- Aghion, P., Bloom, N., Blundell, R., Griffith, R. and Howitt, P. (2005), "Competition and Innovation: An Inverted-U Relationship", *The Quarterly Journal of Economics*, Vol. 120, Issue 2, pp. 701-728.
- Agur, I. (2018), "Populism and Central Bank Independence: Comment", *Open Economies Review*, Vol. 29, Issue 3, pp. 687-693.
- Ahir, H., Bloom, N. and Furceri, D. (2018), "The World Uncertainty Index", mimeo.
- Ahmed, S., Appendino, M. and Ruta, M. (2017), "Global Value Chains and the Exchange Rate Elasticity of Exports", *The B.E. Journal of Macroeconomics*, Vol. 17, No 1, pp. 1-24.
- Ahn, J.B., Duval, R.A. and Sever, C. (2020), "Macroeconomic Policy, Product Market Competition, and Growth: the Intangible Investment Channel", *IMF Working Paper*, No 20/25, International Monetary Fund.
- Akcigit, U. and Ates, S. (2019), "What Happened to U.S. Business Dynamism?", *NBER Working Paper*, No 25756, National Bureau of Economic Research.
- Akcigit, U. and Ates, S. (2021), "Ten Facts on Declining Business Dynamism and Lessons from Endogenous Growth Theory", *American Economic Journal: Macroeconomics*, Vol. 13, No 1, pp. 257-298.
- Albrizio, S., Kataryniuk, I., Molina, L. and Schäfer, J. (2021), "ECB Euro Liquidity Lines", *Working Paper Series*, No 2125, Banco de España.
- Aldasoro, I. and Ehlers, T. (2018), "The Geography of Dollar Funding of Non-US Banks", *BIS Quarterly Review*, Bank for International Settlements, December.
- Aldasoro, I., Huang, W. and Kemp, E. (2020), "Cross-Border Links between Banks and Non-Bank Financial Institutions", *BIS Quarterly Review*, Bank for International Settlements, September.
- Altavilla C., Brugnolini, L., Gürkaynak, R., Motto, R. and Ragus, G. (2019), "Measuring Euro Area Monetary Policy", *Journal of Monetary Economics*, Vol. 108, pp. 162-179.

- Altavilla, C., Miguel, B., Peydró, J.L. and Smets, F. (2020), “[Banking Supervision, Monetary Policy and Risk-Taking: Big Data Evidence from 15 Credit Registers](#)”, *Working Paper Series*, No 2349, ECB.
- Álvarez, L.J., Hurtado, S., Sánchez, I. and Thomas, C. (2011), “The Impact of Oil Price Changes on Spanish and Euro Area Consumer price inflation”, *Economic Modelling*, Vol. 28, Issues 1-2, pp. 422-431.
- Amiti, M., Itskhoki, O. and Konings, J. (2019), “International Shocks, Variable Markups, and Domestic Prices”, *The Review of Economic Studies*, Vol. 86, Issue 6, pp. 2356-2402.
- Ampudia, M., Georgarakos, D., Slacalek, J., Tristani, O., Vermeulen, P. and Violante, G.L. (2018), “[Monetary Policy and Household Inequality](#)”, *Working Paper Series*, No 2170, ECB.
- Andrews, D., Criscuolo, C. and Gal, P.N. (2019), “The Best versus the Rest: Divergence Across Firms During the Global Productivity Slowdown”, *CEP Discussion Papers*, No 1645, Centre for Economic Performance.
- Anzoategui, D., Comin, D., Gertler, M. and Martinez, J. (2019), “Endogenous Technology Adoption and R&D as Sources of Business Cycle Persistence”, *American Economic Journal: Macroeconomics*, Vol. 11, No 3, pp. 67-110.
- Atkinson, A.B. (2003), “Income Inequality in OECD Countries: Data and Explanations”, *CESifo Economic Studies*, Vol. 49, pp. 479-513.
- Auclert, A. (2019), “Monetary Policy and the Redistribution Channel”, *American Economic Review*, Vol. 109, No 6, pp. 2333-2367.
- Auer, R.A., Degen, K. and Fischer, A.M. (2013), “Low-Wage Import Competition, Inflationary Pressure, and Industry Dynamics in Europe”, *European Economic Review*, Vol. 59, Issue C, pp. 141-166.
- Autor, D.H., Dorn, D. and Hanson, G.H. (2013), “The China Syndrome: Local Labour Market Effects of Import Competition in the United States”, *American Economic Review*, Vol. 103, No 6, pp. 2121-68.
- Autor, D.H., Dorn, D., Katz, L.F., Patterson, C. and Reenen, J. van (2020), “The Fall of the Labor Share and the Rise of Superstar Firms”, *The Quarterly Journal of Economics*, Vol. 35, Issue 2, pp. 645-709.
- Avdjiev, S., Everett, M., Lane, P.R. and Shin, H.S. (2018), “Tracking the International Footprints of Global Firms”, *BIS Quarterly Review*, Bank for International Settlements, March.
- Avdjiev, S., Aysun, U. and Hepp, R. (2019), “What Drives Local Lending by Global Banks?”, *Journal of International Money and Finance*, Vol. 90, Issue C, pp. 54-75.
- Bahaj, S. and Reis, R. (2020), “Jumpstarting an International Currency”, *CEPR Discussion Papers*, No 14793, Centre for Economic Policy Research.

- Bahaj, S. and Reis, R. (2021), “Central Bank Swap Lines: Evidence on the Lender of Last Resort”, *The Review of Economic Studies*, forthcoming.
- Bai, L. and Stumpner, S. (2019), “Estimating US Consumer Gains from Chinese Imports”, *American Economic Review*, Vol. 1, No 2, pp. 209-224.
- Baker, S.R., Bloom, N. and Davis, S.J. (2016), “Measuring Economic Policy Uncertainty”, *The Quarterly Journal of Economics*, Vol.131, Issue 4, pp. 1593-1636.
- Bakija, J., Cole, A. and Heim, B. (2012), “Jobs and Income Growth of Top Earners and the Causes of Changing Income Inequality: Evidence from U.S. Tax Return Data”, *Department of Economics Working Papers*, Department of Economics, Williams College.
- Balcilar, M., Demirer, R., Eyden, R. van and Gupta, R. (2017), “The Impact of US Policy Uncertainty on the Monetary Effectiveness in the Euro area”, *Journal of Policy Modeling*, Vol. 39, No 6, pp. 1052-1064.
- Bandt (de), O., Bricongne, J.C. and Fontagné, L. (2021), “Globalisation and Uncertainty”, *Eco Notepad*, Banque de France.
- Barnichon, R. and Mesters, G. (2021), “The Phillips Multiplier”, *Journal of Monetary Economics*, Vol. 117, Issue C, pp. 689-705.
- Barrot, J.N., Loualiche, E. and Sauvagnat, J. (2019), “The Globalization Risk Premium”, *The Journal of Finance*, Vol. 74, Issue 5, pp. 2391-2439.
- Battiston, S., Delli Gatti, D., Gallegati, M., Greenwald, B. and Stiglitz, J.E. (2012), “Liaisons Dangereuses: Increasing Connectivity, Risk Sharing and Systemic Risk”, *Journal of Economic Dynamics and Control*, Vol. 36, Issue 8.
- Beck, R., Ferrari, M. and Groeger, H.L. (2021), “The Best of Both Worlds: Mitigating the Side Effects of Globalisation”, mimeo.
- Belz, S., Wessel, D. and Yellen, J. (2020), “What’s (Not) Up with Inflation?”, *Brookings Institution paper*.
- Bénétrix, A., Gautam, D., Juvenal, L. and Schmitz, M. (2020), “[Cross-Border Currency Exposures: New Evidence Based on an Enhanced and Updated Dataset](#)”, *Working Paper Series*, No 2417, ECB.
- Benmir, G., Jaccard, I. and Vermandel, G. (2020), “[Green Asset Pricing](#)”, *Working Paper Series*, No 2477, ECB.
- Bernanke, B. (2005), “The Global Saving Glut and the U.S. Current Account Deficit”, speech held at the Homer Jones Lecture, St. Louis, Missouri.
- Bertaut, C.C., Bressler, B. and Curcuru, S. (2019), “Globalization and the Geography of Capital Flows”, *FEDS Notes*, Board of Governors of the Federal Reserve System.
- Berthou, A., Chung, J.J.H., Manova, K. and Sandoz, K. (2020), “Trade, Productivity and (Mis)allocation”, *IMF Working Paper*, No 20/163, International Monetary Fund.

- Bianchi, F. and Civelli, A. (2015), "Globalization and Inflation: Evidence from a Time Varying VAR", *Review of Economic Dynamics*, Vol. 18, Issue 2, pp. 406-433.
- Bloom, N., Bond, S. and Reenen, J. van (2007), "Uncertainty and Investment Dynamics", *The Review of Economic Studies*, Vol. 74, Issue 2, pp. 391-415.
- Bloom, N., Draca, M. and Reenen, J. van (2016), "Trade Induced Technical Change? The Impact of Chinese Imports on Innovation, IT and Productivity", *The Review of Economic Studies*, Vol. 83, Issue 1, pp. 87-117.
- Boehm, C.E., Flaaen, A. and Pandalai-Nayar, N. (2019), "Input Linkages and the Transmission of Shocks: Firm-Level Evidence from the 2011 Tōhoku Earthquake", *The Review of Economics and Statistics*, Vol. 101, No 1, pp. 60-75.
- Borin, A. and Mancini, M. (2017), "Follow the Value Added: Tracking Bilateral Relations in Global Value Chains", *Working Papers*, Banca d'Italia, No 1026.
- Borio, C. and Disyatat, P. (2011), "Global Imbalances and the Financial Crisis: Link or no link?", *BIS Working Papers*, No 346, Bank for International Settlements.
- Borio, C. and Filardo, A. (2007), "Globalisation and Inflation: New Cross-Country Evidence on the Global Determinants of Domestic Inflation", *BIS Working Papers*, No 227, Bank for International Settlements.
- Bourguignon, F. (2016), *The Globalization of Inequality*, Princeton and Oxford.
- Boz, E., Casas, C., Georgiadis, G., Gopinath, G., Le Mezo, H., Mehl, A. and Nguyen, T. (2020), "Patterns in Invoicing Currency in Global Trade", *IMF Working Paper*, No 20/126, International Monetary Fund.
- Brand, C., Bielecki, M. and Penalver, A. (2018), "[The Natural Rate of Interest: Estimates, Drivers, and Challenges to Monetary Policy](#)", *Occasional Paper Series*, No 217, ECB.
- Breitenlechner, M., Georgiadis, G. and Schumann, B. (2021), "What Goes Around Comes Around: How Large are Spillbacks from US monetary policy really?", mimeo, ECB.
- Bricongne, J.-C. and Gigout, T. (2020), "Explaining the Persistent Effect of Demand Uncertainty on Firm Growth", *MPRA Paper*, No 97563.
- Bricongne, J.-C., Delpeuch, S. and Lopez Forero, M. (2020), "Productivity Slowdown and MNEs' Intangibles: where is Productivity Measured?", mimeo, Banque de France.
- Brož, V. and Kočenda, E. (2018), "Dynamics and Factors of inflation Convergence in the European Union", *Journal of International Money and Finance*, Vol. 86, pp. 93-111.
- Bruno, V. and Shin, H.Y. (2015), "Cross-Border Banking and Global Liquidity", *The Review of Economic Studies*, Vol. 82, Issue 2, pp. 535-564.

- Bu, M., Lin, C.T. and Zhang, B. (2016), "Globalization and Climate Change: new Empirical Panel Data Evidence", *Journal of Economic Surveys*, Vol. 30, Issue 3, pp. 577-595.
- Buch, C., Bussière, M., Goldberg, L. and Hills, R. (2019), "The International Transmission of Monetary Policy", *Journal of International Money and Finance*, Vol. 91, Issue C, pp. 29-48.
- Busetti, F. and Caivano, M. (2019), "Low Frequency Drivers of the Real Interest Rate: Empirical evidence for Advanced Economies", *International Finance*, Vol. 22, Issue 2, pp. 171-185.
- Bussière, M., Schmidt, J. and Valla, N. (2016), "International Financial Flows in the New Normal – Key Patterns and Why We Should Care", *CEPII Policy Brief*.
- Bustos, P. (2011), "Trade Liberalization, Exports, and Technology Upgrading: Evidence on the Impact of MERCOSUR on Argentinean Firms", *American Economic Review*, Vol. 101, No 1, pp. 304-340.
- Ca' Zorzi, M., Dedola, L., Georgiadis, G., Jarociński, M., Stracca, L. and Strasser, G. (2020), "[Monetary Policy and its Transmission in a Globalised World](#)", *Working Paper Series*, No 2407, ECB.
- Ca' Zorzi, M., Kolasa, M. and Rubaszek, M. (2017), "Exchange Rate Forecasting with DSGE models", *Journal of International Economics*, Vol. 107, pp.127-146.
- Caballero, R.J., Farhi, E. and Gourinchas, P.O. (2015), "Global Imbalances and Currency Wars at the Zero Lower Bound", *NBER Working Paper*, No 21670, National Bureau of Economic Research.
- Caballero, R.J., Farhi, E. and Gourinchas, P.O. (2016), "Safe Asset Scarcity and Aggregate Demand", *American Economic Review*, Vol 106, No 5, pp. 513-18.
- Caballero, R.J., Farhi, E. and Gourinchas, P.O. (2017), "Rents, Technical Change, and Risk Premia Accounting for Secular Trends in Interest Rates, Returns on Capital, Earning Yields, and Factor Shares", *American Economic Review*, Vol. 107, No 5, pp. 614-20.
- Calvo, G.A. (1983), "Staggered Prices in a Utility-Maximizing Framework", *Journal of Monetary Economics*, Vol. 12, Issue 3, pp. 383-398.
- Campa, J.M. and Goldberg, L. (2005), "Exchange Rate Pass-through into Import Prices", *The Review of Economics and Statistics*, Vol. 87, No 4, pp. 679-690.
- Cao, J. and Dinger, V. (2018), "Financial Globalization and Bank Lending: The Limits of Domestic Monetary Policy?", *Working Paper*, No 4, Norges Bank.
- Carluccio, J., Cunat, A., Fadinger, H. and Fons-Rosen, C. (2019) "Offshoring and Skill Upgrading in French manufacturing", *Journal of International Economics*, Vol 118, pp. 138-159.

- Carluccio, J., Gautier, E. and Guilloux-Nefussi, S. (2018), “Dissecting the Impact of Imports from Low-Wage Countries on French Consumer Prices”, *Working Paper Series*, No 672, Banque de France.
- Carney, M. (2017), “[De]Globalisation and inflation”, speech held at the IMF Michel Camdessus Central Banking Lecture.
- Carriero, A., Clark, T. and Marcellino, M. (2020), “Assessing International Commonality in Macroeconomic Uncertainty and its Effects”, *Journal of Applied Econometrics*, Vol. 35, Issue 3, pp. 273-293.
- Carriero, A., Corsello, F. and Marcellino, M. (2018), “The Global Component of Inflation Volatility”, *Working Papers*, Banca d’Italia, No 1170.
- Carvalho, D. and Fidora, M. (2015), “Capital Flows and Euro Area Long-Term Interest Rates”, *Journal of International Money and Finance*, Vol. 54, pp.186-204.
- Carvalho, D. and Schmitz, M. (2021), “[Shifts in the Portfolio Holdings of Euro Area Investors in the Midst of COVID-19: Looking through Investment Funds](#)”, *Working Paper Series*, No 2526, ECB.
- Catão, L. and Milesi-Ferretti, G.M. (2014), “External Liabilities and Crises”, *Journal of International Economics*, Vol. 94, Issue 1, pp. 18-32.
- Cavallo, A. (2018), “More Amazon Effects: Online Competition and Pricing Behaviors”, *NBER Working Paper*, No 25138, National Bureau of Economic Research.
- Cecchetti, S. and Schoenholtz, K. (2018), “GDP at Risk”, VoxEU.
- Cerutti, E., Claessens, S. and Rose, A. (2019), “How Important is the Global Financial Cycle? Evidence from Capital Flows”, *IMF Economic Review*, Vol. 67, Issue 1, International Monetary Fund, pp. 24-60.
- Cesa-Bianchi, A., Martin, F.E. and Thwaites, G. (2019), “Foreign Booms, Domestic Busts: the Global Dimension of Banking Crises”, *Journal of Financial Intermediation*, Vol. 37, pp. 58-74.
- Cetorelli, N. and Goldberg, L. (2012), “Banking Globalization and Monetary Transmission”, *The Journal of Finance*, Vol. 67, Issue 5, pp. 1811-1843.
- Cetorelli, N., Goldberg, L. and Ravazzo, F. (2020), “Have the Fed Swap Lines Reduced Dollar Funding Strains during the COVID-19 Outbreak?”, *Liberty Street Economics Blog*, Federal Reserve Bank of New York.
- Cheikh, N.B. and Rault, C. (2016), “The Pass-Through of Exchange Rate in the Context of the European Sovereign Debt Crisis”, *International Journal of Finance and Economics*, Vol. 21, Issue 2, pp. 154-166.

- Cheung, Y.W. and Sengupta, R. (2013), "Impact of Exchange Rate Movements on Exports: an Analysis of Indian Non-Financial Sector Firms", *Journal of International Money and Finance*, Vol. 39, Issue C, pp. 231-245.
- Choi, S., Furceri, D., Loungani, P., Mishra, S. and Poplawski-Ribeiro, M. (2018), "Oil Prices and Inflation Dynamics: Evidence from Advanced and Developing Economies", *Journal of International Money and Finance*, Vol. 82, pp. 71-96.
- Chung, W. (2016), "Imported Inputs and Invoicing Currency Choice: Theory and Evidence from UK Transaction Data", *Journal of International Economics*, Vol. 99, pp. 237-250.
- Coeuré, B. (2014), "[Policy Coordination in a Multipolar World](#)", speech held at the 5th annual Cusco conference organised by the Central Reserve Bank of Peru and the Reinventing Bretton Woods Committee: "70 years after Bretton Woods: Managing the interconnectedness of the world economy", Cusco, 22 July 2014.
- Cole, D. and Nightingale, S. (2016), "Sensitivity of Australian Trade to the Exchange Rate", *Bulletin*, Reserve Bank of Australia, September.
- Comin, D.A. and Johnson, R.C. (2020), "Offshoring and Inflation", *NBER Working Paper*, No 27957, National Bureau of Economic Research.
- Corrado, C.A. and Hulten, C.R. (2010), "How Do You Measure a "Technological Revolution"?", *American Economic Review*, Vol. 100, No 2, pp. 99-104.
- Corrado, C.A., Haskel, J.E. and Jona-Lasinio, C. (2017), "Knowledge Spillovers, ICT and Productivity Growth", *Oxford Bulletin of Economics and Statistics*, Vol. 79, Issue 4, pp. 592-618.
- Correa, R., Paligorova, T., Sapriza, H. and Zlate, A. (2018), "Cross-Border Bank Flows and Monetary Policy", *International Finance Discussion Papers*, No 1241, Board of Governors of the Federal Reserve System.
- Correa-López, M., Pacce, M. and Schlepper, K. (2019), "Exploring Trend Inflation Dynamics in Euro Area Countries", *Working Paper Series*, No 1909, Banco de España.
- Covarrubias, M., Gutiérrez, G. and Philippon, T. (2019), "From Good to Bad Concentration? U.S. Industries over the Past 30 Years", *NBER Working Paper*, No 25983, National Bureau of Economic Research.
- Crespo Cuaresma, J., Huber, F. and Onorante, L. (2020), "Fragility and the Effect of International Uncertainty Shocks", *Journal of International Money and Finance*, Vol. 108, November.
- Curcuru, S.E., Kamin, S.B., Li, C. and Rodriguez, M. (2018), "International Spillovers of Monetary Policy: Conventional Policy vs. Quantitative Easing", *International Finance Discussion Papers*, No 1234, Board of Governors of the Federal Reserve System.

- Cwik, T., Müller, G. and Wolters, M. (2011), “Does Trade Integration Alter Monetary Policy Transmission?”, *Journal of Economic Dynamics and Control*, Vol. 35, Issue 4, pp. 545-564.
- Darvas, Z. (2019), “Global Interpersonal Income Inequality Decline: The role of China and India”, *World Development*, Vol. 121, pp. 16-32.
- Darvas, Z. (2021), “The Unequal Inequality Impact of the COVID-19 Pandemic”, *Working Paper*, No 06/2021, Bruegel.
- De Loecker, J. (2013), “Detecting Learning by Exporting”, *American Economic Journal: Microeconomics*, Vol. 5, No 3, pp. 1-21.
- De Luigi, C. and Feldkircher, M. (2021), “Euro area Monetary Policy Spillbacks”, mimeo, ECB.
- De Santis, R. and Veken, W. Van der (2020), “[Macroeconomic Risks Across the Globe due to the Spanish Flu](#)”, *Working Paper Series*, No 2466, ECB.
- De Soyres, F., Raphael, M., Frohm, E., Gunnella, V. and Pavlova, E. (2018), “Bought, Sold, and Bought Again: The Impact of Complex Value Chains on Export Elasticities”, *Policy Research Working Paper Series*, No 8535, World Bank.
- Del Negro, M., Giannone, D., Giannoni, M.P. and Tambalotti, A. (2017), “Safety, Liquidity, and the Natural Rate of Interest”, *Brookings Papers on Economic Activity*, Vol. 48, Issue 1, pp. 235-316.
- Del Negro, M., Lenza, M., Primiceri, G. and Tambalotti, A. (2020), “What’s Up with the Phillips curve”, *Brookings Papers on Economic Activity*, Spring 2020, pp. 301-357.
- Delle Monache, D., Petrella, I. and Venditti, F. (2016), “Common Faith or Parting Ways? A Time Varying Parameters Factor Analysis of Euro-Area inflation”, *Advances in Econometrics*, Vol. 35, pp. 539-565.
- Demiralp, S., Eisenschmidt, J. and Vlassopoulos, T. (2019), “[Negative Interest Rates, Excess Liquidity and Retail Deposits: Banks’ Reaction to Unconventional Monetary Policy in the Euro Area](#)”, *Working Paper Series*, No 2283, ECB.
- Deutsche Bundesbank (2014), “The Shadow Banking System in the Euro Area: Overview and Monetary Policy Implications”, *Monthly report*, March.
- Deutsche Bundesbank (2018), “Activities of Multinational Enterprise Groups and National Economic Statistics”, *Monthly Report*, October, pp. 65-78.
- Di Nino, V. and Semjonovs, A. (2020), “[The Role of Multinational Taxation in the First Reversal of Foreign Direct Investment Flows in the Euro Area](#)”, *Economic Bulletin*, Issue 2, ECB.
- Di Nino, V. and Veltri, B. (2020), “[The Viral Effects of Foreign Trade and Supply Network in the Euro Area](#)”, *Economic Bulletin*, Issue 6, ECB.

Di Nino, V., Habib, M.H. and Schmitz, M. (2020), "[Multinational Enterprises, Financial Centres and their Implications for External Imbalances: a Euro Area Perspective](#)", *Economic Bulletin*, Issue 2, ECB.

Duval, R., Hong, G.H., Timmer, Y. and Strahan, P. (2020), "Financial Frictions and the Great Productivity Slowdown", *Review of Financial Studies*, Vol. 33, Issue 2, pp. 475-503.

Ebenstein, A., Harrison, A., McMillan, M. and Phillips, S. (2014), "Estimating the Impact of Trade and Offshoring on American Workers Using the Current Population Surveys", *The Review of Economics and Statistics*, Vol. 96, No 3, pp. 581-595.

Egger, P.H., Nigai, N.S. and Strecker, N.M. (2019), "The Taxing Deed of Globalization", *American Economic Review*, Vol. 109, No 2, pp. 353-390.

Eichengreen, B. and Gupta, P. (2013), "The Real Exchange Rate and Export Growth: Are Services Different?", *Policy Research Working Paper Series*, No 6629, World Bank.

Eichengreen, B., Csonto, B., El-Ganainy, A. and Koczan, Z. (2021), "Financial Globalisation and Inequality: Capital Flows as a Two-Edged Sword", *IMF Working Paper*, No 21/04, International Monetary Fund.

Eickmeier, S. and Moll, K. (2009), "[The Global Dimension of Inflation – Evidence from Factor-augmented Phillips curves](#)", *Working Paper Series*, No 1011, ECB.

Emter, L., Schmitz, M. and Tirpák, M. (2019), "Cross-Border Banking in the EU since the Crisis: What Drives the Great Retrenchment?", *Review of World Economics*, Vol. 155, No 2, pp. 287-326.

Engel, C. (2016), "International Coordination of Central Bank Policy", *Journal of International Money and Finance*, Vol. 67, Issue C, pp. 13-24.

Erceg, C., Gust, C. and López-Salido, D. (2007), "The Transmission of Domestic Shocks in the Open Economy", *International Finance Discussion Papers*, No 906, Board of Governors of the Federal Reserve System.

Estrada, A., Galí, J. and López-Salido, D. (2013), "Patterns of Convergence and Divergence in the Euro Area", *IMF Economic Review*, Vol. 61, International Monetary Fund, pp. 601-630.

European Central Bank (2003a), "[The Outcome of the ECB's Evaluation of its Monetary Policy Strategy](#)", *Monthly Bulletin*, June.

European Central Bank (2003b), [Background Studies for the ECB's Evaluation of its Monetary Policy Strategy](#), November.

European Central Bank (2015), [The International Role of the Euro](#), July.

European Central Bank (2016a), "[Exchange Rate Pass-Through into Euro Area Inflation](#)", *Economic Bulletin*, Issue 7.

European Central Bank (2016b), "[Understanding the Weakness in Global Trade – What is the New Normal?](#)", *Occasional Paper Series*, No 178, IRC Trade Task Force.

European Central Bank (2017), "[The Slowdown in Euro Area Productivity in a Global Context](#)", *Economic Bulletin*, Issue 3.

European Central Bank (2019a), [The International Role of the Euro](#), June.

European Central Bank (2019b), "[The Impact of Global Value Chains on the Euro Area economy](#)", *Occasional Paper Series*, No 221, ECB Working Group on Global Value Chains.

European Central Bank (2020), [The International Role of the Euro](#), June.

European Central Bank (2021), [The International Role of the Euro](#), June.

European Commission (2018), "Towards a Stronger International Role of the Euro", European Commission contribution to the European Council and the Euro Summit, Brussels.

European Systemic Risk Board (2020), "The Global Dimensions of Macroprudential Policy", *Reports of the Advisory Scientific Committee*, No 10.

Everett, M. (2015), "Blowing the Bubble: The Global Funding of the Irish Credit Boom", *The Economic and Social Review*, Vol. 46, No 3, pp. 339-365.

Ferrara, L. (2019), "[What is Behind the Change in the Gap between Services Price Inflation and Goods Price Inflation?](#)", *Economic Bulletin*, Issue 5, ECB.

Ferrari, M., Kearns, J. and Schrimpf, A. (2017), "Monetary Policy's Rising FX Impact in the Era of Ultra-low Rates", *CEPR Discussion Papers*, No 11918, Centre for Economic Policy Research.

Ferreira, T. and Shousha, S. (2020), "Scarcity of Safe Assets and Global Neutral Interest Rates", *International Finance Discussion Papers*, No 1293, Board of Governors of the Federal Reserve System.

Fiorentini, F., Galesi, A., Pérez-Quirós, G. and Sentana, E. (2018), "The Rise and Fall of the Natural Interest Rate", *Working Paper Series*, No 1822, Banco de España.

Fisher, R.W. (2006), "Coping with Globalization's Impact on Monetary Policy", *Essays & Speeches*, No 82, Federal Reserve Bank of Dallas.

Fontagné, L. and Harrison, A. (2017), "The Factory-Free Economy: Outsourcing, Servitization and the Future of Industry", *NBER Working Paper*, No 23016, National Bureau of Economic Research.

Forbes, K.J. (2019a), "Has Globalization Changed the Inflation Process?", *BIS Working Papers*, No 791, Bank for International Settlements.

- Forbes, K.J. (2019b), "Inflation Dynamics: Dead, Dormant, or Determined Abroad?", *Brookings Papers on Economic Activity*, prepared for a conference on 5-6 September in Washington, D.C.
- Freeman, R.B. (2011), "Globalization and Inequality", *The Oxford Handbook of Inequality*, Oxford University Press.
- Fujita, M. and Hamaguchi, N. (2020), "Globalisation and the COVID-19 Pandemic: A Spatial Economics Perspective", VoxEU.
- Gaiotti, E. (2010), "Has Globalisation Changed the Phillips curve? Firm-level Evidence on the Effect of Activity on Prices", *International Journal of Central Banking*, Vol. 6, pp. 51-84.
- Gandhi, A., Navarro, S. and Rivers, D. (2020), "On the Identification of Gross Output Production Functions", *Journal of Political Economy*, Vol. 128, No 8, pp. 2973-3016.
- Georgiadis, G. and Mehl, A. (2016), "Financial Globalisation and Monetary Policy Effectiveness", *Journal of International Economics*, Vol. 103, Issue C, pp. 200-212.
- Georgiadis, G. and Jančoková, M. (2020), "Financial Globalisation, Monetary Policy Spillovers and Macro-modelling: Tales from 1001 Shocks", *Journal of Economic Dynamics and Control*, Vol. 121.
- Georgiadis, G., Gräb, J. and Khalil, M. (2019), "[Global Value Chain Participation and Exchange Rate Pass-Through](#)", *Working Paper Series*, No 2327, ECB.
- Georgiadis, G., Le Mezo, H., Mehl, A. and Tille, C. (2021), "Markets vs. Policies: Can the US Dollar's Dominance in Global Trade be Dented?", mimeo, ECB.
- Gerko, E. and Rey, H. (2017), "Monetary Policy in the Capitals of Capital", *Journal of the European Economic Association*, Vol. 15, Issue 4, pp. 721-745.
- Gerlach, R. and Wang, C. (2020), "Semi-Parametric Dynamic Asymmetric Laplace Models for Tail Risk Forecasting, Incorporating Realized Measures", *International Journal of Forecasting*, Vol. 36, pp. 489-506.
- Gilchrist, S., Sim, J.W. and Zakrajšek, E. (2014), "Uncertainty, Financial Frictions, and Investment Dynamics", *NBER Working Paper*, No 20038, National Bureau of Economic Research.
- Glick, R. (2020), "R* and the Global Economy", *Journal of International Money and Finance*, Vol. 102, Issue C.
- Glick, R. and Leduc, S. (2015), "Unconventional Monetary Policy and the Dollar: Conventional Signs, Unconventional Magnitudes", *Working Paper Series*, No 18, Federal Reserve Bank of San Francisco.
- Goldin, I., Koutroumpis, P., Lafond, F. and Winkler, J. (2020), "Why is Productivity Slowing Down?", *Oxford Martin Working Paper Series on Technological and Economic Change*, No 2020-1.

- Goodhart, C. and Lastra, R. (2018), "Populism and Central Bank Independence", *Open Economies Review*, Vol 29, Issue 1, pp. 49-68.
- Gopinath, G. and Stein, J.C. (2018), "Trade Invoicing, Bank Funding, and Central Bank Reserve Holdings", *American Economic Association*, Vol. 108, pp. 542-46.
- Gopinath, G., Casas, C., Diez, F., Gourinchas, P.O. and Plagborg-Møller, M. (2020), "Dominant Currency Paradigm", *American Economic Review*, Vol. 110, No 3, pp. 677-719.
- Gopinath, G., Itskhoki, O. and Rigobon, R. (2010), "Currency Choice and Exchange Rate Pass-through", *American Economic Review*, Vol. 100, No 1, pp. 304-336.
- Gopinath, G., Kalemli-Ozcan, S., Karabarbounis, L. and Villegas-Sanchez, C. (2017), "Capital Allocation and Productivity in South Europe", *The Quarterly Journal of Economics*, Vol. 132, Issue 4, pp. 1915-1967.
- Gourinchas, P.O. and Obstfeld, M. (2012), "Stories of the Twentieth Century for the Twenty-First", *American Economic Journal: Macroeconomics*, Vol. 4, No 1, pp. 226-265.
- Gourinchas, P.O., Govillot, N. and Rey, H. (2010), "Exorbitant Privilege and Exorbitant Duty", *Discussion Paper Series*, No 20, Bank of Japan Institute for Monetary and Economic Studies.
- Gourio, F. (2012), "Disaster Risk and Business Cycles", *American Economic Review*, Vol. 102, No 6, pp. 2734-2766.
- Gräb, J., Kostka, T. and Quint, D. (2019), "[Quantifying the "Exorbitant Privilege" – Potential Benefits from a Stronger International Role of the euro](#)", *The International Role of the Euro*, 2019, ECB.
- Grossman, G.M. and Rossi-Hansberg, E. (2008), "Trading Tasks: A Simple Theory of Offshoring", *American Economic Review*, Vol. 98, No 5, pp. 1978-1997.
- Guerrieri, L., Gust, C. and López-Salido, J.D. (2010), "International Competition and Inflation: A New Keynesian Perspective", *American Economic Journal: Macroeconomics*, Vol. 2, No 4, pp. 247-80.
- Guilloux-Nefussi, S. (2020), "Globalization, Market Structure and Inflation Dynamics", *Journal of International Economics*, Vol. 123.
- Gust, C., Leduc, S. and Vigfusson, R. (2010), "Trade Integration, Competition, and the Decline in Exchange-Rate Pass-Through", *Journal of Monetary Economics*, Vol. 57, Issue 3, pp. 309-324.
- Gutiérrez, G. and Philippon, T. (2019), "Fading Stars", *NBER Working Paper*, No 25529, National Bureau of Economic Research.
- Habib, M.H. and Venditti, F. (2019), "[The Global Capital Flows Cycle: Structural Drivers and Transmission Channels](#)", *Working Paper Series*, No 2280, ECB.

- Halpern, L., Koren, M. and Szeidl, A. (2015), “Imported Inputs and Productivity”, *American Economic Review*, Vol. 105, No 12, pp. 3660-3703.
- Hazell, J., Herreño, J., Nakamura, E. and Steinsson, J. (2020), “The Slope of the Phillips Curve: Evidence from U.S. States”, *NBER Working Paper*, No 28005, National Bureau of Economic Research.
- Heijden, M. van der, Hemmerlé, Y., Öztürk, B., Schaik, I. van and Schuijren, C. (2021), “Changing International Landscape and the Dutch Economy: Trends, Drivers and Consequences”, *DNB Occasional Study*, Volume 18 – 3, De Nederlandsche Bank.
- Heuser, C. and Mattoo, A. (2017), “Services Trade and Global Value Chains”, *Policy Research Working Paper Series*, No 8126, World Bank.
- Holston, K., Laubach, T. and Williams, J.C. (2017), “Measuring the Natural Rate of Interest: International Trends and Determinants”, *Journal of International Economics*, Vol. 108, pp. 59-75.
- Hsieh, C.T., Ossa, R., Li, N. and Yang, M.J. (2020), “Accounting for the New Gains from Trade Liberalization”, *Journal of International Economics*, Vol. 107, pp. 1-29.
- Hummels, D., Jørgensen, R., Munch, J. and Xiang, C. (2014), “The Wage Effects of Offshoring: Evidence from Danish Matched Worker-Firm Data”, *American Economic Review*, Vol. 104, No 6, pp. 1597-1629.
- Huneus, F. (2018), “Production Network Dynamics and the Propagation of Shocks”, mimeo, Princeton University.
- International Monetary Fund (2013), “The Dog that Didn’t Bark: Has Inflation Been Muzzled or Was It Just Sleeping?”, *World Economic Outlook*, Chapter 3.
- International Monetary Fund (2016), “Monetary Policy and the Rise of Nonbank Finance”, *Global Financial Stability Report*.
- International Monetary Fund (2019), *World Economic Outlook*, April.
- Intersecretariat Working Group on Price Statistics – IWGPS (2020), *Consumer Price Index Manual: Concepts and Methods*, Statistical Office of the European Union, International Labour Organization, International Monetary Fund, Organisation for Economic Co-operation and Development United Nations Economic Commission for Europe, World Bank.
- Intergovernmental Panel on Climate Change (2018), “Global Warming of 1.5°C”, *IPCC Special Report*.
- Jarociński, M. (2020), “[Central Bank Information Effects and Transatlantic spillovers](#)”, *Working Paper Series*, No 2482, ECB.

- Justiniano, A. and Preston, B. (2010), “Can Structural Small Open-Economy Models Account for the Influence of Foreign Disturbances?”, *Journal of International Economics*, Vol. 81, Issue 1, pp. 61-74.
- Kalemli-Ozcan, S., Papaioannou E. and Perri F. (2013), “Global Banks and Crisis Transmission”, *Journal of international Economics*, Vol. 89, Issue 2, pp. 495-510.
- Kamin, S. (2010), “Financial Globalization and Monetary Policy”, *International Finance Discussion Papers*, No 1002, Board of Governors of the Federal Reserve System.
- Kataryniuk, I. (2021), “How Globalisation Affects Long-Run Interest Rates? A Panel Cointegration Approach”, *Working Paper Series*, Banco de España, forthcoming.
- Kaymak, B. and Poschke, M. (2016), “The Evolution of Wealth Inequality over Half a Century: the Role of Taxes, Transfers and Technology”, *Journal of Monetary Economics*, Vol. 77, Issue C, pp. 1-25.
- Kimball, M.S. (1995), “The Quantitative Analytics of the Basic Neomonetarist Model”, *Journal of Money, Credit and Banking*, Vol. 27, No 4, pp. 1241-1277.
- King, M. and Low, D. (2014), “Measuring the ‘World’ Real Interest Rate”, *NBER Working Paper*, No 19887, National Bureau of Economic Research.
- Klein, M. and Shambaugh, J. (2015), “Rounding the Corners of the Policy Trilemma: Sources of Monetary Policy Autonomy”, *American Economic Journal: Macroeconomics*, Vol. 7, No 4, pp. 33-66.
- Kozłowski, J., Veldkamp, L. and Venkateswaran, V. (2020), “Scarring Body and Mind: the Long-Term Belief-Scarring Effects of COVID-19”, *Working Paper*, Jackson Hole Economic Policy Symposium.
- Kuttner, K. and Robinson, T. (2010), “Understanding the Flattening of the Phillips curve”, *North American Journal of Economics and Finance*, Vol. 21, pp. 110–125.
- Lane, P.R. (2006), “Global Bond Portfolios and EMU”, *International Journal of Central Banking*, Vol. 2, Issue 2, pp. 1-23.
- Lane, P.R. (2013), “Financial Globalisation and the Crisis”, *Open Economies Review*, Vol. 24, Issue 3, pp. 555-580.
- Lane, P.R. (2019), “[Globalisation and Monetary policy](#)”, speech at the University of California, Los Angeles, 30 September.
- Lane, P.R. (2020a), [Interview with the Financial Times](#), 2 February 2020.
- Lane, P.R. (2020b), “[The Analytical Contribution of External Statistics: Addressing the Challenges](#)”, speech held at the Joint European Central Bank, Irving Fisher Committee and Banco de Portugal conference, Lisbon.
- Lane, P.R. and Milesi-Ferretti, G.M. (2018), “The External Wealth of Nations Revisited: International Financial Integration in the Aftermath of the Global Financial

Crisis”, *IMF Economic Review*, Vol. 66, Issue 1, International Monetary Fund, pp. 189-222.

Lastauskas, P. and Nguyen, A.D.M. (2021), “[Global Impacts of US Monetary Policy Uncertainty Shocks](#)”, *Working Paper Series*, No 2513, ECB.

Linder, M.H., Peach, R. and Rich, R.W. (2013), “The Parts Are More Than the Whole: Separating Goods and Services to Predict Core Inflation”, *Current Issues in Economics and Finance*, Vol. 19, Federal Reserve Bank of New York.

Liu, E., Mian, A. and Sufi, A. (2019), “Low Interest Rates, Market Power, and Productivity Growth”, *NBER Working Paper*, No 25505, National Bureau of Economic Research.

Lombardi, M., Riggi, M. and Viviano, E. (2020), “Understanding the Phillips Curve through the Lens of Workers’ Bargaining Power and Business Cycle Fluctuations”, VoxEU.

López, C. and Papell, D.H. (2012), “Convergence of Euro Area Inflation Rates”, *Journal of International Money and Finance*, Vol. 31, pp. 1440-1458.

Love, I., Preve, L. and Sarria-Allende, V. (2007), “[Trade Credit and Bank Credit: Evidence from Recent Financial Crises](#)”, *Journal of Financial Economics*, Vol. 83, Issue 2, pp. 453-469.

Ludvigson, S., Ma, S. and Ng, S. (2021), “Uncertainty and Business Cycles: Exogenous Impulse or Endogenous Response?”, *American Economic Journal: Macroeconomics*, forthcoming.

Marazzi, M., Sheets, N. and Vigfusson, R. (2005), “Exchange Rate Pass-Through to US Import Prices: Some New Evidence”, *International Finance Discussion Papers*, No 833, Board of Governors of the Federal Reserve System.

Martínez-García, E. and Wynne, M.A. (2012), “Global Slack as a Determinant of U.S. Inflation”, *Globalization Institute Working Papers*, No 123, Federal Reserve Bank of Dallas.

McCauley, R.N., McGuire, P. and Sushko, V. (2015), “Global Dollar credit: Links to US Monetary Policy and Leverage”, *Economic Policy*, Vol. 30, Issue 82, pp. 187-229.

McCauley, R.N., Bénétrix, A.S., McGuire, P.M. and Peter, G. von (2019), “Financial Deglobalisation in Banking?”, *Journal of International Money and Finance*, Vol. 94, Issue C, pp. 116-131.

McCauley, R. and Schenk, C. (2020), “Central Bank Swap Lines Then and Now: Swaps and dollar liquidity in the 1960s”, *BIS Working Papers*, No 851, Bank for International Settlements.

McQuade, P. and Schmitz, M. (2017), “The Great Moderation in Capital Flows – a Global Phenomenon”, *Journal of International Money and Finance*, Vol. 73, pp. 183-212.

- Mehrotra, A., Moessner, R. and Shu, C. (2019), “Interest Rate spillovers from the United States: Expectations, Term Premia and Macro-financial vulnerabilities”, *BOFIT Discussion Papers*, No 20, Suomen Pankki – Finlands Bank.
- Meier, S. (2013), “Financial Globalization and Monetary Transmission”, *Globalization Institute Working Papers*, No 145, Federal Reserve Bank of Dallas.
- Melitz, M. (2003), “The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity”, *Econometrica*, Vol. 71, Issue 1, pp. 1695-1725.
- Mikolajun, I. and Lodge, D. (2016), “[Advanced Economy Inflation: the Role of Global Factors](#)”, *Working Paper Series*, No 1948, ECB.
- Miranda-Agrippino, S. and Rey, H. (2020), “US Monetary Policy and the Global Financial Cycle”, *The Review of Economic Studies*, Vol. 87, Issue 6, pp. 2754-2776.
- Mishkin, F. (2007), “Inflation Dynamics”, *NBER Working Paper*, No 13147, National Bureau of Economic Research.
- Monacelli, T. (2007), “Comment on Globalization and Inflation Dynamics: The Impact of Increased Competition”, *International Dimensions of Monetary Policy, NBER Chapters*, National Bureau of Economic Research, pp. 579-590.
- Mukhin, D. (2018), “An Equilibrium Model of the International Price System”, mimeo, Princeton University.
- Mumtaz, H. and Surico, P. (2009), “The Transmission of International Shocks: A Factor-Augmented VAR Approach”, *Journal of Money, Credit and Banking*, Vol. 41, No 1, pp. 71-100.
- Natal, J.M. and Stoffels, N. (2019), “Globalization, Market Power, and the Natural Interest Rate”, *IMF Working Paper*, No 19/95, International Monetary Fund.
- Neri, S. and Gerali, A. (2019), “Natural rates across the Atlantic”, *Journal of Macroeconomics*, Vol. 62, Issue C.
- Neri, S. and Notarpietro, A. (2019), “Collateral Constraints, the Zero Lower Bound, and the Debt–Deflation Mechanism”, *Economics Letters*, Vol. 174, Issue C, pp. 144-148.
- Network for Greening the Financial System – NGFS (2020), “Climate Change and Monetary Policy”, *Technical Document*, June.
- Nguyen, A. (2015), “Financial Frictions and the Volatility of Monetary Policy in a DSGE model”, *Working Paper*, No 75949436, Lancaster University Management School.
- Obstfeld, M. (2020), “Global Dimensions of U.S. Monetary Policy”, *International Journal of Central Banking*, Vol. 16, Issue 1, pp. 73-132.

Obstfeld, M. and Rogoff, K. (2002), "Global Implications of Self-Oriented National Monetary Rules," *The Quarterly Journal of Economics*, Vol. 117, Issue 2, pp. 503-535.

Obstfeld, M., Ostry, J. and Qureshi, M. (2019), "A Tie That Binds: Revisiting the Trilemma in Emerging Market Economies", *The Review of Economics and Statistics*, Vol. 101, No 2, pp. 279-293.

Olley, G.S. and Pakes, A. (1996), "The Dynamics of Productivity in the Telecommunications Equipment Industry", *Econometrica*, Vol. 64, Issue 6, pp. 1263-1297.

Ortega, E. and Osbat, C. (2020), "[Exchange Rate Pass-Through in the Euro Area and EU countries](#)", *Occasional Paper Series*, No 241, ECB.

Panetta, F. and Schnabel, I. (2020), "The Provision of Euro Liquidity through the ECB's Swap and Repo Operations", *The ECB Blog*, August.

Passari, E. and Rey, H. (2015), "Financial Flows and the International Monetary System", *Economic Journal*, Vol. 125, No 584, pp. 675-698.

Pastoris, F. and Schmitz, M. (2020), "[Euro area-US Current Account Asymmetries: the Role of Foreign Direct Investment Income in the Presence of Multinational Enterprises](#)", Box 5 in "Multinational Enterprises, Financial Centres and their Implications for External imbalances: a Euro Area Perspective", *Economic Bulletin*, Issue 2, ECB.

Peersman, G. (2018), "International Food Commodity Prices and Missing (Dis)inflation in the Euro Area", *Working Papers*, No 350, Nationale Bank van België/Banque Nationale de Belgique.

Pesaran, M.H., Shin, Y. and Smith, R.P. (1999), "Pooled Mean Group Estimation of Dynamic Heterogeneous Panels", *Journal of the American Statistical Association*, Vol. 94, pp. 621-634.

Piketty, T. and Saez, E. (2006), "The Evolution of Top Incomes: A Historical and International Perspective", *American Economic Review*, Vol. 96, No 2, pp. 200-205.

Rachel, L. and Smith, T.D. (2015), "Secular Drivers of the Global Real Interest Rate", *Working Paper*, No 571, Bank of England.

Rachel, L. and Smith, T.D. (2017), "Are Low Real Interest Rates Here to Stay?", *International Journal of Central Banking*, Vol. 13, Issue 3, pp. 1-42.

Ravallion, M. (2018), "Inequality and Globalisation: A Review Essay", *Journal of Economic Literature*, Vol. 56, No 2, pp. 620-642.

Redding, S. and Weinstein, D. (2020), "Measuring Aggregate Price Indexes with Taste Shocks: Theory and Evidence for CES Preferences", *The Quarterly Journal of Economics*, Vol. 135, Issue 1, pp. 503-560.

- Rey, H. (2016), "International Channels of Transmission of Monetary Policy and the Mundellian Trilemma", *IMF Economic Review*, Vol. 64, Issue 1, International Monetary Fund, pp. 6-35.
- Roache, S.K. (2012), "China's Impact on World Commodity Markets", *IMF Working Paper*, No 12/115, International Monetary Fund.
- Rodrik, D. (2011), *The Globalization Paradox: Democracy and the Future of the World Economy*, W.W. Norton, p. 368.
- Rogoff, K. (2003), "Globalization and Global Disinflation", Jackson Hole Economic Policy Symposium.
- Sbordone, A.M. (2005), "Do Expected Future Marginal Costs Drive Inflation Dynamics?", *Journal of Monetary Economics*, Vol. 52, Issue 6, pp. 1183-1197.
- Sbordone, A.M. (2007), "Globalization and Inflation Dynamics: The Impact of Increased Competition", *International Dimensions of Monetary Policy, NBER Chapters*, National Bureau of Economic Research, pp. 547-579.
- Scatigna, M., Szemere, R. and Tsatsaronis, K. (2014), "Residential Property Price Statistics across the Globe", *BIS Quarterly Review*, Bank for International Settlements.
- Shahbaz, M., Nasir, M. and Roubaud, D. (2018), "Environmental Degradation in France: the Effects of FDI, Financial Development, and Energy Innovations", *Energy Economics*, Vol. 74, Issue C, pp. 843-857.
- Shin, H.S. (2012), "Global Banking Glut and Loan Risk Premium", *IMF Economic Review*, Vol. 60, Issue 2, International Monetary Fund, pp. 155-192.
- Shin, H.S. (2013), "The Second Phase of Global Liquidity and Its Impact on Emerging Economies", Asia Economic Policy Conference, Evening Keynote Address.
- Shu, P. and Steinwender, C. (2018), "The Impact of Trade Liberalization on Firm Productivity and Innovation", *NBER Working Paper*, No 24715, National Bureau of Economic Research.
- Smith, M. (2004), "Impact of the Exchange Rate on Export Volumes", *Bulletin*, Vol. 67, Reserve Bank of New Zealand.
- Stock, J.H. and Watson, M.W. (2019), "Slack and Cyclically Sensitive Inflation", *NBER Working Paper*, No 25987, National Bureau of Economic Research.
- Straub, L. (2019), "Consumption, Savings, and the Distribution of Permanent Income", mimeo, Harvard University.
- Syverson, C. (2017), "Challenges to Mismeasurement Explanations for the US Productivity Slowdown", *Journal of Economic Perspectives*, Vol. 31, No 2, pp. 165-186.

Temesvary, J., Ongena, S. and Owen, A.L. (2018), “A Global Lending Channel Unplugged? Does U.S. Monetary Policy Affect Cross-Border and Affiliate Lending by Global U.S. banks?”, *Journal of International Economics*, Vol. 112, Issue C, pp. 50-69.

Tørsløv, T.R., Wier, L.S. and Zucman, G. (2020), “The Missing Profits of Nations”, *NBER Working Paper*, No 2471, National Bureau of Economic Research.

Varela, G. and Lovo, S. (2016), “Much More to Competitiveness than Real Exchange Rates”, *The Trade Post*, World Bank Blog, 22 December.

Woodford, M. (2003), *Interest and Prices: Foundations of a Theory of Monetary Policy*, Princeton, NJ, Princeton University Press.

World Bank (2020), *World Development Report. Trading for Development in the Age of Global Value Chains*, Washington, D.C.

Work Stream on Digitalisation (2021), “Digitalisation: channels, impacts and implications for monetary policy”, *Occasional Paper Series*, No 266, ECB, September.

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