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Challenges to the monetary policy landscape
from a changing geopolitical environment

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Abstract

Over the past decade, geopolitical developments – and the policy responses to these by major economies around the world – have challenged economic openness and the process of globalisation, with implications for the economic environment in which central banks operate. The return of war to Europe and the energy shock triggered by the Russian invasion of Ukraine in 2022 are the latest in a series of episodes that have led the European Union (EU) to develop its Open Strategic Autonomy (OSA) agenda. This Report is a broad attempt to take stock of these developments from a central banking perspective. It analyses the EU's economic interdependencies and their implications for trade and finance, with a focus on strategically important dimensions such as energy, critical raw materials, food, foreign direct investment and financial market infrastructures. Against this background, the Report discusses relevant aspects of the EU's OSA policy agenda which extends to trade, industrial and state aid measures, as well as EU initiatives to strengthen and protect the internal market and further develop Economic and Monetary Union (EMU). The paper highlights some of the policy choices and trade-offs that emerge in this context and possible implications for the ECB's monetary policy and other policies.

JEL codes: F0, F10, F30, F4, F5, F45, E42, L5, Q43.

Keywords: globalisation, geopolitics, geoeconomics, Open Strategic Autonomy, multilateralism, international trade, capital flows, industrial policy, global value chains, European Central Bank, European Economic and Monetary Union, monetary policy, financial stability, financial market infrastructures.

Non-technical summary

Geopolitical factors affect the EU's economy and the policies of central banks.

Geopolitical considerations are playing an increasingly important role in determining international economic relations. This report is a first, broad attempt to provide a quantitative and qualitative analysis of how a changing geopolitical environment and the EU's Open Strategic Autonomy (OSA)¹ agenda may affect the EU in general and Economic and Monetary Union (EMU) in particular, and the potential implications for the policies of the ECB and the European System of Central Banks (ESCB).

Since the inception of the euro, the world has moved gradually from a dominant narrative favouring an open, multilateral international order to a narrative in which geopolitical considerations are having an increasing impact on the economy.

This might be affecting the process of globalisation and the structure of the international economy, as discussed in Section 1. Geopolitical factors are increasingly influencing decision-makers, including those at the ECB. Central bankers in the EU and around the world are being called upon to deal with the repercussions of strategic economic relations for macroeconomic variables, inflation dynamics, monetary policy, financial stability and market infrastructures.

The change in narrative is gaining traction, despite the fact that the current open, multilateral rules-based system continues to be the engine of economic growth for much of the world's population.

Multilateral institutions and rules are being tested by geopolitical competition against a background of changes in the economic weight of different countries and regions. At the same time, political polarisation, social unrest and within-country wealth inequality² are rising in many parts of the world, leading in some cases to a questioning of the open-based multilateral system. There is also a significant policy and academic debate underway as to whether the international economy is following a trend towards "de-globalisation". Existing evidence appears to indicate that, at least for the time being, there is no such consistent trend, but rather a change in the nature of globalisation, which is leading to a rise in the regionalisation of trade and a certain slowdown in global value chain (GVC) integration and the international trade in goods. At the same time, the growth of international trade in services seems to be signalling a continuation of globalisation trends in those sectors spurred on by technological developments. Some of these phenomena might, to some extent, be a result of geopolitical factors. This changing nature of globalisation is being determined not

¹ More recently, the EU Council, in its [conclusions](#) of 29 March 2022 on the EU's economic and financial strategic autonomy, emphasised that "the EU needs to continue pursuing an appropriate balance between both objectives, striving to achieve its economic and financial autonomy, while maintaining its openness, global cooperation with like-minded partners and competitiveness, and reap the potential benefits thereof."

² As argued in [Box 5](#) of the ECB strategy review ([Work stream on globalisation](#), 2021), even though over the past three decades there has been a steady fall in inequality worldwide *across* countries, inequality *within* countries (notably in some advanced economies) has increased markedly. Globalisation is often seen as one of the key forces driving the rise in inequality in advanced economies, although this effect cannot easily be disentangled from the effects of technological progress. Moreover, countries exposed to similar degrees of trade and financial openness and technological change have exhibited different trends in inequality.

only by public policies, but also by private business initiatives and interests seeking to respond to these changing economic conditions in a context of heightened economic uncertainty and a perception that geopolitical shocks are occurring more frequently.

The EU contributes to and benefits from global economic, trade and financial openness but, almost by definition, openness guided primarily by economic comparative advantage has a flipside, namely (inter)dependence. Section 2 of this report provides a thorough empirical analysis of the EU's trade, financial and labour supply interlinkages with the rest of the world. The section documents the extent to which the EU and the euro area's economy and financial system are deeply intertwined with those of major geopolitical powers. Interdependence is high with the United States and the United Kingdom in terms of both finance and trade,³ with China in terms of trade and with Russia in terms of energy and critical raw materials (CRMs), despite the recent action taken by the EU to reduce its dependency on Russia following the latter's invasion of Ukraine. While this interdependence is an advantage in a first-best, rules-based, comparative-advantage world — for example through GVC participation, seeking the most efficient suppliers or allowing foreign financial players to operate freely in the domestic market — it can also turn into a vulnerability in a second-best, increasingly “geopolitical” world.

The EU's OSA agenda is an emerging set of regulatory, structural and fiscal policies seeking to address the EU's economic vulnerabilities arising from geopolitical factors. These include different types of policies such as those affecting the configuration of GVCs, foreign direct investment (FDI) screening, as well as policies aimed at increasing the resilience of financial market infrastructures, promoting the international role of the euro and designing efficient sanctioning regimes. As discussed in Section 3, there may be trade-offs between these and other policy priorities which may also induce (new) dependencies. Some examples from the analysis set out in this report are as follows.

- (a) A reshoring or friend-shoring of GVCs decreases the impact of foreign supply shocks and reduces external dependence, although it may increase exposure to domestic disruptions and amplify the impact of domestic shocks.
- (b) FDI screening may be necessary to protect strategic sectors from foreign buyers but it may also reduce the availability and efficiency of capital allocation, especially if it is uncoordinated within the Single Market.
- (c) Reorienting trade towards reliable partners that respect an open, multilateral trade order may imply higher costs and prices, with implications for domestic inflation and monetary policy. This is especially relevant for the energy sector and CRMs.

³ Beyond purely economic and financial considerations, external security represents a very important interdependence between the United State and Europe, both within a NATO context and beyond. An analysis of this interdependence and its implications are outside the scope of this report.

- (d) Greater reliance on domestic payment and other financial infrastructures may imply less vulnerability to foreign providers but needs to be met with appropriate measures to ensure continued competition and innovation.

A number of these policy choices and trade-offs are beyond the remit of the ECB but are likely to affect the landscape in which it operates.

In the EU, developments in the area of strategic autonomy are also relevant to the debate on strengthening the EU and EMU, while the increasing significance of geopolitics requires further coordinated EU policy action. The appropriate deepening of EMU and further economic integration in the EU are integral to any attempt to increase resilience and competitiveness and enable the EU to speak with one voice in a more complex world economy. Ambitious EU and national reforms could help increase resilience and reduce vulnerabilities to geopolitical shocks. In line with the position adopted by the ECB Governing Council,⁴ material advances in the capital markets union and the banking union agendas could contribute to reducing constraints in EU/EMU financial markets and the banking sector. The Single Market and the EU trade policy have shown that there are advantages in speaking with one voice vis-à-vis external partners. Closer and more effective coordination of other policies, for example in the energy sector through better interconnectedness of EU energy infrastructures or in energy negotiations with partners outside the EU, illustrate the benefits of such an approach.⁵ In addition, strengthening the international role of the euro could enhance the euro area's strategic autonomy in economic and financial matters while preserving an open economy. Safe assets denominated in euro in the form of national government debt or common EU/euro area-issued debt could further support this process.

The more significant role played by geopolitics and OSA-type policies is likely to influence inflation dynamics, price-setting mechanisms, productivity, competition and the natural interest rate, thereby affecting the landscape in which the ECB operates. More frequent geopolitical shocks and OSA-type policies may imply costs and second-best solutions that the ECB needs to take into account. Section 4 focuses on the impact of these developments on the ECB's policies. A retrenchment of globalisation could lead to a regionalisation of trade flows and value chains, an increase in reshoring initiatives, a reduction in international labour mobility and/or an intensification of industrial policies that seek to encourage the local production of goods considered strategic. These dynamics could affect inflation directly in both the short and the medium term by substituting cheaper inputs with more expensive but "safer" ones, and indirectly through their impact on competition and market structure, price-setting mechanisms and workers' bargaining power. The dynamics impact productivity, which is a critical variable in the determination of the natural rate of interest. At the same time, efforts to diversify imports may result in

⁴ See [Eurosystem](#) (2021). The Eurosystem's position is that "Completing Economic and Monetary Union remains essential to strengthen the euro area's shock absorption capacity. This includes the completion of the banking union and capital markets union. In addition, a permanent central fiscal capacity, if appropriately designed, could play a role in enhancing macroeconomic stabilisation and convergence in the euro area in the longer run."

⁵ See, for example, [McWilliams et al.](#) (2022).

lower dependencies on some countries, which may have a positive effect on global interest rates, given that the savings of these countries have played an important role in depressing global interest rates. Section 4 also shows that GVCs can amplify shocks in the economy as they move up and down the production network and change the slope of the Phillips curve. Moreover, shocks to central nodes, as well as shocks to suppliers of CRMs, tend to generate higher economic and price fluctuations through strong spillover effects. In addition, OSA-like policies that target near-shoring or reshoring could foster either economic convergence or economic divergence across EU/euro area countries, with potential implications for the transmission of monetary policy. In the particular case of energy, the greening of the economy makes it possible to reduce dependencies but this requires time and introduces elements that impact inflation, inflation volatility and relative prices within the energy mix.

Geopolitically-induced shocks of a transitory nature may blur the picture for monetary policy by increasing uncertainty. More frequent geopolitical shocks have the potential to increase output and inflation volatility, which may generate persistent dynamics that, even if transitory, could pose a challenge to the conduct of monetary policy, its communication and its transmission.

Geopolitical factors could also impact capital and financial flows⁶ and the smooth functioning of payment and financial market infrastructures, thus posing risks to financial stability. The euro area is more financially open than other major strategic players and is also home to a number of major investment hubs. Nevertheless, a number of elements (such as the prominent role of offshore centres or complex multinational entities in intermediating FDI and portfolio flows) blur the picture of the ultimate investor-destination linkages and make it difficult to map financial exposures. With regard to financial market infrastructures, the current overreliance of EU market participants on third-country payment and clearing services, with the EU authorities having only limited reach in a crisis situation, is a potential source of financial stability risks.

Economic and financial openness has been a boon for the EU/euro area economy. Thus, it is important to guide the OSA strategy in a way that will allow Europe to continue to reap the economic and social benefits of globalisation, while at the same time protecting it from the challenges of a tenuous geopolitical world. From this perspective, the case for OSA-type policies should be sufficiently scrutinised, especially for those initiatives of a structural nature which could introduce distortions and increase economic policy uncertainty if not well defined. Against this background, and given that in at least some cases the search for strategic autonomy might imply a second-best solution to an openness based on pure comparative advantage, the EU's defence of an open, multilateral rules-based system is still the first-best option.

⁶ For the sake of simplicity, for the remainder of the text we will use the term “capital flows” to refer to both capital and financial flows, the latter including direct, portfolio and other investments, as defined in the IMF’s Balance of Payments and International Investment Position Manual, 6th edition.

1 Geopolitics, international economic relations and OSA

Until recently, the world was undergoing a process of increasing multilateralism and globalisation. The bulk of globalisation in trade and financial flows took place in a favourable geopolitical environment. Two favourable milestones were the lifting of the Iron Curtain and the incorporation of China into the World Trade Organisation (WTO) (see Box 1).

In this context the EU — and the euro area in particular — achieved significant levels of economic openness and integration with the rest of the world. Euro area trade in goods and services had reached 95% of GDP by the end of 2021 (see Chart 1, panel a, which includes flows between members). Excluding intra-euro area flows, trade still reached 54% of euro area output, compared with 26% in the case of the United States. The EU has been instrumental in promoting global rules and common standards. According to mainstream economic theory, open trade and finance, driven by comparative advantage, improves the allocation of resources and maximises economic efficiency, resulting – all things being equal – in higher growth and employment for all economies involved. Despite the gains made by the EU from openness, its share of world GDP has fallen over time, with the direct consequence that economic developments in the rest of the world have assumed greater significance.⁷ In particular, emerging market economies (EMEs) have become much more prominent in world GDP in a relatively short period of time (see Chart 1, panel b).

The process of globalisation has been hindered by geopolitical considerations, which are becoming an increasingly important determinant of economic relations.⁸ Multilateralism and its institutions are being increasingly replaced by regionalisation and bilateral trade agreements (see Box 1). Trade disruptions and economic policy uncertainty shocks have become more frequent, while political polarisation, social unrest, conflict and geopolitical risk have also been on the rise in a significant number of countries with cross-border spillovers⁹ (see Chart 2). These trends are affecting the EU's major economic partners, including the United States and China. These two countries are, respectively, the most important financial and trade partners of the euro area (see Section 2), with the United States also central to the EU's external security and China arguably the largest geopolitical

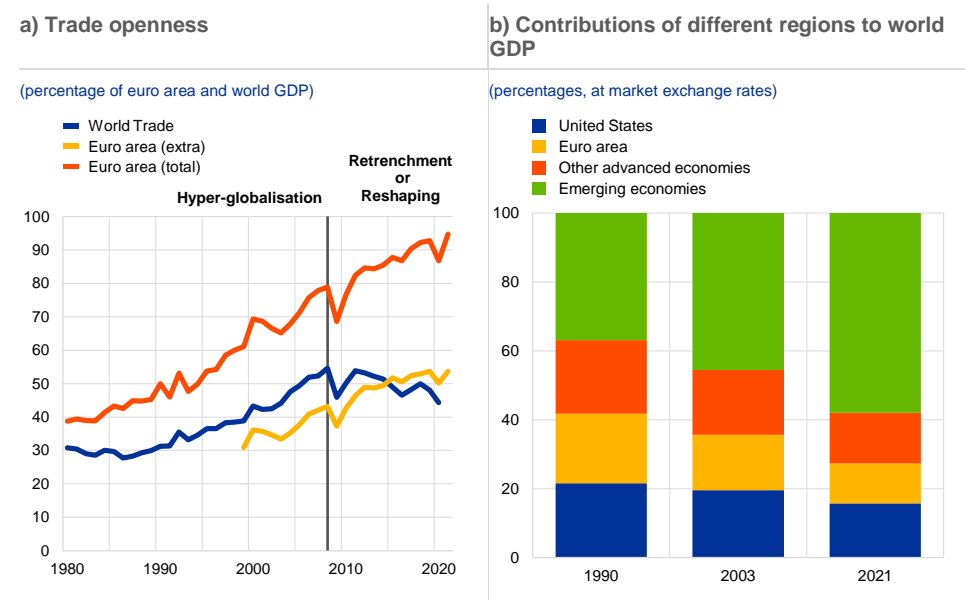
⁷ See, for example, Lane (2019) and the ECB strategy review (*Work stream on globalisation*, 2021).

⁸ See, for example, Lagarde (2022a and 2022b) and Yellen (2022).

⁹ See, for example, Ghirelli et al. (2021), Diakonova et al. (2022a), Diakonova et al. (2022b), Mueller and Rauh (2022), and the references quoted therein. This branch of the literature shows how different measures of institutional instability, including economic policy uncertainty, political polarisation, social unrest and conflict, have a significant negative bearing on macroeconomic and financial outcomes. In addition, shocks of this type in some countries and regions impinge on other countries through trade and financial exposures. Caldara and Iacoviello (2022) analysed the trend towards rising geopolitical risk using a geopolitical risk index (GPR Index). They provide evidence that this is having an impact on investment and employment and increasing downside risks.

and economic power after the United States, with a permanent seat on the United Nations Security Council.¹⁰

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 (GFC). 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 panel (a), the latest observations are 2021 for euro area trade and 2020 for world trade. In panel (b), world GDP is taken as the total for all the countries included in the WDI database.

A weaker narrative in support of multilateralism might also reflect a reordering of the global balance of power. Some countries are becoming increasingly concerned with maintaining or improving their economic and geopolitical status relative to other competing areas and countries, even to the detriment of preserving free trade and the ensuing benefits for their own economies.¹¹

From a European perspective, Russia’s invasion of Ukraine in February 2022 is the starkest example of the potentially severe consequences of geopolitical disruptions. It has led, among other things, to an unprecedented degree of economic and financial sanctions being imposed, such as the exclusion of Russian banks from SWIFT, the freezing of the country’s financial assets (including central bank reserves) and the halting of trade in key raw materials and agricultural products. It has required the EU – at considerable cost – to drastically reduce its

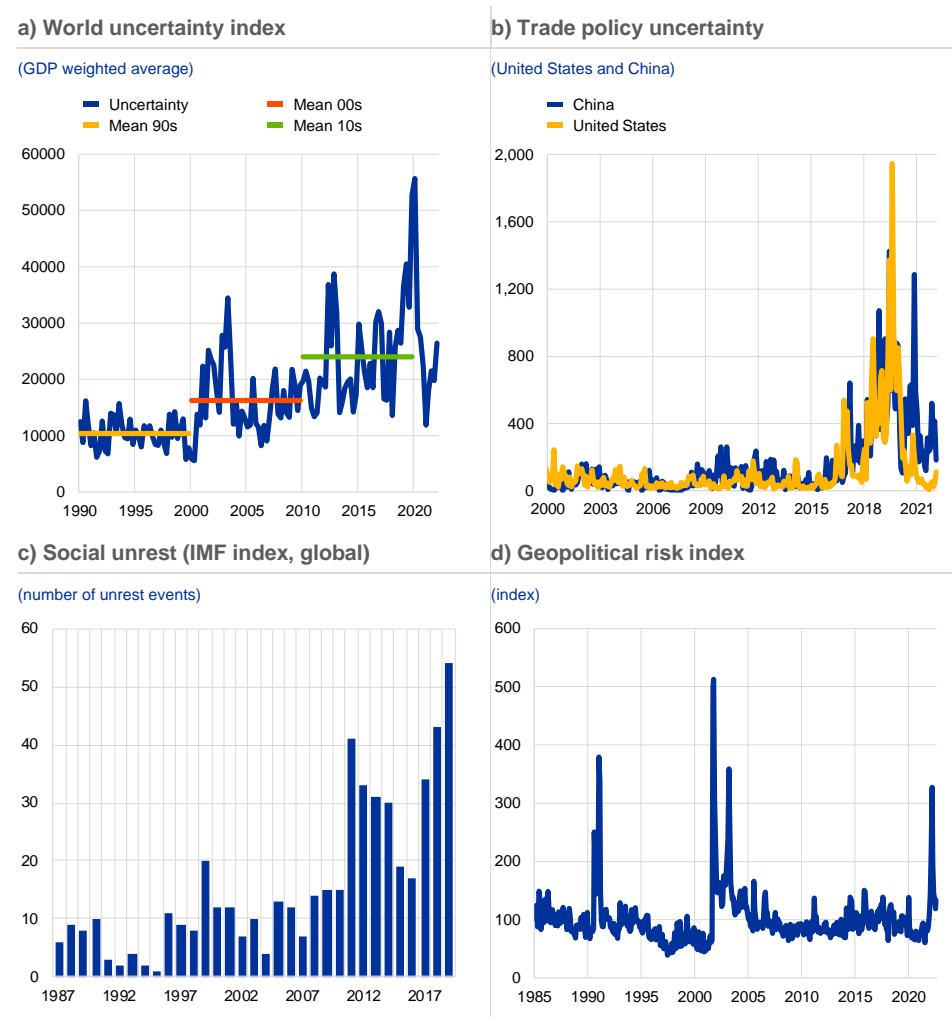
¹⁰ These developments have given rise to a new theme of “geoeconomics” which merges geopolitical and economic goals. See, for example, Schmucker (2021).

¹¹ The trade liberalisation of the 1990s was spurred on by subsiding geopolitical rivalries following the demise of the Soviet Union. As several countries started to embrace the principles of a democratic, market-based system, trade integration became a way to achieve economic convergence in per capita incomes across countries which was expected, in turn, to strengthen political convergence. However, according to some observers, persisting political divergence led to an erosion of mutual trust between countries. The perception that trade liberalisation could, overall, be a positive-sum game (even if some countries might benefit more from trade liberalisation than others) gave way to the perception that it is a zero-sum game. According to this scenario, actors became more concerned with the distribution of existing economic and political power than with creating and sharing new wealth (Felbermayr, 2020). On the shifts of global power and the economic and governance implications for Europe more generally see, for example, European Commission 2022a, Layne (2012), WZB (2021), Graaf and Lesage (2015).

dependence on Russia, given the latter's "weaponisation" of its role as the EU's main energy provider.

Chart 2

Different dimensions of geopolitical risk



Sources: International Monetary Fund and the [Economic Policy Uncertainty Index](#).

Notes: The world uncertainty index is computed by counting the percentage of the word "uncertain" or its variants in the Economist Intelligence Unit country reports, according to Ahir et al. (2022). The trade policy uncertainty index reflects the frequency of articles in newspapers that discuss economic policy uncertainty and also contain references to trade policy, following the Baker et al. (2016) methodology. The frequency of unrest events is the number of countries that report unrest events, according to Barrett et al. (2020). The geopolitical risk index of Caldara and Iacoviello (2022) uses a textual analysis of printed articles in English-language newspapers.

This is the latest episode in a series of geopolitical events leading to economic disruption. These include US-China trade and technology tensions since 2018, the US Administration's abandonment of the Iran agreement in 2018 and the United States' extraterritorial legal reach affecting EU banks in that case, China and the United States challenging the EU's sovereignty over its digital policy (e.g. 5G telecommunications and data privacy rules), China's purchase of European firms and infrastructure of key strategic importance (e.g. robotics and ports), the threat to impose sanctions on European firms following geopolitical disagreements, the war in Syria and disagreements over the migration crisis, uncertainty over the

implementation of the Iran nuclear deal, tensions over Taiwan and the geopolitics of decarbonisation.¹²

Third countries' economic policies have become less predictable, affecting an economic landscape which has been uncertain since the GFC. Geopolitical tensions and the uncertainty these induce could thus change the environment in which monetary policy operates. The EU finds itself in the middle of significant – and potentially rising – geopolitical tensions between the United States, China and Russia, with the first two competing both geopolitically and economically.¹³ These tensions come amidst the twin transitions of climate change and digitalisation, which in themselves have implications for energy and CRMs. Geopolitical tensions can have notable consequences, not only for peace and security but also for economic developments, especially in the areas of trade (including energy and key raw materials) and finance (including financial market infrastructures).¹⁴

The rising importance of geopolitical shocks has led to a debate over the trend and nature of globalisation, in particular whether the international economy is on a “de-globalisation” trend which would imply, among other things, a reduction in international trade and the reshoring or friend-shoring of GVCs.

While the marked slowdown in firms' decisions concerning the relocation abroad of a part of their production processes (offshoring) or the rise in repatriations of previously offshored activities (reshoring) suggest that a de-globalisation phase may be imminent, this view is qualified by a number of other factors.¹⁵ The levelling off of trade in goods rather hints at a “slowbalisation” phenomenon, while the continued growth of international trade in services seems to signal a continuation of globalisation trends in sectors driven by technological progress.¹⁶ It appears that for the time being there is no consistent trend towards “de-globalisation”, but instead a change in the nature of globalisation, leading to a rise in the regionalisation of trade (e.g. within the EU or between Asia-Pacific countries) and a certain slowdown in GVC participation. This changing nature of globalisation is being determined not only by public policies but also by private business initiatives and interests, which are seeking to respond to changing framework conditions arising from national and global policy changes. An overview of the globalisation debate and key stylised facts are provided in Box 2. In addition, Box 3 provides empirical evidence that the process of regionalisation of GVCs caused, for example, by geopolitical risk is still weak. The box explains that US imports of GVC-related goods from countries with similar UN voting behaviour to the United States have not outpaced GVC-related imports from countries more closely aligned with China. A difference-in-difference

¹² See [Adelphi Research](#) (2020).

¹³ This also has the potential to lead to (proxy) war(s) between the main global powers – see [Allison](#) (2017).

¹⁴ The latest developments come on top of China's rise over the past two decades as a geopolitical power, one of the world's largest economies and the second-largest trading block after the EU. Other developments include the rising economic size and geopolitical role of emerging economies more broadly and the parallel relative shrinking of the EU in terms of world GDP, trade, finance, population (growth) and technological advancement. This is even more the case for (even the biggest) individual EU Member States.

¹⁵ See [Antràs](#) (2021).

¹⁶ See [Blázquez et al.](#) (2022).

approach shows that there is only weak evidence for a shift of US GVC-import shares in recent years to US-aligned countries.

In an extreme – although for the time being hypothetical – scenario, the world could become divided along geopolitical lines, resulting in a “bad-for-all” fragmentation of the global economy into blocs. This would affect not only trade in goods and services but also the mobility of persons and the flow of technologies, innovation and ideas. According to the literature, the impact of fragmentation on trade and welfare would be considerable (see Box 4).

A narrative that questions the open-based multilateral system is also gaining traction within many advanced economies, including some in the EU, on the grounds of income and wealth inequality in certain countries. Even though there has been a steady fall in inequality worldwide (across countries) over the past three decades, inequality within countries (notably in some advanced economies) has increased markedly, as lower and middle-income individuals’ incomes have stagnated in relative terms when compared with those of the better off. In particular, inequality has increased in the euro area (although it remains well below that of the United States) after accounting for redistribution (see Chart 3). Globalisation is often seen as one of the key forces driving the rise in inequality in advanced economies, through competitive pressures exerted on low-skilled workers and their wages and the enhanced role of offshoring in advanced economies in recent decades. One problem with this narrative is that the incidence of globalisation on income inequality cannot easily be disentangled from the effects of technological progress and the fact that international experience demonstrates that countries exposed to similar degrees of trade and financial openness and technological change have shown different trends in inequality.¹⁷

The new geopolitical environment might have a direct impact on inflation trends in the euro area, the EU and around the globe and pose new challenges for key central bank policy areas such as financial stability, payment systems and banking supervision. For example, the shock of Russia’s invasion of Ukraine has contributed to the build-up of the highest short-term inflation rates in decades. Central banks and governments have acted to address these shocks and dampen their impact and will probably need to remain highly alert to such tensions going forward.¹⁸

In this context, the openness that until recently had been largely regarded as one of the uncontested strengths of the EU could, in a number of cases, turn into a source of vulnerability, amplifying the transmission of exogenous, geopolitical shocks. This is because a large portion of the euro area economy is reliant on the smooth international exchange of goods, services and capital, coupled with substantial energy and technological dependence, among other issues. In

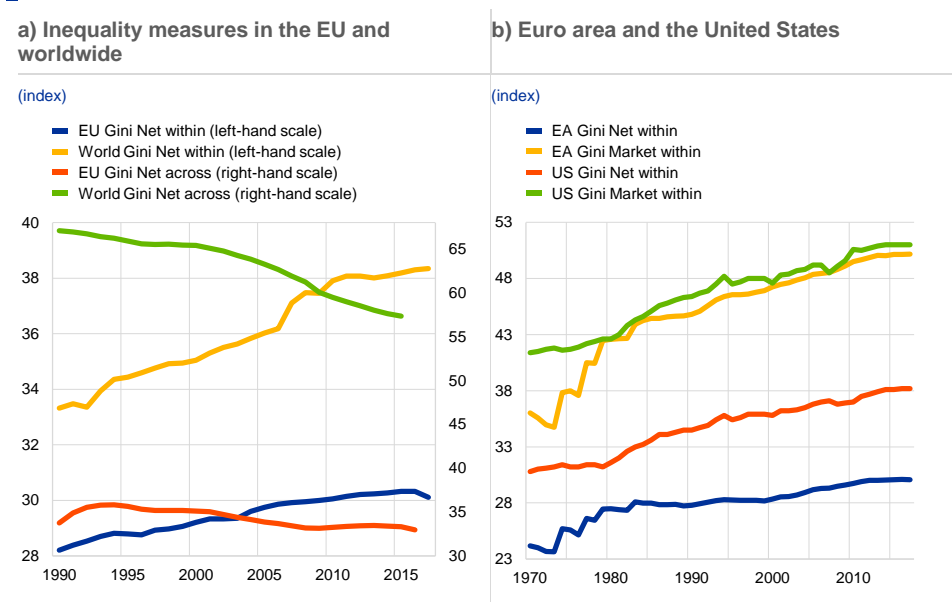
¹⁷ For additional arguments and references see Box 5 in the ECB strategy review ([Work stream on globalisation](#), 2021).

¹⁸ More broadly, although this is contested, the longer-term ebb and flow of globalisation has been presented as a key determinant of inflation dynamics ([James](#), 2022).

addition, more frequent, larger geopolitical shocks would be likely to affect different EU regions asymmetrically.

Chart 3

Trends in inequality within and across countries



Sources: Box 5 in the ECB strategy review ([Work stream on globalisation](#), 2021), Darvas (2019) and World Bank.
 Notes: The within-countries index is computed as a weighted average of country-level Gini coefficients using GDP purchasing power parity (PPP) shares as weights. The across-country Gini index is computed as explained in 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; Gini Net is post-tax. The latest observation is for 2017 (2016 for World Gini).

The concept of OSA has become increasingly relevant and now includes a debate over the EU’s ability to act autonomously while maintaining its openness. This is also relevant for the ECB. Strategic autonomy refers to the ability of a state to defend its sovereignty, pursue its interests and adopt its preferred (foreign) policies without being too dependent on foreign states or having its policies influenced or even manipulated by other foreign states. The EU’s policymakers see strategic autonomy as the Union’s “capacity to act autonomously when and where necessary and with partners wherever possible”.¹⁹ While the concept derives from (and is related to) foreign and security policy, it is linked with (increasingly in recent years) the economy and international economic relations (see Box 5).

Several policy actions have been undertaken or announced under the OSA “umbrella”. Beyond the foreign and security dimension, examples in the economic and financial sphere include the identification of CRMs, measures to strengthen energy security, the screening of inward FDI and increasing the resilience of domestic financial markets. In general, however, a significant number of initiatives are still under development (see Box 5).

In the EU, developments in the context of strategic autonomy are also related to the debate over strengthening the EU and EMU. Individual Member States might not be economically or geopolitically powerful enough to achieve desirable

¹⁹ See [Council of the European Union](#) (2016a).

elements of open autonomy by themselves in a globalised environment and some of the issues discussed previously can only be addressed through common action undertaken by all Member States. Moreover, where strategic autonomy touches on policy areas of exclusive or shared EU competence and derives from the strength and resilience of the EU/EMU economy as a whole, the policy response must come through common action undertaken in the context of the EU/EMU. Thus, beyond trade policy per se, the need for more strategic autonomy is related to several discussions and initiatives in areas such as industrial policy and state aid, as well as the need to tap the potential of the internal market in general and strengthen EMU in particular. The latter will require concrete and substantial advances in the capital markets union and the banking union and an appropriately designed, permanent fiscal capacity.²⁰ The Russian invasion of Ukraine has forced the EU to take measures with regard to energy and agricultural policies, which has further modified the EU's approach to OSA and could have a lasting effect on economic growth and inflation.

The aim of this report is to provide a first attempt to examine the direct and indirect consequences of this new environment for the ECB's monetary (and other) policies. In this environment, several features may gain prominence: (i) geopolitical shocks may become more frequent, (ii) the authorities may undertake policy actions that alter the open-economy paradigm of recent decades, (iii) the smooth functioning of EMU may be affected and, most relevant to this report (iv) the medium-term economic analysis performed by the ECB and the Eurosystem might need to incorporate new elements and analytical tools, most notably for the study of inflation dynamics, monetary policy and its transmission and the potential impact on other central bank policy areas such as financial stability and payment systems. Thus, while OSA is not a direct goal of the ESCB, it is directly relevant for the economic environment in which it operates. In some cases, it is also directly relevant for the primary mandate of the Eurosystem/ESCB, as well as for some of its key principles, such as economic openness (Article 119 of the Treaty on the Functioning of the European Union, TFEU) and its competences, such as payment systems and financial stability (Article 127 TFEU).

This report reviews euro area (and EU) exposures in the areas of trade (goods and services including digitalisation, energy and raw materials), financial flows and regulatory changes (Section 2). It looks at such exposures not only as a source of prosperity but also as a potential source of vulnerability in a world in which more frequent and ever-larger geopolitical shocks are occurring. Section 3 of the report reviews the possible trade-offs introduced by policies intending to achieve OSA against the potential cost of limiting openness based on comparative advantage or introducing domestic distortions. It also illustrates how the further strengthening of EU/EMU could be instrumental in increasing the resilience of the EU economy.

²⁰ See [Eurosystem \(2021\)](#) for the Governing Council's position. With regard to strengthening EMU in particular: "Completing Economic and Monetary Union remains essential to strengthen the euro area's shock absorption capacity. This includes the completion of the banking union and capital markets union. In addition, a permanent central fiscal capacity, if appropriately designed, could play a role in enhancing macroeconomic stabilisation and convergence in the euro area in the longer run."

Finally, Section 4 discusses the (possible) implications of the changing geopolitical environment for the macroeconomy, monetary policy and other central bank tasks.

Box 1

The challenges to the multilateral rules-based trading system

The multilateral rules-based trading system embedded in the WTO has been the cornerstone of trade integration since the Second World War.²¹ The WTO was created as a forum for negotiating and operating a global system of trade rules (defined in multilateral trade agreements) and settling trade disputes between its members. These common rules are inspired by the principles of “non-discrimination”, meaning that a country should not discriminate between its trading partners (but should give them equally “most-favoured-nation” status) and “national treatment”, meaning that it should not discriminate between its own and foreign products, services or nationals. Several rounds of trade negotiations led to a large-scale reduction of tariffs and non-tariff barriers and a strong rise in international trade, spurring globalisation.

Despite its significant achievements in reducing tariffs and non-tariff barriers (since the early 1990s average tariffs have declined considerably, from around 15% to 5%²²) the WTO has had a mixed track record in recent years as regards fulfilling its mandate. Trade negotiations on key dossiers have stalled and the Doha round launched in 2001 has not yet been formally concluded. While pursuing an ambitious agenda aimed at modernising and broadening global trade rules, the WTO’s 164 members have found it difficult to reach consensus in a number of important areas (such as fisheries subsidies and flexibility for developing countries). Moreover, the functioning of another important pillar of the WTO, namely the dispute settlement mechanism, has been impaired since 2019, given that the WTO Appellate Body is unable to review appeals because of deadlock over the appointment of new judges.²³ As a result, trade negotiations between pairs or groups of countries are increasingly being managed outside the consensus-based decision-making process of the WTO. Recent decades have seen a proliferation of regional/bilateral trade agreements (RTAs), including the Association of Southeast Asian Nations (ASEAN) and the North American Free Trade Agreement (NAFTA)/United States-Mexico-Canada Agreement (USMCA), which have increased in number from around 80 in 2000 to more than 300 in 2022.²⁴ More recently, in December 2017 a group of WTO countries decided to move towards plurilateral negotiations and launched the [Joint Statement Initiative](#) (JSI) with the aim of progressing negotiations or discussions related to issues of increasing relevance to the world trading system. The ultimate goal of the JSIs is to strengthen and reinforce the multilateral trading system. They are open to all WTO members and offer a mechanism which facilitates cooperation without all WTO members having to agree to participate.²⁵ This proliferation of regional and plurilateral initiatives reflects in part the need for deeper integration

²¹ The General Agreement on Tariffs and Trade was established in 1948 in the form of a multilateral trade agreement. In 1995 it was transformed into a fully fledged international organisation with the creation of the WTO.

²² See [European Central Bank](#) (2021a).

²³ To overcome the impasse arising from the US Administration’s stance, in March 2020 47 WTO member states, including the EU and China, created a new Multi-Party Interim Appeal Arbitration Arrangement (MPIA) as a temporary mechanism for arbitrating any WTO disputes among themselves which would otherwise be appealed to the non-functional WTO Appellate Body. The MPIA founding members are committed to resolving the impasse at the WTO Appellate Body and to ceasing operation of the MPIA as soon as the Body is functional once again.

²⁴ See [Regional trade agreements and the WTO](#).

²⁵ The JSIs are open to all WTO members and encourage as many members as possible to participate. So far, four JSIs have been launched in the following areas: e-commerce, investment facilitation for development, services domestic regulation and micro, small and medium-sized enterprises.

than that achieved by multilateral agreements so far and in part the need to overcome the impasse in the decision-making process at WTO ministerial conferences.²⁶ Nonetheless, the [12th Ministerial Conference](#) (MC12) in June 2022 marked a significant turning point as an agreement was reached in a number of important areas such as fisheries subsidies, WTO reform, pandemic preparedness, food security and e-commerce. The MC12 also reached an agreement on the prohibition of subsidies contributing to illegal, unregulated and unreported (IUU) fishing.²⁷ On WTO reform, ministers launched a process of concrete reform which included the restoration of a functioning dispute settlement system. The aim was for results to be achieved by the 13th Ministerial Conference, which is to be convened between December 2023 and March 2024.

In tandem with a move towards bilateral/plurilateral agreements, there has been an increase in protectionist/isolationist interventions in recent years, which poses an existential threat to the multilateral trading system (see Section 1). In this new environment, countries have started to demand stronger protection from unfair trading practices (*a need to establish and enforce a level playing field*) and to seek ways to reduce asymmetric dependencies in strategic sectors (*a need for security*). Faced with challenges for which the WTO's rulebook no longer appears suited, countries have started to take unilateral action aimed at achieving security in strategic sectors and securing protection against unfair trade practices.

Among the world's largest trading powers, these actions have recently led to specific initiatives such as the EU's Open Strategic Autonomy (see Box 5 in this report), the US initiative aimed at [building resilient supply chains](#) and China's [dual circulation strategy](#). In the United States, the Administration is looking into ways to improve supply chain resilience in the aftermath of the coronavirus (COVID-19) pandemic. A task force, mandated to investigate the issue, provided some recommendations focused in particular on the manufacturing of semiconductors, large capacity batteries, critical minerals and materials and pharmaceuticals and active pharmaceutical ingredients. The task force suggested a two-pronged approach. First, it stressed the importance of increased international cooperation in fostering supply chain resilience. Second, the task force recommended that the US Government play a more direct role in strengthening the United States' industrial base by making use, for example, of financial instruments such as production incentives, loans and subsidies. As for China's dual circulation strategy, its first objective is to insulate China's domestic market from the rest of the world. To this end, China aims to achieve independence in terms of natural resources and technology, which will allow it to vertically integrate its production and achieve self-reliance thanks to its huge domestic market. Its second goal is to boost external demand through open markets in the emerging world. The Belt and Road Initiative (BRI) is fully part of this goal. What these initiatives have in common is that they call for the more active use of industrial policy supported by stronger government intervention in sectors deemed strategic from a national security standpoint, including those related to climate change. An example of this type of intervention in the EU is the European Chips Act (see Box 7 in this report).

While the multilateral rules-based trading system has yielded undeniable benefits in terms of poverty reduction and improved living standards across the globe, it is now facing an existential threat. Under the current circumstances, the chances of a return to big multilateral trade deals or

²⁶ In many RTAs, negotiations go beyond tariffs to cover multiple policy areas that affect trade and investment in goods and services, including behind-the-border regulations such as competition policy, government procurement rules and intellectual property rights. These RTAs are known as "deep" agreements, in contrast to "shallow" agreements that cover tariffs and other border measures only.

²⁷ For this agreement to enter into force negotiations on the corresponding UN Sustainable Development Goal (SDG 14.6) will need to be concluded.

the full restoration of the WTO's judicial system appear remote. However, given the gains derived from globalisation so far, the international community could lose out significantly in terms of development and prosperity if it turned its back on global cooperation and dialogue as a means of finding joint solutions to the challenges facing an open international economic order. Baldwin and Grozoubinski (2022) are among those arguing in favour of infusing the WTO with renewed political support in order to rise to today's global challenges. In particular, the WTO could play an important role with regard to climate-related policies and their trade implications (e.g. the WTO could act as a forum in which countries could have transparent discussions of new and planned environmental policies impacting trade) as well as digitalisation (e.g. how to amend the existing rulebook to account for the growing relevance of international trade in services).

Box 2

Recent trends in trade globalisation

Despite the collapse in global trade flows because of the COVID-19 health crisis, international trade had returned to its pre-pandemic levels by the end of 2020. However, some analysts claim that the pandemic, and the subsequent global shocks on supply chains, might have a long-lasting impact on trade globalisation as it could lead to the relocation of firms' activities and the reorganisation of GVCs. It should be noted, nonetheless, that these trends are part of larger-scale, pre-pandemic processes encompassing the crisis of the WTO multilateral framework (see Box 1) and the slowdown in goods trade observed in the aftermath of the GFC – tendencies that generated an extensive debate over the recent evolution of trade globalisation. This box presents the main elements of this debate and illustrates the key stylised facts needed to frame it – facts that summarise the key past and present trends in international trade.²⁸

In the last decade, the debate over international trade has focused mainly on explaining the slowdown in cross-border trade activity observed in the years following the GFC. This manifested itself in the stagnation of world trade as a share of global GDP (Antrás, 2021) and in the reduction in the ratio of world imports to GDP growth (commonly referred to as “income elasticity of trade”) observed since 2012 (see IRC Trade Task Force, 2016, also Martínez-Martín, 2016). Faced with these developments, some authors claimed the world had entered a phase of de-globalisation (Van Bergeijk, 2019), as the global economy seems to be oscillating restlessly between periods of globalisation and periods of de-globalisation. According to other studies, however, the process of globalisation is simply experiencing a slowdown – hence the term “slowbalisation”²⁹ – which, far from being a purely temporary phase, could prove to be a lasting, structural phenomenon. In this respect, Antrás (2021) argues that the massive expansion of globalisation (known as the “hyperglobalisation” phase) observed since 2008 was due to the development of information and communication technology, a significant fall in effective trade costs on the back of tariff elimination and technological factors, and political forces that promoted the adoption of market economy practices in several Asian countries – forces that have lost steam in recent years, making a slowdown in trade globalisation inevitable.

The stylised facts that can be observed in the data show that establishing the trajectory of trade globalisation since the GFC is a complex exercise, the results of which ultimately depend on the

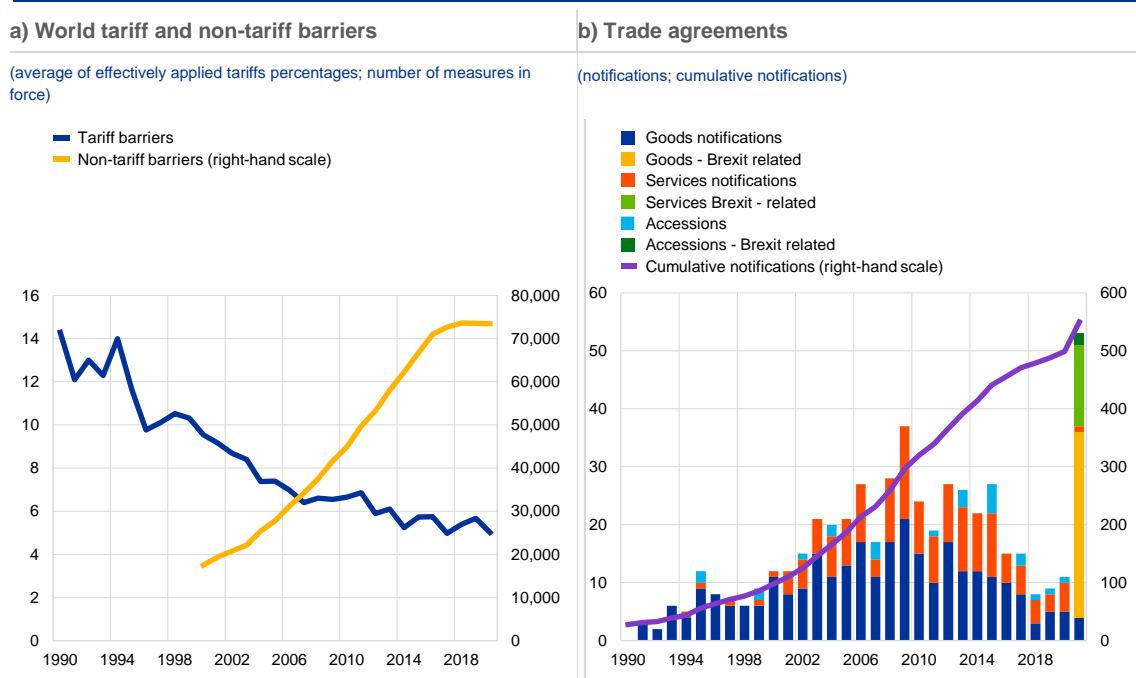
²⁸ The box is based on the analysis in [Kataryniuk et al. \(2021\)](#).

²⁹ See, among others, [The Economist \(2019\)](#) and [Irwin \(2020\)](#).

aggregate under consideration. By way of example, the marked slowdown in firms' decisions concerning the relocation abroad of part of their production processes (commonly referred to as "offshoring") that was observed in the last decade, as well as the numerous cases of repatriations of previously offshored activities in the years that preceded the COVID-19 pandemic (a phenomenon known as "reshoring"), suggest that a de-globalisation phase may be underway.³⁰ On the other hand, the levelling off of trade in goods hints more at a "slowbalisation" phenomenon. The continued growth of international trade in services, for its part, seems to signal a continuation of pre-GFC globalisation trajectories. All in all, the data hint at the increased complexity of international trade relations, further supported by higher fragmentation caused by US-China trade tensions and the Brexit process, coupled with a rebound of regionalisation in key areas.

Chart A

The evolution of trade-related policy measures



Sources: World Bank, UNCTAD and WTO.

Notes: Effectively applied tariffs are defined as the lower of preferential tariffs and "most-favoured-nation" tariffs.

In particular, a first stylised observation is that post-GFC trade policy measures provide a mixed picture of the trajectory of trade globalisation. In the years that followed the GFC, the decrease in tariff barriers (measured as the simple average of effectively applied tariffs) slowed, which was further complicated by the US-China trade war (see Chart A, panel a).³¹ At the same time, non-tariff

³⁰ The pandemic itself, on the other hand, does not seem to have spurred a massive wave of reshoring, although survey evidence suggests that in some sectors the repatriation of previously offshored production processes may constitute a tangible risk in the years to come. See Section 3.2.1 for a thorough discussion of the impact of the COVID-19 crisis on firms' reshoring decisions.

³¹ Effectively applied tariffs are defined as the lower of preferential tariffs and "most-favoured-nation" tariffs. The series does not include the tariffs imposed as a consequence of the trade tensions between the United States and other countries, which have emerged since 2018.

barriers increased markedly.³² Restrictions on international trade in services, for their part, did not lessen significantly in the medium term (Kataryniuk et al., 2021), although 2021 data signal that there was some loosening of regulatory barriers in certain sectors.³³ The number of trade agreements in force increased steadily after the GFC. Still, in recent years there has been a slowdown in the number of new trade agreements notified. This deceleration could in part be related to the increased complexity of trade treaties, which recently have typically started to incorporate sophisticated clauses covering investment, labour and environmental issues (“deep agreements”), necessarily resulting in longer times needed for the agreements themselves to be concluded and approved. It should be noted that the peak in new agreements observed in 2021 was mostly due to Brexit, which led to a proliferation of bilateral treaties between the United Kingdom and third countries, hinting at the increasing fragmentation and complexity of international trade relations (see Chart A, panel b).

A second observation concerns the diverging growth of trade in goods and services. The levelling off of trade flows recorded after the GFC is associated with lower trade openness, as measured by the sum of imports and exports relative to GDP. This pattern is mostly related to openness in goods trade, which tended to decline due to several factors such as the rebalancing of the Chinese economy, the slowdown in global investment and the absence of any marked liberalisation initiatives (see Chart B, panel a). By contrast, services trade as a share of GDP continued to increase after the GFC, boosted by technological advances – a trend that has been led, crucially, by EU countries.³⁴ As the chart shows, these medium-term dynamics have been temporarily overturned in the context of the pandemic. While the contraction in goods trade was relatively contained during the COVID-19 crisis and the recovery relatively fast, service trade was much more deeply affected by pandemic-related restrictions and struggled to recover to its pre-crisis levels.

³² Some of these measures, such as sanitary and phytosanitary measures, are typically used as standard-setting provisions and may end up having a neutral or even positive impact on trade flows, although this impact is found to be widely heterogeneous across products and partner countries. Other types of non-tariff measures such as quantity and price controls, export restrictions and contingent trade-protective measures, have traditionally been used as instruments of commercial policy and have been found to have an adverse impact on trade flows. See, among others, [Beghin and Li \(2012\)](#) and [Conesa and Timini \(2019\)](#).

³³ See [OECD \(2022\)](#).

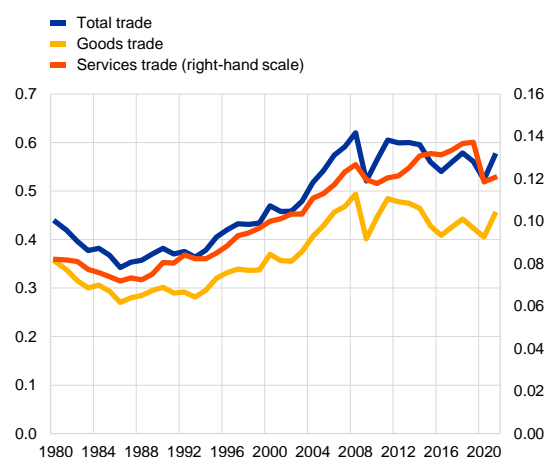
³⁴ See [Kataryniuk et al. \(2021\)](#).

Chart B

Trajectory of world trade and GVC-related trade

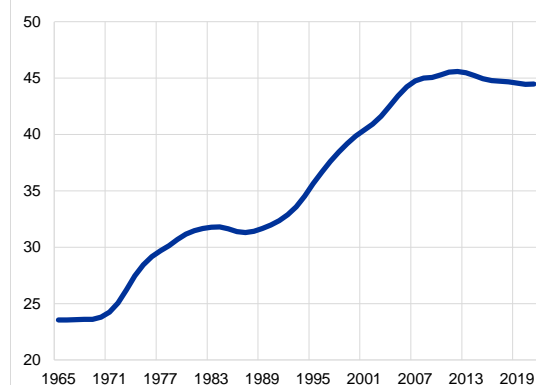
a) World trade openness

(sum of imports and exports related to GDP)



b) GVC-related trade

(share of total trade, percentages)



Sources: World Bank and own elaboration based on the Long-run World Input-Output Database (WIOD), OECD (Trade in Value Added) and Trade Data Monitor.

Notes: GVC-related trade is measured as the value of goods crossing more than one border as a share of total goods trade, as defined in Borin et al. (2022b).

A third observation relates to the recent rise in regionalisation. In the EU28 (i.e. the EU in its pre-Brexit composition) and among NAFTA countries, the internal share of trade in goods and services was on a declining trend in the early 2000's but started to increase in the post-GFC period (see Chart C, panel a). This is consistent with the finding that the EU has been increasingly sourcing value-added from within the region in recent years (Bontadini et al., 2022). In other highly-integrated areas, like the countries of the Asia-Pacific region that recently agreed the Regional Comprehensive Economic Partnership (RCEP) trade treaty,³⁵ the regionalisation of goods trade was on an increasing trend even before the GFC. Focusing on European economies, the level of regionalisation, as measured by the internal share of trade, is higher among EU28 countries than within the euro area (see Chart C, panel b). As shown by Kataryniuk et al. (2021), the post-GFC increase in regional integration among EU countries seems to be related to a strengthening of trade linkages between euro area economies and other EU countries outside the euro area, while EU27 integration with the United Kingdom, by contrast, has been diminishing both on the goods and the services side, a trend that has accelerated since the Brexit referendum of 2016.

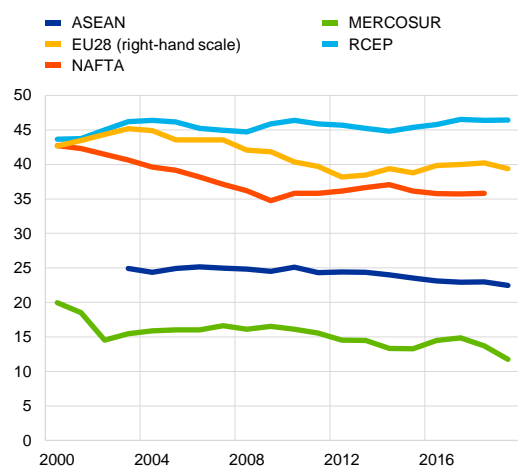
³⁵ The countries were Australia, Brunei, China, Indonesia, Japan, Korea, Laos, Malaysia, Myanmar, New Zealand, the Philippines, Singapore, Thailand and Vietnam.

Chart C

Regionalisation of trade linkages

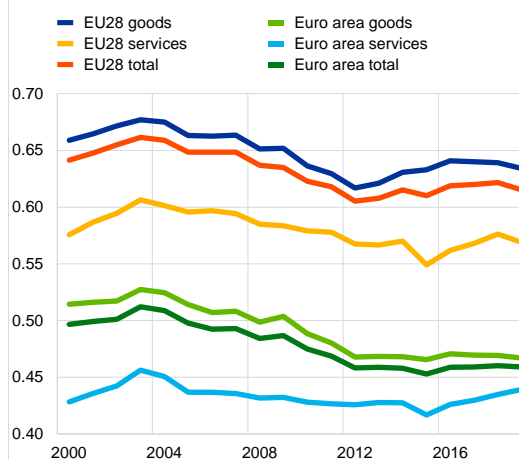
a) Evolution of internal trade

(percentage of total trade)



b) Regionalisation in the euro area and the EU

(internal trade/total trade)



Sources: Eurostat, ASEANStatsDataPortal, IMF and WTO.

Notes: In panel a, NAFTA and the EU28 include the trade of goods and services – other blocs only goods trade. ASEAN: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam; NAFTA: US, Canada, Mexico; MERCOSUR: Argentina, Brazil, Paraguay, Uruguay; RCEP: ASEAN + Australia, China, Japan, Korea, New Zealand; Euro area refers to the 19 economies currently integrated in the bloc.

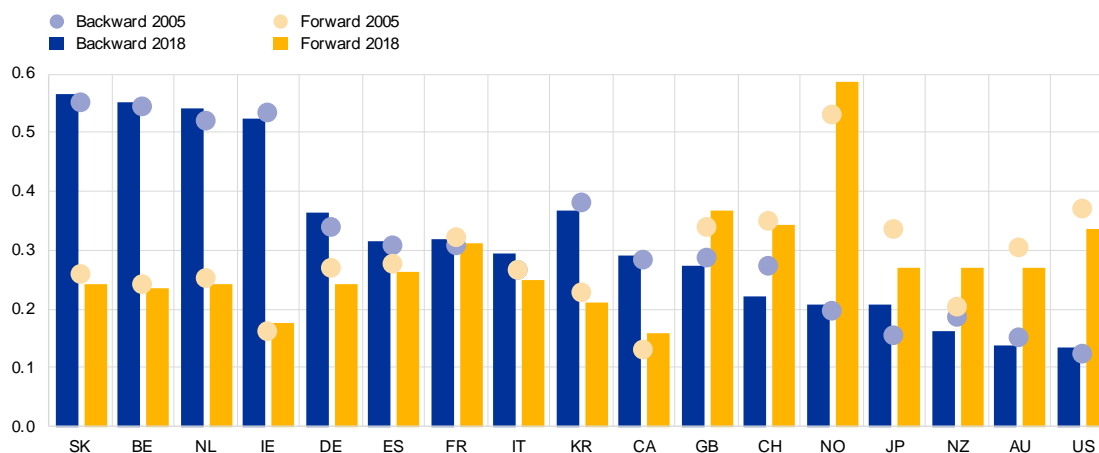
Another stylised fact concerns the slowdown in GVC fragmentation. After the GFC the fragmentation of GVCs levelled off as GVC-related trade, after having bounced back in the aftermath of the crisis, remained practically unchanged (see Chart B, panel b). Nonetheless, some significant differences emerged between the integration in global production processes of advanced and emerging economies. As Chart D shows, advanced economies' GVC participation in 2018 was almost unchanged on its 2005 level, including in the most important European economies such as Germany, Spain, France and Italy. By contrast, some developing countries have undergone significant modifications in their GVC participation since the mid-2000s. Indeed, China experienced a large reduction in the share of foreign value-added embodied in its gross exports (an index of “backward” value chain participation), balanced by a rise in the domestic value-added embedded in foreign exports (proxying “forward” value chain participation), signalling a shift in the country's position in the global production chain. Backward integration also diminished in other Asian countries such as Malaysia, Thailand and the Philippines.

Chart D

GVC participation

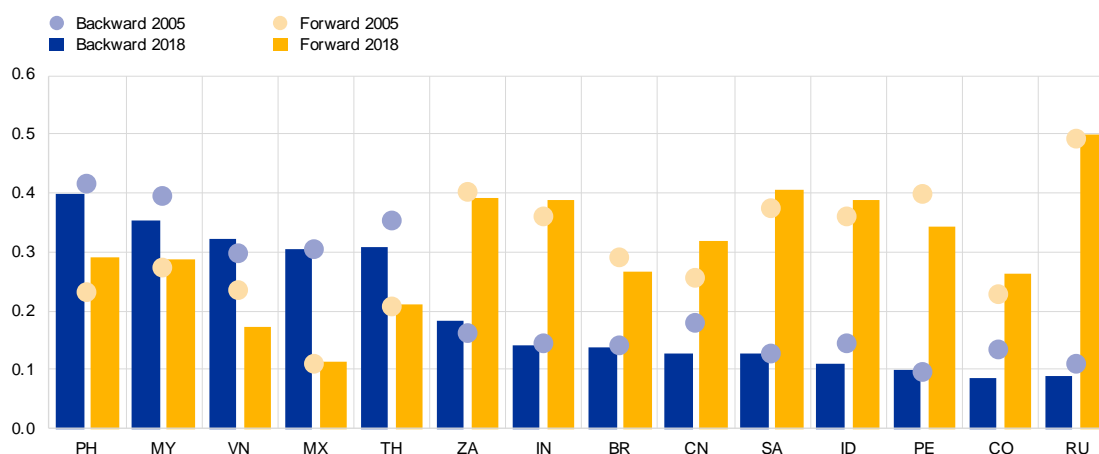
a) Selected advanced economies

(backward participation: foreign value-added in gross domestic exports/gross domestic exports; forward participation: domestic value-added in gross foreign exports/gross domestic exports)



b) Selected emerging economies

(backward participation: foreign value-added in gross domestic exports/gross domestic exports; forward participation: domestic value-added in gross foreign exports/gross domestic exports)



Source: UNCTAD.

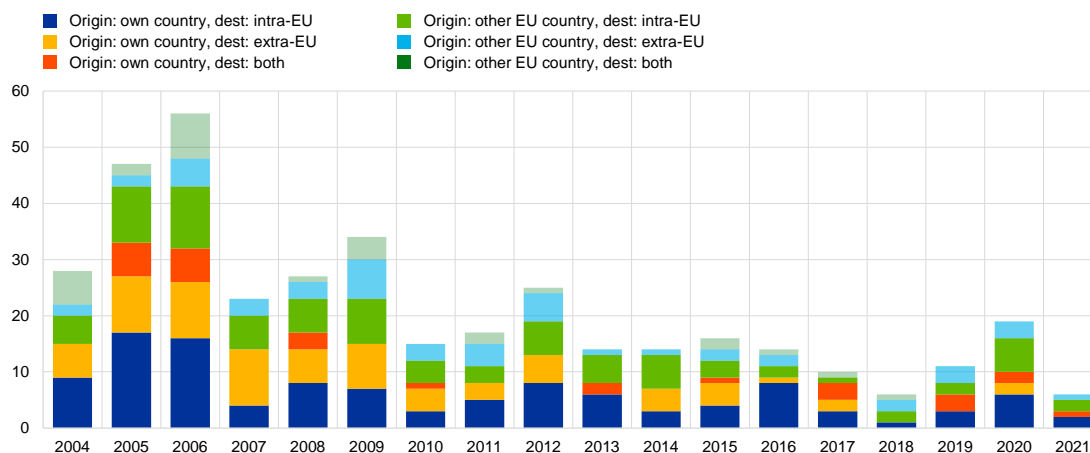
Notes: AU=Australia, BR=Brazil, CA=Canada, CH=China, CN=Canada, CO=Colombia, GB=United Kingdom, ID=Indonesia, IN=India, JP=Japan, KR=Korea, MX=Mexico, MY=Malaysia, NO=Norway, NZ=New Zealand, PE=Peru, PH=Philippines, RU=Russia, SA=Saudi Arabia, TH=Thailand, US=United States, VN=Vietnam, ZA=South Africa.

Chart E

Offshoring and relocation out of EU countries

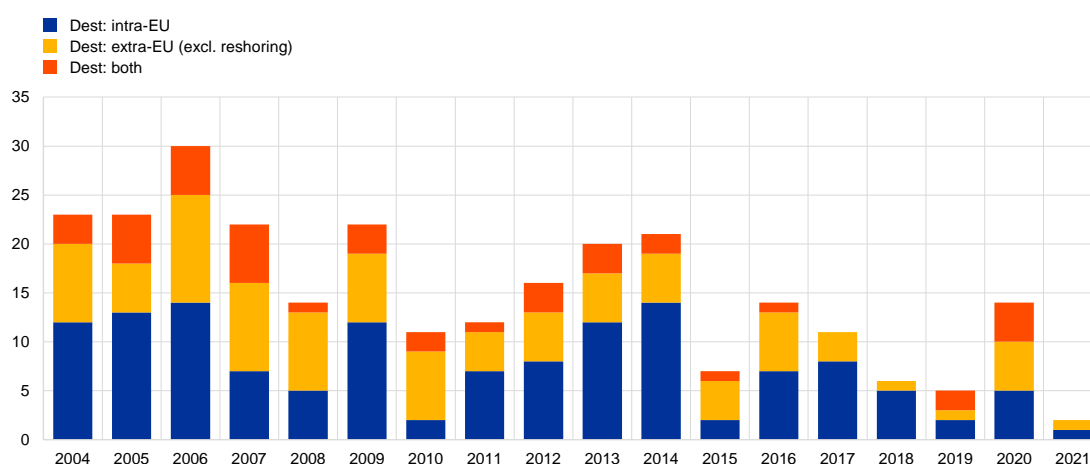
a) Offshoring of EU firms

(number of cases)



b) Relocation of non-EU firms out of EU countries

(number of cases)



Sources: Banco de España based on the European Restructuring Monitor.

Notes: In panel a, offshoring denotes the relocation of part of the production process to a new country, excluding the country of origin of the firm. In panel b, data reflect the relocation of part of the production process to a new country, excluding the country of origin of the firm. Data include only relocation decisions originating in an EU country. EU refers to the EU27, i.e. the EU in its current composition. Intra (extra)-EU denotes a relocation decision whose destination is exclusively an intra (extra)-EU country. "Europe" and "Eastern Europe" destinations, in the terminology used in the European Restructuring Monitor, are considered to be intra-EU. Relocation decisions whose destination is not specified are not included.

A final observation relates to the reduction in firms' offshoring decisions, namely the decision to relocate part of the production process to a foreign country. The slowdown in GVC fragmentation entailed a reduction in the offshoring of production, as evidenced by the decrease in the number of European firms that resorted to offshoring to both EU and non-EU destinations (see Chart E, panel a). In contrast to the offshoring decisions taken by EU firms, relocation of part of the production process out of EU countries on behalf of non-EU companies has only tended to decrease since 2014 (see Chart E, panel b). At the same time, reshoring, namely the decision to relocate back home a production process that had previously been moved to a foreign country, became a

significant phenomenon. Among European firms, between 2016 and 2018 nearly 100 cases of reshoring from extra-EU countries were reported, along with 90 from other EU economies.³⁶

Box 3

Are there any signs of the “friend-shoring” of GVCs?

The trade war between the United States and China, Brexit, the COVID-19 pandemic and the Russian war against Ukraine have highlighted the fragility of GVCs. In many countries these events have triggered a political push towards the “friend-shoring” of GVCs. “Friend-shoring” here refers to a trade strategy whereby a country seeks to reduce geopolitical risk in trade exposures by orienting its trade relationships towards countries with which it has close political alignment (see Section 1 and Box 2).³⁷

On the basis of monthly real US imports of GVC-related goods at the (Harmonised System) HS-6 digit level,³⁸ Niemann (2022) shows that **US GVC-related import data³⁹ do not reveal clear evidence that “friend-shoring” has actually taken place in recent years.** In his empirical exercises based on countries’ votes at the United Nations General Assembly, Niemann distinguishes between a block of countries that display a higher level of foreign-policy similarity to the United States than they do to China (e.g. Canada, the EU countries, Australia, Japan and South Korea) and a second block that is closely aligned with China.⁴⁰

According to Niemann’s paper, overall, after the start of the US-China trade war, US GVC-related imports from US-aligned countries did not grow faster than those from countries in the China block (see Chart A, panel a). They fared somewhat better in 2019, and in the first months of 2020 they did not fall by as much as GVC-related imports from the China block. However, the latter episode was related to the closure of the Chinese economy because of the spread of COVID-19. When China’s economy reopened and other countries were in lockdown, GVC-related imports from the China block quickly caught up with those from US-aligned countries.

When pandemic-specific effects are controlled for, there is still no clear evidence in support of the “friend-shoring” of US GVC-related imports. Niemann (2022) shows this by using a difference-in-difference approach on a panel of imports of GVC-goods. In his regression framework, the time-varying effect of political alignment with the United States on GVC-related imports is captured by a

³⁶ According to data from the [European Reshoring Monitor](#).

³⁷ The term has been promoted by [Yellen \(2022\)](#).

³⁸ The data source for nominal imports is the Trade Data Monitor. The sub-indices for US import prices provided by the Bureau of Labour Statistics match the HS-good classification at a fine-grained level, allowing for the construction of real US imports.

³⁹ GVC-related goods refer here to processed and specific goods for intermediate consumption according to the United Nations’ 2018 Broad Economic Categories Commission. These goods account for roughly 20% of overall US goods imports.

⁴⁰ [Niemann \(2022\)](#) reports UN General Assembly votes in the year 2015 as listed in the Foreign Policy Similarity Database ([Häge, 2017](#)). The calculation procedure for foreign policy similarity indices is described in [Bekkers and Góes \(2022\)](#).

dummy for countries in the US block, which is interacted with time dummies. At the same time, the regression controls for pandemic-related workplace closures in source countries.⁴¹

According to the estimation there were no significant trends for “friend-shoring” prior to the trade war between the United States and China. The coefficients for the effect of policy alignment with the United States are largely not significant at the 5% level (see Chart A, panel b). After 2019, the number of significantly positive “friend-shoring” coefficients increases, although it still does not show any clear trend. The evidence in support of “friend-shoring” is even weaker if NAFTA membership or the use of English as an official or spoken language are used instead as a criterion for demonstrating closeness with the United States. The findings also hold if pandemic-related goods are excluded from GVC-goods or if the classification of the IMF (2022) is used. When the analysis zooms in on exposed goods with a high Chinese market share, a high concentration on a few source countries or a low trade elasticity (Fontagné et al., 2022), the estimated size of the “friend-shoring” coefficient increases on average, albeit with higher statistical uncertainty and again without showing any clear trend.

The absence of any clear evidence for the “friend-shoring” of US GVCs, despite the recent large global shocks, suggests that a reorganisation of GVCs would be costly or time-consuming. The weaker growth in the average number of source countries of GVC-goods compared with those of final goods, as found by Niemann (2022), corroborates the notion that GVC-related trade relationships are more difficult to build.⁴² This is also reflected by various firm surveys (e.g. Allianz Research, 2020; Di Stefano et al., 2021; McKinsey, 2021). However, if geopolitical tensions proved to be persistent, the momentum for “friend-shoring” might gain traction.

⁴¹ More specifically, the panel regression specification reads as:

$$y_{ijt} = \alpha + \gamma_b \cdot 1(\text{USBlock}_i) + \gamma_t \cdot 1(\text{Month}_t) + \beta_t(1(\text{Month}_t) \cdot 1(\text{USBlock}_i)) + \gamma_j + \delta \cdot \text{Covid}_{i,t} + \varepsilon_{i,j,t}$$
where y_{ijt} is a logarithmic time series of US imports of the GVC-related good j from country i at time t . $1(\text{USBlock}_i)$ is a dummy that controls for systematic differences between import volumes of both country blocks. $1(\text{Month}_t)$ is a vector of time dummies for each month over the sample from January 2017 to June 2022 that controls for common developments relative to the base period January 2018. The coefficients β_t measure the time-varying effect of political alignment with the United States on GVC-related US imports. γ_j are good-fixed effects and $\text{Covid}_{i,t}$ controls for current value and three lags of the Oxford COVID-19 Government Response Tracker’s index for workplace closures in trade partner countries (Angrist et al., 2021). Import data and import price deflators are sourced from the Trade Data Monitor and the Bureau of Labor Statistics.

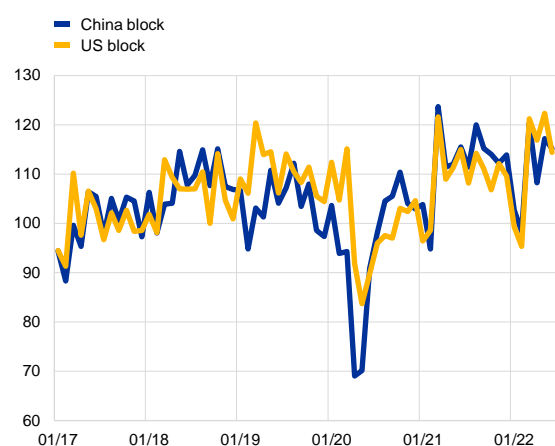
⁴² Section 3.2. discusses further reasons for a slow re-organisation of GVCs as well as signs of an increasing effort by firms to improve supply chain resilience.

Chart A

Effect of “friend-shoring” on GVC-related imports to the United States

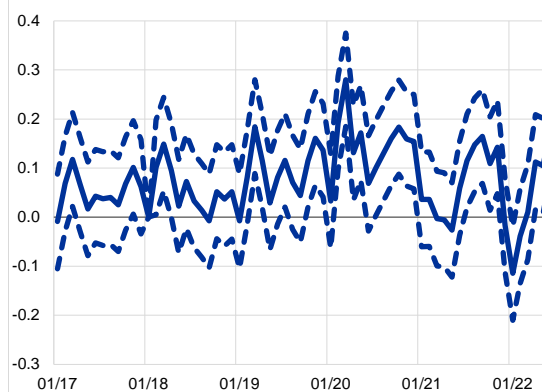
a) US GVC-related import volumes from countries with foreign policies aligned with the United States and from countries aligned with China

(2017=100, monthly data)



b) Regression coefficients for friend-shoring effect

(time-varying coefficient measuring the differential effect of political alignment with the United States on GVC-related US imports)



Sources: Trade Data Monitor, Bureau of Labour Statistics, Häge (2017), Hale et al. (2021) and own calculations.

Notes: In panel a, real imports of GVC-related goods to the United States are from countries with a closer foreign-policy alignment with the United States and from countries with a closer foreign-policy alignment with China, based on their votes in the United Nations General Assembly in 2015. GVC-related goods are processed and specific goods are processed for intermediate consumption according to the Broad Economic Categories (UN, 2018) and are observed at the HS-6 good level. In panel b, the chart shows coefficients of a regression of pre-trade war-adjusted imports of a panel of GVC-related HS-6 goods i from US trade partners j on a dummy for countries which are more closely aligned with the United States, which is interacted with a time-dummy. Dotted lines represent the 90% confidence interval. The sample starts in January 2017 and ends in June 2022. The regression controls for workplace closures (Oxford COVID-19 Government Response Tracker, Hale et al., 2021) and includes fixed effects for months and HS-6 good categories.

Box 4

The impact of geopolitical fragmentation on global trade

The increasing role of geopolitical tensions poses a significant risk for global trade and has the potential to generate trade policy restrictions (see Section 1). What is the possible economic impact of increases in trade restrictions along geopolitical borders?

In a recent paper, Campos et al. (2023) use a general equilibrium trade model to examine how the fragmentation of the world into trade blocs along political borders would affect global trade flows. Bloc boundaries are defined according to how countries voted on the 9 April 2021 United Nations General Assembly resolution concerning the suspension of the membership rights of the Russian Federation in the Human Rights Council. Countries are part of a western, eastern or neutral bloc, depending on whether they voted with Russia, against Russia or abstained. Trade policy relations between geopolitical blocs are assumed to have returned to levels similar to those during the Cold War era. The increase in trade costs is modelled by estimating the impact of a measure of aggregate trade restrictions covering both tariff and non-tariff measures (“MATR”, Estefanía-Flores et al., 2022) on bilateral trade flows using a theory-consistent structural gravity model and assuming that trade costs rise as if MATR had returned to its highest country-specific historical levels for trade between the western and eastern blocs.

The trade and welfare effects of trade fragmentation are sizeable. It is estimated that exports from the eastern bloc to the western bloc fall by almost 20% and exports from the western bloc to the eastern bloc by roughly 27%. The neutral bloc benefits by attracting some of the trade volume reduction between the opposing blocs due to trade diversion. It is predicted that it would increase its

exports to the eastern bloc by 3% and its imports from the western bloc by 1%. A typical country in the eastern bloc suffers a larger GDP drop than a typical western country.

The aggregate numbers mask heterogeneity at the country level. In general, countries that are more open are more affected by any fragmentation between blocs, as are countries with strong trade relationships with countries belonging to the opposing bloc, as illustrated in Figure A. Losses experienced by countries in the EU are mitigated, however, by the fact that most of their trade is with EU partners (53% of EU world merchandise trade) or with other western bloc economies (trade with the United States, the United Kingdom and EFTA countries alone corresponds to 15% of EU world merchandise trade). Trade flows with the western bloc are predicted to increase for all countries in the EU.

Some countries could gain from trade fragmentation. It is predicted that a small number of countries in South-East Asia and in Africa would be better off in a fragmented world, as they would increase their trade with countries in the two opposing blocs. This is because the increase in trade costs between the eastern and western blocs makes goods produced in the neutral bloc relatively cheap. This happens primarily when countries step into the void left by western countries which have reduced their trade relations with China. The trade gains are small, however, in relation to the losses experienced by countries affected by trade fragmentation and might be erased in scenarios of deeper trade fragmentation in which the trade flows of neutral countries are also affected.

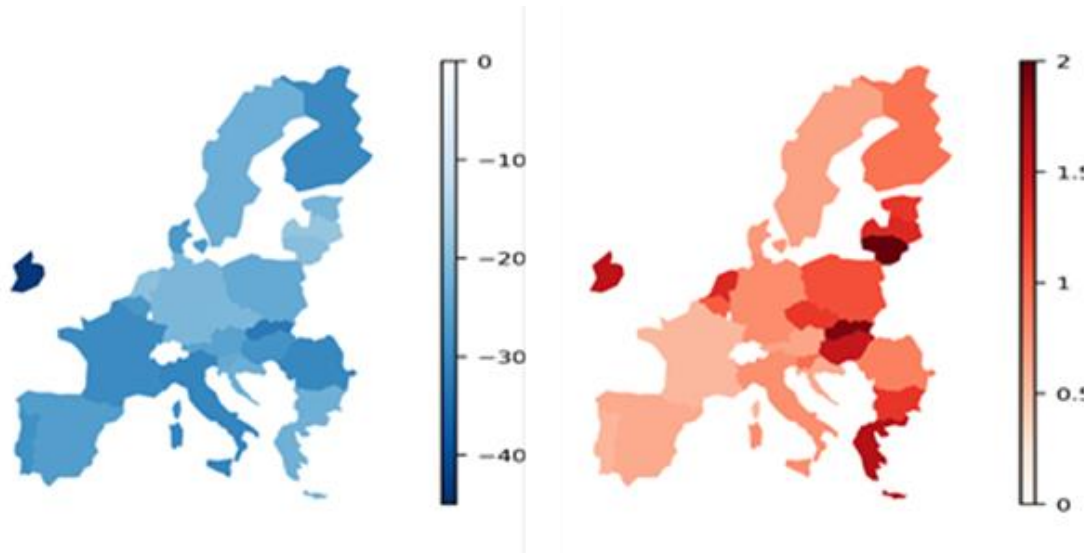
The estimates discussed in this box can be interpreted as a conservative bound. The model used in the simulations only considers the trade channel and does not take into account any effects stemming from the existence of multiple sectors in the economy and their interconnections, GVCs, financial linkages or any dynamic effects, such as – for example – the impact of fragmentation on investment or productivity. Results are therefore likely to err on the side of caution. Moreover, the trade model computes the difference between two equilibria, with no transition costs, and impacts are interpretable as long term effects. Finally, the exact definition of geopolitical borders and the size of the increase in trade costs are uncertain.

Figure A

Change in EU27 trade flows in a trade fragmentation scenario

Trade with the western bloc (left-hand map) and trade with the eastern bloc (right-hand map)

(percentage points)



Source: Based on results reported in Campos et al. (2023).

Notes: The chart shows the predicted change of trade flows (calculated as the weighted average growth rate of imports and exports) over the long term. The map on the right shows the decrease in trade flows between individual EU27 countries and the group of countries of the eastern bloc. The map on the left shows the increase of trade flows between individual EU27 countries and the group of countries in the western bloc. The appendix in Campos et al. (2023) contains detailed figures for all countries.

Box 5

OSA: concept and EU legislative actions

The concept of “strategic autonomy” was explicitly mentioned in the European Council (EUCO) conclusions of December 2013, in the context of the first thematic debate on defence held after the entry into force of the Lisbon Treaty (2009).⁴³ Leaders affirmed the need for a more integrated defence, technological and industrial base in order to develop and sustain European defence capabilities. This would enhance the strategic autonomy of the EU and its ability to act with partners.⁴⁴

Strategic autonomy became a key part of the [European Union Global Strategy \(EUGS\)](#) adopted at the EUCO meeting on 28 June 2016, featuring a wider, integrated and open perspective, which included elements of hard power⁴⁵ and soft power.⁴⁶ The EUGS identified five priorities for external action by the EU: strengthening security and defence, investing in the resilience of the states and societies in the east and south of the EU, developing an integrated approach to conflicts and crises,

⁴³ Although the term “open strategic autonomy” has become increasingly familiar in recent years, it has actually been a feature of European economic integration from the start. In fact, several of the first European treaties and common policies of the post-war period, such as the European Coal and Steel Community, Euratom and the Common Agricultural Policy (CAP), contained distinct elements of strategic autonomy.

⁴⁴ See [Council of the European Union \(2013\)](#).

⁴⁵ Such as the improvement of defence capabilities, which led to the setting up of the European Defence Fund, see [European Commission \(2018a\)](#).

⁴⁶ Such as job opportunities, inclusive societies, human rights or the resilience of states and societies, among others.

promoting and supporting cooperative regional orders, and reinforcing global governance based on international law.⁴⁷

The conclusions of the [Council of Ministers in November 2016](#) provided the EU's first concrete – and perhaps only – official definition of strategic autonomy so far, stated as its “capacity to act autonomously when and where necessary and with partners wherever possible” (see also Figure A).⁴⁸ Although implicitly present in earlier economic documents but up to then essentially referring to a common European defence culture and values⁴⁹, the term “open strategic autonomy” appeared explicitly in the European Commission Communication on the proposal for the Next Generation EU (NGEU) programme in May 2020.⁵⁰ The EU Council of Ministers of 16 November 2020 reaffirmed the importance of achieving strategic autonomy while preserving an open economy in the most sensitive industrial ecosystems and in other specific areas.⁵¹ On 19 January 2021, the Commission published a Communication with the aim of asserting an increasingly leading role in global financial and economic governance. The Commission is committed to strengthening the EU internally by further reinforcing the Single Market and completing the banking union and the capital markets union, and by proposing steps aimed at strengthening the international role of the euro, enhancing efficiency and ensuring the resilience of EU financial market infrastructures and payment solutions, as well as improving the EU sanctions framework and the EU's resilience when faced by unjustified unilateral extraterritorial sanctions imposed by third parties.

The EC revised its state aid framework in response to the COVID-19 crisis⁵² and, more recently, to the Russian invasion of Ukraine,⁵³ in order to support the EU's economy while ensuring a level playing field. The European Parliament and the Council adopted a regulation establishing a framework for the screening of FDI into the EU on the grounds of security and public order.⁵⁴ The Commission revised its trade policy in 2021 to support the EU's open strategic autonomy.⁵⁵ The EU also revised its industrial strategy in two Commission communications in 2020 and 2021 respectively,⁵⁶ to further support the twin green and digital transitions. With regard to the latter, on the topic of digital sovereignty, the Commission also proposed a Chips Act⁵⁷ and a comprehensive set of measures to ensure the EU's security of supply, resilience and technological leadership in semiconductor technologies and applications. Finally, in the digital domain, the EC presented a proposal for a regulation covering the Single Market for digital services⁵⁸ as well as a proposal for a

⁴⁷ See [European External Action Service](#) (2016), and [Council of the European Union](#) (2016b).

⁴⁸ Strategic autonomy became a key concept for the European Commission in 2019 when Commission President von der Leyen stated her intention to set up a “geopolitical commission” (see [Blockmans](#), 2020). For further development of the term see [Lippert et al.](#) (2019), [Van den Abeele](#) (2021) and [Anghel et al.](#) (2020).

⁴⁹ See [Macron](#) (2017) and [Michel](#) (2020).

⁵⁰ See [European Commission](#) (2020a).

⁵¹ Such as health, defence industry, space, digital, energy and critical raw materials. See [Council of the European Union](#) (2020).

⁵² Successive amendments to the state aid framework can be found on the European Commission's web page on competition policy. The latest consolidated version can be found in [European Commission](#) (2021a).

⁵³ See [European Commission](#) (2022b).

⁵⁴ See [European Parliament and Council](#) (2019). The current, consolidated version can be found here.

⁵⁵ See [European Commission](#) (2021b).

⁵⁶ See [European Commission](#) (2020b) and [European Commission](#) (2021c). The EU's revised and updated industrial policy aims to provide further impetus to the twin energy and digital transitions, supporting the relevant GVCs and the industrial ecosystems, and to diversify supply chains.

⁵⁷ See [European Commission](#) (2022c).

⁵⁸ Also known as the Digital Services Act (see [European Commission](#), 2020c).

regulation on contestable and fair markets in the digital sector,⁵⁹ with the aim of creating a safer digital space protecting the fundamental rights of all users of these services and of establishing fair and equal conditions to promote innovation, growth and competitiveness in the Single Market and the global arena. These proposals were adopted in 2022 and enter into force in 2023.⁶⁰

The term “open” in OSA is intended to indicate that OSA should not be understood as an attempt by the EU to turn towards protectionism in pursuit of strategic autonomy. At the same time, autonomy may necessitate less reliance on and/or exposure to the global economy. This balancing of openness and autonomy, especially over longer periods of time and in an environment of geopolitical uncertainty, may lead to differences in policy choices. Against this background, the term “OSA” remains an “essentially contested concept” (Council of the European Union, 2021), mainly due to the different national and historical appreciations of sovereignty in a European context.⁶¹ At the same time, recent events have triggered some convergence in key aspects of the sets of policies requiring agreement among EU Member States. The policy perspective tensions entailed within the term “OSA” seem to point towards an intention to enhance resilience while maintaining an open, multilateral perspective which may require both building up self-reliance and increasing diversification. This needed balance derives from the fact that the EU has been characterised, since its inception, by openness, especially with regard to trade and finance, and draws much of its strength, prosperity and success from this openness. In addition, the EU also aspires to project its global influence as a standard-setter in areas such as climate change or human, social and labour rights, often using instruments such as trade and investment agreements as a vehicle for ensuring the commitment of partners. However, the flipside of the EU’s openness is its potential exposure to external (geopolitical) shocks which arise from sources including the non-compliance of some countries with the international, rules-based world order (see Anghel et al., 2020).

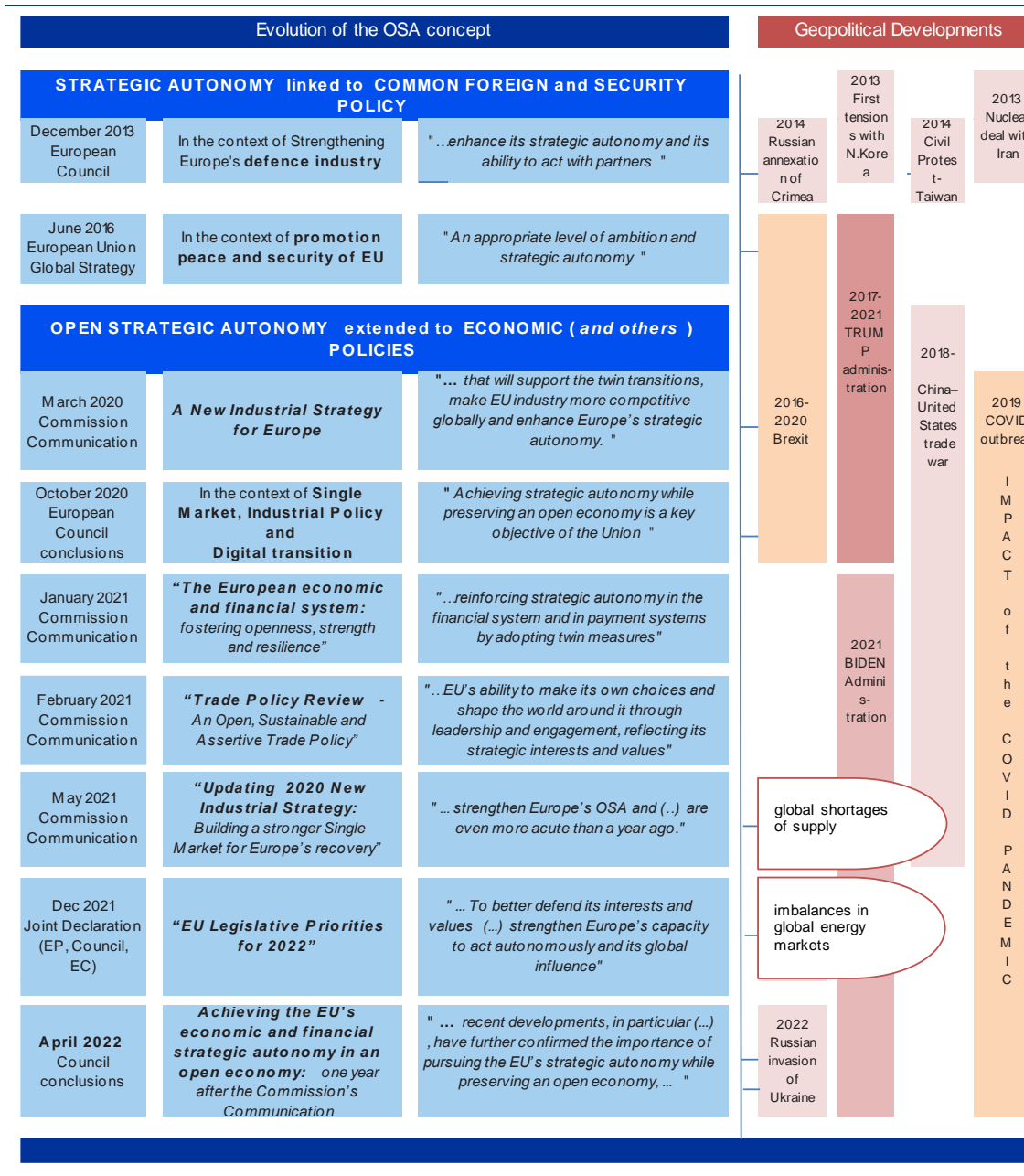
⁵⁹ Also known as Digital Markets Act (see [European Commission, 2020d](#)).

⁶⁰ [Regulation \(EU\) 2022/2065 \(Digital Services Act\)](#) and [Regulation \(EU\) 2022/1925 \(Digital Markets Act\)](#).

⁶¹ See [Van den Abeele \(2021\)](#).

Figure A

Geopolitical events and the evolution of the EU's OSA concept to date⁶²



⁶² The COVID-19 pandemic is included as a "geopolitical development" insofar as it had a geopolitical dimension that made it necessary in some cases, according to stated intentions, to act in the interests of national security (e.g. closing borders or ensuring adequate numbers of vaccines).

2 EU external dependencies

This section discusses the EU's trade interdependencies, at both an aggregate and a granular level, with a particular focus on energy and CRMs. One problem with detailed and granular statistics is the delay in their publication, meaning that in some cases the data used in the analysis pertain to 2020, 2019 or even 2018. Nonetheless, a partial update of key figures is provided where possible, given that the war in Ukraine has led to drastic changes in some EU dependencies, notably with regard to Russian energy supplies.

In addition, this section discusses the potential vulnerabilities and dependencies arising from cross-border investment and finance linkages, as well as those arising from the current architecture of payments and financial market infrastructures. It also addresses the OSA-relevant vulnerabilities faced by issuers of non-dominant currencies.

The section also looks at the international labour market and population flows, and the implications of a potentially less favourable legislative framework for the movement of people across frontiers for geopolitical reasons. The context of this discussion is the fact that the EU has benefited from the regular flow of low and high-skilled workers from third countries, who have contributed to enriching European labour markets and compensated for adverse demographic trends.

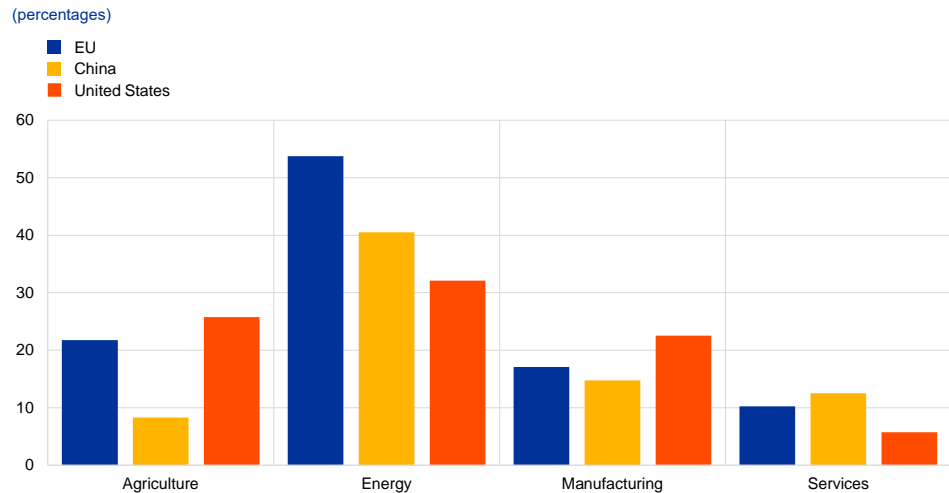
2.1 Trade dependencies

From an aggregate perspective, the EU is more dependent than other major economies on imported energy. At the macro-sectoral level, when dependencies are computed, domestic production and global interlinkages are taken into account through the use of inter-country input output tables.⁶³ To this end, a measure of foreign dependency may be calculated as the share of directly and indirectly imported value-added over directly and indirectly imported value-added plus domestic value-added. The index ranges from 0-100% and will be close to 100% when a country or a region relies only on foreign goods (see Box 6 conveys a full description of the methodology used to analyse trade dependencies). Chart 4 reports this sectoral index, computed for the EU, China and the United States. In the energy sector, these three regions exhibit a high level of dependency on foreign production, the EU being the most dependent with a foreign-to-total value-added ratio above 50%. Even taking into account the recent reduction in imports coming from Russia, this figure is not likely to be significantly lower at the current juncture, given that energy substitution is coming from other foreign sources (most notably the United States and Norway). In the agricultural sector, China relies less on foreign products, while the EU and the United States show a similar degree of foreign dependency (20%). In the manufacturing sector, the degree of dependency is similar for China

⁶³ See [Borin and Mancini \(2019\)](#).

and the EU (around 15%), while it is slightly higher for the United States (20%). Finally, the services sector is intrinsically less dependent on foreign sourcing, as it is less tradable than goods and presents ratios that are not above 10%.

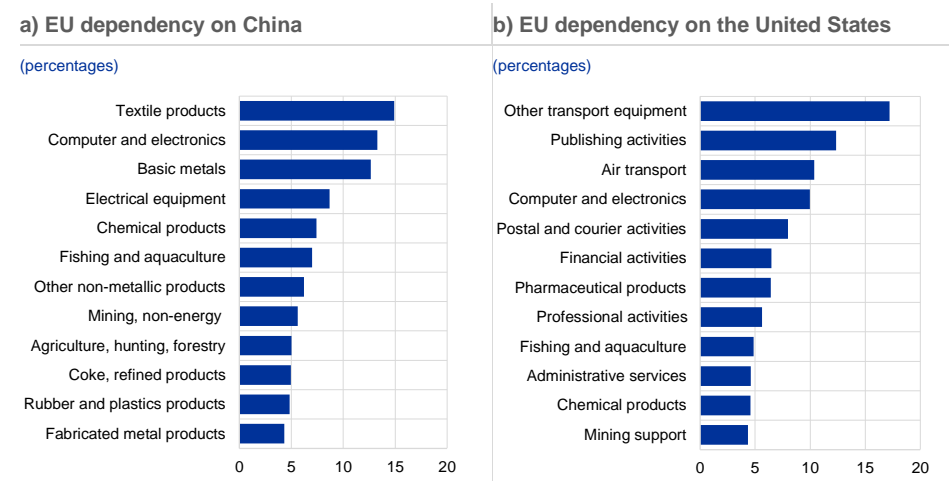
Chart 4
Aggregate import dependency at macro-sectoral level (2018)



Sources: Own elaboration with OECD (Trade in Value Added) data for 2018 and the Inter-Country Input-Output (ICIO) Stata tool (see Belotti et al., 2021).

Notes: Blue bars: foreign value-added by sector of origin directly or indirectly imported by the EU/(foreign value-added by sector of origin directly or indirectly imported by the EU + EU value-added by sector of origin); orange bars: foreign value-added by sector of origin directly or indirectly imported by the United States/(foreign value-added by sector of origin directly or indirectly imported by the United States + US value-added by sector of origin); yellow bars: foreign value-added by sector of origin directly or indirectly imported by China/(foreign value-added by sector of origin directly or indirectly imported by China + China value-added by sector of origin).

Chart 5
EU direct and indirect bilateral import dependency at sectoral level (2018)



Sources: Own elaboration with OECD (Trade in Value Added) data for 2018 and the Inter-Country Input-Output (ICIO) Stata tool (see Belotti et al., 2021).

Notes: Panel a: Chinese value-added by sector of origin imported directly or indirectly by the EU/(foreign value-added by sector of origin imported directly or indirectly by the EU + EU value-added by sector of origin); panel b: US value-added by sector of origin imported directly or indirectly by the EU/(foreign value-added by sector of origin imported directly or indirectly by the EU + EU value-added by sector of origin).

EU import dependency on Chinese and US production is very heterogeneous at the sectoral level. The reliance on Chinese imported value-added is highest for EU production in textiles, computers and electronics and the basic metal sectors

(see Chart 5). Dependency on US value-added is more concentrated in the transport equipment sector, the services sectors (including publishing, audio-visual and broadcasting activities), and the air transport and computer and electronics sectors. The semiconductor GVC in particular and the EU's position in that chain is discussed in more detail in Box 7.

International trade in agricultural commodities also creates dependencies.

Internal EU prices and supplies of food products are heavily affected by geopolitical events and fluctuations in international markets, although the operation of the CAP provides a partial cushion. At the global level, a number of risks are mounting after the Russian invasion of Ukraine. Fuel prices and fertiliser shortages, two key inputs for food production, are combining with deteriorating climate conditions. As a result, social unrest associated with food prices and food shortages is mounting in some developing and emerging countries.⁶⁴

In the EU, the application of the CAP cushions the disturbances in international commodity prices. The CAP supports agricultural production through a broad set of interventions that impact the prices and the production of agricultural commodities in the EU. This system is based on three main tools, namely direct subsidies to farmers, price support mechanisms and guaranteed minimum prices, complemented by tariffs and quotas on imports of agricultural products to the EU. As a result, international and EU year-on-year price changes for the same raw material tend to be lower in Europe than on international markets (see Chart 6, panel a). The CAP also seems to have a moderating effect on those commodity prices for which EU is more self-sufficient, as is the case for dairy products (see Chart 6, panel b). These issues are discussed in greater depth in Box 8.

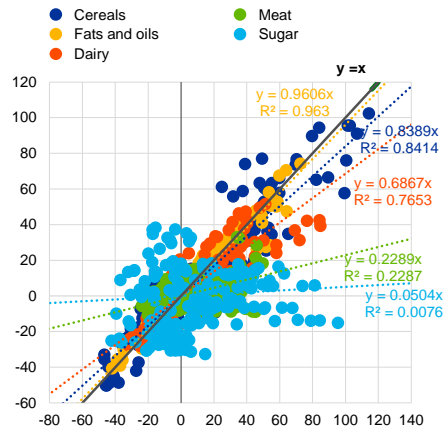
⁶⁴ See the article entitled “Costly food and energy are fostering global unrest”, *The Economist*, 19 July 2022.

Chart 6

EU and international food commodity prices

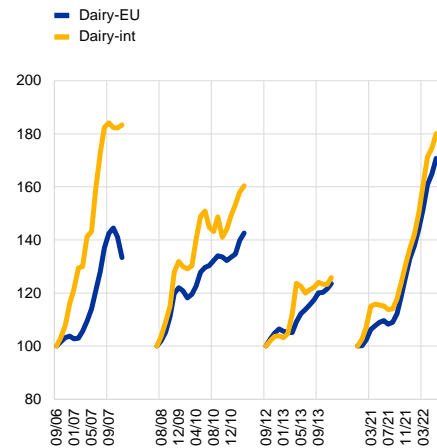
a) EU and international food commodity prices

(y-axis: EU prices year-on-year percentages; x-axis: international prices in euros, year-on-year percentages)



b) EU and dairy product prices during episodes of price rises

(Index = 100 at the start of the period of rising prices)



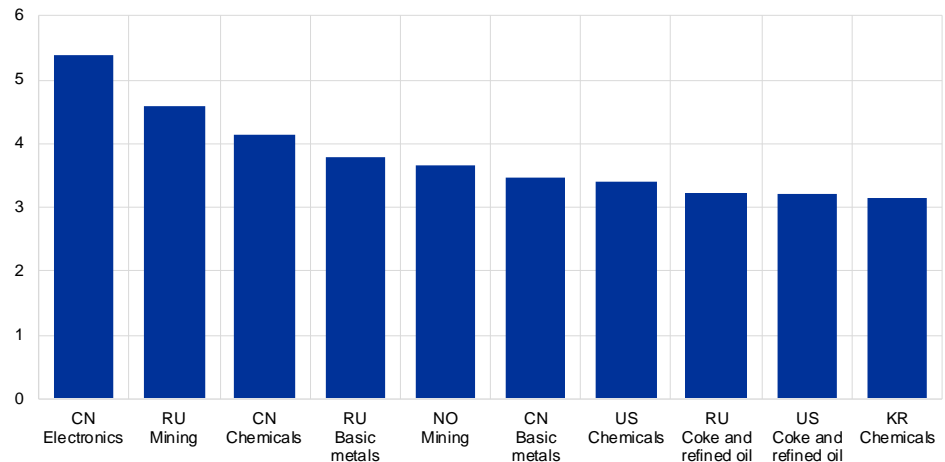
Sources: DG AGRI, Refintiv and Comtrade.

The importance of Chinese manufacturing sectors and primary energy exporters is amplified by their central role in the GVC. The importance of a sector in the GVC can be shown by weighting its connections as a provider/client by the number of backward/forward linkages with other sectors. With regard to energy import markets, European value chains rely heavily on Russian – and to a lesser extent Norwegian – primary sectors, while China holds a central position in the manufacturing sector (see Chart 7).

Chart 7

Value chain centrality, non-EU sectors, by geographic supplier (2019)

(Katz-Bonacich index)



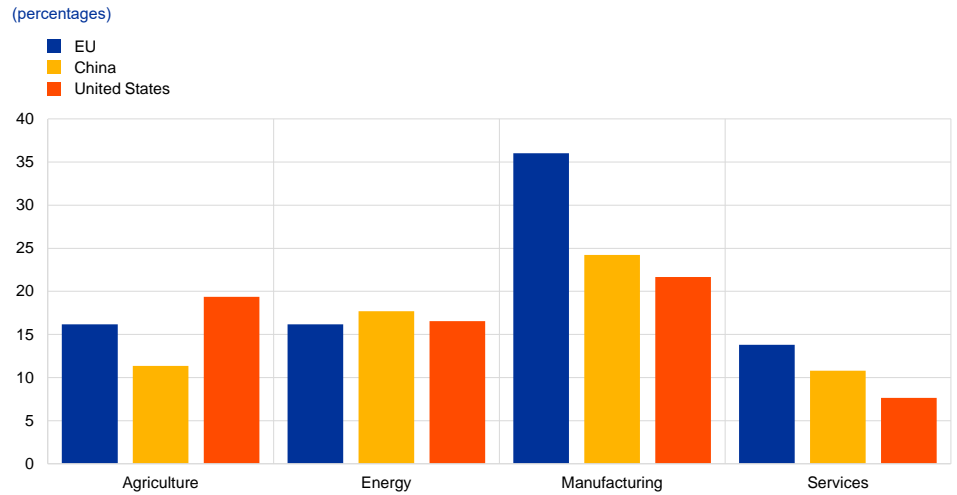
Source: WIOD.

Note: The Katz-Bonacich index is a network centrality measure which, in this case, measures the importance of an industry as a supplier in global supply chains.

CN=China, KR=Korea, NO=Norway, RU=Russia, US=United States.

As an open economy with a substantial trade surplus in manufacturing products, the EU is also central to the GVC, which entails a high exposure to foreign demand. 35% of the EU's manufacturing GDP is absorbed outside the EU, much more than for other regions (see Chart 8). As for the main partners, around 8% of total value-added in the manufacturing sector is absorbed in the United States.

Chart 8
Aggregate export dependency at macro-sectoral level (2018)

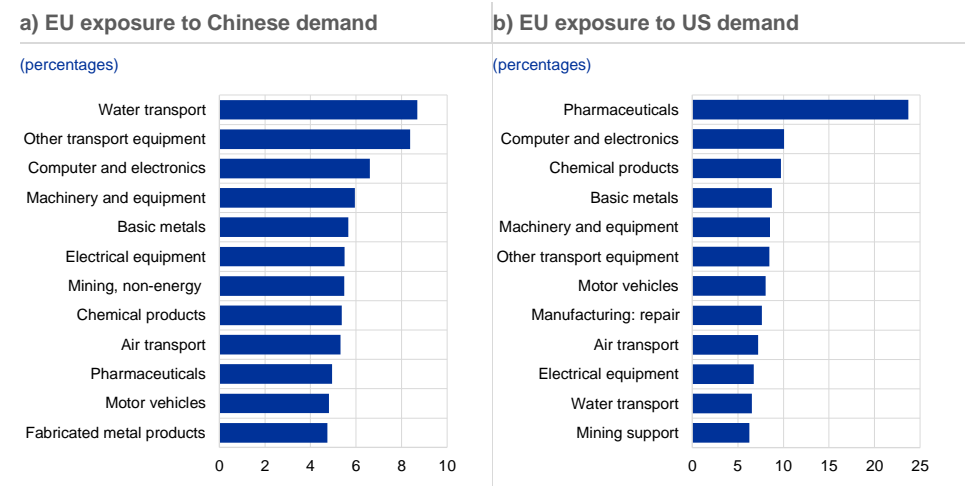


Sources: Own elaboration with OECD (Trade in Value Added) data for 2018 and the Inter-Country Input-Output (ICIO) Stata tool (see Belotti et al., 2021).
Notes: Blue bars: EU value-added by sector of origin absorbed abroad/total EU value-added by sector of origin; yellow bars: Chinese value-added by sector of origin absorbed abroad/total Chinese value-added by sector of origin; orange bars: US value-added by sector of origin absorbed abroad/total US value-added by sector of origin.

In terms of sectoral export dependence on China and the United States, the high exposure of the pharmaceuticals sector stands out. The United States absorbs around a quarter of the total value-added generated in that sector and almost half of the total value-added exported in that sector (see Chart 9). For China, the exposure is much lower and, with the exception of machinery, focused on smaller sectors such as water transport or other transport equipment.

Chart 9

EU direct and indirect bilateral export dependency at sectoral level (2018)



Sources: Own elaboration with OECD (Trade in Value Added) data for 2018 and the Inter-Country Input-Output (ICIO) Stata tool (see Belotti et al., 2021).

Notes: Panel a: EU value-added by sector of origin absorbed in China/total EU value-added by sector of origin; panel b: EU value-added by sector of origin absorbed in the United States/total EU value-added by sector of origin.

A heatmap may be a useful tool for summarising the EU’s trade dependencies and identifying particularly vulnerable sectors.⁶⁵ The heatmap in Table 1 makes use of three core dependency indicators (see [European Commission, 2021d](#)). For imports, dependency indicators reflect the import concentration, internal scarcity and substitutability of a product.⁶⁶ For EU exports, only export concentration and internal scarcity indices are used. To construct the heatmap, each index is aggregated at the macro-sector level⁶⁷ and then standardised using the mean and standard deviation computed over the entire sector sample, so as to obtain a z-score.⁶⁸ Sectors are then classified and color-coded according to the quantile to which their z-scores belong, with scores closer to red signalling a (relatively) higher potential vulnerability. Individual dependency indices can be aggregated to obtain an indication of “overall” dependency.⁶⁹ Moreover, column 5 of the heatmap accounts for the “political proximity” of partner countries by weighting the import concentration indicator with a country-specific score indicating “distance to the US-led Western order”, as derived from UN voting patterns.⁷⁰

⁶⁵ For this analysis, we use trade data from the *Base pour l’Analyse du Commerce International of the Centre d’études prospectives et d’informations internationales* (BACI-CEPII) at the HS-6 level.

⁶⁶ See Box 6 for a detailed description of the core dependency indices. For imports, the heatmaps use the information embedded in indicators CDI1 (concentration), CDI2 (scarcity) and CDI3 (substitutability), as defined in Box 6. For exports, the heatmaps use concentration and scarcity indicators (CDI1_X and CDI2_X respectively).

⁶⁷ This is necessary in the case of the CDIs applied to goods trade, which are originally computed at the six-digit level of aggregation. Building a fully disaggregated heatmap using the five thousand six-digit level products of the CEPII database is feasible, but the result is impossible to present in a readable manner.

⁶⁸ For a discussion of the methodology see [Aikman et al. \(2017\)](#) and [IMF \(2019\)](#).

⁶⁹ In the case of imports we apply weights of 0.5, 0.25 and 0.25 to concentration, scarcity and substitutability respectively. For exports, the weights on concentration and scarcity are 2/3 and 1/3 respectively.

⁷⁰ See [Bailey et al. \(2017\)](#).

At the sectoral level, import dependencies are particularly strong in primary products, while export dependencies are high in chemical products and the manufacturing of transport equipment (see Chart 9). The vulnerability of import dependencies in mineral products is discussed in Section 2.1.2 (Energy). With regard to agricultural products, these combine high import and export concentration with internal scarcity and low substitutability. However, such products represent a small share of EU trade. Sectors that account for significant shares of EU trade, such as the manufacturing of machinery, transport equipment and chemical products, are characterised by higher substitutability and internal availability, although import concentration is high for some specific goods. At the same time, some of these sectors (such as the chemicals industry and the manufacturing of transport equipment) are characterised by strong export dependencies, due to high export concentration and relatively low internal demand. The fifth column shows that for the sector accounting for the highest share of imports (machinery/electrical equipment), the vulnerability of import concentration is higher when the political proximity of partner countries is taken into account.

Table 1
Summary heatmap of EU trade dependencies

(quintiles)

	IMPORTS					% imports	EXPORTS			
	CONCENTRATION	SCARCITY	LOW SUBSTITUTABILITY	OVERALL	Concentration + political proximity		CONCENTRATION	SCARCITY	OVERALL	% exports
Animals, animal products	Red	Orange	Red	Red	Red	1.6	Red	Yellow	Red	1.8
Vegetable products	Orange	Orange	Red	Red	Yellow	3.2	Red	Green	Orange	1.7
Foodstuffs	Yellow	Green	Orange	Green	Yellow	2.5	Orange	Yellow	Orange	4.1
Mineral products	Green	Red	Red	Red	Green	19.8	Green	Yellow	Green	3.8
Chemicals industries	Orange	Green	Green	Yellow	Green	10.6	Orange	Orange	Red	15.0
Plastics/rubber	Green	Green	Green	Green	Green	3.5	Green	Green	Green	18.0
Raw skins, leathers, etc.	Orange	Orange	Yellow	Orange	Red	0.7	Green	Red	Yellow	0.8
Wood, wood products	Red	Green	Green	Yellow	Orange	1.5	Yellow	Green	Yellow	2.2
Textiles	Green	Red	Orange	Green	Yellow	6.5	Green	Green	Green	2.4
Footwear/headgear	Yellow	Yellow	Yellow	Yellow	Red	1.4	Yellow	Green	Green	0.6
Stone/glass	Yellow	Red	Orange	Orange	Green	3.1	Red	Red	Red	3.1
Metals	Green	Green	Yellow	Green	Orange	6.2	Yellow	Green	Green	4.9
Machinery/electrical	Green	Yellow	Green	Green	Orange	23.4	Green	Orange	Green	21.7
Transportation	Green	Green	Green	Green	Green	9.0	Orange	Orange	Orange	13.8
Miscellaneous	Red	Yellow	Green	Orange	Orange	7.1	Green	Red	Yellow	6.3

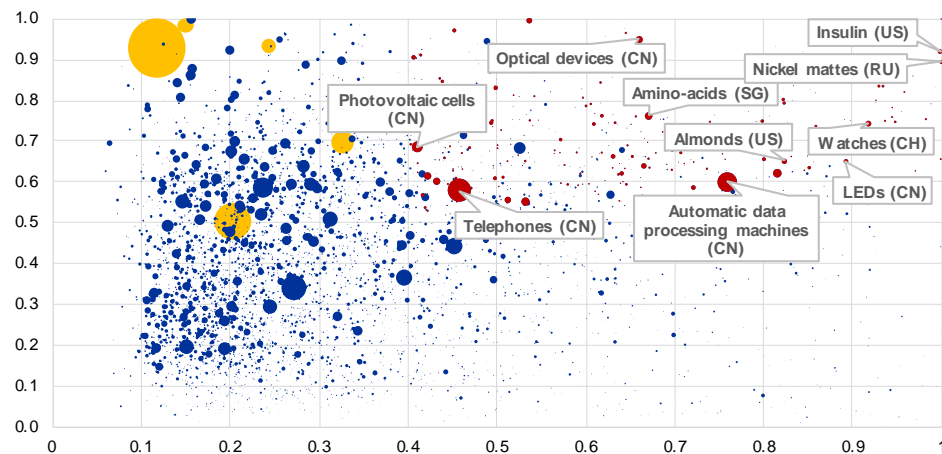
Sources: CEPII-BACI database, Bailey et al. (2017) and own calculations.
Notes: The heatmap uses indicators of concentration, scarcity and substitutability as defined in Box 6. Sector-specific indicators are standardised by the mean and the standard deviation for the whole sample. Sectors are then classified and colour coded according to the quintile to which their z-scores belong, with scores closer to red signalling higher vulnerability. Individual indices are also aggregated to obtain an indication of "overall dependency". The fifth column shows the import concentration index in which import shares are weighted with an indicator of "political proximity", based on UN voting patterns and calculated following Bailey et al. (2017).

Dependencies can also arise at the level of specific goods. The analysis reveals that a sizable portion of EU imports is either concentrated on few trade partners or is scarce in intra-EU trade (see Chart 10). At the HS-6 product group level, energy products provide an example of EU imports that are reasonably well diversified, yet very scarce. The imports for some manufacturing products, such as computers, photovoltaic cells, LEDs or optical devices, are both very concentrated (in China) and scarce.

Chart 10

Concentration and scarcity of imports to the EU (2019)

(x-axis: concentration index (CDI1); y-axis: scarcity (CDI2))



Source: Own elaboration based on the CEPII BACI database.

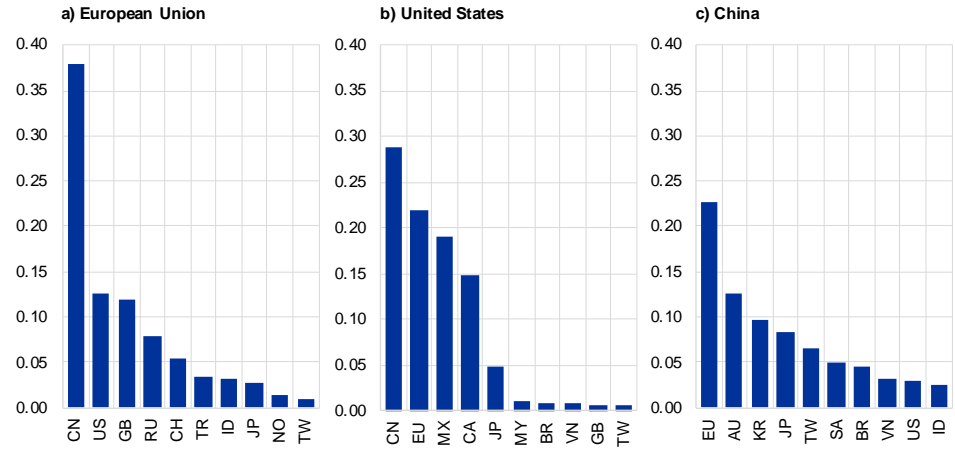
Notes: The horizontal axis shows the Herfindahl-Hirschman Concentration Index as a measure of import concentration at the product level, with a value of 0 denoting a continuum of sources and a value of 1 indicating one single external exporter. The vertical axis shows scarcity as the share of extra-EU in total imports. The bubble size represents the total value of extra-EU imports of a product. Red bubbles identify high-dependency products, whose concentration, scarcity and substitutability indexes exceed the critical thresholds defined by the European Commission (2021d). For some of these products, the main exporter to the EU is shown in brackets. Yellow bubbles represent energy products (oil, gas and coal).

By far the highest bilateral import concentration of the EU in goods trade is with China (with intra-EU trade excluded, see Chart 11). The bilateral import concentration measures the degree to which exporting countries have a dominant export share of the goods they supply to the importer (for further details see Box 6). The reduction in imports from China due to the pandemic and the impact of this on European industries are analysed in Box 2.4. Other trade partners with which the EU has high bilateral import concentrations are the United States, the United Kingdom and also – because of the EU’s dependencies on energy products and key commodities such as nickel or uranium – Russia. Switching perspective shows that both the United States and China exhibit a high bilateral import concentration with the EU. The United States’ highest bilateral import concentration is with China, although the degree of dependency is lower than for the EU. US imports are also concentrated with North American Free Trade Agreement (NAFTA) trade partners (NAFTA has now become the United States-Mexico-Canada Agreement, USMCA). China’s main import dependencies, in turn, are in the Asia-Pacific region. This shows that geographic proximity can drive import dependencies.

Chart 11

Bilateral import concentration index (2019)

(index)



Source: Own elaboration based on the CEPII BACI database.

Notes: Bilateral import concentration is measured by weighting the total extra-EU import value for each HS-6 product group for which the partner country is the main exporter to the EU by the respective import concentration index (CDI1).

AU=Australia, BR=Brazil, CA=Canada, CH=Switzerland, CN=China, GB=United Kingdom, ID=Indonesia, JP=Japan, KR=Korea, MX=Mexico, MY=Malaysia, NO=Norway, RU=Russia, SA=Saudi Arabia, TR= Turkey, TW=Taiwan, US=United States, VN=Vietnam.

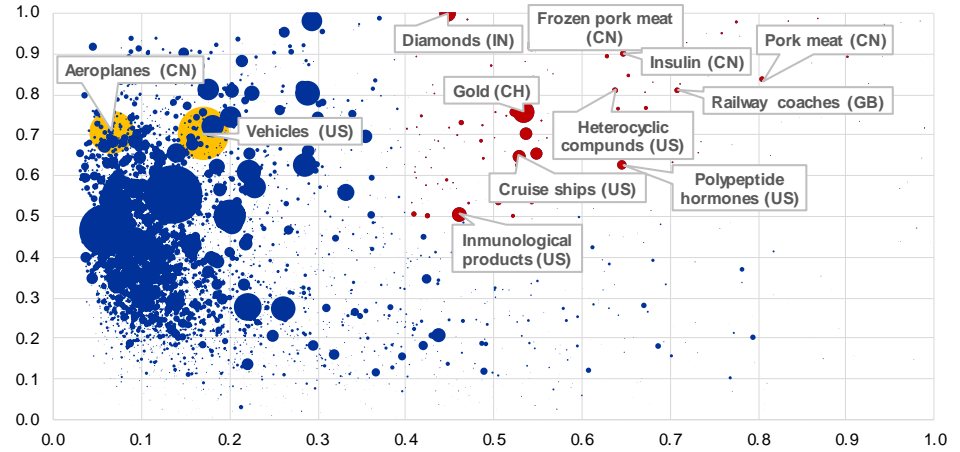
Export dependencies can arise from the concentration of exports in a few trade partners. While EU exports are normally well diversified, some products are exported to a handful of external partners (see Chart 12). A granular analysis of export dependence shows that exports of large, manufactured goods tend to be diversified across destinations to some extent, although their intra-EU demand can be relatively scarce (this is the case for large aeroplanes and medium-sized vehicles). Other goods – mainly pharmaceuticals and chemical products, high-tech manufactures, but also some food products — are exported to just a few partners and are characterised by low internal demand.

EU exports are strongly concentrated in the United States. Other destinations with highly concentrated exports are the United Kingdom and, to a lesser extent, China and Switzerland (see Chart 13). US exports, for their part, are mostly concentrated in the EU and in NAFTA/USMCA countries. The United States is the main destination for Chinese products, although the EU is also a significant importer.

Chart 12

Concentration of exports and scarcity of internal demand for the EU (2019)

(x-axis: concentration index (CDI1_X); y-axis: scarcity of internal demand (CDI2_X))



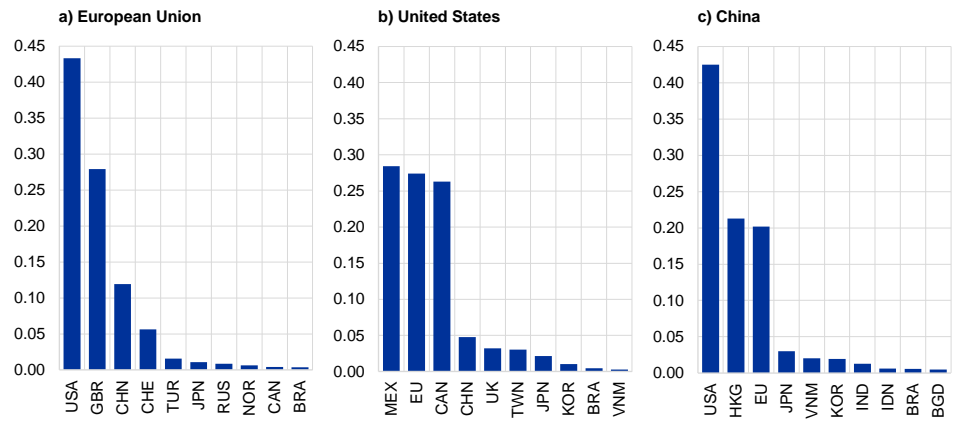
Source: Own elaboration based on the CEPII BACI database.

Notes: The horizontal axis shows the Herfindahl-Hirschman Index as a measure of export concentration at the product level, with a value of 0 denoting a perfectly diversified destination and 1 indicating one single external importer. The vertical axis shows scarcity of internal demand as the share of extra-EU in total exports. The bubble size represents the total value of extra-EU exports of a product. Red bubbles identify high-dependency products, whose concentration and scarcity indexes exceed the critical thresholds defined by the European Commission (2021d). For some of these products, the main importer from the EU is shown in brackets. Yellow bubbles identify representative products characterised by relatively scarce internal demand but a diversified export base.

Chart 13

Bilateral Export Concentration Index (2019)

(index)



Source: Own elaboration based on the CEPII BACI database.

Notes: Bilateral export concentration is measured by weighting the total extra-EU export value for each HS-6 product group for which the partner country is the main importer from the EU by the respective export concentration index (CDI1_X).

The EU is the largest exporter and importer of services in the world. The importance of the EU's trade in services has grown significantly in the past decade, with the value of exports and imports of services equalling 13.2% of EU GDP in 2021. Taking extra and intra-EU trade in services together, the EU represented 30% of the world's trade in services in 2021. The significant global position, the large

export share and the relatively diversified trade partners provide resilience against import vulnerabilities at the aggregate level.⁷¹

A number of key sectors display high values of import concentration and internal scarcity: the financial services; telecommunication, computer and information services; and royalties and license fees sectors are the most concentrated and internally scarce. EU imports of services display the highest concentration in the royalties and license fees and financial services sectors (see Chart 14).⁷² Imports of travel and transport services are, by contrast, the least concentrated.⁷³ At the same time, the scarcity indicator shows that the share of extra-EU imports in many service sectors is high, especially in financial services, telecommunication, computer and information services, and royalties and license fees, which seem the most vulnerable, in terms of both concentration and internal scarcity.

The United States and the United Kingdom are the EU's largest trade partners in terms of imports of financial services, although various offshore financial centres (the Cayman Islands, Bermuda and the Bahamas) also play a key role. The EU's main trading partners are the United States (22% of the total), offshore financial centres (20%) and the United Kingdom (18%), while other countries account for much smaller shares of extra-EU imports (see Figure 1). The telecommunication, computer and Information sector is the most reliant on extra-EU partners (the United States, the United Kingdom, Switzerland and India account for 70%) and, currently, the ability of the EU to substitute these imports is a key aspect of strategic dependency, especially in specific sub-sectors like cybersecurity and IT software.

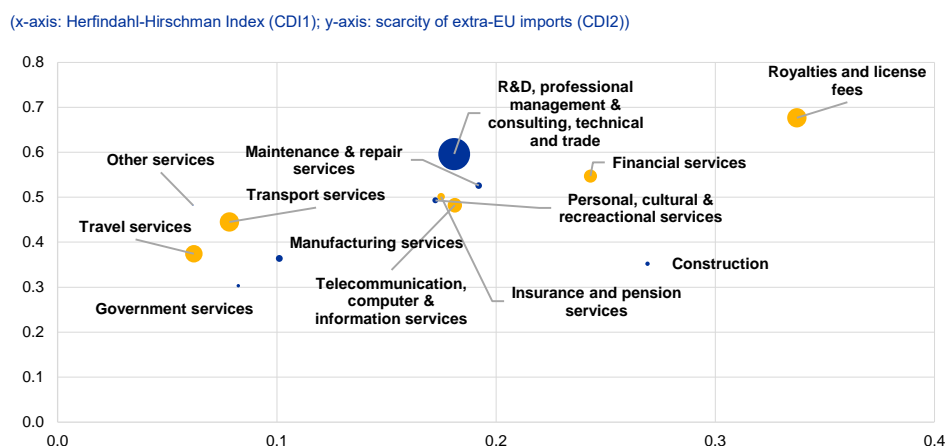
⁷¹ However, there are strategic sectors and specific sub-sectors which require greater attention. See [European Commission \(2022c\)](#) regarding cybersecurity and specific IT software.

⁷² Imports of royalties reflect EU payments to extra-EU partners for the use of intellectual property (e.g. patents, trademarks, copyrights and franchises).

⁷³ See Box 6 for a detailed description of the indicators used to measure concentration, scarcity and substitutability. Due to the different level of aggregation, the concentration index in Chart 14 cannot be compared to its equivalent for granular goods trade, which is used in Chart 11.

Chart 14

Concentration and scarcity of services imports in the EU (2019)

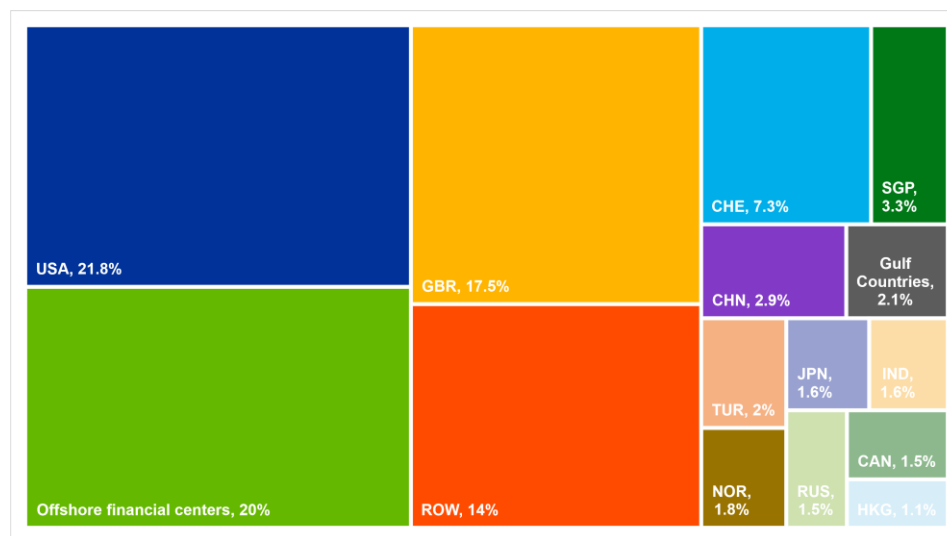


Source: Eurostat ITS database.
 Notes: The horizontal axis shows the Herfindahl-Hirschman Index as a measure of import concentration of extra-EU imports of services (CDI1). The vertical axis shows scarcity of extra-EU imports (CDI2). The bubble size represents the import share. Yellow bubbles identify strategic sectors. See Box 6 for additional details.

Figure 1

Main geographical counterparts of EU imports of services in selected sectors (2019)

(percentages)



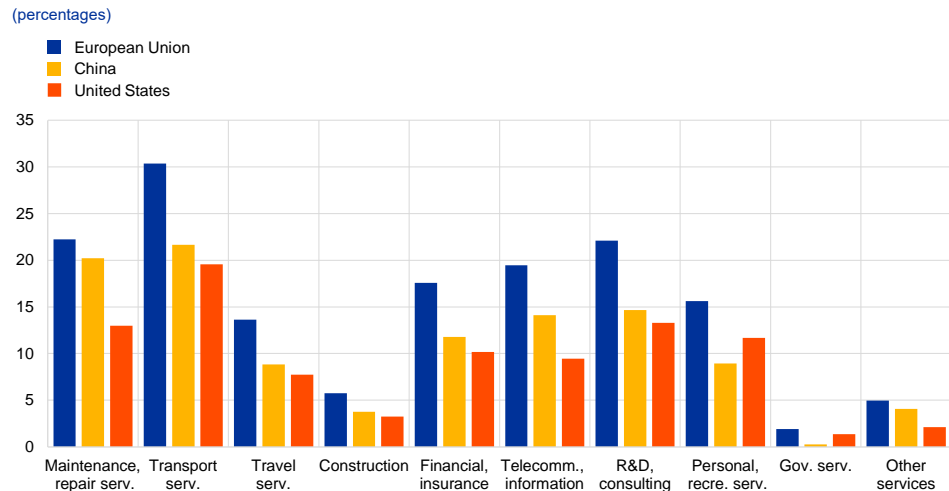
Sources: Eurostat ITS database and BPM6.
 Note: The selected sectors covered by the Figure are: research and development, professional management & consulting, transportation, travel, finance, insurance, computer and information services, and royalties and license fees.

In terms of the export of services, the largest trade partners are the United Kingdom and the United States. The former is the destination of 21% of total EU exports, while the United States accounts for 18%. Other important partners are Switzerland (8%), offshore financial centres (8%) and China (5%). The most important sectors for extra-EU exports are: transportation; travel services; telecommunication, computer and information services; and R&D and management services. Together these account for more than 70% of all extra-EU service exports. EU service exports are relatively well diversified among trading partners (see Chart

15). The most concentrated sectors are transport services and R&D and management services, where around 20% and 15% of the value-added are absorbed by the United States and China respectively.

Chart 15

Aggregate foreign export dependency in services at macro-sectoral level (2018)



Source: Own elaboration with OECD (Trade in Value Added) data for 2018 and the Inter-Country Input-Output (ICIO) Stata tool (see Belotti et al., 2021).

2.2 Energy dependencies

Energy dependence is one of the key sources of the EU's foreign trade exposure.

At the current juncture, the reliance on imported fossil fuels has increased the exposure of the EU to geopolitical risk. This has direct implications for monetary policy, as the energy sector is a key sector and one of the most difficult to substitute. In the future there is likely to be a switch from fossil fuels to renewable sources. In this sense, the debates over strategic interdependence and the energy transition are intertwined, as the production of less carbon intensive energy sources (i.e. nuclear and renewables) is usually higher in Europe.

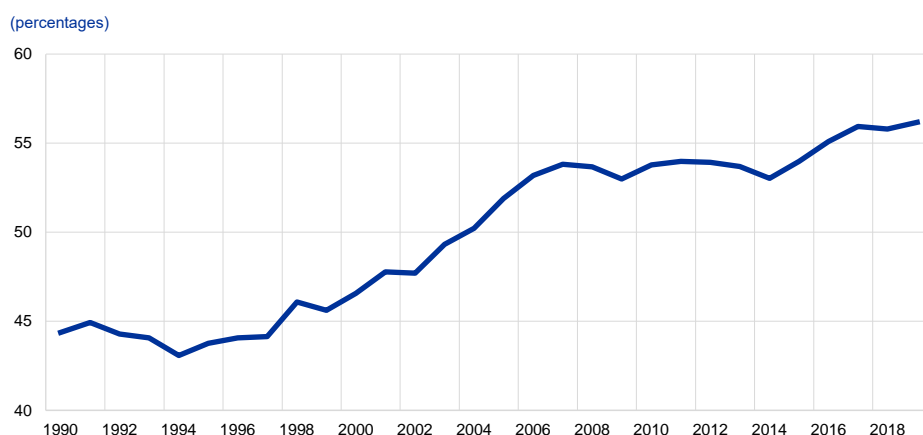
Most of the energy consumed in the EU is imported. In 2020, more than 55% of energy consumed in the EU was imported from an extra-EU country.

The share of imported energy has gradually increased over the past 30 years (see Chart 16), mainly due to: (i) the decline in the domestic production of fossil fuels (in the 1990s around half of the natural gas consumed and 80% of coal and other solid fossil fuels consumed were domestic, compared with 20% and 60% respectively in recent years); and (ii) the substitution of coal with natural gas (and to a lesser extent oil), which has more imported content. In recent years the importance of renewable energy sources within the energy mix has increased, but this increase is still not sufficient – at least not yet – to reverse the trend in energy imports and counter the two forces dominant in explaining the overall trend.

Energy dependence is very heterogeneous across European sectors and countries. Countries with high renewable shares in energy production (Denmark, Finland and Sweden), high nuclear capacity (Bulgaria, France, Slovakia and Sweden) or high domestic production of fossil fuels (Czech Republic, Poland and Romania) show lower energy dependency (see Chart 17). In terms of sectors, manufacturing sectors such as chemicals, plastic and metals, as well as the transport sector, are more intensive in their energy use (see Chart 18).

Chart 16

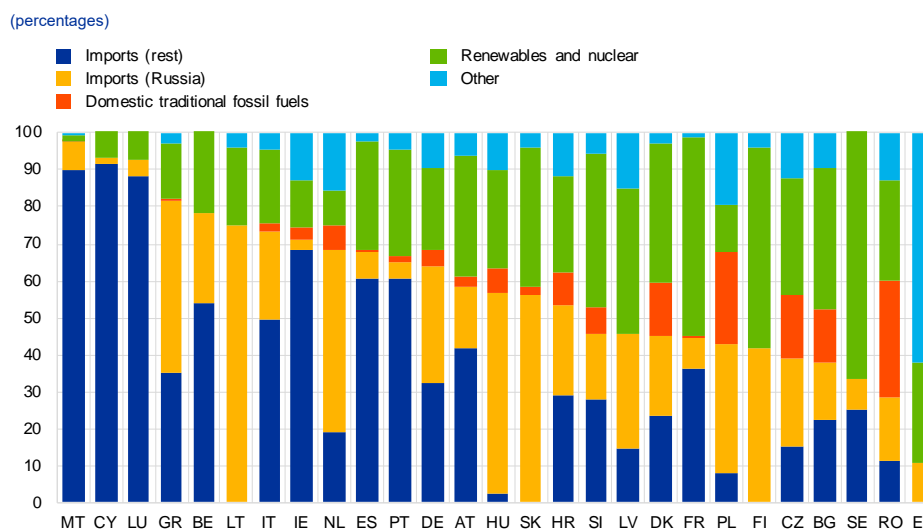
EU foreign dependency in the energy mix since the 1990s



Source: Eurostat.

Chart 17

Energy consumption as a share of gross available energy by source, pre-war (2020)



Source: Eurostat.

Notes: "Imports (rest)" includes all other import origins. In the cases of countries with a high energy transit of Russian sources, such as Estonia, Latvia, Lithuania, Hungary, Slovakia and Finland, the share of Russian energy of gross available energy might be overestimated. "Domestic traditional fossil fuel" includes coal, gas and oil. "Other" includes other domestic sources of energy not included in the previous two.

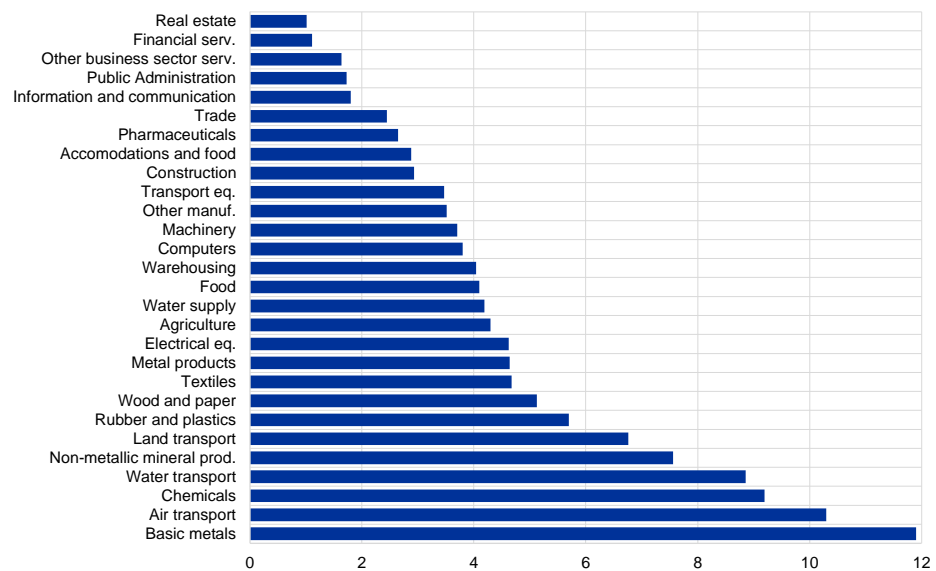
AT = Austria, BE = Belgium, BG = Bulgaria, CY = Cyprus, CZ = Czechia, DK = Denmark, DE = Germany, EE = Estonia, ES = Spain, FI = Finland, FR = France, GR = Greece, HR = Croatia, HU = Hungary, IE = Ireland, IT = Italy, LT = Lithuania, LU = Luxembourg, LV = Latvia, MT = Malta, NL = Netherlands, PL = Poland, PT = Portugal, RO = Romania, SE = Sweden, SI = Slovenia, SK = Slovakia.

It is with regard to crude oil, natural gas, coal and uranium that EU Member States have the most vulnerable external dependencies. Table 2 summarises the information provided by the import dependency indicators (CDIs) constructed previously with the aim of identifying those sectors whose external dependencies are particularly vulnerable. The chart confirms that crude oil and natural gas are internally scarce and difficult to substitute. Imports of natural gas in a gaseous state are also very concentrated, whereas those of crude oil and liquefied natural gas (LNG) are relatively diversified, reflecting the global nature of these markets. The chart shows that LNG has a low import concentration. As things currently stand, however, some EU Member States have a strong need for LNG, meaning that existing LNG terminal capacity is insufficient. In this respect, the low import concentration shown underestimates actual demand. In general, a greater overall dependency is related to a relatively low number of potential providers because of geographical or infrastructure constraints, and thus to greater difficulty in substituting import sources. The chart also shows that the import sourcing of uranium and coal products is particularly vulnerable. The fifth column shows that some of the exposures change when the political proximity of trade partners is taken into account. Import concentration becomes more vulnerable in non-crude petroleum oil and in coke, and less so in coal products.

Chart 18

Value-added of the energy sector embedded in the EU's final demand, by sector of economic activity (2018)

(percentages)



Source: OECD (Trade in Value Added).

Table 2
EU import dependencies in energy products

(quintiles)

	CONCENTRATION	SCARCITY	LOW SUBST.	OVERALL	Concentration + political proximity	ENERGY IMPORTS
Crude oil	Red	Red	Red	Orange	Green	57.59
Petroleum oil, not crude	Green	Yellow	Yellow	Green	Orange	22.59
Natural gas, in gaseous state	Red	Orange	Orange	Red	Red	8.85
Natural gas, liquified	Green	Red	Red	Orange	Yellow	3.93
Coal	Orange	Red	Red	Red	Yellow	3.22
Propane, liquified	Yellow	Orange	Orange	Orange	Green	1.26
Electrical energy	Green	Green	Green	Green	Green	0.89
Biodiesel	Orange	Green	Green	Green	Orange	0.78
Butane, liquified	Yellow	Orange	Orange	Yellow	Green	0.36
Enriched uranium	Red	Yellow	Green	Red	Red	0.24
Wood, for fuel	Orange	Green	Yellow	Yellow	Green	0.17
Coke and semi-coke	Green	Green	Green	Green	Orange	0.12
Peat	Red	Green	Green	Green	Red	0.01

Source: CEPIL-BACI database, Bailey et al. (2017) and own calculations.

Notes: The heatmap uses indicators of import concentration, scarcity and substitutability, as defined in Box 6. Sector-specific information is standardised by the mean and standard deviation of the whole sample. Sectors are then classified and colour-coded according to the quintile to which their z-scores belong, with scores closer to red signalling higher vulnerability. Individual indices are also aggregated to obtain an indication of "overall dependency". The fifth column shows the import concentration index (CDI1) in which import shares are weighted with an indicator of "political proximity", based on UN voting patterns and calculated following Bailey et al. (2017).

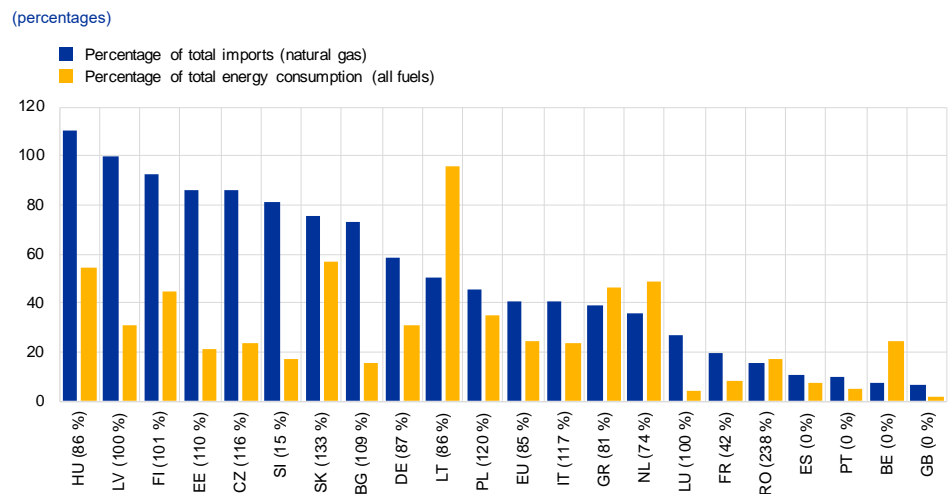
Russia has, until recently, been the main European trading partner for energy products. In 2019 it accounted for 29% of imported oil, around 40% of imported natural gas (see Chart 19) and 54% of imported coal. In turn, Norway accounted for 8% of oil imports and 21% of gas imports. The share of Russian gas is higher (and imports are more concentrated) for EU countries that are supplied mainly through pipelines, while countries with LNG capacity had a more diversified import base before the invasion of Ukraine.

Since 2021, and especially after the invasion of Ukraine, Russia has practically halted its pipeline exports. This immediately prompted European countries to search for alternative suppliers. LNG imports increased by about 23 billion cubic metres in 2022 since a year ago (see Chart 20), with existing plants working at 100% of installed capacity and new plants being built in Lithuania and Finland, which were largely able to replace their Russian gas imports almost immediately. Moreover, additional pipeline imports were sourced from Norway and Azerbaijan.

However, only a limited share of total gas imports from Russian pipelines can be substituted in the short run. Due to insufficient integration of the internal market (as a result of limited cross-border pipeline flow capacity between some countries), LNG imports arriving in western Europe cannot be delivered to central Europe, leaving some regasification (and storage) capacity unused. Countries without LNG capacity generally tend to hold higher inventories (see Chart 21), although in the long run additional gas resources or substitution by other energy sources will be necessary.

The main obstacle to the substitution of natural gas is the huge concentration in some exporters. It is difficult to build up additional gas extraction and LNG production capacities (as well as LNG regasification capacity in destination countries) as this involves hefty investment and lengthy execution times. Incentives to do this are also fraught with uncertainty because profitability can only be ensured for a sufficiently long projected lifespan and long-term supply contracts.

Chart 19
EU dependency on Russian natural gas by country (2019)



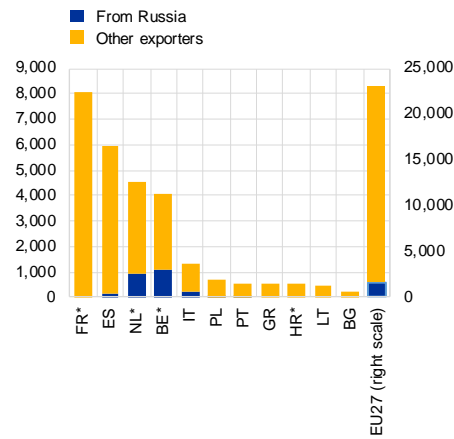
Source: Own calculations based on Eurostat data.
Notes: Figures in the country labels represent the percentage of gas imports from Russia via pipeline.
BE=Belgium, BG=Bulgaria, CZ=Czechia, DE=Germany, EE=Estonia, ES=Spain, FI=Finland, FR=France, GB=United Kingdom, GR=Greece, HU=Hungary, IT=Italy, LT=Lithuania, LU=Luxembourg, LV=Latvia, NL=Netherlands, PL=Poland, PT=Portugal, RO=Romania, SK=Slovakia.

Chart 20

Substitution of Russian pipeline gas with alternative sources (2022)

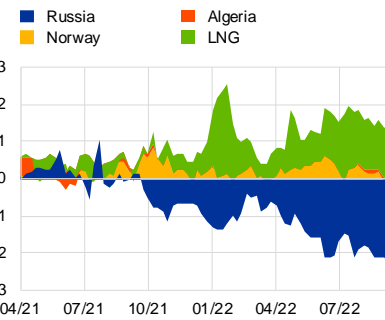
a) Year-on-year change in LNG imports

(million cubic metres, cumulative flows Jan-Jun. 2022)



b) EU imports of natural gas, by origin

(million cubic metres, year-on-year change)



Sources: Own calculations based on Eurostat (panel a) and Bruegel (panel b) figures.

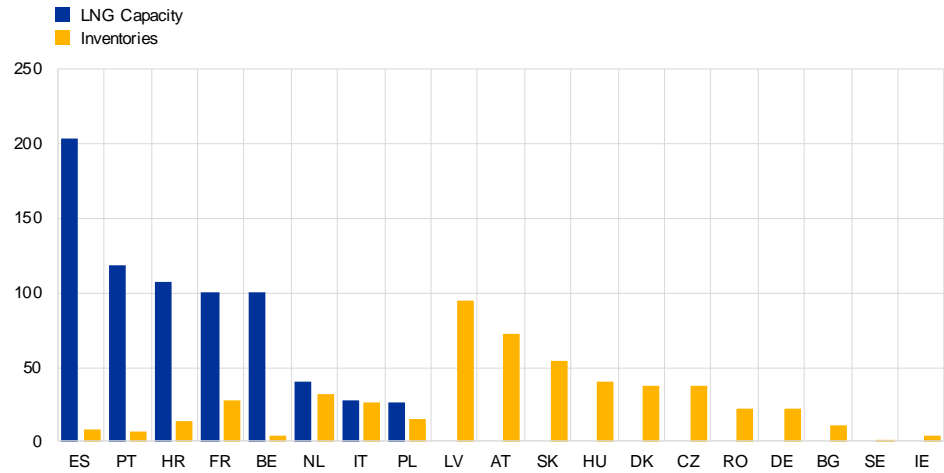
Notes: Panel a: Change in LNG imports is shown as the year-on-year change in cumulated flows (in volume terms) from January to June. Figures for countries with an asterisk (*) show cumulative flows for the period January-July (instead of for January-June). Panel b depicts the year-on-year change in weekly flow data (in terms of four-week moving averages) from different sources of EU gas imports, in order to identify new sourcing patterns (and remaining shortfalls) in the efforts made by the EU (relative to 2021) to replace Russian gas in 2022.

BE = Belgium, BG = Bulgaria, ES = Spain, FR = France, GR = Greece, HR = Croatia, IT = Italy, LT = Lithuania, NL = Netherlands, PL = Poland, PT = Portugal.

Chart 21

LNG capacity and inventories in EU Member States

(percentage of gas consumption)



Sources: Own calculations based on BP data on consumption and Bruegel storage data (October 2022).

Notes: Figures for cumulative flows for LNG capacity (blue bars) and inventories (yellow bars) are depicted relative to overall total gas consumption, in percentages.

AT = Austria, BE = Belgium, BG = Bulgaria, CZ = Czechia, DE = Germany, DK = Denmark, ES = Spain, FR = France, HR = Croatia, HU = Hungary, IE = Ireland, IT = Italy, LV = Latvia, NL = Netherlands, PL = Poland, PT = Portugal, RO = Romania, SE = Sweden, SK = Slovakia.

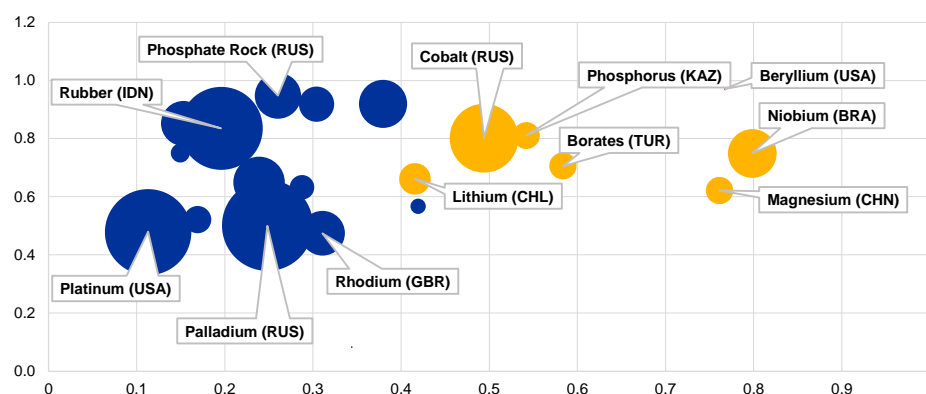
2.3 Critical raw materials dependencies

The European Commission considers 30 raw materials to be critical, based on an evaluation across two dimensions.⁷⁴ In terms of economic relevance, the importance of a material is determined by the sum of its end-use shares in each sector of economic activity, multiplied by the value-added of that sector. The assessment also considers a substitutability factor that takes into account multiple possible substitutes, according to a cost-performance evaluation. In terms of supply risk, aspects such as import reliance, sourcing country concentration and recycling rates are relevant and will be considered in more detail in this section. Similarly to the granular study of general import dependency presented previously, the import dependency of the EU is analysed here in respect of critical raw materials (CRMs), following the methodology outlined in European Commission (2021d).⁷⁵ In 2019, the EU imported more than USD 15 billion of CRMs from extra-EU sources (equivalent to 0.1% of EU GDP). Chart 22 summarises the results of this analysis.

Chart 22

EU critical raw materials import dependency (2019)

(x-axis: concentration index (CDI1); y-axis: scarcity (CDI2))



Source: Own calculations based on the CEPII BACI database.

Notes: CRMs as defined in European Commission (2020e), except for coking coal, gallium, germanium, hafnium and indium, which are not included in the graph. The HS codes from European Commission (2020f) available at the six-digit level are used, corresponding to both the extraction and the processing stage, and the whole trade value relative to the HS codes is employed in the calculations. Internal scarcity: extra-EU/total EU imports (CDI2). Import concentration: Herfindahl-Hirschman index (CDI1). Bubble area is proportional to the value of extra-EU imports. Main exporter to the EU in parenthesis. Yellow bubbles identify the materials whose concentration, scarcity and substitutability indexes exceed the thresholds defined in European Commission (2021d). China is the EU's main import source of antimony, barite, bismuth, magnesium, graphite, rare earths and scandium, and tungsten; Russia is the EU's main import source of cobalt, palladium, phosphate rock and vanadium; the United Kingdom of iridium, osmium and ruthenium, and rhodium; the United States of beryllium and platinum; Guinea of bauxite; Turkey of borates; Mexico of fluor spar; Chile of lithium; Indonesia of natural rubber; Brazil of niobium and tantalum; Norway of silicon metal; Japan of strontium; Kazakhstan of phosphorus and Sierra Leone of titanium.

⁷⁴ See European Commission (2020e).

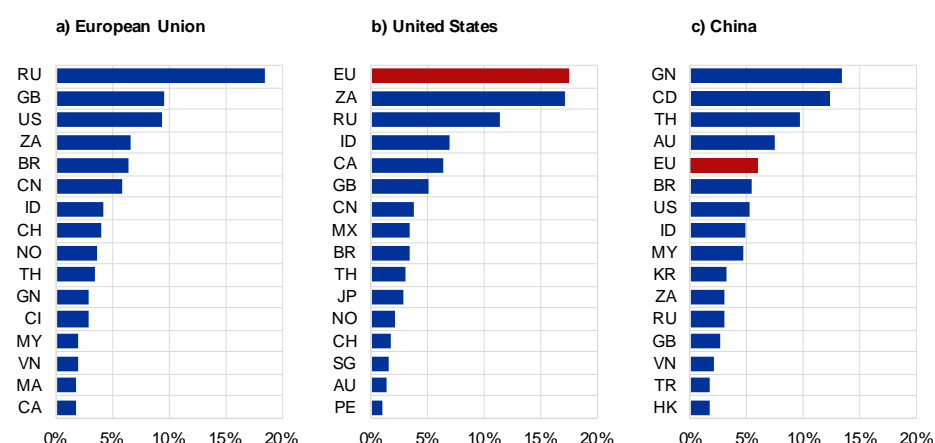
⁷⁵ Based on BACI-CEPII data for bilateral trade flows at six-digit level. Six-digit level data make it possible to provide results for 25 CRMs out of the 30 identified in European Commission (2020e). The HS codes from European Commission (2020f) are used, corresponding to both the extraction and the processing stage. In this sense, the data reflect both raw materials and intermediate products containing large quantities of raw materials and/or intermediate products that are indispensable for CRMs to be processed and embedded in final products. Also, the whole trade value relative to the HS codes from European Commission (2020f) is employed in the calculations. Applying the percentages of CRM content from European Commission (2020f) and other sources to the import value of the HS codes yields a lower EU import share from Russia (13%), although the country remains the main import source for the EU for products of this kind.

Most CRMs are scarce within the EU, as measured by the ratio of extra-EU imports over value of total imports. For some CRMs, EU imports are also highly concentrated in a few trading partners. Of all the scarce and concentrated materials, the seven marked in yellow in the chart (beryllium, borates, cobalt, lithium, magnesium, niobium and phosphorus) would be impossible to fully substitute with European production⁷⁶ if extra-EU imports were to face some kind of limitation. We identify these CRMs as those of greatest dependency for the EU. The share of EU imports of CRMs from different extra-EU partners is displayed in Chart 23, panel (a). In 2019, the highest share of CRMs, in terms of import value, was sourced from Russia (18%). Other significant sources of CRMs for the EU are the United Kingdom and the United States (with more than 9% each) and, among emerging economies, South Africa, Brazil and China (close to 6% each). As regards the seven CRMs of high dependency, Russia, China and Brazil are among the leading exporters to the EU. Russia provides 70% of European imports of cobalt, Brazil 87% of those of magnesium and China 89% of those of niobium.

Chart 23

Share of value of critical raw materials imports by country of origin (2019)

(index)



Source: Own calculations based on the CEPII BACI database.

Note: CRMs are defined as in Chart 25.

AU=Australia, BR=Brazil, CA=Canada, CD=Democratic Republic of the Congo, CH=Switzerland, CI=Côte d'Ivoire, CN=China, GB=United Kingdom, GN=Guinea, HK=Hong Kong, ID=Indonesia, JP=Japan, KR=Korea, MA=Morocco, MY=Malaysia, MX=Mexico, NO=Norway, PE=Peru, RU=Russia, SG=Singapore, TH=Thailand, TR=Turkey, US=United States, VN=Vietnam, ZA=South Africa.

Demand is bound to increase for several CRMs in the near future. Transition to a carbon-neutral economy employs many technologies that rely heavily on CRMs. In particular, permanent magnets require borates and rare earths and are key to a variety of applications, especially wind turbines and e-mobility (European Commission, 2020g). The same holds for the ongoing digitalisation process, in which five out of the seven CRMs of highest dependency for the EU are considered key inputs. 3D printers as well as magnetic RAM modules are examples of specific products relying on these CRMs. According to the European Commission, demand for some of these could increase more than fivefold by 2030.

⁷⁶ Production is proxied by total exports (intra-EU and extra-EU) as production data is not available at the required level of disaggregation.

Reuse and recycling could be one way to reduce external dependency on

CRMs. So far, rates of recycling and reuse have remained low for most CRMs. Rates are as high as 42% for tungsten but remain at one-digit values for the majority of CRMs (European Commission, 2020e). Among the subgroup of CRMs that cannot be fully substituted, there is no recycling and reuse at all for beryllium, niobium, and phosphorus. Retention rates are higher for magnesium (13%) and cobalt (22%).

Other major economic areas such as the United States and China also show a high level of dependency on CRMs.

Chart 23, panels (b) and (c) illustrate the CRM dependency of the United States and China respectively. In 2019, China imported more than USD 16 billion (0.11% of GDP) and the United States around USD 13 billion (0.06% of GDP) of CRMs. As regards source countries, the United States is highly dependent on the EU, as more than 17% of the CRMs imported by the country comes from the EU.⁷⁷ China, for its part, is heavily reliant on African exporters, with nearly 25% of its imports sourced from Guinea and the Congo. CRMs imports also seem to follow regional patterns, with the United States sourcing comparatively more from NAFTA countries and China more from the Asia-Pacific region than other global importers. China also displays a higher concentration of CRM imports at the country level in comparison with the EU and the United States as it imports large quantities of bauxite, rubber and cobalt, with imports concentrated in just a few exporters (Guinea, Thailand and the Congo respectively).⁷⁸

2.4 Digital transition

The rapid digital transformation of the European economies is of crucial importance in the context of the global digital transition.

However, the EU is facing challenges stemming from the need to catch up with regard to the use of digital solutions and the dependence of digital technologies and services on imports. The EU lags behind other advanced economies and major competitors when it comes to overall digital performance, according to the European Commission's International Digital Economy and Society Index (I-DESI) (see Chart 24).⁷⁹

⁷⁷ Mainly palladium, rhodium and platinum, which are re-exported to the United States from Germany and Belgium.

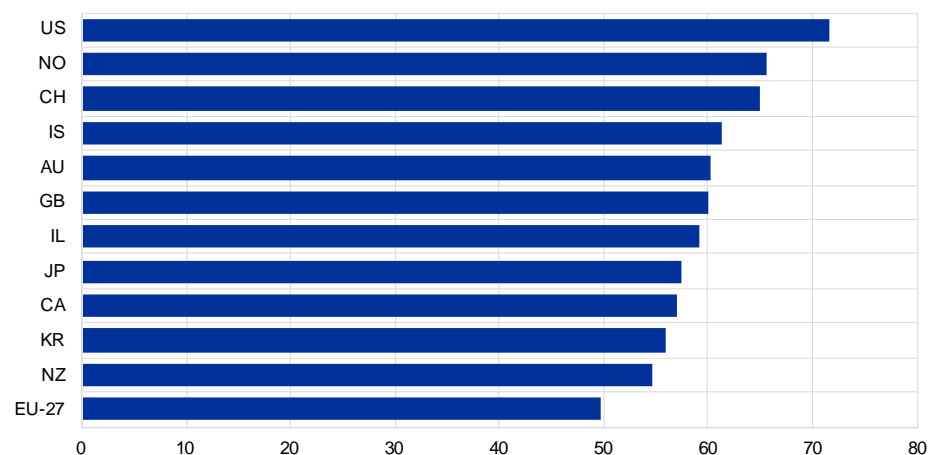
⁷⁸ Import concentration at the country level is measured by the sum of product-level Herfindahl-Hirschman Indexes of import concentration weighted by the respective import values (see Box 6 for additional details). It is worth mentioning that China's high import concentration of bauxite, the main input material for aluminium production could, in principle, affect European industries if bauxite sourcing issues affecting China resulted in a global aluminium shortage.

⁷⁹ I-DESI is a comprehensive indicator which provides an overview of the state of digitalisation in the EU and 18 third countries. It is comprised of five components: i) connectivity, (ii) human capital, (iii) use of internet, (iv) integration of digital technologies in the corporate sector and (v) digital public services. Data are from 2018. For a detailed description of the methodology, see European Commission (2020h). This chapter does not present the results for individual EU Member States, as it aims to provide a horizontal overview of the EU-27. Nevertheless, I-DESI points to strong heterogeneity in the state of digitalisation within the EU. For more details on the results for individual EU Member States, see European Commission (2020h).

Chart 24

Overall digital performance of the EU-27 compared with other advanced economies (2018)

(I-DESI in points, 2018)



Source: European Commission.

Notes: I-DESI measures the digital economy performance of EU27 Member States and the EU as a whole in comparison with 18 other countries around the world: Australia, Brazil, Canada, Chile, China, Iceland, Israel, Japan, Mexico, New Zealand, Norway, Russia, Serbia, South Korea, Switzerland, Turkey, the United Kingdom and the United States. I-DESI consists of five weighted sub-indices (connectivity, digital skills, use of internet, digital technology and digital public services). Data are normalised ranging from 0 to 100 with higher figures indicating higher digitalisation. The latest data for I-DESI are for 2018. For further details see [I-DESI 2020: How digital is Europe compared to other major world economies?](#)

AU=Australia, CA=Canada, CH=Switzerland, GB=United Kingdom, IL=Ireland, IS=Iceland, JP=Japan, KR=Korea, NO=Norway, NZ=New Zealand, US= United States.

With regard to the EU's corporate sector, there is significant room for improvement in the use of digital solutions as well as strong heterogeneity in the use of individual technologies. A breakdown of Eurostat data⁸⁰ on the use of several digital technologies in the corporate sector shows that the use of enterprise resource planning software (ERP software⁸¹), cloud-computing services, supply chain management and – with a somewhat greater distance – the internet of things is more widespread than the use of big data analysis, 3D-printing and artificial intelligence, as shown in Chart 25. Moreover, the chart shows that there is relatively high heterogeneity in the use of cloud computing (interquartile gap of 27 percentage points) and in the use of supply chain management (interquartile gap of 25 percentage points) among EU Member States.

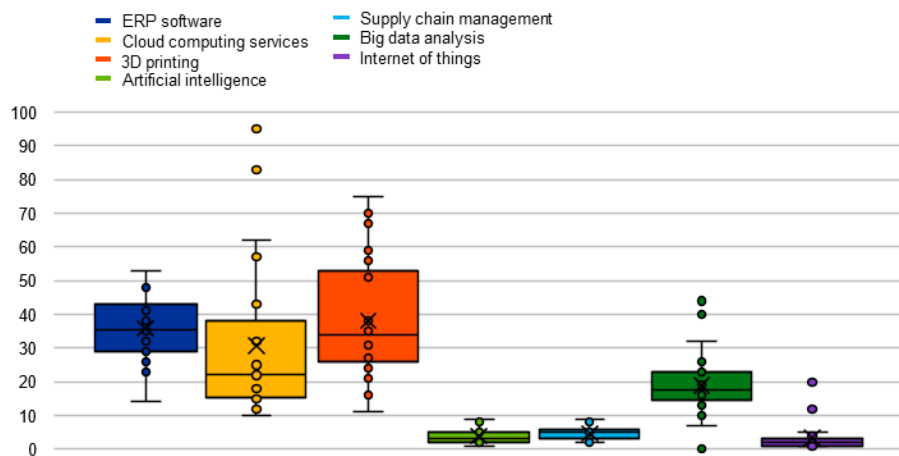
⁸⁰ Data from Eurostat. For explanatory notes and meta data see [Eurostat](#) (ICT usage in enterprises (isoc_e)).

⁸¹ ERP software is a product in which various modules are available for planning, recording and managing business activities (e.g. materials management, financial accounting and human resources).

Chart 25

Use of digital technologies in the corporate sector of EU Member States (2020)

(values for 2020 as a percentage of corporates, multiple entries possible) 1)



Source: Eurostat.

Notes: The size of the boxes indicates the interquartile distance and, therefore, the dispersion of the values. The median (solid line) and the mean (cross) are shown in each box. At the end of the antenna are the values that either exceed the interquartile distance by 1.5 times (maximum values) or fall below it (minimum values). Data outside this range are defined as outliers and are represented by a dot.

1) Data on ERP software from 2019.

Difficulties in the rapid adoption of digital technologies may stem from structural weaknesses in the EU economies in terms of infrastructure, digital skills of the population and regulation.

First, with regard to infrastructure, according to the OECD⁸² and the results of research presented in the empirical literature,⁸³ a likely explanation as to why EU enterprises need to catch up in the field of digitalisation is weaknesses in network capacities. Eurostat data for 2021 show that only 52% of enterprises in the EU-27 had a high-speed internet connection,⁸⁴ indicating an urgent need to catch up in order to manage the digital transition successfully. Second, employees' digital skills are also important in the use of digital technologies, as shown by Andrews et al. (2018) and Gal et al. (2019). According to Eurostat's Digital Skills Index 2.0 (DSI 2.0),⁸⁵ in 2021, 26% of the population aged between 16 and 64 years had above-average digital skills; 27% had average digital skills and 47% had little to no digital knowledge. A lack of information and communications technology (ICT) specialists also fits this picture. According to Eurostat data, 38% of firms seeking ICT specialists were not able to fill their vacancies as the applicants lacked the required skills.⁸⁶ Finally, results from the empirical literature point to the impact of international competition, rigidities in labour

⁸² See OECD (2020).

⁸³ See Andrews et al. (2018) and De Backer et al. (2017).

⁸⁴ A minimum download rate of 100 Mbit/s was assumed for 5G operators looking to buy a frequency band during the frequency auction in some EU Member States (including Germany). Therefore, all internet connections with a download speed of (at least) 100 Mbit/s, 500 Mbit/s or 1 Gbit/s are considered in this analysis. For detailed information on the 5G-auctions in the EU Member States see National 5G Strategies – 5G Observatory.

⁸⁵ It is a composite indicator of five areas: (i) information and data literacy skills, (ii) communication and collaboration skills, (iii) digital content creation skills, (iv) safety and (v) problem solving skills. For a detailed description and metadata see Eurostat's Individuals' level of digital skills (from 2021 onwards). (isoc_sk_dskl_i21) (europa.eu).

⁸⁶ For the data see Eurostat statistics.

and product markets and the availability of risk capital on the use of digital technologies⁸⁷. In particular, the OECD indicator for barriers to entry in services and network sectors points to significantly lower barriers in leading advanced economies than in the EU.⁸⁸

In addition, given the rising volume of data processed in cloud infrastructures, dependencies in this sector will become even more important during the digital transition. However, market providers have been limited to only major companies from third countries, given the required levels of cutting-edge innovation, a lack of investment from other areas, network externalities and first-mover advantages.⁸⁹ This market structure could create entry barriers for new or smaller companies, reduce the ability to control the use of sensitive personal data and create risks of further concentration of the market through anti-competitive practices.

It is also important to analyse the possible vulnerabilities that may arise from the lack of an appropriate framework which would facilitate access to the privately held data used to produce official statistics and make it easier to produce highly transparent, reliable and granular statistics. Although the ESCB relies primarily on data collections governed by regulations and guidelines, many refinements in the statistical framework could be facilitated through access to third-party data handled by “big tech” or “big data” enterprises. Against this backdrop, the EU has launched an EU data strategy, including the drafting of the Data Governance Act and the Data Act (see Box 13). At this stage, the framework does not address the key concerns of official statistics, which include access to privately held third-party data or the development of the key infrastructural elements of an EU data framework, such as the legal entity indicator (LEI). These concerns are both highly relevant to the efficient and effective provision of data to support evidence-based policymaking. The EU data strategy includes the setting up of “data spaces”, which include one dedicated to financial data. These data spaces are important tools supporting the strategic ability of the EU to handle, protect and disseminate data. Meanwhile, the impact on the ESCB of these key infrastructural elements of the EU data strategy has still to be assessed.

⁸⁷ See [Andrews et al. \(2015\)](#), [Andrews and Criscuolo \(2013\)](#), [Perla et al. \(2015\)](#) and [Bloom et al. \(2012\)](#).

⁸⁸ A sub-component of the product market regulation (PMR) index. For more information on the PMR see [Indicators of Product Market Regulation - OECD](#).

⁸⁹ See also [European Commission, 2021d](#). According to Synergy Research Group's data, a few EU cloud and telco providers (OVH cloud, Deutsche Telecom, Orange and KPN) challenge the popularity of the global players to a limited extent, within selected national markets in the EU. See [Synergy Research Group \(2021\)](#).

2.5 Financial interdependencies

2.5.1 Cross-border investment and financial linkages

The euro area is characterised by a high degree of financial openness. Not only is the euro area more financially open than the United States and China, it is also more financially open than the average open advanced economy (see Chart 26, panel a). Over the past decade external asset and liability positions have averaged almost 480% of GDP in the euro area, compared with 320% in the United States and 170% in China (including Hong Kong).⁹⁰ Euro area members also intermediate a large share of global financial flows on both the asset and the liability side, including substantial intra-area flows (see Chart 27). As discussed by the ECB strategy review (*Work stream on globalisation*, 2021), the pace of global financial integration slowed after the global financial crisis (GFC), following the unprecedented rise seen before the crisis. FDI flows remained resilient in the wake of the GFC, while portfolio debt and bank flows collapsed. Since 2018, however, the euro area has experienced subdued FDI flows, whereas portfolio and bank flows have picked up.⁹¹ At the same time, financial integration within the euro area has continued to increase.

The euro area is also home to a number of investment hubs whose importance has increased since the GFC. The euro area is home to six investment hubs (Belgium, Ireland, Cyprus, Luxembourg, Malta and the Netherlands), whose cross-border positions dwarf even those of other global financial centres (see Chart 26, panel b).⁹² They intermediate most of the euro area FDI flows, although only a small share of these flows stay in the domestic economy as the remainder transit through to other intra and extra-euro area destinations. Not only are FDI flows intermediated by these investment hubs larger, they are also more volatile than the FDI flows recorded by the other euro area members.

The EU's main FDI partners are other advanced economies, in particular the United States, the United Kingdom and Switzerland.⁹³ Together, the United States, the United Kingdom and Switzerland account for almost 60% of EU inward and outward FDI stocks over the past 20 years, while other advanced economies have been responsible for a further 10% (see Chart 28). China (including Hong Kong) has been responsible for around 3% of EU outward and inward FDI. Other relevant destinations for EU FDI include the LATAM countries (6%), Russia (3%) and the Euromed group, including Turkey (2%). Overall, EMEs still represented a small source of EU inward FDI.

⁹⁰ For the EU, the average value of external asset and liability positions stood at 390% of GDP over the period from 2014 (the earliest year with available data) to 2021.

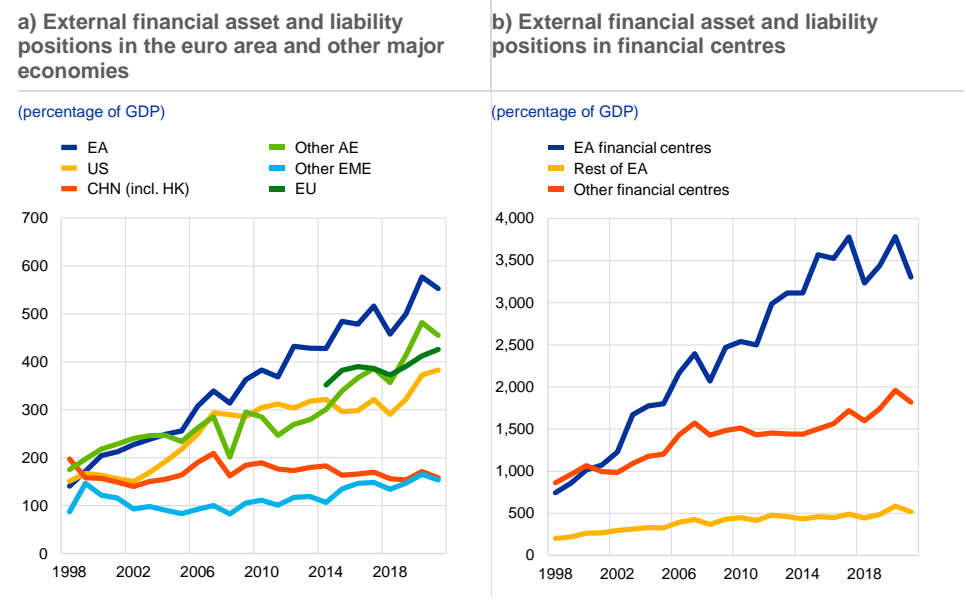
⁹¹ These subdued dynamics are largely due to the US tax reform enacted in 2018, and led to disinvestment, changes in intra-group positions and the repatriation of profits. As discussed below, the euro area was particularly affected by the presence of investment hubs, which act as a conduit for FDI.

⁹² For a definition of cross-border financial centres/investment hubs, as well as a list of euro area hubs, see [Pogliani and Wooldridge \(2022\)](#) and [Di Nino et al. \(2020\)](#).

⁹³ The discussion on FDI is at the EU, not the euro area, level, as it is for the rest of the section. This is because disaggregated data by partner countries and sectors of economic activity, and special purpose entity (SPE) data, are only available at the EU level.

Chart 26

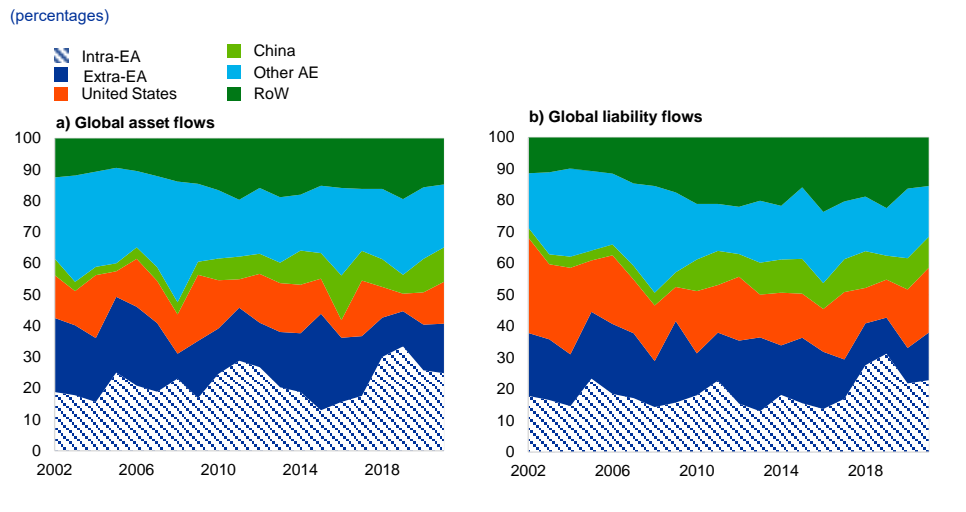
The euro area is more financially open than most of its partners and is home to major investment hubs



Sources: Lane and Milesi-Ferretti (2022), IMF BoP Statistics, Eurostat and own calculations.
Notes: In panel a, the lines show the sum of gross external financial asset and liability stocks as a percentage of GDP. The “EA” line shows extra-euro area positions only, while the “EU” line shows extra-EU positions only (data only available since 2014). The “Other AE” line shows the median value for the following group of countries: UK, CHE, JAP, AUS, CAN, NZ, NOR and KOR. The “Other EME” line shows the median value for the following group of countries: BRA, IND, RUS, MEX, TUR, THA, IDN, MEX and ZAF. In panel b, the blue and yellow lines show the sum of gross stocks of external assets and liabilities for the group of six euro area investment hubs (BEL, NLD, LUX, CYP, IRE and MLT) and for the rest of the euro area members respectively, as a percentage of each group’s GDP. These positions include both intra and extra-euro area positions. The blue line shows the median value for the following group of countries: UK, CHE, SNG and HK.

Chart 27

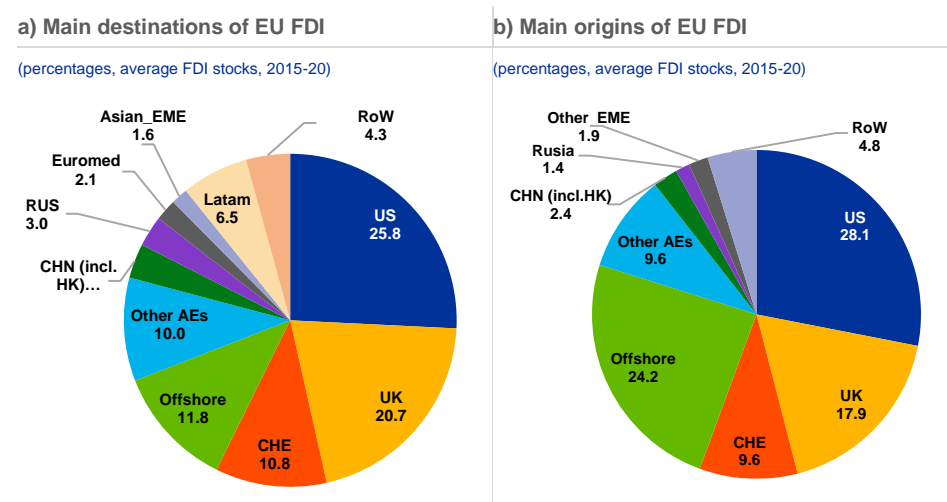
Euro area countries intermediate a substantial share of global financial flows



Sources: IMF BoP Statistics and own calculations.
Notes: Each area shows respective shares of total global asset and liability financial flows. Financial flows are the sum of FDI, portfolio and “other” flows. Intra-euro area flows are shown in shaded blue, while extra-euro area flows are shown in block blue. Data start in 2005 for AUT and IRE. Data on FDI flows in 2021 are missing for CYP. “Other AE” includes the advanced economies AUS, CAN, JAP, KOR, NOR, CHE and UK. “Intra-EA” stands for intra-euro area; “Extra-EA” stands for extra-euro area; “RoW” stands for rest of the world.

Chart 28

The main counterparts for EU FDI are other advanced economies



Source: Eurostat and own calculations.

Notes: Each area shows shares of EU outward and inward FDI stocks respectively. "Other AE" includes the advanced economies AUS, CAN, JAP, KOR and NOR. "Asian EME" includes the emerging market economies IND, IDN, THS and MYS. "Latam" includes BRA, CHL, MEX, COL and PER. "Euromed" includes 15 southern Mediterranean, African and Middle Eastern countries which are part of the Euro-Mediterranean partnership with the EU.

FDI exposures between the EU and its main partners are concentrated in the services and manufacturing sectors.

In particular, the financial services sector attracts the largest volumes of both inward and outward FDI positions, along with a number of manufacturing sectors such as "petroleum, chemical, plastic and pharmaceutical" and "metal, machinery and transport equipment" (see Chart 29). The main origins of inward FDI in "financial services" are the United States and offshore centres, each accounting for 30% of the total. Overall, while the United States is the main source of FDI across most sectors, it has a particularly high share for the manufacturing of "computers and electronic products" (60%) and "metals, machinery and transport equipment" (45%) (see Chart 30).

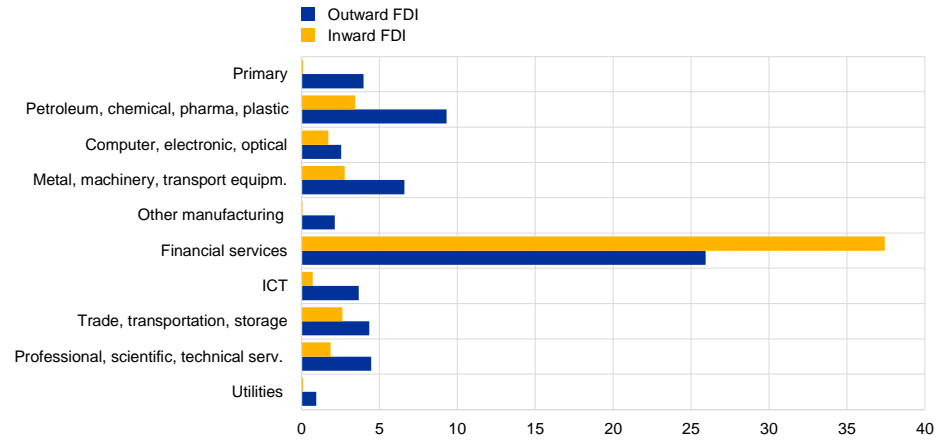
Moving beyond aggregate data and looking specifically at FDI through merger and acquisition (M&A) deals reveals a number of patterns.

A large part of foreign investment in Europe in 2020 originates in the United States and Canada (nearly 35% of M&A in the EU), followed by the United Kingdom (31% of total M&A). Investments are concentrated in the manufacturing sector (about 30% of the total number and value of investments), followed by information technology and financial services (15% and 10% respectively). Across all sectors, the United States is the origin of the largest number and value of investments, followed by the United Kingdom and, after that, Switzerland (see Chart 31).

Chart 29

Inward and outward FDI positions, by sector of economic activity

(percentage of EU GDP, average stocks, 2015-19)



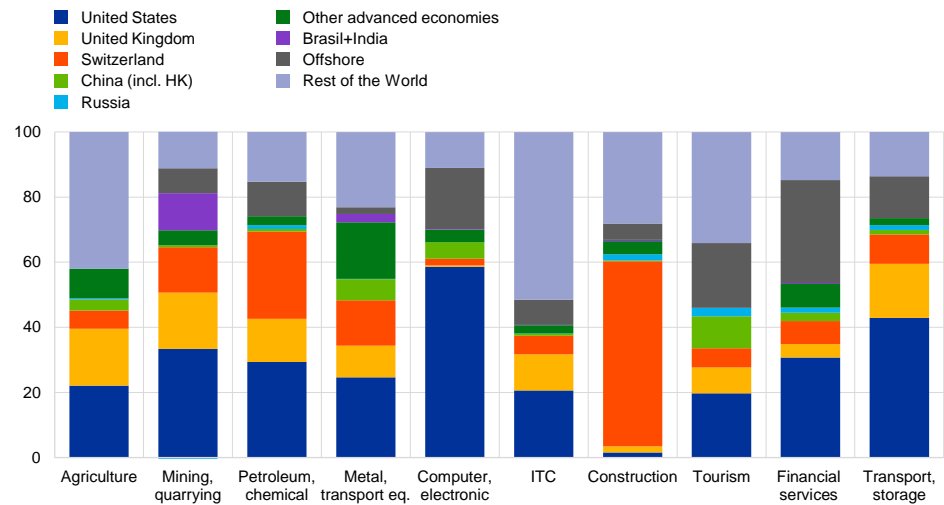
Sources: Eurostat and own calculations.

Notes: Horizontal bars show the average volume of inward and outward FDI stocks in each sector, as a share of EU GDP.

Chart 30

EU inward FDI positions by sector of economic activity and partner country

(percentages, average, 2015-19)

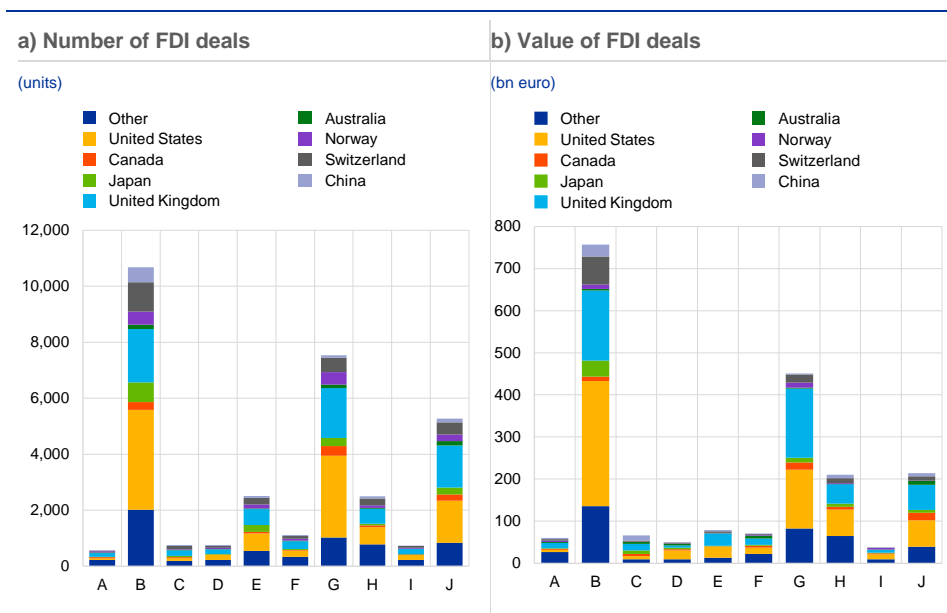


Sources: Eurostat and own calculations.

Notes: Vertical bars show the average share of each partner country of total inward FDI stocks for each sector.

Chart 31

Number and value of FDI deals in the EU by sector of economic activity (2000-21)

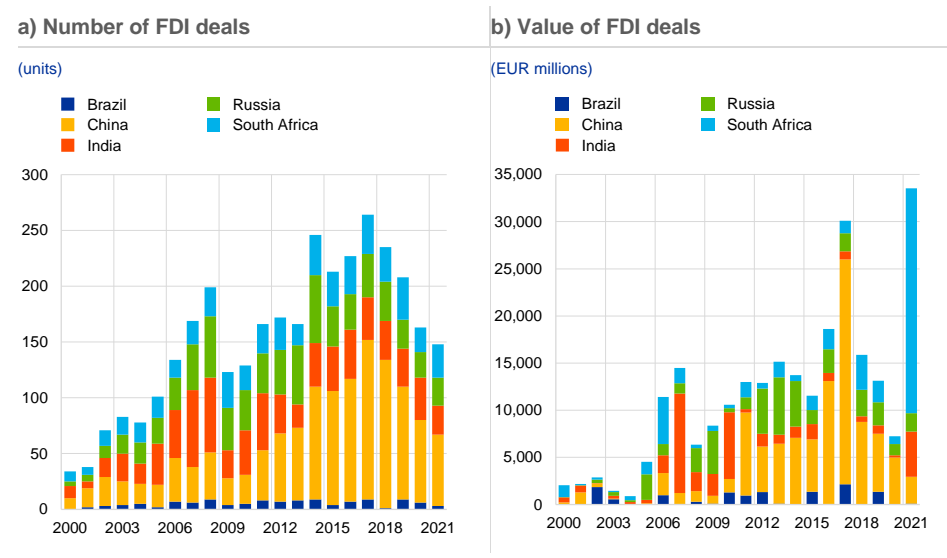


Source: BvD Zephyr.
 Note: A: agriculture, mining and quarrying; B: manufacturing; C: energy and utilities; D: construction; E: wholesale and retail trade; F: transport; G: IT and publishing; H: financial services; I: real estate; J: other services.

One of the most noticeable trends is the large increase in extra-EU cross-border M&A deals from BRICS countries. M&A deals from Brazil, Russia, India, China and South Africa (BRICS) investors have increased over the last 20 years, although they were starting from a low level (see Bencivelli et al., 2019). EMEs represented less than 20% of total M&A deals in 2021. China accounted for the lion's share in terms of both the number and the value of completed deals (see Chart 32). Chinese investments are directed disproportionately towards manufacturing (about 50% of deals in number terms), while all other sectors received less than 10% each. However, looking at the value of the operations, the distribution of Chinese investments appears to be more in line with that of other countries. Manufacturing received about 40% of the total amount of resources, followed by energy (and other utilities) and transportation (18% and 12% respectively), broadly reflecting heightened interest in the infrastructure sectors and the large amount invested per transaction. The sharp reduction of Chinese outward investment after 2017 is largely attributable to the tightening of capital controls by the Beijing government. For its part, Russia accounted for a significant share of deals until 2014. However, Russian deals stalled between 2014 and 2015 following the sharp devaluation of the Russian rouble and the sanctions imposed by the EU due to the 2014 annexation of Crimea.

Chart 32

FDI acquisition in the EU originating in BRICS countries (2000-21)



Source: BvD Zephyr.

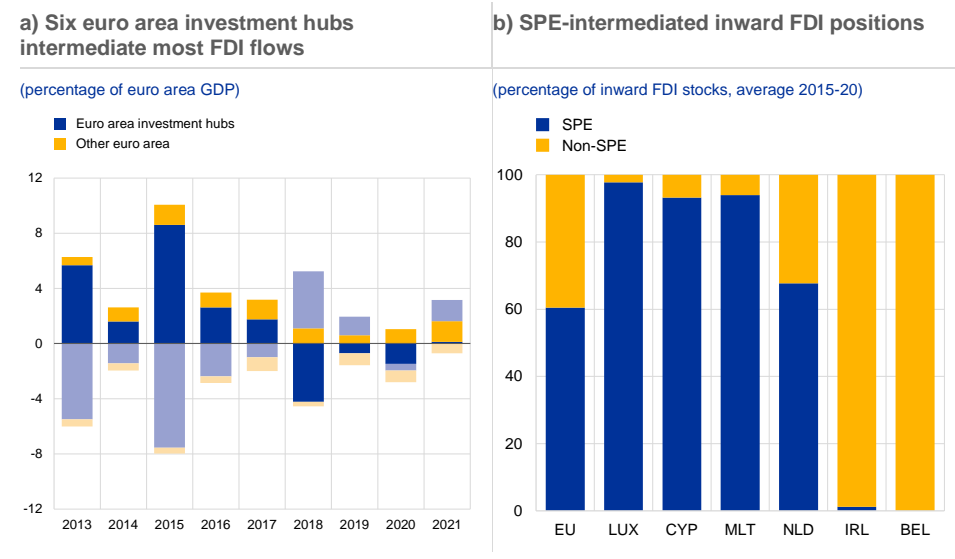
A number of elements blur the picture of the ultimate investor-destination linkages between EU members and their partners.

First, as we saw previously, around a quarter of FDI in the EU originates in offshore centres, while the six euro area investment hubs intermediate most of the inward and outward FDI flows (see Chart 33, panel a). Second, around 60% of EU inward FDI is intermediated by SPEs.⁹⁴ SPE activity in the EU is concentrated in a small number of countries, notably Cyprus, Luxembourg and Malta, whose inward FDI is almost entirely intermediated by domestic SPEs (see Chart 33, panel b). Third, Alcidi et al. (2021) estimate that in 2019 around 20% of non-SPE FDI flowing into the EU had an immediate investor resident in the EU but an ultimate investor non-resident in the EU, and that two-thirds of intra-EU investment originating in Luxemburg and the Netherlands was made by investors who were non-resident in these countries. Thus, when restated on an ultimate investor basis, FDI inflows from the United States almost double, while FDI inflows from China are almost three times larger. While these estimates should be treated with caution, they provide an indication of the complex picture of cross-border ultimate investment ownership.

⁹⁴ SPEs are set up in countries with favourable regimes for a variety of reasons, but mainly for tax purposes, to move the risk out of parent companies' balance sheets or for reasons of confidentiality. These entities are part of complex chains of ownership usually spanning several countries.

Chart 33

Most EU FDI is intermediated by investment hubs and channelled through SPEs



Sources: Eurostat and own calculations.

Note: In panel a, liability flows are shown in shaded colours and with a negative sign for visualisation purposes. Negative (positive) assets (liabilities) indicate disinvestments and the repatriation of profits. In panel b, vertical bars show the shares of SPE-intermediated and non-SPE intermediated inward FDI stocks respectively, over the period 2015-20.

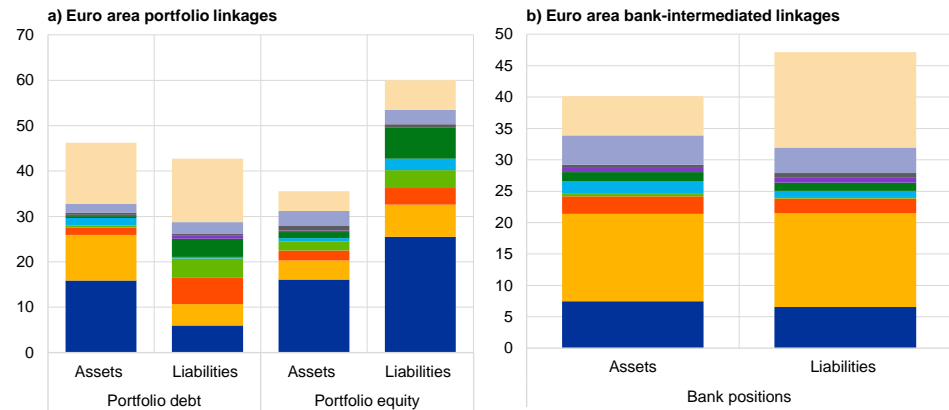
The euro area's portfolio and banking linkages are dominated by other advanced economies, although portfolio holdings of EME debt may be understated.

Reflecting the development of their capital markets and the global outreach of their financial institutions, other advanced economies (in particular the United States and the United Kingdom and, to a lesser extent, Japan and Switzerland) are the main investors in, and destinations of, euro area portfolio investment (see Chart 34, panel a). In particular, the United States is both the main investor in euro area portfolio instruments (holding almost half of euro area equity liabilities) and the country in whose securities euro area countries invest the most (accounting for about half of euro area equity and one-third of euro area debt assets). The United Kingdom is also a significant investor in euro area equity and debt securities and is the issuer of around a quarter of euro area-held foreign debt securities. China (including Hong Kong) is an important investor in equity and debt instruments issued by the euro area, although it accounts for a smaller share of foreign equity and debt securities held by the euro area. Nevertheless, the actual magnitude of euro area portfolio exposures may be larger, as argued by Coppola et al. (2021), who restate global portfolio holdings from residency-based to nationality-based. In particular, they find that euro area holdings of Russian and Chinese debt triple when issuance via tax havens is accounted for. With regard to bank-intermediated linkages (cross-border loans and deposits), the United Kingdom has a prominent position, accounting for around one-third of both asset and liability positions (see Chart 34, panel b).

Chart 34

Main partners of euro area portfolio and bank-intermediated positions

(percentage of euro area GDP, average 2015-21)



Sources: Eurostat, IMF Coordinated Portfolio Survey (CPIS) and own calculations.

Notes: In panel a, vertical bars show the composition of euro area portfolio debt and equity asset and liability positions respectively, by partner country, as a share of euro area GDP. Liabilities to China, India and Brazil are estimated based on data from the CPIS and Eurostat. In panel b, vertical bars show the composition of bank loan, currency and deposit asset and liability positions respectively, by partner country, as a share of euro area GDP.

Chinese FDI and lending for infrastructure in the EU and neighbouring countries have raised concerns for EU policymakers, given their potential geopolitical motivations.

As discussed above, FDI from China represents a relatively small share (around 3%) of FDI stock in the EU. However, the strategic aspect of some Chinese acquisitions in Europe and the opaque nature of Chinese overseas lending practices have raised a number of concerns.

The first concern refers to the acquisition of stakes in a number of strategic transport and energy infrastructure facilities across the EU as a part of China’s Belt and Road Initiative (BRI).

One prominent example of this is ports: China has stakes in 14 ports across the EU and handles about 10% of Europe's shipping container capacity.⁹⁵ On the one hand, estimates show that the reduction in transport times and trade costs brought about by the BRI could be very beneficial to the EU from a trade perspective and, in practice, the acquisitions have been accompanied by investments in port and road infrastructure.⁹⁶ On the other hand, given that the Chinese company (COSCO) involved in most of these ports is a state-owned enterprise, there are worries about undue political influence, as well as other

⁹⁵ See [Giamello and Mardell \(2021\)](#).

⁹⁶ See [Felbermayr et al. \(2020\)](#).

strategic concerns.⁹⁷ A number of recent Chinese attempts to acquire ports in Europe have been blocked.

The second concern refers to the risk of debt vulnerabilities for emerging and developing economies taking part in the BRI, including central and eastern European EU and EU-candidate countries. On the one hand, Chinese investment in EMEs allows these countries to address their infrastructure gap and has been shown to have beneficial effects on economic growth.⁹⁸ On the other hand, the literature has discussed the risk of hidden debt for these countries, given the opacity in terms of volumes and contractual clauses that characterises Chinese state-owned lending for infrastructure projects.⁹⁹ Another concern is whether countries prefer to turn to China instead of the IMF when experiencing financing difficulties. In that regard, Sundquist (2021) shows that China has been willing to provide funding, acting as an alternative to the IMF, only to countries able to repay it using methods other than cash (typically through exports of natural resources and geopolitical concessions). In the European context, there are concerns that the terms of BRI lending may be incompatible with EU regulations, particularly with regard to EU procurement rules. Several BRI infrastructure projects in the EU and western Balkans have been subject to EU investigation and have had to be shelved or modified as they did not comply with EU procurement and transparency rules.¹⁰⁰

For their part, major advanced economies use aid provision and influence in international institutions to support geopolitically important partners.

Kuziemeko and Werker (2006) found that the United States increases aid significantly to countries which rotate into one of the United Nations Security Council seats and this effect is stronger during years in which key diplomatic events take place. Furthermore, countries are more likely to receive an IMF loan (and these loans are systematically larger and with less conditionality) if they vote with the United States and other G7 countries in the various United Nations Councils¹⁰¹ or if they have a larger stock of G7 country FDI and bank assets.¹⁰²

2.5.2 Limits to investment finance in the EU

The European banking sector remains partly segmented along national lines.

In particular, the crisis management framework for small and medium-sized banks is less robust than it is for larger banks and there are still some prudential regulatory

⁹⁷ The case of the port of Piraeus illustrates the tension between (EU-asymmetric) economic benefits and strategic concerns. According to observers, after COSCO acquired 51% of the port of Piraeus in 2016, the Greek government [objected to the EU statement in 2017 at the UN concerning human-rights violations in China](#). Piraeus has become the busiest port in the Mediterranean and the 4th busiest in Europe (up from 17th place in 2017). Another recent case that created much debate was the acquisition by the Chinese firm COSCO of a stake in one terminal at the port of Hamburg. Due to serious concerns within the German Federal Government about the strategic implications of the acquisition, the German cabinet decided to reduce COSCO's stake from the 35% originally envisaged to 24.9%.

⁹⁸ See [Mueller \(2023\)](#).

⁹⁹ See [Horn et al. \(2021\)](#), [Gelpern et al. \(2021\)](#).

¹⁰⁰ See [Think Tank European Parliament \(2018\)](#).

¹⁰¹ See [Barro and Lee \(2005\)](#), [Dreher et al. \(2009\)](#) and [Dreher and Jensen \(2007\)](#).

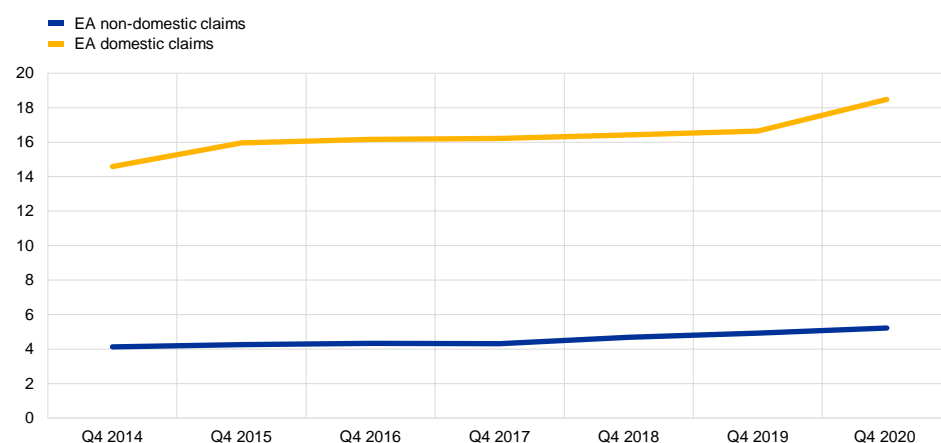
¹⁰² See [Oatley and Yackee \(2004\)](#), [Presbitero and Zazzaro \(2012\)](#).

barriers to a truly single European banking market. Cross-border integration has been progressing at a slow pace. In 2021, the amount of domestically held assets was more than four times the size of non-domestic euro area assets.¹⁰³ This poses two problems. First, European banks have to compete with other global players that enjoy much deeper domestic markets (a larger domestic market is conducive to profitability). Euro area banks are less profitable than their US peers: their average return on equity between 2008 and 2020 stood at 2.1% compared with 7.5% for US banks. While the recent acceleration in the digitalisation of the EU banking system, together with further progress on non-performing loan workout, has helped to tackle some of the causes of lagging profitability, further cross-border integration may help close the existing profitability gap. Second, cross-border private risk sharing remains low and is exposing the euro area to asymmetric shocks. In turn, this puts further pressure on public budgets and impairs monetary policy transmission.

Chart 35

Domestic and non-domestic claims in the euro area (2015-21)

(EUR trillions)



Source: Consolidated Banking Statistics and ECB calculations.

Notes: Four-quarter moving average of total exposures for credit, counterparty credit and dilution risks and free deliveries.

The EU bank-based financial system lacks an adequate complement in deeper and broader capital markets.

While total assets held by non-bank financial institutions in the euro area doubled between 2009 and 2021, European capital markets are still lagging behind other markets.¹⁰⁴ For example, the overall availability of risk capital in the EU is roughly ten times lower than it is in the United States (0.044% of GDP versus 0.633% of GDP).¹⁰⁵ This lack of risk capital relates to different types of financing instruments supporting different stages in the lifecycle of firms. In particular, there is scope for EU countries to develop their private equity markets into a more dynamic source of risk capital, which would give rise to better growth opportunities for young and innovative companies (see Chart 36). The EU specifically lacks large equity financing deals that start-ups typically need for them to move on from the early stages to the scale-up phase (growth capital).¹⁰⁶ Scale-up

¹⁰³ See [Enria \(2022\)](#).

¹⁰⁴ Their total assets have increased from €25 trillion in 2009 to about €52 trillion in Q4 2021.

¹⁰⁵ See [Demertzis et al. \(2021\)](#).

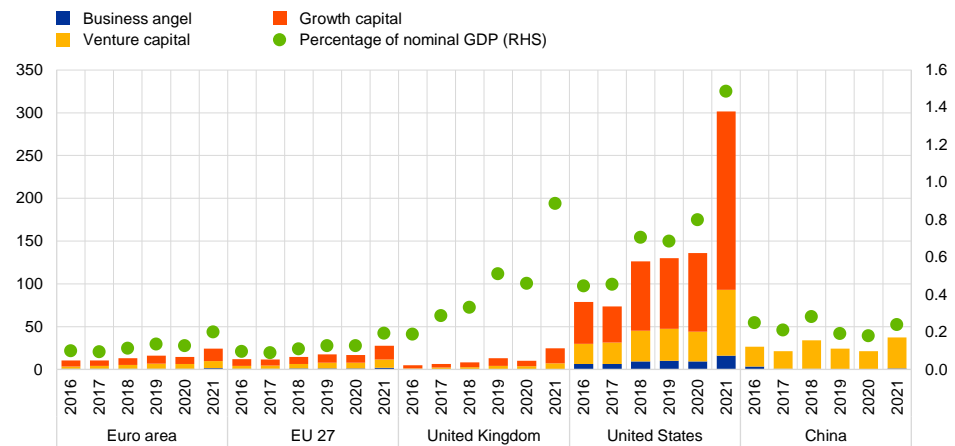
¹⁰⁶ [Gossé et al. \(2022\)](#).

companies – when financed properly – contribute disproportionately to innovation, which is important from a strategic autonomy perspective.¹⁰⁷

Chart 36

Business angel, venture capital and private equity (growth capital) across jurisdictions

(EUR billions, left-hand scale; percentages, right-hand scale; annual data: 2016-21)



Sources: European Business Angel Network, Invest Europe, National Venture Capital Association, Pitchbook, FRED Economic Data, ECB and ECB calculations.

Notes: The data cover all euro area countries and EU countries except Cyprus, Malta, Slovakia and Slovenia. "Business angel" investments include "angel" and "seed" financing. They are (high-risk) investments made by early-stage private investors, typically in the form of seed financing for start-up businesses. Angel investments comprise both financial contributions and the time, expertise and connections the investors provide in exchange for ownership equity. Seed investment is funding for launch and is provided before the investee company has started mass production/distribution, the aim being to complete research or define and design the product, including market testing and creating prototypes. This funding is not used to start mass production/distribution. Venture capital is a subset of private equity and refers to equity investments made for early development (start-up) or expansion (later stage venture). "Start-up" is funding provided to companies once the product or service has been fully developed, in order to start mass production/distribution and cover initial marketing. Companies may be in the process of being set up or may have been in business for a short time but are yet to sell their product commercially. The capital would be used mostly to cover capital expenditure and initial working capital. "Later stage venture" is financing provided for an operating company, which may or may not be profitable. This tends to be financing provided to companies already backed by venture capital. For further details see, among others, [Invest Europe](#).

Firms are finding it difficult to fund the twin transition, which requires a major investment effort from both the public and the private sectors. While the NGEU programme offers some support to the public sector, private investment has still to find its way (see Box 15). Despite the notable euro area financial surpluses at the aggregate level discussed in the previous subsection, European firms find it difficult, as Box 10 explains, to implement their relatively far-reaching investment plans, given the lack of funding.

Euro area banks play a limited role in euro area capital market services.

Although European banks are amongst the largest in the world, they face strong competition from abroad when it comes to the provision of essential services in EU capital markets. It is estimated that about 45% of the banks involved in non-financial corporations' bond issuance activities in the euro area – as managers, co-managers, bookrunners, participants or underwriters – were foreign banks in 2021.¹⁰⁸ Similarly, 48% of euro area initial public offering activities were carried out by non-euro area institutions. Strong reliance on foreign players in performing key services for capital markets exposes the euro area to a number of strategic autonomy risks. For

¹⁰⁷ [European Central Bank](#) (2022a).

¹⁰⁸ According to Dialogic data for 2021.

example, non-EU-based banks may not be able to ensure financing if they face potential sanctions due to geopolitical concerns.

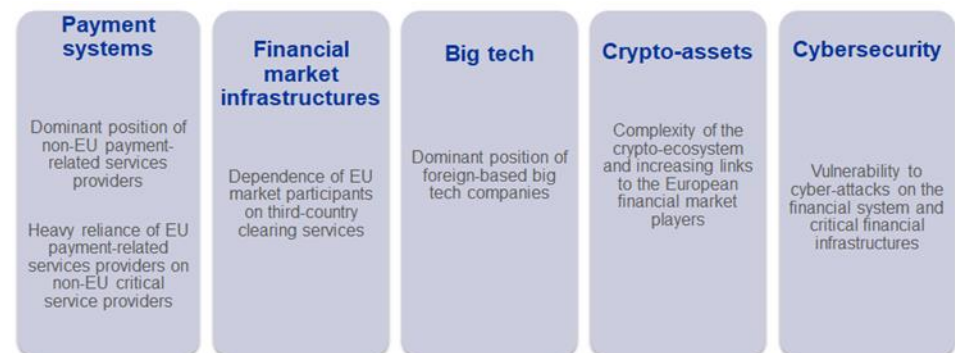
Innovation in the European financial system relies heavily on non-EU companies. Recently, several non-EU fintech and big tech companies have entered the EU capital market and banking landscape. These new foreign-based players provide financial services in the EU mostly through payment licenses, but also through some banking and credit licenses. These companies could pose risks to the European financial system, as will be discussed in the next section. However, healthy market competition from abroad could also be a catalyst for innovation in the EU financial sector. Faced with the rise of fintech and big tech companies, European banks may be more inclined to innovate.

2.5.3 Payments and financial market infrastructures

This section discusses dependencies on non-EU players in payments, financial market infrastructures and digital financial services, as well as cybersecurity risks, as shown in Figure 2.

Figure 2

Dependencies on non-EU players in payments, financial market infrastructures and digital financial services



Source: Own elaboration.

The dominant position of non-EU payment-related service providers in intermediating European payment transactions has raised concerns over EU payment markets' resilience, competitiveness and data privacy, as well as traceability in the fight against tax evasion, money laundering and terrorist financing. Non-European payment-related service providers handle around 70% of European card payment transactions and show a high degree of market concentration in segments such as card transactions and online payments.¹⁰⁹ While European cardholders can pay with one card all over Europe, the pan-European acceptance of cards issued under a national card scheme is reliant on co-badging with an international card scheme. In addition, European payment-related service

¹⁰⁹ European Central Bank (2019).

providers rely heavily on critical services providers (e.g. cloud services,¹¹⁰ technology providers or mobile device manufacturers¹¹¹), some of which are governed from outside the EU and whose interests may not necessarily coincide with those of European stakeholders. Given these strong non-European dependencies, it cannot be excluded that geopolitical tensions may negatively affect the functioning of the European payments ecosystem. For this reason, the upcoming Digital Operational Resilience Act will establish an oversight framework, comprising the European supervisory authorities, to oversee such providers, even if they reside outside the EU (contingent on certain conditions being met).

The current overreliance of EU market participants on third-country central clearing services, meaning that EU authorities have only limited reach during a crisis, is a potential source of financial stability risks. In particular, the dependence of the EU financial system on services provided by UK-based central counterparties (CCPs) could be a source of vulnerability, especially during a crisis and the resolution of that crisis. Risks to the EU's financial stability could arise from the size of the exposures of EU clearing members and clients to UK CCPs,¹¹² as well as from the interconnections between UK clearing services and a number of EU financial market infrastructures.

Potential disruptions of clearing operations – as well as certain CCP risk management decisions – could affect the functioning of markets for financial instruments denominated in euro that are relevant for monetary policy implementation. For instance, UK centrally-cleared short-term interest rate derivatives denominated in euro play a fundamental role in the effective implementation of monetary policy.¹¹³ Disruptions at a systemically important clearing service for financial instruments in euro could cause the propagation of liquidity risk to EU market participants and through the EU financial system.¹¹⁴ This could lead to severe liquidity strains or disruptions at other CCP participants, which could in turn affect the smooth operation of payment systems in the EU, most notably large-value payment systems like TARGET2 for the euro (European Systemic Risk Board, 2021).

¹¹⁰ A few large non-European cloud providers dominate the market in the EU, with the largest EU cloud service provider accounting for less than 1% of total revenues generated in the European market (European Commission, 2021d).

¹¹¹ The EU's mobile devices market is dominated by a few Asian and US providers. EU suppliers currently have very limited market presence in the EU or globally (the EU's global market share in communication electronics was only 5% in 2019) (European Commission, 2021d).

¹¹² For instance, in 2020, out of all derivative transactions denominated in EU currencies cleared in UK and EU CCPs, 76% were cleared by two EU operators (LCH Ltd and ICE Clear Europe Ltd) which were considered to be of systemic importance to the EU (ESMA, 2021). Moreover, in 2020 LCH Ltd cleared 97% of all euro-denominated forward rate agreements and interest rate swaps (European Systemic Risk Board, 2021).

¹¹³ These derivatives measure market expectations of future interest rates and are a key instrument for determining the effectiveness of the transmission of monetary policy measures.

¹¹⁴ In the event of a crisis, such as the default of a large market-maker carrying out interest rate derivative transactions denominated in euro or other EU currencies, the UK CCP would no longer receive payments from the defaulting clearing member, but would still have to make payments to the original counterparties of the defaulting party. The CCPs' urgent need to close their positions could result in a significant and rapid increase in their demand for liquidity in euro or other EU currencies, which might put great pressure on EU clearing members and their clients, as well as on liquidity providers.

Cybersecurity vulnerabilities are coming to the fore, as cyberspace is increasingly exploited for political and ideological purposes and the malicious targeting of critical infrastructure is a major global risk. Cyber risk has been identified by the ESRB as a potential source of systemic risk to the financial system. Interconnectedness across financial market infrastructures, financial entities and financial markets could lead to cyber incidents rapidly escalating from an operational failure to a liquidity and solvency crisis, with possible serious negative consequences for the real economy (European Systemic Risk Board, 2020). The ESRB has also highlighted the risk of a coordination failure between financial authorities at the EU level during the response to a cyber incident. As such, the ESRB has identified the need for a future pan-European systemic cyber incident coordination framework (European Systemic Risk Board, 2022).

The rapid increase in the involvement of non-European big tech companies in EU financial services entails operational and financial stability risks, competition concerns and consumer protection issues. Europe only accounts for 6.3% of total global tech market capitalisation, while the United States and China account for 70% and 18% respectively (Atomico and Slush, 2021). In fact, the combined market capitalisation of the ten biggest US tech companies is still ten times bigger than that of Europe. US and Chinese-based big tech companies are increasingly entering the realm of retail payments and financial services, including in Europe where they currently operate for the most part through partnerships with payment-related service providers and banks.¹¹⁵ The growing presence of these new players could pose financial stability risks. For instance, greater pressure on incumbents' profitability may encourage traditional providers to take bigger risks (Financial Stability Board, 2019). It may also affect their solvency (Vučinić, 2020) or generate new types of interdependencies (European Banking Authority, 2019). The interconnection between financial markets and the many services that US and Chinese big techs provide may amplify financial stability risks (ESMA, 2020). Non-European big tech solutions could also have an adverse impact on competition, potentially leading to a more concentrated EU payments market and winner-takes-all effects.¹¹⁶ Concentrated positions could also have a systemic impact on the EU's payment system in the event of any operational failures or targeted cyberattacks. Consumer protection issues and potential data abuse are additional sources of concern arising from the activities of these big techs, given that US and Chinese big techs concentrate large quantities of customer data.

The complexity of the crypto-ecosystem raises a number of concerns, including concentration risks due to few large crypto-asset service providers (e.g. exchanges) which are often located outside the EU, non-transparent linkages across the ecosystem with insufficient risk management, and the development of decentralised finance that could provide unregulated crypto

¹¹⁵ In 2019, big techs made about 11% of their revenues from financial services. To date, big techs have followed a well-worn strategy of broadening their activities in finance. They often start with payments, in many cases overlaying such services on top of existing payment infrastructures. Increasingly, they have expanded beyond payments into the provision of credit, insurance, and savings and investment products, either directly or in cooperation with financial institutions as partners.

¹¹⁶ These effects stem from the fact that big tech companies have payment solutions that benefit from pre-established customer bases, and which can harness network effects and deploy retention strategies that involve high switching costs for consumers.

lending or borrowing services. The crypto market is characterised by high volatility, while its interconnectedness with European financial market players is increasing. Many of the crypto-asset issuers and service providers are located outside the EU and are still mostly unregulated. This poses various risks, including risks to the payment system and financial stability, as well as risks related to illicit business purposes. This is especially the case for unbacked, decentralised crypto-assets, which are also the most volatile as they are not based on any inherent value. For their part, although it is claimed that stablecoins constitute stable crypto-assets, their underlying mechanisms are typically insufficient to ensure stability. The issuers of stablecoins are mostly located outside the EU and their products are offered globally. The perception of safety, combined with a lack of regulation, could generate concrete risks for the euro area, including risks to financial stability (e.g. in the event of a run), to the payment system and to consumers.

2.5.4 The role of currencies¹¹⁷

The international use of an issuer’s currency can lead to broader, cheaper and more easily accessible funding for the domestic economy, even in times of geopolitical stress. For example, the literature on US dollar dominance emphasises the outsized role relative to trade patterns of the US currency in global markets.¹¹⁸ Among other areas, the dollar dominates in international funding markets, trade invoicing and settlement, as well as in foreign exchange reserves. The United States benefits from the large, strongly embedded base of transactions denominated in US dollars. As Maggiori et al. (2020) argue, one potential benefit that accrues to countries that issue an international currency like the US dollar is that “international currencies effectively open up the capital account for firms that only borrow in domestic currency.”

The extent of the international use of a currency depends on several factors, including geopolitics. The literature identifies factors such as sound institutions, macroeconomic fundamentals (including price stability) and geopolitical considerations as determinants of international currency status. Research suggests that since the early nineteenth century the leading international currencies have been those of countries where, among other things, the rule of law is respected, creditors are well represented and there is an emphasis on political checks and balances, and which build durable international alliances (Eichengreen, 2013). The literature also stresses that international reserve currencies are chosen on the basis of broad strategic and geopolitical considerations. One study has found, for example, that military alliances boost the share of a currency in a partner’s foreign reserve holdings by about 30 percentage points.¹¹⁹ All in all, in addition to economic and financial determinants, international currency status is also heavily influenced by political and geopolitical factors.

¹¹⁷ This section draws on [Habib and Mehl \(2022\)](#).

¹¹⁸ See, for example, [Boz et al. \(2020\)](#).

¹¹⁹ [Chițu et al. \(2019\)](#) used data on the foreign reserves of 19 countries pre-First World War.

In turn, international currency status may reduce exposure to global (geopolitical) shocks. Most notably, international currency status is a key factor which makes it possible to promote strategic financial (and economic) autonomy, thereby reducing vulnerabilities and exposures to external exogenous shocks. Even if not dominant, the broad international use of a currency across a range of dimensions¹²⁰ may be relevant to any discussion of the strategic autonomy of the issuer, for a number of reasons. For example, greater use of a currency may allow broader access to international financial markets in times of geopolitical stress and diversified funding, both in terms of its source and its geographical origin.¹²¹ This leads to more secure – and possibly more abundant and cheaper – funding, even at times of domestic and global economic or geopolitical stress. Enhanced international currency status may thus also provide some protection against global (geopolitical) shocks.

Other countries may also gain from using a currency that provides stability and protection. Holding foreign reserves, and possibly also issuing foreign debt, in a dominant currency makes it easier to purchase essential goods and services offered in that currency and provides a safe haven and store of value in times of trouble. Likewise, by gaining access to the deeper, more liquid financial markets of international currency issuers, and limiting foreign exchange risk for the lenders, foreign debt issuers could benefit from cheaper funding costs. While the underlying logic is primarily economic, it may also bring geopolitical benefits as it encourages cooperative behaviour in times of geopolitical tension.

Another channel of dependency based on the broad international use of an issuer's own currency is the invoicing of strategic materials and commodities. Purchasing such materials and commodities in an issuer's own currency provides a degree of protection against exchange rate volatility, greater price transparency and room for manoeuvre should economic tensions arise.¹²² It follows that avoiding the use of a dominant international currency could be costly, which provides an incentive to cooperate with the issuer.

From an institutional and legal perspective, the international role of a currency may also make it easier to maintain or increase influence in global decision-making. This may be the case, for example, in discussions and negotiations about international debt management and balance of payments, or in respect of participation in international financial fora such as the Bretton Woods institutions. As far as the legal dimension is concerned, the application of domestic law with de facto extraterritorial reach is another tool that could enhance strategic autonomy.¹²³ These aspects broaden the definition of the “exorbitant privilege”, which relates primarily to

¹²⁰ See Chinn and Frankel (2007). These dimensions refer not only to a currency's use in reserves but also more generally to its use as a vehicle for storing value and foreign investment, as an accounting unit and as a medium of international exchange.

¹²¹ While the literature speaks of “global shocks”, geographically diversified financial flows and funding may imply that, at times of globalised economic/financial stress, one foreign region may continue to supply capital to the domestic economy as another stops doing so, thus avoiding an (excessively) abrupt capital flow fall or even halt.

¹²² See Goldberg and Tille (2009).

¹²³ The extraterritorial reach of US law has been discussed in the literature and the media (e.g. in the case of Iran).

financing costs which are lower, even under adverse economic conditions.¹²⁴ At the same time, the exorbitant privilege may be countered by an “exorbitant duty”, resulting in a stronger exchange rate and global financial stability issues at times of global financial stress. All in all, the international status of currencies, whether dominant, reserve or widely used, has implications for the degree to which countries enjoy the advantages and disadvantages of such a status. The relevance of these considerations to the euro’s role in OSA is analysed in Section 3.3.3.

2.6 Labour market and migration interdependencies

Increasing flows of workers into the EU, demographic trends and changes in labour participation patterns have transformed the supply of labour in the EU.¹²⁵ Focusing on migration, over the past twenty years the number of non-EU immigrants and mobile EU citizens living in EU-27 Member States has increased by about 60%. The number rose from 34 million (6.9%) of the EU’s total population in 2000 to about 60 million (around two-thirds from non-EU countries) in 2019, accounting for 11.1% of its population.

The composition of the flows of immigrants entering the EU is also changing. While immigration has been primarily driven by economic motives, in the last few years Europe has experienced a major surge of refugees fleeing wars and conflicts in Syria, Afghanistan, Iraq and, more recently, Ukraine (see Chart 37). The slowdown in internal and international migration caused by the pandemic reversed in 2021 and 2022, and migration has been marked by even larger flows than before.¹²⁶

At the same time, EU labour markets have experienced profound transformations in their occupational and industrial structures, transforming labour demand. A significant shift in employment from manufacturing to services has taken place alongside a process of labour market polarisation (upgrading), fuelling demand for highly skilled workers at the expense of lower-skill groups. Employment shares are mostly increasing for occupations at the top and (less so) at the bottom of the skill distribution, with the share of middle-skilled jobs declining, leading to a noticeable polarisation/upgrading of the labour market in many European countries (see Chart 38). Globalisation and technology are the main drivers behind these trends. Technology is affecting polarisation through two channels: (i) a reduction of employment in routine manual and cognitive tasks, moving displaced workers to less-routine employment at the lower end of the skills distribution, and (ii) an increase in demand for workers in higher-skilled and (to a lesser extent) lower-skilled occupations, leading to growth at the upper and lower

¹²⁴ See [Gourinchas and Rey \(2007\)](#).

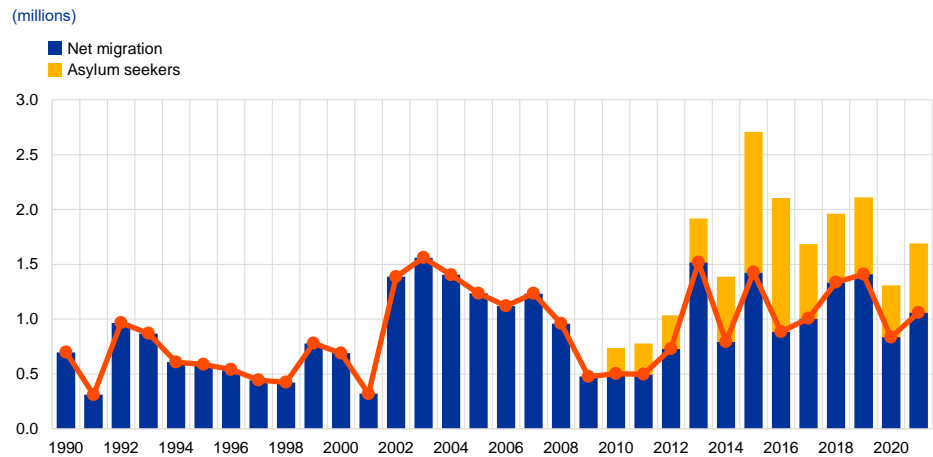
¹²⁵ In addition to rising immigration and intra-EU mobility, the fall in fertility, an ageing population and increasing female and older workers’ labour participation rates, accompanied by decreasing rates for male prime-age workers, have changed the size and composition of the EU labour force.

¹²⁶ See [OECD \(2022\)](#).

ends of the skill distribution.¹²⁷ At the same time, rapid globalisation has moved many routine jobs to countries with lower labour costs.¹²⁸

Chart 37

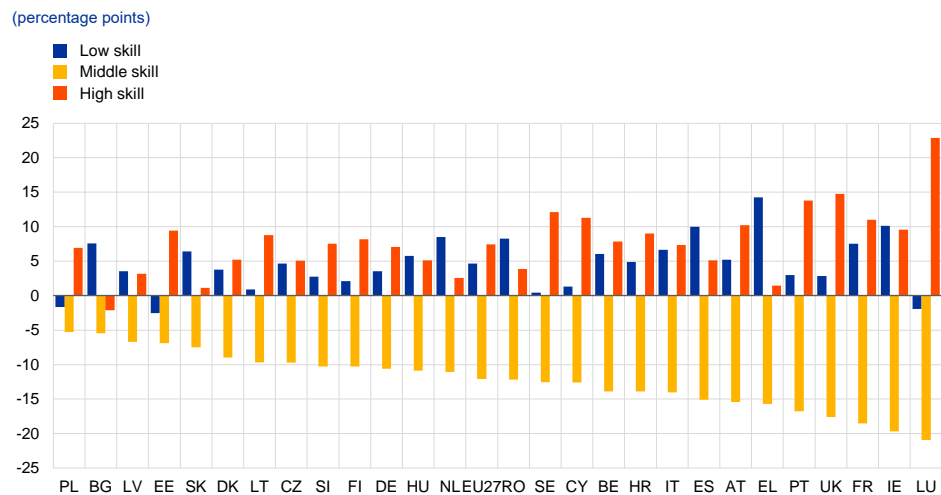
Net migration and asylum applicants in the EU



Source: Eurostat.
 Note: Net migration data include a statistical adjustment for the total population.

Chart 38

Percentage point change in share of total employment, 2002-18



Source: Own elaboration based on the EU Labour Force Survey.
 Notes: High-skilled occupations include jobs classified under the ISCO-88 major groups 1, 2 and 3, namely legislators, senior officials and managers (group 1), professionals (group 2) and technicians and associate professionals (group 3). Middle-skilled occupations include jobs classified under the ISCO-88 major groups 4, 7 and 8, namely clerks (group 4), craft and related trades workers (group 7) and plant and machine operators and assemblers (group 8). Low-skilled occupations include jobs classified under the ISCO-88 major groups 5 and 9, namely service workers and shop and market sales workers (group 5) and elementary occupations (group 9).

At the aggregate level, migrant workers help to ensure a better match between supply and demand, thereby reducing labour shortages in the EU labour

¹²⁷ For a discussion of how technological transformations are shaping the European labour market see, for example, [European Commission \(2018b\)](#).
¹²⁸ See [Blinder \(2007\)](#).

market.¹²⁹ In particular, the positive contribution made by migrant workers to matching supply and demand helps reduce labour shortages in both high and low-skilled occupations (and sectors) that are subject to widespread shortages. New immigrants represent 15% of entries into strongly growing occupations. These include, notably, health-care and STEM (Science, Technology, Engineering and Mathematics) occupations.¹³⁰ At the same time, immigrants represent about a quarter of entries into the most strongly declining middle-skill occupations while almost half of the low-skilled (mostly routine) jobs are taken up by immigrants in the EU (see Chart 39 (a) and (b)).¹³¹ In all these areas, immigrants are meeting labour needs by taking on jobs regarded by domestic workers as unattractive or lacking in career prospects. Besides, free movement of migrants in the EU adds adjustment capacity to labour markets.¹³² More generally, labour mobility has helped to improve the allocation of labour resources and has contributed significantly to labour-market flexibility within the EU.¹³³

Despite these benefits many challenges and untapped potential remain. First, despite its recent increase, intra-EU mobility remains relatively low and below the levels of internal mobility in large countries like the United States, given the presence of big mobility barriers such as language.¹³⁴ In this context, migration can play a role in reducing labour shortages in particular countries, regions, sectors or occupations.¹³⁵ Second, from a potential growth perspective, the quality of the new entrants (in terms of skills and education) plays a crucial role in maintaining and improving the productivity of labour. The positive contribution made by high-skilled migration to growth is observed through different channels: increasing the stock and variety as well as the quality of human capital, raising the productivity of the economy, incentivising the adoption of new technologies and stimulating capital accumulation. In this regard, despite the rise in skilled migration to the EU, Europe is still struggling to recruit these immigrants and is lagging behind other regions when it comes to attracting top talent and skills (see Chart 40).¹³⁶ Moreover, the potential

¹²⁹ At the level of each Member State and among sending and receiving countries, there may be gains and losses from mobility depending on the longer-run dynamics of labour mobility, particularly with regard to the question of if and when mobile workers return to their home country. Such questions are at the centre of debates regarding “brain drain” and “brain waste”. See, for example, [Beine et al. \(2008\)](#), [Gërmenji and Milo \(2011\)](#), [Albano \(2012\)](#), [Biondo et al. \(2012\)](#), [Hunter \(2013\)](#) and [Böhme and Glaser \(2014\)](#). In the context of intra-EU mobility and third-country migration, it is also being increasingly recognised that return migration (“brain circulation” or “brain flow”) can contribute to skills transfer and innovation in both receiving and sending countries, underlining the complexity of the phenomenon of migration flows ([European Commission, 2018c](#)).

¹³⁰ [OECD/European Union \(2014\)](#).

¹³¹ [Fasani and Mazza \(2020\)](#).

¹³² Estimates suggest that as much as a quarter of the asymmetric labour market shock – namely that occurring at different times and with different intensities across countries – may have been absorbed by migration within a year ([Jauer et al., 2019](#)).

¹³³ See for example, [Arpaia et al. \(2016\)](#) and [Kahanec \(2012\)](#).

¹³⁴ [Bodewig and Ridao-Cano \(2018\)](#).

¹³⁵ For example, some studies suggest that migrants can improve the adjustment capacity of regional differences (see [Guzi et al., 2021](#)).

¹³⁶ See [Bossavie et al. \(2022\)](#) and [Di Iasio and Wahba \(2021\)](#). Interestingly, recent evidence shows that skilled net migration from the EU to the United States generates asymmetric effects. Between 2000 and 2010 the share of patents filed by immigrants in the United States was around seven times higher than the share in the EU. However, this migration flow generated positive effects, both individually (as migrants increase their patenting activity by 42% after migration) and in the aggregate, as in the EU the benefits from spillovers to the EU co-authors of the emigrants increases their patenting by 15% (see [Prato, 2022](#)).

contribution of migrants is currently low mainly for the higher-educated segment, resulting in over-qualification or lower employment rates for highly-educated international migrants.¹³⁷

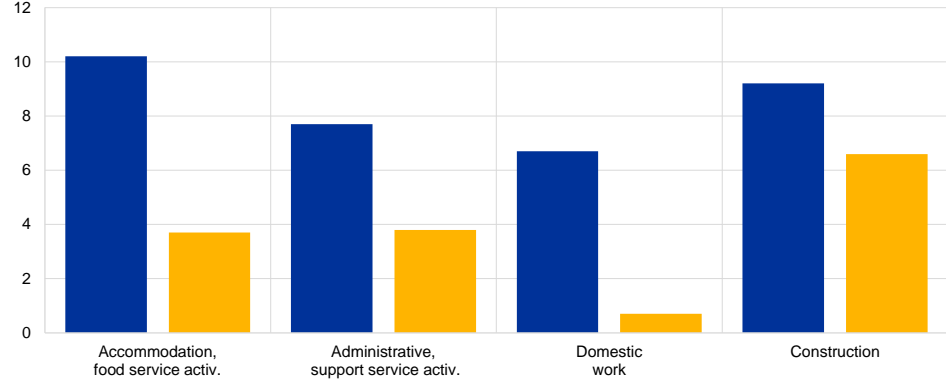
Chart 39

Overall employment in occupations and sectors over represented by non-EU workers (2021)

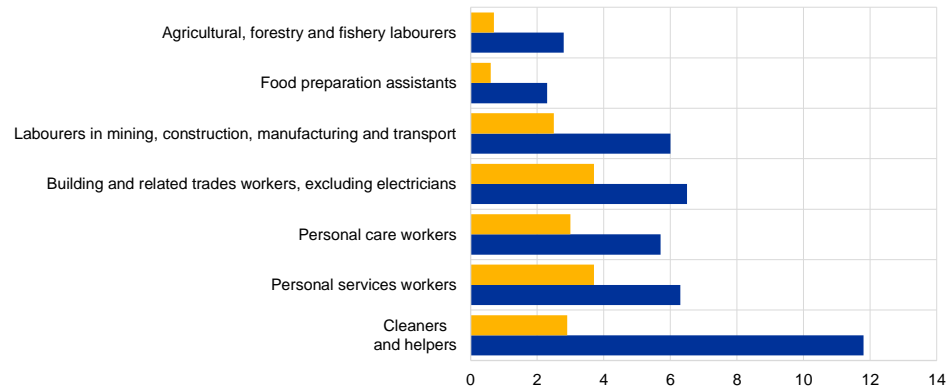
(percentage of overall employment)

■ Non-EU citizens
■ EU citizens

a) Sectors



b) Occupations



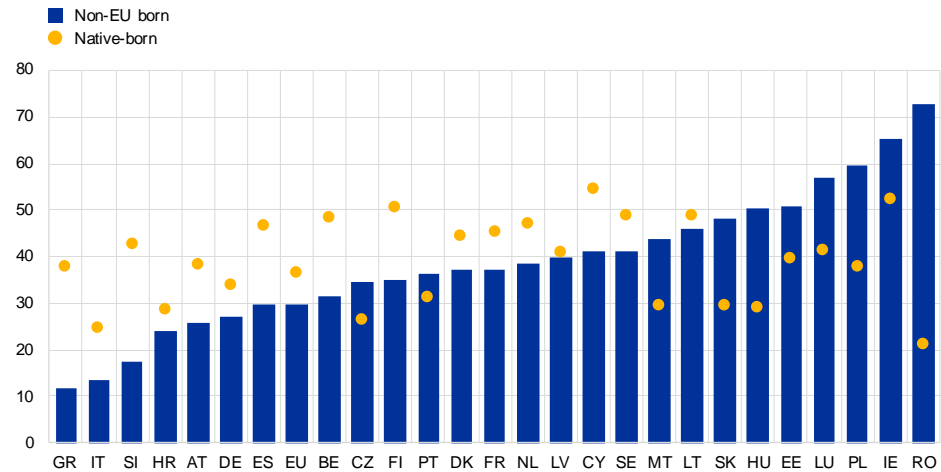
Source: Eurostat.

¹³⁷ See Stirling (2015).

Chart 40

Tertiary level of educational attainment by country of birth (2020)

(percentage of population aged 25-54 years)



Source: Eurostat.

AT = Austria, BE = Belgium, CY = Cyprus, CZ = Czechia, DE = Germany, DK = Denmark, EE = Estonia, ES = Spain, FI = Finland, FR = France, GR = Greece, HR = Croatia, HU = Hungary, IE = Ireland, IT = Italy, LT = Lithuania, LU = Luxembourg, LV = Latvia, MT = Malta, NL = Netherlands, PL = Poland, PT = Portugal, RO = Romania, SE = Sweden, SI = Slovenia, SK = Slovakia.

Geopolitical shocks and public policies may exacerbate or ease these

challenges. First, migration flows caused by geopolitical shocks, such as those from Syria, northern Africa and Ukraine, expand the pool of low-skilled workers even more and make it more difficult to meet the rising demand for high-skill labour and innovation.¹³⁸ Moreover, policies restricting the mobility of labour across international borders, such as those in place during the COVID-19 pandemic, have an impact on the supply of high-skill labour or the availability of offshore skills.¹³⁹ Second, policies fostering the transition towards a low-carbon economy are accelerating the process of de-routinisation and the demand for high-skill labour. Primary industries, such as mining, and high-emission manufacturing industries are those most negatively affected by the transition. While new jobs are created as a result of the greening of the economy, these jobs are in different industries, often in different regions, and frequently require different skillsets compared with the jobs that have been lost.¹⁴⁰ Well-designed policies focusing on better managing migration flows promote brain circulation, attract highly-skilled professionals and limit their emigration, thus helping to address these challenges.¹⁴¹

¹³⁸ It also has complex shorter-term and longer-term budgetary implications, for example through the need to support and implement migrant integration policies, or through their impact on social security.

¹³⁹ See, for example, [Bossavie et al. \(2022\)](#).

¹⁴⁰ On the other hand, (re)industrialisation and the reshoring of strategic activities can partially offset these trends, increasing the demand for routine middle-skill labour and, hence, making it easier to integrate migrants into the labour market.

¹⁴¹ See for example, [Eurofound \(2021\)](#) and [Bossavie et al. \(2022\)](#).

Box 6

The methodology used in the analysis of trade dependencies

In Section 2 of the report we analyse the trade dependencies of the EU and other global players from both an import and an export point of view, using a set of indicators based on the trade flows of goods and services.

A first set of dependency indicators, employed at the aggregate level, is built using trade in value-added statistics, which makes it possible to take production and the complex structure of global interlinkages into account by using Inter-Country Input Output tables. Specifically, following the Borin and Mancini (2023) importer perspective to trace value added in a country's imports, foreign dependency is measured as the share of directly and indirectly imported value added over directly and indirectly imported value added and domestic value added:

$$Mdep_{VA_i^s} = \frac{FVA_m_i^s}{FVA_m_i^s + DVA_i^s}$$

where $Mdep_VA_i^s$ is the **value added import dependency** of country i in sector s , $FVA_m_i^s$ denotes the value added imported, directly or indirectly, by sector s in country i , and DVA_i^s , domestic value added. Therefore, the index will be close to 1 when a country or a region relies mainly on foreign intermediates and final goods, without domestic production. By contrast, the index will be low when domestic production is much higher than foreign sourcing.

A bilateral version of the same index can be used to gauge the bilateral dependency of sector s in country i in respect of value added coming from country j :

$$Mdep_{VA_{i,j}^s} = \frac{FVA_{i,j}^s}{FVA_m_i^s + DVA_i^s}$$

where $FVA_{i,j}^s$ is the value added imported, directly or indirectly, from country j by sector s in country i .

On the export side, foreign dependency is measured as the share of domestic value-added that is absorbed abroad over total domestic value added:

$$Xdep_{VA_i^s} = \frac{DVAx_i^s}{DVA_i^s}$$

where $Xdep_VA_i^s$ is the **value added export dependency of country i in sector s** , $DVAx_i^s$ denotes the domestic value added produced by sector s in country i and absorbed abroad, and DVA_i^s is the total domestic value added of sector s in country i .

The bilateral dependency of sector s in country i from exports absorbed by country j can be computed as:

$$Xdep_{VA_{i,j}^s} = \frac{DVAx_{i,j}^s}{DVA_i^s}$$

where $DVAx_{i,j}^s$ is the value added produced by sector s in country i and absorbed by country j .

A second set of indicators, used at a more disaggregated level, is computed using bilateral gross trade flows. In particular, the analysis of dependencies in goods trade makes use of data from the

“Base pour l’Analyse du Commerce International of the Centre d’études prospectives et d’informations internationales” (BACI-CEPII) at the HS-6 level. The analysis of dependencies in services trade relies instead on data from the Eurostat International Trade in Services database.

At the disaggregated level, and in line with European Commission (2021d), we describe strategic import dependencies by computing three **core dependency indicators (CDIs)**. First, for each product p we define **import concentration** using the Herfindahl-Hirschman Index (HHI):¹⁴²

$$CDI_{1,i}^p = \sum_{j=1}^N (s_{i,j}^p)^2$$

where $s_{i,j}^p$ is the share of country i imports of product p coming from country j in the total imports of product p of country i . When the importing country is the EU, the index is constructed using only imports from extra-EU economies. The CDI_1 index ranges between 0 and 1, with highly concentrated imports resulting in a higher value of the indicator.¹⁴³ Exporters’ shares $s_{i,j}^p$ are also used to identify the primary exporter of each product.

Import concentration can also be measured at the country level through a weighted sum of the concentration indexes of all imported products, using their shares in total imports as weights.

$$CDI_{1,i} = \frac{\sum_{p=1}^P CDI_{1,i}^p \cdot M_i^p}{\sum_{p=1}^P M_i^p}$$

where $CDI_{1,i}$ is the **country-level import concentration** of country i , M_i^p denotes imports of country i of product p , while P indicates the total number of products imported.

A bilateral version of the previous index makes it possible to gauge the **bilateral concentration** of country i imports coming from country j :

$$CDI_{1,i,j} = \frac{\sum_{p_{max}=1}^{P_{max}} CDI_{1,i}^{p_{max}} \cdot M_i^p}{\sum_{p=1}^P M_i^p}$$

where p_{max} denotes the products for which country j is the major exporter to country i , and P_{max} is their total number.

A second index we can compute, considering the EU as an importer, is a **scarcity** indicator, which measures the unavailability of intra-EU production using the share of extra-EU imports of the total imports of a product:

$$CDI_{2,EU}^p = \frac{M_{EU,EXTRA}^p}{M_{EU,EXTRA}^p + M_{EU,INTRA}^p}$$

where $M_{EU,EXTRA}^p$ and $M_{EU,INTRA}^p$ denote EU imports coming, respectively, from extra-EU and EU countries. CDI_2 also ranges between 0 and 1 with a higher value denoting a deeper scarcity of a certain product within the EU.¹⁴⁴

¹⁴² In the case of services, p denotes sub-sectors.

¹⁴³ A CDI_1 equal to 1 represents a case of extreme concentration, namely a product that is imported from one trade partner only.

¹⁴⁴ Given the lack of data on domestic trade flows at disaggregated level, the CDI_2 index is not computed for other importing countries.

A third indicator measures the **substitutability of imports** with domestic production, by proxying the latter with export flows:

$$CDI_{3,i}^p = \frac{M_i^p}{X_i^p}$$

where M_i^p and X_i^p are, respectively, imports and exports of product p of country i . When the importing country is the EU, imports refer only to those imports coming from extra-EU sources, while exports include both intra and extra-EU flows. A higher value of CDI_3 indicates a lower degree of substitutability, with a value higher than 1 denoting products whose imports from third countries would be impossible to fully substitute with domestic production.

Chart A provides a clarifying example of the use of the CDI indexes in the characterisation of import dependencies. Accordingly, following [European Commission \(2021d\)](#), the three CDI indicators can be used to identify the **products of highest import dependency for the EU**. Namely, the highest dependency products can be pinned down as those whose CDIs exceed the following thresholds, as defined in [European Commission \(2021d\)](#):

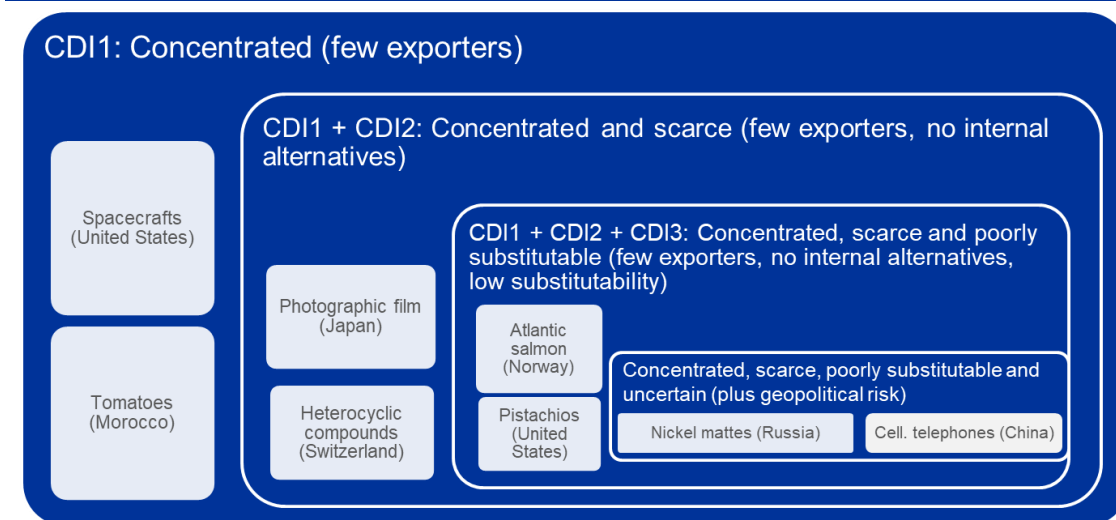
$$CDI_1 > 0.4$$

$$CDI_2 > 0.5$$

$$CDI_3 > 1$$

Figure A

Characteristics of import dependency at the product level



Sources: Own elaboration with BACI-CEPII trade data at the level of HS-6 product groups.

Similar indicators can be used, still at the disaggregated level, to measure export dependencies. For each product p , we identify **export concentration** using an export-based version of the Herfindahl-Hirschman Index:

$$CDI_{X1,i}^p = \sum_{j=1}^N (s_{x_{i,j}}^p)^2$$

where $s_{x_{i,j}^p}$ is the share of country i exports of product p destined to country j in the total exports of product p of country i . When the exporting country is the EU, the index is constructed using only exports destined for extra-EU economies. As its import-based equivalent, the CDI_{X_1} indicator ranges between 0 and 1, with highly concentrated exports resulting in a higher value of the index. Importers' shares $s_{x_{i,j}}$ are also used to identify the primary importer of each product.

The **country-level export concentration** can be measured through a weighted sum of the concentration indexes of all exported products, using their shares of total exports as weights:

$$CDI_{X_{1,i}} = \frac{\sum_{p=1}^P CDI_{X_{1,i}}^p \cdot X_i^p}{\sum_{p=1}^P X_i^p}$$

where X_i^p denotes exports of country i of product p , while P indicates the total number of products exported.

The **bilateral concentration of exports** of country i destined to country j :

$$CDI_{X_{1,i,j}} = \frac{\sum_{p_{max}=1}^{P_{max}} CDI_{X_{1,i}}^{p_{max}} \cdot X_i^p}{\sum_{p=1}^P X_i^p}$$

where p_{max} denotes the products for which country j is the major importer from country i , and P_{max} is their total number.

When considering the EU as an exporter, we can gauge the **scarcity of internal demand** through the share of extra-EU exports in the total exports of a product:

$$CDI_{X_{2,EU}}^p = \frac{X_{EU,EXTRA}^p}{X_{EU,EXTRA}^p + X_{EU,INTRA}^p}$$

where $X_{EU,EXTRA}^p$ and $X_{EU,INTRA}^p$ denote EU exports destined, respectively, to extra-EU and EU countries. CDI_2 also ranges between 0 and 1, with a higher value denoting higher demand scarcity of a certain product within the EU.¹⁴⁵

The indicators can be used to identify the **products of highest export dependency for the EU** as those whose CDIs exceed the following thresholds, as defined in [European Commission \(2021d\)](#):

$$CDI_{X_1} > 0.4$$

$$CDI_{X_2} > 0.5$$

Box 7

The semiconductor global value chain and the EU's position¹⁴⁶

Semiconductors – tiny chips composed of miniaturised electronic circuits layered on thin (often silicon) wafers – are the essential components that power virtually every digital or digitalised sector of the economy, including means of payment (e.g. chip cards and payment

¹⁴⁵ As in the case of imports, the CDI_{X_2} index is not computed for other exporting countries.

¹⁴⁶ Parts of this box draw heavily on [Buysse and Essers \(2022\)](#).

terminals). Moreover, innovations in semiconductors form the backbone of the transformative digital technologies of the future, including artificial intelligence, 5G/6G, autonomous electric vehicles, cloud/quantum/ edge computing and the internet of things. For these reasons, all major economic blocs, including the United States, Europe, China and Japan are paying close attention to the semiconductor industry. Interest in semiconductors has increased further in the wake of the COVID-19 pandemic, when a combination of shifts in consumer demand, chip factory closures, a faster than expected economic recovery and strategic stockpiling induced chip shortages that reverberated throughout the various supply chains, and particularly in the automotive sector (Hess and Kleinhans, 2021).

The global semiconductor value chain is extensive, highly complex and geographically dispersed. Depending on the specific type of semiconductor product, the manufacturing process may involve several hundred steps, an ecosystem of several thousand suppliers and dozens of international border crossings (Varas et al., 2021). Figure A gives a highly stylised overview of the main steps in semiconductor value chains.¹⁴⁷ In basic terms, raw materials and chemicals are transformed into chip wafers using design software (electronic design automation), intellectual property and specialised semiconductor manufacturing equipment, most of which have their origins in fundamental research. The design stage and “front-end” manufacturing process is controlled either by vertically integrated firms (so-called integrated device manufacturers, IDMs) or by “fabless” chip designers that contract “foundries” or “fabs” for the actual production of chip wafers.¹⁴⁸ The chips are then assembled, tested and packaged, usually through outsourcing to other firms, before being sent off to the semiconductors’ final consumers, who include electronic device producers and car manufacturers.

The value chain’s configuration is marked by multiple cross-border dependencies and “chokepoints”. Because of far-reaching specialisation and high entry barriers in terms of knowhow and capital, several indispensable processes and inputs throughout the chain are controlled by just a handful of – or sometimes just a single – firm(s). This poses geopolitical risks, such as when countries in which the owners of such dominant firms reside use their position strategically to isolate others (Kleinhans and Lee, 2021). A case in point is the increasingly expanded set of export controls that the United States has imposed on Huawei, its affiliates and other Chinese digital technology companies since 2019, motivated by US national security concerns. These controls cut Chinese firms off first from US-made semiconductors and electronic design automation software and then later from third-country chips and chip inputs that are designed/manufactured using US technology or equipment (Bown, 2020; Buysse and Essers, 2022).¹⁴⁹

Chart A provides the latest available breakdown of company turnover (for the year 2020) in the various parts of the semiconductor value chain according to the location of the “global ultimate owner” (i.e. the entity at the top of the corporate ownership structure) (Ciani and Nardo, 2022). The

¹⁴⁷ For much more detail see, for example, [Baisakova and Kleinhans \(2020\)](#), [Kleinhans and Lee \(2021\)](#) and [Varas et al. \(2021\)](#).

¹⁴⁸ Increasingly, large end-users of semiconductors, such as Apple, Alibaba, Alphabet, Amazon, Huawei, Meta and Tesla are starting to design their own (application-specific) chips, using the fabless-plus-foundry set-up.

¹⁴⁹ Likewise, as part of a longstanding foreign policy conflict, in 2019 Japan announced restrictions on the export of specific chemicals used in semiconductor manufacturing to South Korea. Even though, ultimately, Japan approved exports of some of the targeted chemicals, South Korea initiated a WTO dispute ([Goodman et al., 2019](#)).

chart demonstrates that different regions and countries occupy different segments of the chain.¹⁵⁰ By and large, the United States dominates in the upstream value chain segments that are most R&D intensive, most notably in fabless chip design (with companies such as Qualcomm, Broadcom and Nvidia) and among software and IP providers (e.g. Synopsis and Cadence, which are not shown as a separate category in Chart B). American IDMs (e.g. Intel, Micron and Texas Instruments) and also American equipment suppliers (e.g. Applied Materials, KLA and Lam Research) have large shares of global turnover in their respective fields. Japan is a key provider of wafer material, chemicals and gases (e.g. Shin-Etsu, Sumco and Sumitomo) as well as equipment (e.g. Tokyo Electron, Nikon and Canon), and home to a few large IDMs (e.g. Toshiba and Renesas). Other Asian countries dominate in the downstream segments of the value chain. South Korean companies are leading players in the foundry segment, especially in the area of memory chips (e.g. Samsung and SK Hynix – IDMs which also work as foundry contractors for foreign chip designers). Taiwanese companies are dominant in the foundry business' sub-segment of "leading-edge" logic chips used for processors (e.g. TSMC and UMC) and in advanced assembly, packaging and testing (e.g. ASE). China hosts several foreign-owned foundries, although Chinese companies themselves are most active in the (more labour-intensive) assembly, packaging and testing segment (e.g. JCET and Tongfu Microelectronics) and are increasingly active in the area of chip design (e.g. HiSilicon, Goodix and Omnivision).

Europe's current footprint is almost exclusively concentrated in the upstream part of the semiconductor value chain, where it plays an important role in specific niches and in research. EU-owned firms represent negligible shares of global turnover in fabless chip design, foundries, and assembly, packaging and testing. Conversely, the large European chemical industry provides a significant share of some of the high-purity materials that are used in chip production (e.g. BASF, Air Liquide and Siltronic). In addition, while EU-owned IDMs play a minor role in advanced logic and memory chip markets, they are significant in the "trailing-edge" logic and discrete/analogue sub-segments of chip design and manufacturing for automotive and industrial applications (e.g. Infineon, NXP, STMicroelectronics and Bosch). Also, the EU has a dominant position in particular types of manufacturing equipment (e.g. ASML¹⁵¹, Aixtron and Besi) (de Jong, 2020). Moreover, several leading research and technology institutes that have been involved in fundamental semiconductor innovations are based in the EU (e.g. IMEC, CEA-Leti and Fraunhofer-IAF). In line with these patterns, the EU is a net importer of the more advanced chips – primarily from Taiwan, South Korea, China (given the country's role in the final stages of the chain) and the United States – and is a net exporter of chip manufacturing equipment – mostly to the same countries. Furthermore, a preliminary study of firm-level supply chain linkages suggests that, on average, nearly 80% of companies which supply European semiconductor firms are headquartered outside the EU, while companies with extra-EU ownership account for more than 60% of the customers of these European firms (Ciani and Nardo, 2022).

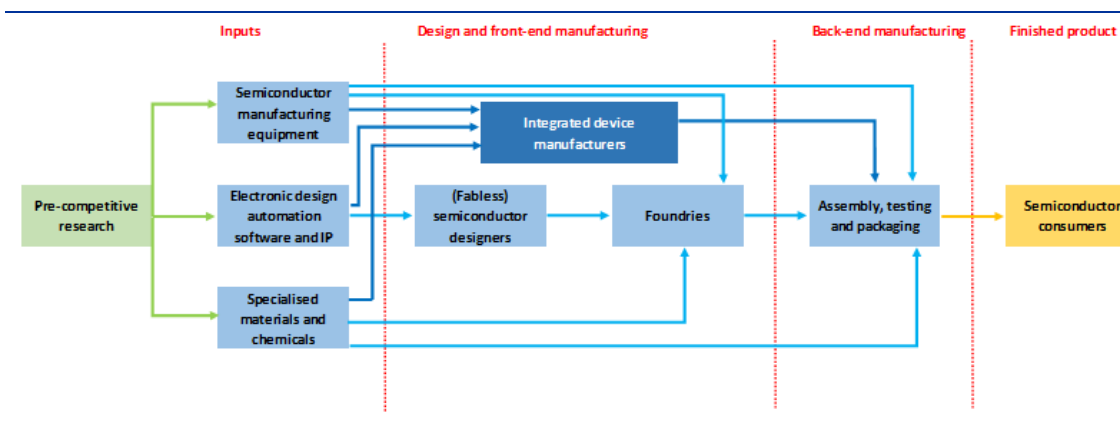
In February 2022, the European Commission (2022d) proposed a Chips Act, which has so far received a mixed reaction. The European Chips Act package revolves around three main pillars, to be financed with public and private funds of at least €43 billion up to 2030. The first pillar involves strengthening existing EU semiconductor research, design and manufacturing capacities, as well as

¹⁵⁰ Alternative estimations of the breakdown in value-added by value chain segment and country (e.g. by Varas et al., 2021 and Poitiers and Weil, 2021) show some significant variation in the percentages listed (likely due to differences in the firm-level sample, production stage delineation, ownership definitions, the timing of data collection, etc.), although the overall picture remains similar.

¹⁵¹ ASML has a monopoly of the extreme ultraviolet lithography machines that are used to produce the world's most advanced chips.

developing skills training and reaching a better understanding of global semiconductor value chains. The second pillar offers support for “first-of-a-kind” (i.e. beyond the current EU state-of-the-art) production facilities, in order to achieve the goal of producing at least 20% of the world’s cutting-edge and most energy-efficient chips in the EU by 2030. Finally, the third pillar consists of systems for monitoring supply chain risks as well as for crisis response, with a toolbox including measures such as mandatory information gathering, the prioritisation of orders for critical sectors, common purchasing schemes and perhaps even export controls. Based on what we know about the global semiconductor value chain and Europe’s position in it, it will be very challenging to build (almost from scratch) frontier chip production in the EU and find sufficient demand for it (Kleinhans, 2021). It will probably be necessary to offer large subsidies and other incentives to attract leading manufacturing firms from Taiwan, South Korea or the United States. Given that the other major blocs are also planning to invest heavily in frontier manufacturing, critics of the Chips Act suggest that the EU should focus its efforts on defending its current leadership in chips research and manufacturing equipment, as this would help it to retain its own strategic leverage in the value chain. Over the medium term, the EU could also venture further into high-value added, less capital-intensive upstream activities (e.g. chips design and software) in areas where there is a good fit with the needs of European industry (Poitiers and Weil, 2021; Gross, 2022). Finally, cooperation with (several) partner countries will be inevitable if a steady supply of chips is to be secured. Protectionist instruments, such as export controls on placed on chip inputs, should be considered only as last-resort measures.

Figure A
Stylised overview of the main steps in semiconductor value chains

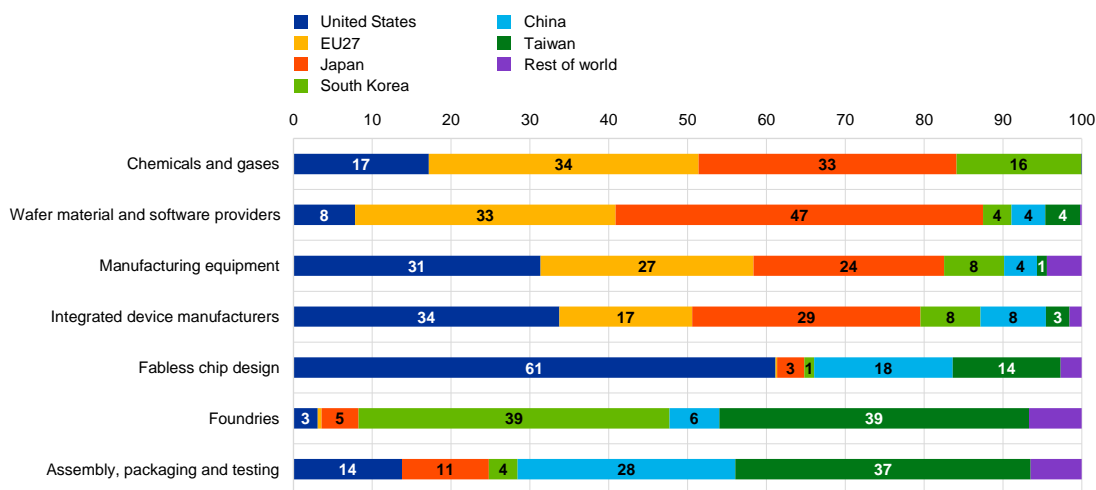


Source: Author’s elaboration based on the literature (e.g. Baisakova and Kleinhans, 2020; Kleinhans and Lee, 2021; Varas et al., 2021).

Chart A

Turnover for the year 2020 in different segments of the semiconductor value chain, broken down by location of the global ultimate owner of the company

(percentage of global turnover in the value chain segment)



Source: Author's elaboration based on Ciani and Nardo (2022).

Notes: Original calculations are based on firm-level information obtained from Orbis, Bureau van Dijk and (for the largest companies) financial reports. The country sample consists of 886 firms with non-missing turnover data for 2020, out of a list of 1,084 firms identified by the EU's Joint Research Centre as operating in the semiconductor value chain. "Global ultimate owner" is defined as the individual or the entity at the top of the corporate ownership structure.

Box 8

Food dependencies, food prices and the Common Agricultural Policy

The Common Agricultural Policy (CAP)¹⁵² was among the first community-wide policies implemented under the Treaty of Rome establishing the European Economic Community (EEC) in 1957. It was also the policy that has, until recently, absorbed most of the EU's annual budget, and still today employs a sizeable share of resources. The objectives of the CAP, set out in paragraph 1, Article 39 TFEU¹⁵³, are "(a) to increase agricultural productivity by promoting technical progress and by ensuring the rational development of agricultural production and the optimum utilisation of the factors of production, in particular labour; (b) thus to ensure a fair standard of living for the agricultural community, in particular by increasing the individual earnings of persons engaged in agriculture; (c) to stabilise markets; (d) to assure the availability of supplies; (e) to ensure that supplies reach consumers at reasonable prices."¹⁵⁴ Some of these objectives focus on vulnerabilities and risks to prices and the supply of food products, which are prone to bouts of volatility.¹⁵⁵ It is worth noting that other economic areas also support the domestic agricultural sector for strategic purposes.

The CAP has been reformed several times since its inception. It has been criticised in the past¹⁵⁶ for distorting world markets by exerting downward pressure on agricultural commodity prices¹⁵⁷. The

¹⁵² For a summary, see Swinnen (2016).

¹⁵³ See Article 33 of the Treaty Establishing the European Community.

¹⁵⁴ See Article 39 TFEU.

¹⁵⁵ Due to factors such as adverse meteorological conditions, natural disasters, military conflicts (as recently seen in the war in Ukraine) or the effects of climate change, among others.

¹⁵⁶ Mainly by other significant agricultural producer countries and also by international organisations.

¹⁵⁷ Thereby contributing to global poverty and food insecurity.

initial CAP combined guaranteed minimum prices for producers, export subsidies and import tariffs. It has also been criticised for contributing to instability in world markets as a result of export subsidies and growing surplus stocks inside the EU.¹⁵⁸ International pressure and increasing budgetary costs brought the introduction of reforms that replaced price support mechanisms with subsidies linked to production. Further reforms decoupled the link between subsidies and production, aiming instead to provide direct income support to farmers (see Chart A, panel a). Support has also been made conditional on environmental standards being met. The combined effect of reforms has been to reduce subsidies to production and trade, reducing their distortive effect on international markets, eliminating production surpluses to a large extent, increasing the alignment of food prices with international markets, and reducing the size of the CAP as a percentage of the total EU budget (see Chart A, panel b). However, this has also reduced the capacity of the EU to contribute to global food supply safety by increasing food exports in response to episodes of scarcity and price volatility.¹⁵⁹

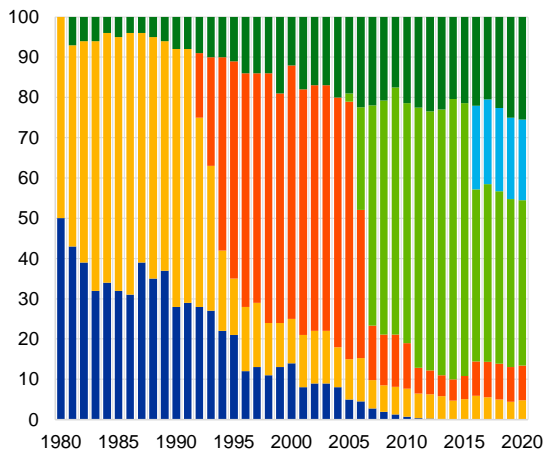
Chart A

EU CAP Expenditures and CAP intervention prices

a) EU CAP expenditures

(percentages)

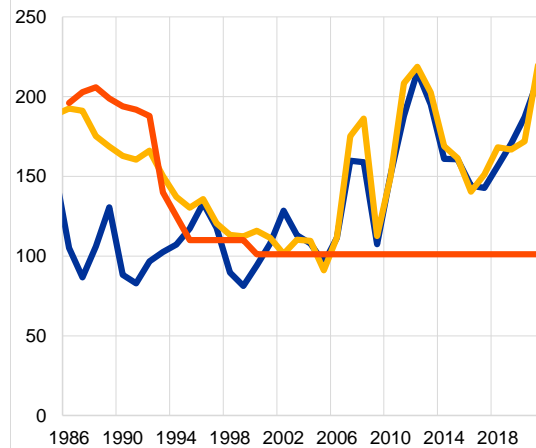
- Export subsidies
- Other market support
- Coupled direct payments
- Decoupled direct payments
- Greening
- Rural development



b) EU CAP intervention prices

(EUR per tonne)

- Soft read US price
- Germany wheat price
- Intervention price



Source: European Commission.

Notes: "Coupled direct payments" refers to compensatory payments to farmers linked to fixed areas, yields or number of animals; "Decoupled direct payments" refers to compensatory payments not linked to a specific type of production but to the value of historical subsidy receipts; "Rural development" refers to funds directed at supporting farmers' entrepreneurship, environmental undertakings etc.; "Greening" refers to payments to farmers who adopt or maintain farming practices that contribute to EU environmental and climate goals; "Other market support" refers to measures aimed at stabilising agricultural markets, preventing market crises from escalating, boosting demand and helping EU agricultural sectors to better adapt to market changes.

Results are mixed with regard to how effective recent CAP reforms have been in meeting domestic objectives relevant to strategic autonomy (such as ensuring security of supply and stabilising prices

¹⁵⁸ See Swinnen (2016), Chapter 18, footnote 4: "EU import tariffs and export subsidies varied to capture the difference between (fixed) domestic prices and (fluctuating) world market prices. This system of variable tariffs and subsidies ensured stable prices inside the EU, but intensified fluctuations outside the EU since export subsidies would be even higher when world market prices were lower." Also see Swinnen (2016), p. 271: "The high import tariffs and growing surplus stocks, which were exported with subsidies, caused global agricultural prices to decline."

¹⁵⁹ See Swinnen (2016), p. 271, Squicciarini and Swinnen (2012), and Squicciarini et al. (2011).

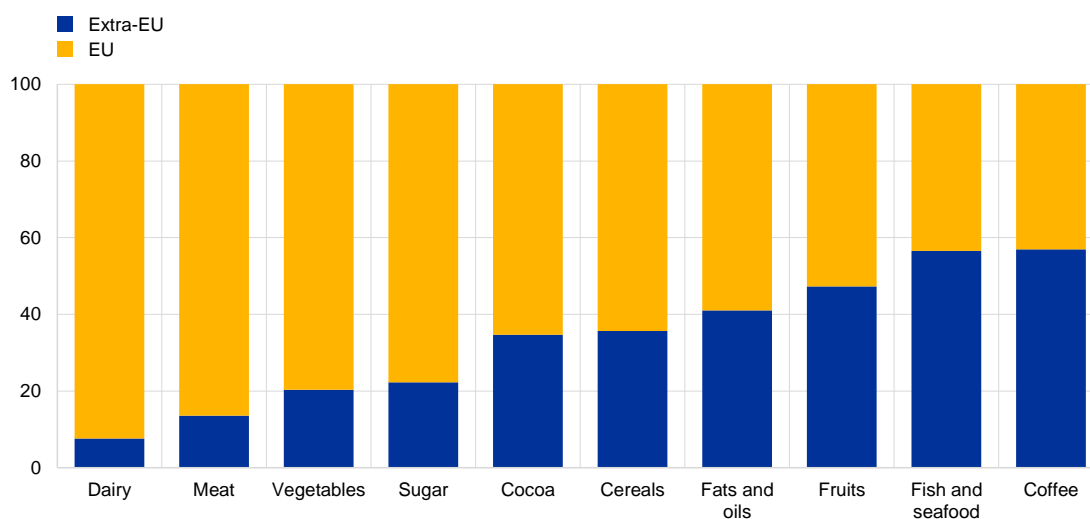
of agricultural commodities) while streamlining budgetary costs in order to address efficiency concerns. Reform efforts aimed at decoupling aid to farmers from production to mitigate distortions (such as those arising from the accumulation of large surplus stocks) have not been fully effective in the presence of indirect coupling channels (land markets, risk, credit constraints, future expectations and labour markets) which re-establish a partial linkage between direct income subsidies and production decisions.¹⁶⁰ Recent work focusing on the resilience of European agriculture – specifically on the dimensions of robustness, adaptation and transformation – point to problems in ensuring supply safety.¹⁶¹ It has been shown that the effectiveness of decoupled payments and rural development payments (the main instruments in the current CAP) are heterogeneous across regions and farm types. Decoupled payments have no significant or negative effects on farm robustness, while rural development payments enhance it, and both instruments have no significant effect on adaptation and transformation in most regions. These results suggest it would be a good idea to devise alternative policy instruments to support farm resilience. Lastly, recent analysis points to an increase in the exposure of EU farmers to higher international price volatility as a result of CAP reform.¹⁶² Lower price support has a modest market impact but negative global welfare effects as it exposes risk-averse farmers to world price volatility, an issue that has not been solved by direct payments with negligible market and global welfare impacts. It is suggested that unbiased futures markets could solve global welfare issues by making it possible to transfer price risks.

Chart B

EU Food imports and food balance

a) EU origin of food imports

(percentage of imports)



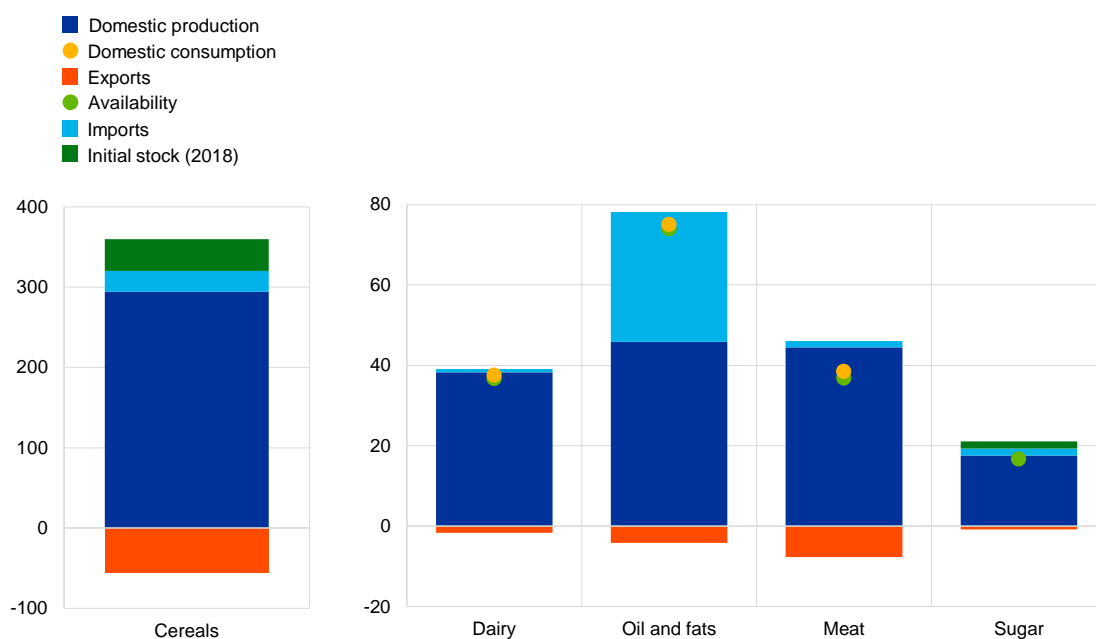
¹⁶⁰ See, for example, [Boulanger et al. \(2017\)](#), who cover a review of relevant literature and assess potential coupling factors using a general equilibrium approach.

¹⁶¹ See [Slijper et al. \(2022\)](#), who use FADN data to quantify the resilience of European farms.

¹⁶² See [Gohin and Zheng \(2020\)](#), who adopt a risk management perspective.

b) EU food production, imports and exports

(millions of tons)



Source: European Commission.

A first approach to analysing the effects of the CAP is to observe the extent to which self-sufficiency in the EU is achieved by importing from abroad. Applying the same methodology as that used for CRMs (see Box 6) reveals that the EU is highly self-sufficient in dairy products, meat and vegetables, for which less than 20% of the value of imports produced by EU Member States comes from outside the EU (see Chart B, panel a). By contrast, more than 50% of the value of imports of coffee and fish and seafood comes from outside the EU. In order to calibrate self-sufficiency, we show the contribution of imports to the availability of some of the main groups of food in the EU. Chart B, panel (b) shows the role played by initial stock, imports, exports and production in the availability of food in the EU. Notably, the EU is a net exporter of cereals, the availability of which goes well beyond internal needs, explaining the relatively high level of exports. By contrast, the EU is highly dependent for fats and oils, for which its production falls far short of its needs.

Another point worth considering is the role played by stocks of food commodities at times of market stress in the context of the CAP. Until very recently food stocks tended to offset price movements, so that when prices went up, stocks went down to supply the EU market with the food for which prices had increased, and when prices went down, stocks increased and a support cushion was built up (see Chart C, panels a and b). Recently, during the 2021-22 season, this behaviour disappeared in cereals since stock levels, which are high, have not and will not be reduced, despite the increase in prices, according to the European Commission's summer forecasts.¹⁶³ For cereals (see Chart C, panel c), the black line represents the relationship between prices and stocks up until the 2020-21 season, while the red line, which includes the following two seasons (2021-22 estimated and 2022-23 forecasted), has flattened, showing that the relationship has weakened. In the case of powdered skimmed milk (see Chart C, panel d), the relationship between prices and

¹⁶³ According to these forecasts, the availability of cereals in the 2022-23 harvest season will be almost identical to that of the previous season and the surplus maintained (the sufficiency rate in cereals is 112%) will be very similar to that of the previous decade (an average of 109% from 2011-12 to 2020-21).

stocks still holds (the red line maintains its negative slope), as stocks have responded to the latest price hike. However, as the EU has consumed most of its stock, the ability of this powdered milk to continue offsetting further price increases has been diminished.

Assessing the impact of food commodity prices on consumer prices is a complex task, given that this depends on how increases are transmitted throughout the value chain of the production and distribution of the goods and services that are part of the consumption basket. The impact is usually estimated using econometric models which make it possible to quantify the intensity and duration of the transmission of the shock. In the case of the EU, as mentioned above, it is necessary to use the internal prices of these food commodity prices in the analysis, which already incorporate the effect of the CAP. According to recent research, when the growth rate of food commodity prices temporarily increases by 10% in a specific month, there is an increase in the rate of general year-on-year inflation in the euro area of about 0.3 percentage points after 12 months.¹⁶⁴ As Chart D shows, this increase occurs gradually, reflecting the fact that producers along the value chain and retailers initially absorb, but then progressively pass on, the higher cost of raw materials to the final consumer. How does this compare with other countries? There is an extensive literature on the impact commodity prices have on inflation in the United States, including for food commodity prices, and these studies generally find, as do we, that commodity prices have minimal impact on inflation.¹⁶⁵ However, Ciner (2011) claims that when accounting statistically for frequency dependency using frequency domain methods, a long-term causality can be found between commodities and inflation.

¹⁶⁴ See [Borrallo et al. \(2022\)](#).

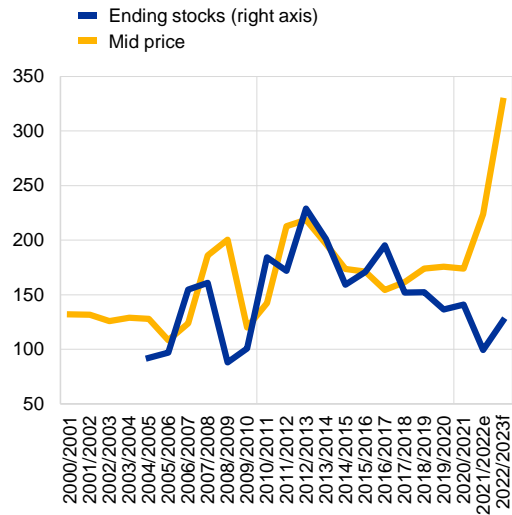
¹⁶⁵ See [Jiménez-Rodríguez and Morales-Zumaquero \(2022\)](#).

Chart C

The response of food stocks to market tensions

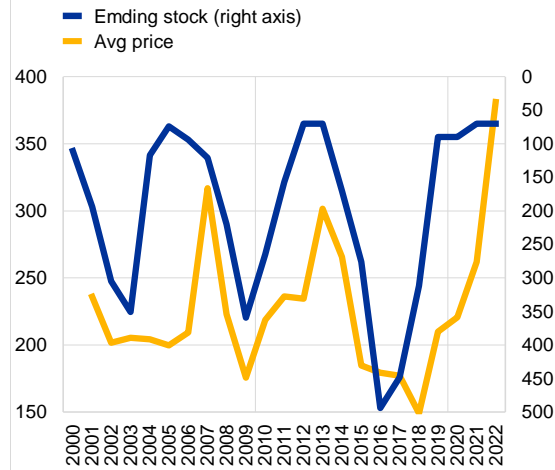
a) Cereals

(EUR per ton, left-hand scale; million tons, right-hand scale)



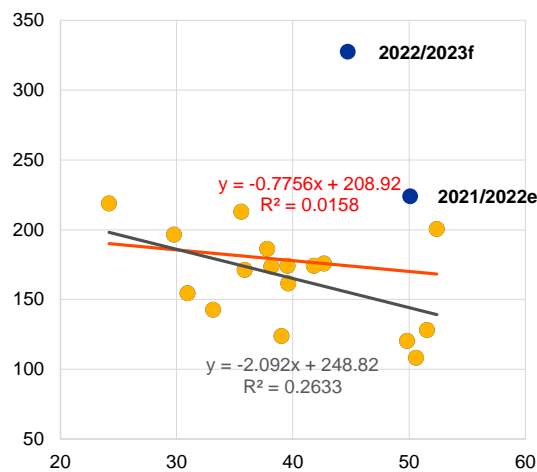
b) Skimmed milk powder

(EUR per 100kg, left-hand scale; thousand tons, right-hand scale)



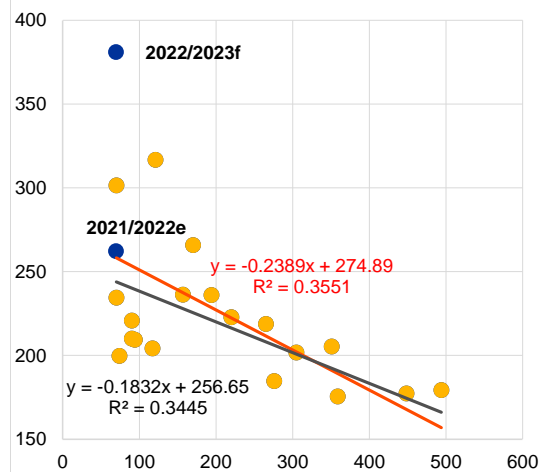
c) Cereals: relationship between prices and stocks

(y-axis: EUR per ton, x-axis: million tons)



d) Skimmed milk powder: relationship between prices and stocks

(y-axis: EUR per 100 kilos, x-axis: thousand tons)



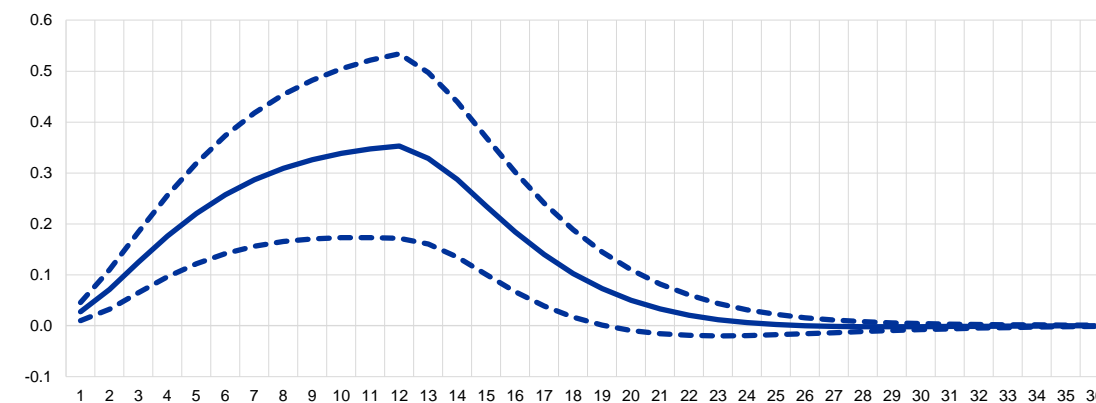
Source: European Commission.

Notes: This chart shows that stocks of cereals and powdered skimmed milk have tended to move in the opposite direction that prices did in the past. However, more recently this behavior has changed. The black line shows the relationship between prices and stocks until the 2020-21 season, whereas the red line (also including 2021-22 estimated and 2022-23 forecasted) has flattened for cereals, while still is maintained for powdered skimmed milk.

Chart D

Euro area inflation response to a temporary ten percentage point shock in food commodity prices

(y-axis: year-on-year increase; x-axis: months)



Source: Own calculations based on data from the European Commission.

Notes: This chart shows the aggregate impact on year-on-year inflation of a ten percentage point increase in agricultural commodity price growth for a range of foodstuffs (cereals, meat, dairy and eggs, fats and oils, sugar and coffee). Internal EU agricultural prices are used, except for sugar (as the sample starts in 2006) and coffee, where international prices are used. The estimation period is from January 1997 to February 2022. The dotted lines represent the upper and lower bound of the 95% confidence band, which is calculated by weighting each food group's confidence bands.

Box 9

The role of Chinese imports in Europe's industry

In recent years, China's supply chains to major industrial regions have faced severe challenges. With the rapid spread of COVID-19 in China in early 2020, the authorities implemented strict containment measures, which disrupted global supply chains. Later in the pandemic the focus shifted as China restarted its production relatively fast, which likely supported the recovery in trading partners' industries. More recently, strict containment measures in important industry hubs and ports in China have posed a stress to supply chains already strained by the Russian war in Ukraine. This box analyses the extent to which frictions in trade with China have affected manufacturing sectors in the EU during the COVID-19 pandemic.

The Chinese supply chain disruption in early 2020 had a significant impact on European manufacturing production. Khalil and Weber (2022) use a structural vector autoregression (SVAR) with sign restrictions (see Chart A, right table) to identify the effects of shocks to trade with China on euro area manufacturing output.¹⁶⁶ The identification strategy builds on the idea that Chinese supply chain shocks result in some degree of trade diversion, meaning that in the short run European firms can partially substitute Chinese imports with imports from other countries. The approach differentiates between supply-type shocks, which are associated with bottlenecks in the Chinese supply chain, and demand-type shocks. The latter represent shifts of euro area demand towards goods with a high input content sourced from China (such as, for example, consumer electronics and some medical products) at the expense of imports from other trading partners. As they put strain on Chinese production, these shocks raise the prices of imports from China.

¹⁶⁶ The variables in the SVAR are euro area manufacturing production, euro area real imports from China, euro area real manufacturing imports from the rest of the world, and Chinese manufacturing producer prices converted into euros (all in growth rates). The sample period is January 2000 to June 2022. The estimation uses Bayesian techniques imposing a Normal-Wishart prior on the parameter distributions and assuming three lags. Data sources are Eurostat (manufacturing production and manufacturing imports) and the National Bureau of Statistics of China (Chinese producer prices).

A historical shock decomposition indicates that shocks to the Chinese supply chain lowered manufacturing production in the euro area by up to 7% in the spring of 2020 (see Chart A). Overall, however, the main contributions to the recession came from domestic sources.¹⁶⁷ Whereas the impact of unexpected frictions in trade with China was sizable, it did not cause persistent damage to euro area manufacturing production. The effect of Chinese supply-side shocks quickly faded with the reopening of the Chinese economy. During the recovery, demand-type forces played a dominant role, strengthening the trade linkages of the two regions and raising the prices of imports from China.

Industries with a higher dependency on Chinese imports were hit harder by Chinese containment measures. Khalil and Weber (2022) illustrate this using a difference-in-difference approach. They construct a measure of import exposure to China based on the cost shares of inputs for manufacturing industries in the EU.

$$\text{Import Exposure China}_i = \sum_j \frac{use_{ij}}{M_i + Comp_i} \frac{imp_j}{Q_j + imp_j} \frac{imp_{j-China}}{imp_{j-World}}$$

For each input good, j , the measure accounts for the overall cost of this good in production in industry i , use_{ij} , relative to the cost of all input goods, M_i , plus the wages paid in this industry, $Comp_i$. This ratio is weighted by the import share of intermediate input j in the total supply, i.e. the sum of domestic output Q_j and imports imp_j . The last fraction captures, for each good, the share of Chinese imports relative to total imports.¹⁶⁸ In the regression framework, an indicator variable for industries with a high exposure to imports from China, which is interacted with time dummies, captures the time-varying effect of the disruption of the Chinese supply chains.¹⁶⁹

At the trough of the pandemic recession in April 2020, production in EU manufacturing industries with above-median import exposure to China declined by around 25% more than it did in industries with below-median exposure (see Chart B). However, the effect was short-lived, reflecting the reopening of the Chinese economy and the subsequent recovery of Chinese exports. In 2022, the prospect of a prolonged Chinese zero-Covid policy with potentially repeated supply chain disruptions might, however, leave a more lasting mark on European industries and encourage a search for alternative suppliers.

This episode cautions against an excessive dependency on one large supplier. However, the sharp rebound of European industrial production and the quick closing of the gap between industries with more and those with fewer exposures to China indicate strong resilience of supply

¹⁶⁷ The effects of Chinese supply chain disruptions discussed in this box are similar for US manufacturing industries (see Khalil and Weber, 2022). See also Deutsche Bundesbank (2021) for a related analysis.

¹⁶⁸ To construct the exposure measures, the authors use data from supply-and-use tables in the input-output-tables by Eurostat as well as custom values for imports from China and the rest of the world in 2019 following Eurostat's classification of products by activity. The 70 NACE sectors are mainly three-digit, except for the beverage (C11) and tobacco (C12) sectors, for which data are only available at the two-digit NACE level.

¹⁶⁹ More specifically, the panel regression specification, adopted from Flaaen and Pierce (2019), reads $y_{it} = \alpha + \beta_1 1(M_t = t)D(\text{Imports Exposure China}_i) + \gamma_1 1(M_t = t)D(\text{Import Exposure RoW}) + \rho_1 1(M_t = t)D(\text{Export Exposure World}_i) + \theta_1 1(M_t = t)D(\text{Import Substitution}_i) + \delta_i + \delta_t + \varepsilon_{it}$,

where y_{it} is a logarithmic time series of industry i 's production at time t , adjusted for a linear pre-crisis trend. $1(M_t = t)$ is a vector of time dummies for each month in the sample from January 2019 to June 2022. Imports Exposure China _{i} is an industry-specific variable. Imports Exposure RoW _{i} , Export Exposure World _{i} , and Import Substitution _{i} are control variables. δ_i and δ_t are industry and time fixed effects. For each right-hand side variable, binary dummy variables, $D(\cdot)$, are used to partition industries according to the median of the indicator. The coefficients β_t measure the time-varying effect of the Chinese supply chain disruption. The data are sourced from Eurostat.

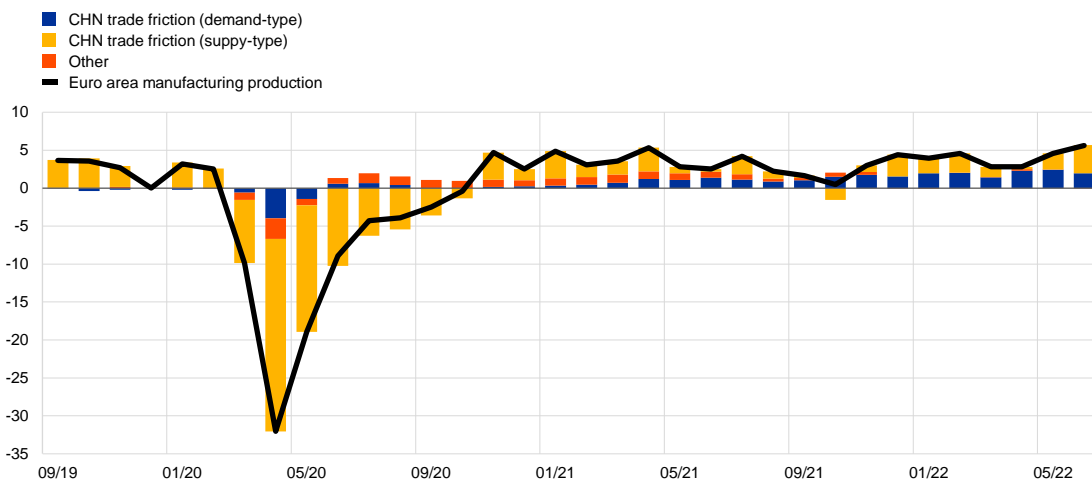
chains. Importantly, later in the pandemic when the Chinese economy reopened and other countries, including those in the EU, were in lockdown, European industries profited from their trade ties to China. Thus, this episode does not provide a cogent argument for reshoring. Instead, a diversification of supply chains could mitigate the effect of shocks stemming from one supplier, while also cushioning against domestic shocks.

Chart A

Effects of Chinese supply chain shocks on aggregate manufacturing production in the euro area

Historical shock decomposition of euro area manufacturing production

(shock contributions, percentages)



Sources: Eurostat, National Bureau of Statistics of China and own calculations.

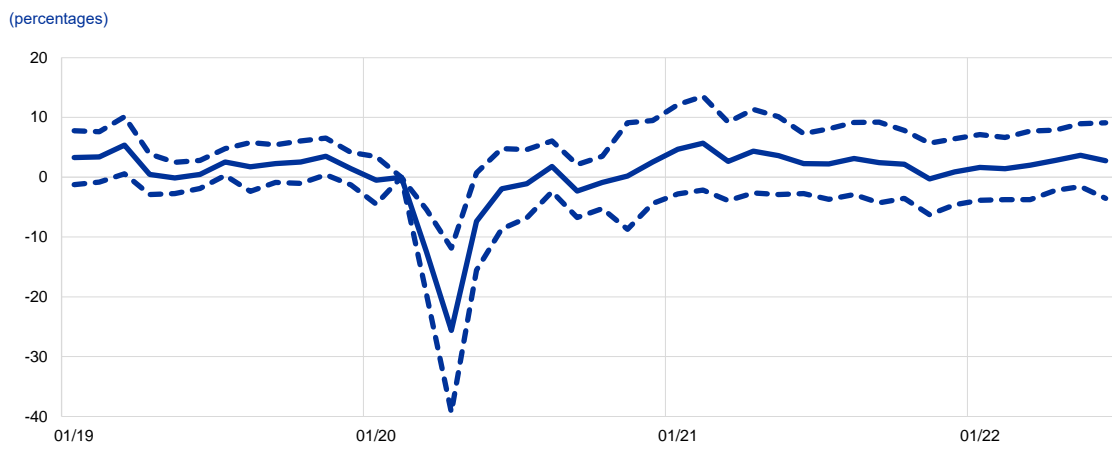
Notes: The chart shows a historical shock decomposition of euro area manufacturing production using a SVAR model estimated on monthly data from February 2000 to June 2022. "CHN trade friction" refers to Chinese supply chain shocks where "supply-type" indicates that an increase in trade frictions is associated with an increase in Chinese producer prices and "demand-type" indicates that an increase in trade frictions comes with a decline in Chinese-produced goods. "Other" includes euro area demand and euro area supply shocks, and the deterministic component. The table shows the sign restrictions for the SVAR. The sign restrictions for the effect of Chinese supply chain shocks on euro area production are imposed one month after the shock, implicitly assuming storage buffers and delays between imports of inputs and production. All other sign restrictions are effective in period zero of the shock.

Table A

Shocks Variables	Domestic demand	Domestic supply	CHN trade friction (sup.)	CHN trade friction (dem.)
Industrial production	Positive	Positive	Negative	Negative
ROW imports	Positive	Negative	Positive	Positive
CHN imports	Positive	Negative	Negative	Negative
CHN import prices	None	None	Positive	Negative

Chart B

Effects of Chinese containment measures in early 2020 on manufacturing sectors with high exposure to China



Source: Own calculations based on Eurostat data.

Notes: The blue line shows the coefficients of a regression of the pre-crisis-adjusted production of a panel of euro area industries on a dummy for industries with an above-median exposure to Chinese imports that is interacted with time dummies. Dotted lines represent the 90% confidence interval. The panel includes 70 mostly three-digit NACE industries. The sample starts in January 2019 and ends in February 2022. As controls, the regression includes a dummy for industries with an above-median import exposure to the rest of the world interacted with time dummies, a dummy for industries with an above-median export exposure interacted with time-dummies, a dummy for industries whose imports are more easily substitutable with domestically produced goods, as well as time dummies and industry dummies.

Box 10

The challenges of innovation financing in the EU

European firms experience specific constraints when seeking the funds they need – in particular funds for the purposes of innovation. Although the structure of financing varies considerably across EU countries, relying as it does largely on debt rather than equity, it is one reason why private investment is lagging behind when it comes to addressing future challenges. Equity financing, however, is more likely to buoy up innovative transformations. European commitments to the twin climate change and digital transitions are therefore aimed at strengthening and diversifying sources of financing, notably by encouraging intra-EU equity financing to ensure that the financing of innovation is more resilient.

EU firms are still only making limited investments in digitalisation and climate transition, mainly due to financial constraints. With regard to digitalisation and innovation, EU firms lag significantly behind the United States. According to the European Investment Bank Investment Survey (EIBIS), 64% of EU firms did not introduce any innovation in 2020, compared with 49% in the United States (see Chart A).¹⁷⁰ In the case of EU firms, any innovation appears to be more related to new processes within the firms, rather than a broader innovation capacity for the domestic or global economy (see Chart A).

Compared with non-European firms, European entities face more constraints when seeking funds for their own long-term investments (see Table A). A Lack of available finance was a major obstacle for 20% of EU firms in 2019, compared with only 10% in the United Kingdom and 8% in the United States. The difference in comparison with foreign firms is even higher among small firms, although it

¹⁷⁰ EU firms also show less implementation of digital technologies inside firms. In 2019, only 62% of EU firms implemented digital technologies, compared with 74% in the United States, according to the EIBIS.

varies between EU Member States. Financial constraints are, for instance, twice as great for eastern European countries as they are for Germany or the Netherlands.¹⁷¹

Long-term investment decisions are also concerned with adapting to the climate change transition. In 2019, a higher proportion of EU firms than US firms produced investment plans to tackle the impact of weather events and the reduction of emissions (45% compared with only 32% in the United States). However, the availability of finance to fund these plans appears to present a major challenge, as only 39% of EU firms faced no obstacles in financing investment plans aimed at tackling the energy transition, compared with 63% in the United States. This level of financing constraint applies to all types of firm in the EU, whereas it only applies to SMEs in the United States. There is, therefore, a paradox between the number of EU firms which have investment plans as part of their business strategy and the (high) number of EU firms which face constraints in implementing concrete investments due to lack of financing.

Financial constraints faced by EU firms stem in part from the structure of financing in the EU, with its large reliance on debt rather than equity. In 2019, newly issued equity represented only 0.2% of EU firms' external financing, compared with a figure of 2.3% for US firms and 0.7% for the United Kingdom.

There is a disequilibrium in the use of bonds and equity issuance between larger and smaller EU firms, whereas the relationship is slightly more balanced for the United States and the United Kingdom. This indicates that SMEs have more limited access to financial markets in the EU. Equity financing, which is structurally more favourable to innovation than bank-based funding,¹⁷² is much more developed in the United States and the United Kingdom than it is in the euro area, representing up to 220% of US GDP compared with only 91% of euro area GDP in Q2 2021.¹⁷³ ¹⁷⁴ At the same time, the growth of investment funds (and notably equity funds) in the euro area over the last few years has not benefited euro area firms, since two-thirds of these flows exited the euro area in the period 2019-21.

¹⁷¹ Dufouleur *et al.* (2020).

¹⁷² See [European Central Bank](#) (2022a).

¹⁷³ Euro area countries excluding Germany.

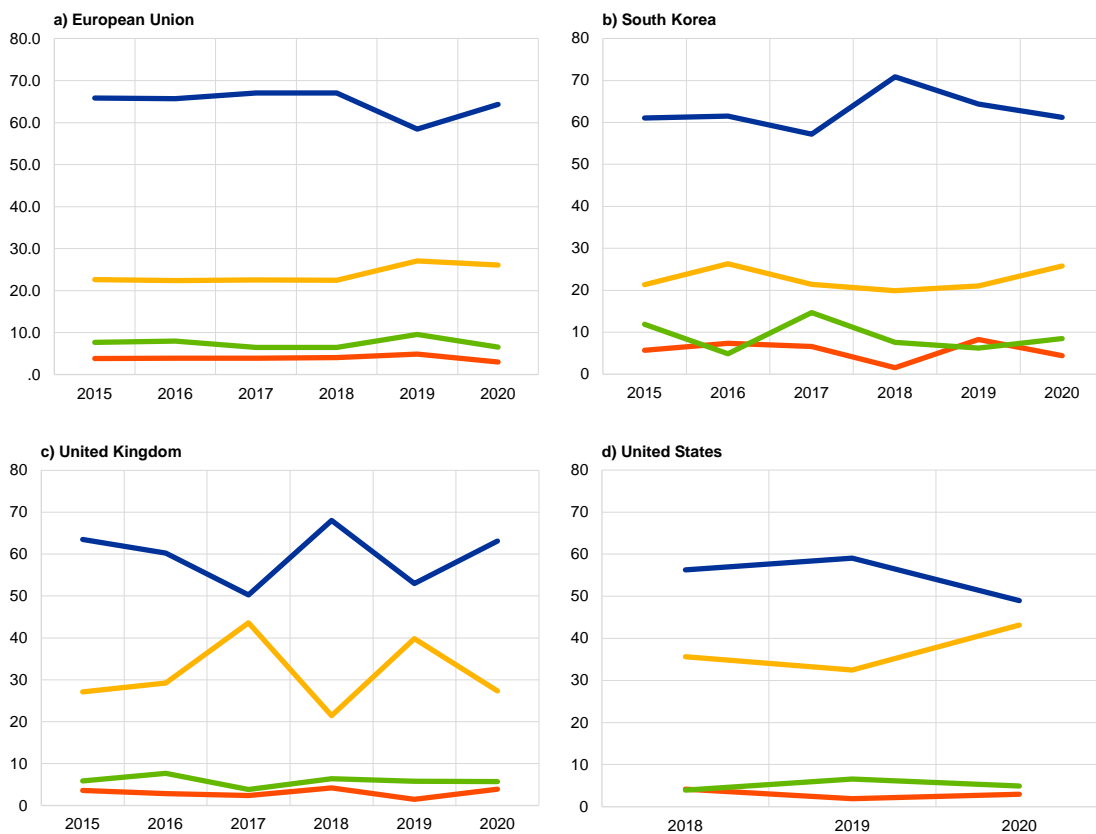
¹⁷⁴ See [Hege et al.](#) (2008) and [Revest and Sapio](#) (2012).

Chart A

Proportion of firms introducing products and processes new to the firm, country or world (2015-20)

(percentages)

- No innovation
- New to the firm
- New to the country
- New to the world



Source: EIBIS.

Table A

Availability of finance as a major obstacle to long-term investment decisions in 2019

(percentages)

	EU countries	United States	United Kingdom	South Korea
Small firms	23	14	18	11
Medium firms	20	4	8	7
Large firms	17	8	8	6
All firms	20	8	10	8

Sources: EIBIS.

The euro area's reliance on extra-euro financing was higher in 2021 than it was in the early 2000s (see Chart B, panel a). This is a trend shared with the United Kingdom (see Chart B, panel b). In this regard, while euro area equity financing has been rising, especially for non-financial corporations, the rise is dependent on non-euro area financing in net terms.¹⁷⁵ The trend is even

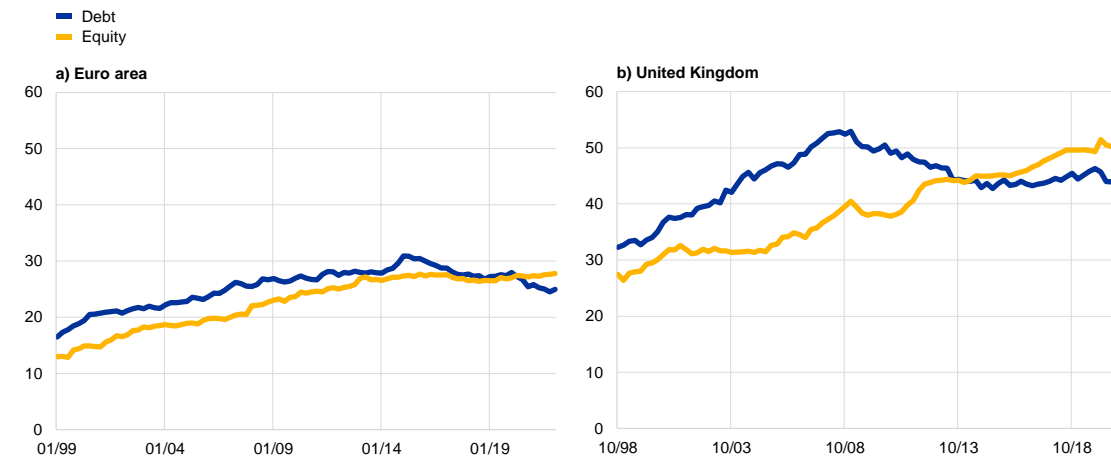
¹⁷⁵ See [European Central Bank \(2022a\)](#).

more marked for market segments such as start-ups, whose financing needs are met at a later stage of their growth by non-European funds rather than domestic ones.

Chart B

Proportion of euro area and UK stocks of equity and debt liabilities from the rest of the world

(percentages)



Source: Eurostat and author's calculations.

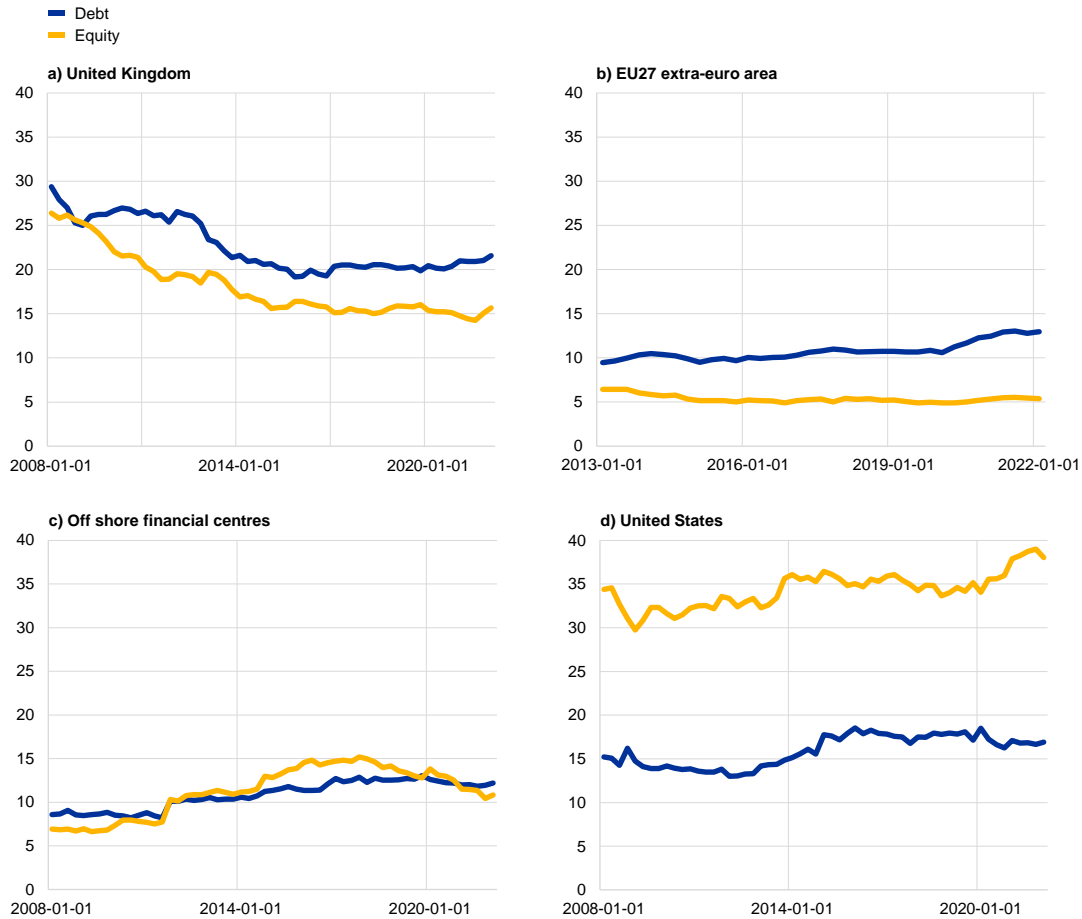
Note: Share of euro area and UK stocks of equity and debt liabilities held by the rest of the world of the total equity and debt stocks of the respective economies.

Extra-euro area equity financing has originated mainly in the United States, which represented 40% of the stock of equity liabilities in the euro area's international investment position in 2021 (see Chart C). Innovation needs equity-type financing (Brown et al., 2009) to thrive (Hall and Lerner, 2009) and European firms are dependent on foreign investors for this type of investment. The question thus arises as to whether – and if so how – the euro area could use its financial surpluses to scale up domestic private investment to meet the needs of innovation.

Chart C

Euro area International Investment Position (IIP) – counterparts' stocks of equity and debt liabilities

(percentages, stocks by the rest of the world)



Sources: Eurostat and authors' calculations.

Notes: Share of different geographical counterparts (United Kingdom, EU27 extra-euro area, offshore financial centres, United States) out of total euro area stocks (IIP) of equity and debt liabilities. "Debt" refers to direct and portfolio investments in debt and other investments; "Equity" refers to direct and portfolio investments in equity instruments.

3 Policy options and trade-offs

Following the empirical analysis background presented in Section 2, this section discusses the policy options for dealing with EU/EMU vulnerabilities and strategic dependencies, including those proposals put forward by EU authorities, and highlighting the trade-offs. Specifically, the EU is deploying measures to enhance its strategic autonomy in the area of industrial and trade policy – measures that need to be appropriately chosen and calibrated. These policies, such those aimed at increasing the resilience of GVCs, as well as establishing FDI screening mechanisms and financial sanctions, should seek to protect the EU's status quo as an open economy and level playing field as much as possible, while at the same time minimising the costs of such policies. There may be trade-offs between these and other policy priorities, which may also induce (new) interdependencies or necessitate the prioritisation of certain issues. Although a large number of these policies do not fall within the ECB's remit, they still have a direct or indirect impact on monetary policy. In addition, to attain a well-balanced OSA the EU and Member States need to act where appropriate. Member States can more easily pursue OSA-related policies if they reduce their vulnerabilities to external shocks arising from a more geopolitically-affected global order. Strengthening EMU and further advancing EU integration could contribute to this and to achieving some of the stated objectives of the EU's OSA policies.

3.1 Economic and financial trade-offs of current OSA policies

3.1.1 General considerations

EU industrial policy can be used as a tool to increase resilience and develop key technologies when market mechanisms fail to deliver. An industrial policy should be dedicated to correcting market failures, developing key competitive advantages and increasing productivity. For example, market failures could arise under the presence of agglomeration effects (or Marshallian externalities) when firms learn from the competitive environment surrounding them. When correctly accompanied by structural reforms, industrial policies can help the EU to enhance resilience. However, it is crucial that market mechanisms are not repealed, as this would induce efficiency costs.¹⁷⁶ As discussed in previous sections, the rise in geopolitical tensions, the trade interruptions during the early phases of the pandemic, as well as the recent low growth dynamics and the need to accelerate the digital and green transitions have sparked discussions on the role of industrial policy at the EU/EMU level.¹⁷⁷

¹⁷⁶ See [Rodríguez-Clare \(2007\)](#).

¹⁷⁷ For the latest policy efforts see [European Commission \(2020i\)](#).

The structural transformation of the European economy can be accelerated by reforms aimed at improving conditions for growth.

A horizontal, rule-based industrial policy could enhance economies of scale and network effects.¹⁷⁸ In addition, a policy that leads to the upgrading of human or physical capital could complement R&D subsidies.¹⁷⁹ Such a policy should also direct resources towards innovative and knowledge-intensive activities whose growth has been hampered by market failures¹⁸⁰ or which have a “latent” competitive advantage, so that their development would continue beyond the duration of the specific policy.¹⁸¹ Examples of this include measures that promote the development of the IT sector.¹⁸² By contrast, an industrial policy implemented by targeted, steered government interventions (e.g. the direct promotion of individual sectors or enterprises) carries the risk of unintended side effects. This could lead, for example, to allocative inefficiencies, because such measures could undermine product market competition.¹⁸³ Moreover, the measures could circumvent the preferences of firms and consumers.¹⁸⁴

The provision of European public goods, the smooth operation of the Single Market and the capacity to directly address market failures, could strengthen market conditions and tackle geopolitical risks, thus limiting the need to resort to OSA-specific policies.

The set-up of the EU, with limitations to EU-common action imposed by the ultimate sovereignty in fiscal and economic policies of the Member States, may lead to the under-provision of important European public goods. When it comes to network and energy, the benefits of the interconnection between two critical nodes are spread to the rest of the network while the costs are borne by the countries in which the nodes are located. In this regard, EU actions could contribute to minimising overall costs and could maximise overall benefits through, for example, common financing or EU-wide regulation. An example of overcoming the pandemic and meeting challenges are the NGEU¹⁸⁵ funds whose aim is to help Member States to promote digitalisation by investing in network infrastructure and digital skills (on the contribution of NGEU to OSA see Box 15).¹⁸⁶ Similarly, in the case of the green transition, the commitments implied by the net zero strategy require significant investments to be made from European funds. In addition, the recently established regulatory framework for business cooperation in

¹⁷⁸ See [Liu \(2020\)](#).

¹⁷⁹ See [Akcigit et al. \(2020\)](#).

¹⁸⁰ See [Harrison and Rodríguez-Clare \(2010\)](#).

¹⁸¹ See [Itskhoki and Moll \(2019\)](#).

¹⁸² See [Manelici and Pantea \(2020\)](#).

¹⁸³ See [Aghion et al. \(2015\)](#).

¹⁸⁴ See [German Council of Economic Experts \(2019\)](#).

¹⁸⁵ The Recovery and Resilience Facility, which is set out in the EU's medium-term financial framework (2021-26) and is specifically designed to support economic recovery following the COVID-19 pandemic, also aims to strengthen resilience and adapt to green and digital change. It is a part of the NGEU package. To benefit from the support of the facility, Member States submit their recovery and resilience plans to the European Commission. Each plan sets out the reforms and investments to be implemented by end-2026. See [European Commission \(2020j\)](#).

¹⁸⁶ The Maastricht Treaty has already set the EU the task of establishing and developing Trans-European Networks in the transport, telecommunications and energy sectors. The networks are intended to contribute to the development of the internal market and to strengthen economic and social cohesion, and link island regions, internal regions and peripheral regions with the central territories of the EU and connect EU territory with neighbouring third countries. See Article 194(1)(d) of the [Treaty on the functioning of the European Union](#).

the area of strategically important projects known as IPCEI (important projects of common European interest) shows that the provision of European public goods can also be facilitated through regulation.¹⁸⁷ The latest developments in such transnational projects of European strategic interest (e.g. in microelectronics, batteries, hydrogen or the cloud) are notable examples.

Another example of an area in which the provision of EU-wide public goods may be reinforced is foreign and security policy.¹⁸⁸ In this regard, the provision of military spending is currently almost entirely decided at the national level in the EU, despite a growing trend towards cooperation within the EU.

Any discussion of foreign and security policy in the EU needs to take into account the framework of (military) alliances, notably the North Atlantic Treaty Organisation (NATO), to which 21 of the 27 EU Member States are signatories.¹⁸⁹ Among other things, NATO security guarantees have for many years provided relative geopolitical stability and peace in Europe. They have made it possible for defence expenditure to fall as a share of GDP over the past few decades without, seemingly, undermining the EU's external security (the "peace dividend"). From an EU point of view, while there is a certain degree of cooperation between Member States through the Common Foreign and Security Policy (CFSP) and the Common Security and Defence Policy (CSDP), EU Member States remain fully sovereign in military affairs.

Recent geopolitical developments and, especially, the Russian invasion of Ukraine have led to unprecedented financial sanctions and may reverse the trend towards falling military expenditure in Member States. Together with broader developments in foreign policy, external security and defence, this may well have significant fiscal and economic implications for the EU and its Member States. EU countries spend an average of 1.3% of GDP on their military capabilities through government consumption and investment. In some cases, military spending is also a driver of R&D and military equipment can be a notable export and/or import item. As such, the maintenance and development of military capability has a significant impact on the economy, from weighing on public finances and generating public employment (which may imply macroeconomic stabilisation) to altering the terms of trade, with potentially significant implications for growth and inflation. While the level of military expenditure normally depends on external security considerations, the economic perspective may add an efficiency aspect. First, the provision of external security and defence at the national level in the EU could lead to fragmentation and inefficiency. Providing external security as a public good at the European level could result in economic efficiency gains for EU Member States, for example with regard to procurement, investment and public finances. Second, the composition of military expenditure is known to have a significant impact on spending efficiency, also from the point of view of military capability. The literature

¹⁸⁷ The framework for IPCEI is intended to enable the promotion of transnational cooperation and the mapping of the value chain from applied research, development and innovation to the first-time industrial implementation and to key infrastructure projects in the environmental, energy and transport sectors which will be supported by state aid.

¹⁸⁸ Beyond economics, the concept of the strategic autonomy of the EU was initially developed with foreign and security considerations in mind.

¹⁸⁹ Two more EU Member States, Finland and Sweden, have recently applied to join NATO.

suggests that, as a minimum, military expenditure is economically more productive when it is directed less towards compensating personnel and intermediate consumption, and more towards capital investment and R&D (see Box 16).

Model simulations show that the efforts made to accelerate the green and digital transitions need to go beyond an initial EU demand push and should aim to raise productivity in the medium term. A demand push in specific sectors could have heterogeneous effects on the economy (see Box 11). While the targeted sector and its suppliers may benefit, more downstream sectors (and countries) could lose out, as the increases in prices could undo the positive demand effects. However, an increase in productivity could have growth-enhancing effects in the majority of sectors and countries.

In order to accommodate some measures, a relaxation of policies regarding state aid might be necessary, while making sure any unwarranted effects are avoided. Throughout the COVID-19 crisis, EU Member States used different vehicles under the State Aid Temporary Framework to shield strategic firms and sectors from unwanted third-country takeovers, or to contain large-scale market access by foreign competitors and protect the domestic job market.¹⁹⁰ These instruments included direct capital participation and the granting of guarantees and subordinated loans. Most recent adjustments¹⁹¹ to the relaxed state aid policies were accompanied by significant changes to the regulatory framework (i.e. stricter rules for emissions or for data processing and storing) which also took into consideration the significant investment needs of the twin transition to a green and digitalised economy, which could justify the prolongation of the temporary relaxation of state aid policies implemented during the COVID-19 crisis.¹⁹² In any case, a careful review of state aid is needed to ensure that there are no unintended effects on productivity or modifications to the level playing field in the Single Market.¹⁹³

Although industrial policies are predominantly an internal matter, they also affect the external dimension of the Single Market. By keeping the Single Market open, competitive and resilient to external shocks, the EU preserves its most important asset in multilateral negotiations. This is why the EU Commission lists most of these instruments as a tool to “unlock[ing] the benefits of the EU’s trade agreements, coupled with assertive enforcement of both its market access and sustainable development commitments”.¹⁹⁴ In the Commission’s view, these measures are a critical element of OSA, given their potential to stem protectionist tendencies and counter the unwanted effects of globalisation. It is therefore not erroneous to assume that these instruments are also part of the trade policy toolbox, despite their capacity to act on internal markets.

¹⁹⁰ See [Alonso et al. \(2021\)](#).

¹⁹¹ The Commission had already amended the State Aid Temporary framework in November 2021 to support the economic recovery and, at the same time, the adjustment to digital and green transition. See [European Commission \(2021a\)](#).

¹⁹² The Commission announced that the [State Aid Temporary Framework](#) would be extended beyond end-June 2022, with a few minor exceptions.

¹⁹³ See [Tunali and Fidmuc \(2015\)](#).

¹⁹⁴ [European Commission \(2021b\)](#).

The Single Market ensures the competitiveness of EU industry, allows EU economies to cushion global shocks and increases market size as well as rule-setting power in the international context. However, it also comes with drawbacks. As explained in Box 12, subsidies can be trade-distortionary as they can have a negative effect on imports in comparison with domestic production. For this reason the case for adopting domestic measures should be carefully assessed. Adopting measures can be justified if they target specific inputs and raw materials, such as those needed for key technologies. Moreover, under specific circumstances the EU Commission can selectively limit market access to third-country enterprises.¹⁹⁵

3.1.2 EU OSA industrial and trade policies to date

The European Commission is putting together a toolbox with three different aims: preserving an international level playing field, strengthening the resilience of internal markets and responding to geostrategic threats (see Chart 45).

Table 3
Some key OSA initiatives undertaken by EU authorities

	Instrument	Relevant text	Potential pros	Potential cons
Preserving an international level playing field	Foreign government subsidies	Proposal COM 223, 5.5.2021	Correct distortions, tackle carbon leakage	Potential interventionism, protectionism
	Carbon border adjustment mechanism	Proposal COM 564, 14.7.2021		
	Digital Markets Act	COM 842 final, 15.12.2020		
EU industrial system for increasing resilience of internal markets	Strategic investment facility	Regulation (EU) 2021/523, 26.3.2021	Reduce vulnerabilities, increase resilience	Heterogeneous shocks, fiscal cost
	Action Plan on Critical Raw Materials	Communication COM 474, 3.9.2020		
	Circular economy plan	Communication COM 98, 11.3.2020, European Commission (2020s)		
	Strategic dependencies	Staff Working document 352, 5.5.2021		
Protecting and strengthening the EU financial system	The European economic and financial system: fostering openness, strength and resilience	COM/2021/32 final	Prevent abuse of market power, lack of supervision/regulation and minimise financial stability risks	Economic inefficiency
Response to geostrategic threats	FDI screening	Regulation (EU) 2019/452, 19.3.2019	Prevent geostrategic conflicts and technology transfer Secure energy supplies at reasonable cost	Economic inefficiency, abide with global rules
	Anti-coercion measures	Proposal COM 775, 8.12.2021		
	Energy emergency measures	COM/2022/553 final		

Source: Own elaboration.

¹⁹⁵ According to Article 36 TFEU, market access can be limited in the case of derogations to the internal market freedoms. For more details see [European Commission \(2021e\)](#).

With regard to instruments for strengthening the resilience of the internal market, these seek to assess the vulnerabilities in the supply chains and provide the European Commission with adequate tools to ensure that external supply shocks will not compromise the EU's production capacity. The building block of this set of measures is the package on strategic interdependencies that aims to measure and manage weak spots in EU strategic supply lines. The intention is to increase the EU's economic resilience by applying (preferably) market solutions. More interventionist policies may lead to distortions and, in some cases, raise fiscal burdens. Through its Action Plan on Critical Raw Materials¹⁹⁶, the European Commission intends to work together with EU Member States and industry representatives to develop measures which can strengthen the resilience of value chains, increase diversification and reduce the EU's import dependency on critical commodities. This includes the possibility of engaging in strategic partnerships with resource-rich countries such as Australia, Canada and Chile (e.g. through signing new trade agreements).

Strategic action plans for CRMs are being put forward not only by the EU, but also by the United States and China. The United States has also created strategic action plans to deal with dependency in this area. The plans focus on supporting industry initiatives aimed at achieving more reliable sourcing, identifying recycling and domestic mining options, as well as outlining potential strategic partnerships and opportunities for cooperation. Most goals, however, are rather broad and general. This holds in particular for the EU plan, while the US plan proposes some more specific measures such as improving access to federal lands for mining. China, by contrast, has not published an explicit CRM strategic action plan. Nevertheless, the country is trying to secure its supply of critical global resources, including CRMs, with very concrete actions, especially in Africa. De La Bruyère and Picarsic (2020) investigated various instances of Chinese engagement in Africa and point out that it is often comprehensive, involving investment and loan schemes as well as government and private sector relationships. As an example, through strategic investment in cobalt mines China has secured the vast majority of production in the Congo, the world's largest cobalt producer.

The war in Ukraine has highlighted the importance of accelerating the green transition and eliminating the vulnerabilities caused by the EU's dependence on Russian energy commodities. The Network of Central Banks and Supervisors for Greening the Financial System scenarios provide an estimation of the impact of "net zero" strategies on overall energy dependence. Holding the import content of each energy source constant, the substitution of fossil fuels with clean energy would imply a reduction in the import content of energy consumption from 55% to 40% in 2050 under current policies, although this will be reduced to less than 10% if a net zero strategy is adopted in the EU (see Chart 46). However, current green policies imply not only a reduction in the import content but also a switch in energy providers. The "REPowerEU" plan is specifically designed to address that dependency. The EU intends to phase out Russian fuel imports well before 2030, starting with natural gas and coal in 2022, and partly substitute them with additional

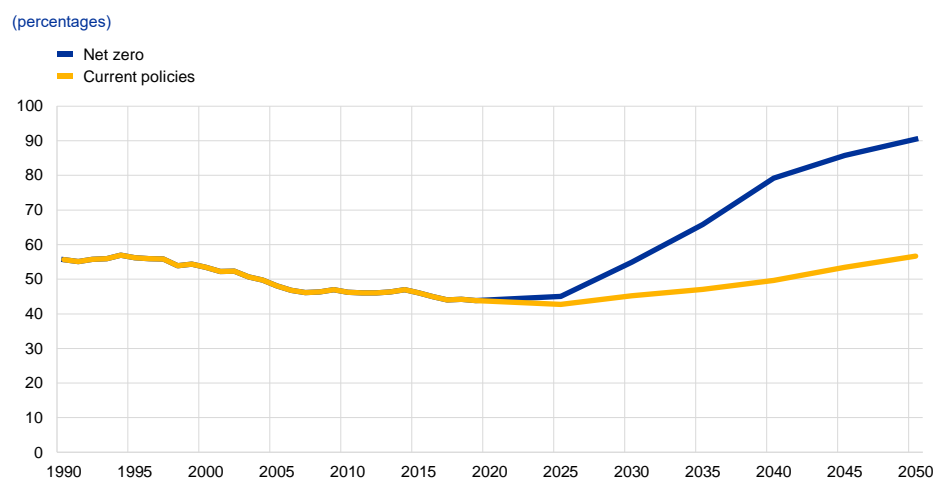
¹⁹⁶ [European Commission](#) (2020k).

LNG imports from various third countries. At present, however, the expansion of LNG imports appears to be possible only to a limited extent as building up the – currently insufficient – storage and transport capacity in the EU may take several years. Moreover, energy dependence at the national level would be reduced with if there were more interconnections between European countries. The EU has set a target for the interconnection of electricity (in terms of the total capacity of cross-border connections) of 15% by 2030. Although gas and electricity interconnections are well-developed in central and eastern Member States, southern European countries are less well-connected. Furthermore, some countries, such as Italy and Spain, are in a better position to diversify their gas imports as they source gas from North Africa or have higher LNG capacities – this would increase the overall resilience of the system. A similar picture emerges for gas interconnections. The literature has shown that considering the gas and electricity markets jointly is crucial to understanding the dynamics of energy prices¹⁹⁷ and that a more interconnected system could minimise the impact of demand peaks and supply shortages.

Thus, having an EU-wide infrastructure network in place that would allow adequate energy to be redistributed to Member States would reduce the dependency on a single – or a few – suppliers (as recently experienced by some Member States). From an ECB point of view, this could ensure less overall and also less heterogeneous volatility in energy inflation between euro area Member States.

Chart 41

Domestic production in the energy mix – historical and scenarios



Sources: Eurostat and Network for Greening the Financial System.

Tariff and non-tariff measures aimed at preserving the international level playing field focus on offsetting the competitive disadvantages EU enterprises might face arising from less stringent environmental or state aid policies in third countries. As foreign subsidies are not subject to the EU's strict state aid control, any such support could give a beneficiary country an unjustified advantage in the acquisition of European firms, or when participating in public procurement

¹⁹⁷ Deane et al. (2017).

procedures or in other economic activities carried out in the EU. The European Commission has therefore proposed a [Regulation on foreign subsidies distorting the internal market](#)¹⁹⁸. This regulation comprises tools for investigating concentrations and public procurements involving financial contributions made by non-EU governments. Although the Regulation helps to prevent unfair competition from third countries, it also increases the regulatory burden on companies, thus reducing the EU's attractiveness as an investment destination and in international procurement processes. In the case of climate change, as the strict internal rules for carbon emissions in industrial processes can incentivise enterprises to relocate outside the EU ("carbon leakages"), the EU intends to impose import tariffs related to carbon content ([carbon border adjustment mechanism](#)¹⁹⁹). If approved in their current form, the tariffs would be applied gradually, starting with goods characterised by high carbon intensity, such as cement, steel, aluminium, fertilisers and electricity generation. Although the issue of carbon taxation and the carbon border adjustment mechanism may incentivise the development and scaling-up of climate-friendly technologies within the EU and the transfer of this knowledge to third countries, it could also increase the regulatory burden on market access and risks being seen as "green protectionism" by some trading partners, possibly spurring protectionist countermeasures ("trade retaliation"). Finally, digital markets are dominated by large platforms that act as "digital gatekeepers" by controlling key distribution channels. These companies benefit from strong network effects in the digital environment, the intermediary role they play between provider and buyer and their ability to access a large amount of data, which, in turn, gives them a competitive advantage. Through the [Digital Markets Act](#) the EU puts ex ante obligations and prohibitions on companies already operating in the EU Single Market (see Box 13 on digital space).

Finally, the aim of a third bundle of measures is to reinforce the EU's strategic global positioning. While the EU is generally committed to open markets, European enterprises may be crowded out in the domestic market by takeovers launched by foreign state-owned enterprises which may benefit from favourable financing conditions or another form of support from their national governments. The EU has therefore tightened its FDI rules in the area of critical infrastructure such as energy, health, media, telecommunications and transport, and in critical technologies such as data-driven businesses, robotics and artificial intelligence. The [FDI screening mechanism](#), which entered into force in 2020, sets out minimum requirements for EU Member States' FDI screening²⁰⁰ and defines the criteria which may cause the Commission to take action (see Section 3.1.3). With regard to [Coercion](#) (pressure by a third country on the EU or one of its Member States aimed at preventing the implementation of certain regulations),²⁰¹ the EU has established a multistep procedure, starting with negotiations and arbitration between the EU and the third country involved and ending with countermeasures as a last resort.

¹⁹⁸ [European Commission](#) (2021f).

¹⁹⁹ [European Commission](#) (2021g).

²⁰⁰ It is not mandatory to have a national FDI screening mechanism, although the European Commission encourages EU Member States to set up such a mechanism.

²⁰¹ An example would be pressure applied by the US government (by increasing tariffs on certain French products) to prevent the French government from introducing a digital tax on big tech companies.

To sum up, the EU has, so far, used various industrial policy tools and provides European public goods in the area, for example, of energy and digital infrastructure. Promoting business cooperation in strategically important areas, fostering research projects and building up network capacities increases economies of scale. In the context of less stringent environmental and state aid policies in third countries, the regulatory changes discussed seem appropriate in the short term. However, with regard to these less strict regulations outside the EU, although the measures preserve the functioning of the Single Market they could reduce its attractiveness to investors from third countries. For this reason, the EU should step up its efforts to find multilateral solutions to international competition distortions. As the number of non-tariff barriers has increased significantly in [WTO countries](#) recently, a corresponding change in the multilateral framework would be useful in order to enhance competition and prosperity in the long term and contain the effects of climate change in the economy.

3.1.3 FDI screening mechanism

As Section 2 shows, the EU is one of the most open international investment areas and one of the main destinations for FDI worldwide. EU treaties acknowledge the importance of openness to foreign investors, as this can spur innovation and, as a consequence, competitiveness and job creation. The relationship between FDI and economic activity is multifaceted and has been described extensively in the literature from both a micro and a macro perspective. Microeconomists have emphasised the effects, usually positive, on the recipient firms' performance in terms of profitability,²⁰² productivity,²⁰³ financial structure²⁰⁴ and innovation.²⁰⁵ Frey and Goldbach (2021) find positive effects on the productivity of both the home and the host company. In aggregate terms, there is a positive correlation between FDI accumulation and GDP growth (see Chart 47), which is fairly stable across different levels of income. The transmission from firm adjustment to macroeconomic effects takes place through increased competition in the sectors targeted by foreign investors²⁰⁶ and spillovers of technology and managerial skills.²⁰⁷

Without questioning the overall principle of openness, in specific circumstances FDI can pose a threat to national security or public order. The concept of national security has changed significantly in Europe over the last three decades as new security threats and technologies have emerged. It is no longer only assets related to the defence industry that are seen as deserving of specific protection. As advanced technologies have become central to the operation and connectivity of the digital economy, threats have morphed from the traditional theft of industrial secrets to include cyberattacks and data breaches involving personal and industrial information. Thus, critical assets now include, for example, network

²⁰² See [Braguinsky et al. \(2015\)](#).

²⁰³ See [Bircan \(2019\)](#).

²⁰⁴ See [Bencivelli and Pisicoli \(2022\)](#).

²⁰⁵ See [Guadalupe et al. \(2012\)](#).

²⁰⁶ See [Barrios et al. \(2005\)](#).

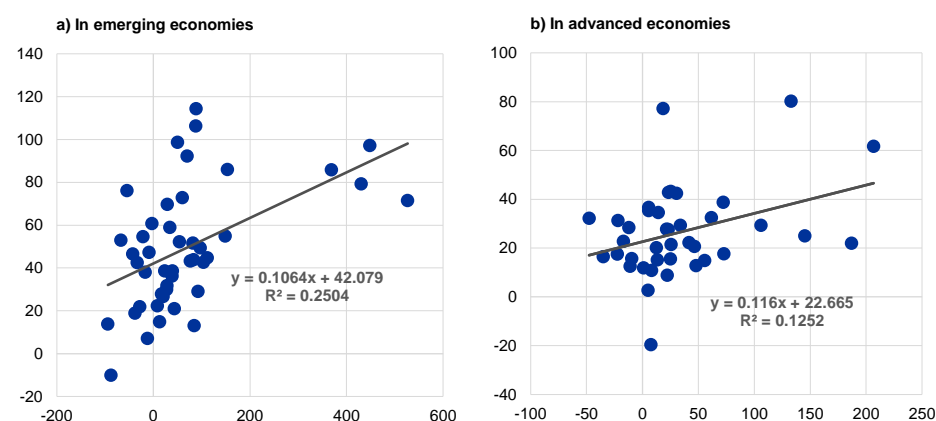
²⁰⁷ See [Javorcik \(2004\)](#).

infrastructure such as cables and data storing facilities. In addition, the diffusion of supply chains has introduced new vulnerabilities, especially when these include facilities located in countries in which disruptions are likely to occur.

Chart 42

Relationship between the variation in the stocks of inward FDI and the variation in real GDP over the period 2009-19

(y-axis: cumulated real GDP growth; x-axis: change in inward FDI stock)



Sources: IMF and World Bank.

Notes: Emerging economies are Afghanistan, Albania, Argentina, Burkina Faso, Bangladesh, Bosnia Herzegovina, Brazil, Chile, Colombia, Costa Rica, Djibouti, Dominican Republic, Ecuador, Egypt, Georgia, Honduras, Haiti, Indonesia, India, Jamaica, Jordan, Kazakhstan, Kirgizstan, Republic of Laos, Morocco, Madagascar, Mexico, Mozambique, Malawi, Namibia, Nigeria, Nicaragua, Pakistan, Peru, Philippines, Paraguay, Russia, Sudan, El Salvador, Serbia, Thailand, Turkey, Uganda, South Africa and Zambia. Advanced economies are Australia, Austria, Belgium, Bulgaria, Switzerland, Cyprus, Czech Republic, Germany, Denmark, Spain, Estonia, Finland, France, United Kingdom, Greece, Hong Kong, Croatia, Hungary, Ireland, Iceland, Italy, Japan, South Korea, Lithuania, Luxembourg, Latvia, Malta, Netherlands, Norway, New Zealand, Poland, Portugal, Romania, Singapore, Slovakia, Slovenia, Sweden and the United States.

After the GFC, numerous countries around the world adopted FDI screening regimes, thus reversing the global trend towards full openness that had begun after the Second World War. In addition, the acquisition of a significant number of major EU firms by non-EU buyers²⁰⁸ sparked a debate on the need to provide the Single Market with an instrument that could protect national strategic assets from foreign takeovers. Such takeovers can embed risks related to the transfer of technology, data sensitivity and the control of critical infrastructures, all of which have the potential to hamper the security and competitiveness of the EU economy.

Since 2019, the European Council has approved a common FDI screening mechanism to coordinate the actions of Member States, 18 of which have their own mechanism. The EU Regulation²⁰⁹ does not impose a single mechanism, but instead provides a common coordination framework to which Member States must adapt their respective process. It also mandates the exchange of information between governments and the European Commission regarding assets affecting European projects. The Regulation has an inter-governmental dispute resolution mechanism for those foreign investments destined for one Member State but with

²⁰⁸ For example, the acquisition of the major German robot maker Kuka by the Chinese conglomerate Midea was extremely controversial, not only because of the amount of technology that was going to be transferred to a Chinese counterpart but also because of the industrial secrets about Kuka's customers that were about to be made available to a Chinese industrial actor.

²⁰⁹ [Regulation 2019/452 of the European Parliament and of the Council as updated on 23 December 2021.](#)

potential cross-border fallout affecting others. In order to assess the sensitivity of certain investments, the Regulation allows Member States to consider, for example, the identity of the investor. It therefore allows governments to discriminate on the grounds of investors' nationality, thus taking a geopolitical angle.

The first annual report published by the European Commission in November 2021 found the FDI Screening Regulation to be an efficient tool for protecting the interests of the EU while maintaining the EU as a top investment destination.

Members States reported the review of 1,793 dossiers in 2020, of which 20% underwent formal screening. Only 2% of the latter were finally prohibited -. The Member States notified 265 investments to the Commission – mostly by Germany, France, Spain, Italy and Austria. The three sectors with the highest number of transactions were manufacturing, ICT and wholesale and retail trade, the top four countries of origin being the United States, the United Kingdom, Canada and the United Arab Emirates.²¹⁰

In 2020, the COVID-19 crisis prompted the European Commission and national governments to further tighten control of incoming FDI.

The crisis created supply fragilities, especially for pharmaceuticals and food. In addition, it strained the financial conditions of numerous EU firms, making them more vulnerable to foreign takeover. Energy and digital transitions combined with heightening geopolitical tensions (culminating with the Russian invasion of Ukraine in February 2022) have increased the urgency of the issue.

It is likely that the new EU mechanism will create a regulatory burden, especially for regulation requiring ex ante authorisation, as well as uncertainty over the investment process, which will affect FDI flows.²¹¹ ²¹²

Although to some extent this could reduce the attractiveness of EU Member States to foreign investors, other important partners, such as the United States²¹³ and the United Kingdom²¹⁴ also have similar screening mechanisms. In the United States, the Foreign Investment Risk Review Modernization Act of 2018 increased the investigative power of the Committee on Foreign Investment in the United States. In the United Kingdom, the National Security and Investment Act, which has been in force since 4 January 2022, has established 17 sensitive subjects for which foreign investors require preliminary approval. Harmonising national regulations in the EU would be a step in the right direction when it comes to mitigating this effect.

²¹⁰ The Italian government blocked the takeover of two companies by Chinese counterparts: a seed producer by Syngenta and an intermediate goods manufacturer in the semiconductor industry by Shenzhen Investments Holdings.

²¹¹ Efficient FDI screening requires a certain degree of flexibility to accommodate the emergence of new types of protection from takeover arising from technological advancement or geopolitical developments.

²¹² Article 3 of the EU Regulation requires country members to adopt transparent and nondiscriminatory procedures with specific time frames to temper these possible drawbacks.

²¹³ The Committee on Foreign Investment in the United States may screen investments in critical technology, infrastructure and sensitive personal data business under certain conditions, according to a new regulation in 2020 implementing the Foreign Investment Risk Review Modernization Act of 2018. Restrictions, notably those regarding "foreign adversaries", were enhanced in 2021.

²¹⁴ In 2020 the United Kingdom set up a new agency, the Investment Security Unit, to take charge of a review of FDI.

3.1.4 Payments and financial market infrastructure

The dominant position of non-EU payment-related service providers in intermediating European payment transactions raises several concerns. In this context, one aim of the recent retail payment strategies put forward by the Eurosystem²¹⁵ and the European Commission²¹⁶ is to address challenges to the EU's sovereignty in the payments market. Both strategies seek to reduce dependencies on non-EU payment-related service providers and foster a resilient EU ecosystem of payments by encouraging the development of a pan-European solution for payments, governed at the European level, that could achieve global acceptance in the long run. Further goals included in one or both of the retail payment strategies are: the reinforcement of the EU's independence, efficiency, competitiveness and resilience in the field of payments by enhancing consumer protection and the safety of payment solutions; the full deployment of instant payments; the improvement of cross-border payments between the EU and other jurisdictions; and active support for innovation and digitalisation. Among a number of private initiatives launched in order to meet the objectives of the retail payments strategy, a group of major euro area banks have established the European Payments Initiative. Their aim is to create a unified payment solution for European consumers and merchants alike.²¹⁷

Secondly, the current overreliance of EU market participants on third-country central clearing services has prompted the European Commission to call for the building up of domestic clearing capacity. In the context of the adoption of a time-limited equivalence decision for UK CCPs, the European Commission has called for EU market participants to reduce their reliance on UK CCPs, in particular in respect of over-the-counter derivatives denominated in EU currencies.²¹⁸ In addition, the European Commission is currently drafting a number of proposals aimed at building up EU central clearing activities and strengthening the EU's supervisory framework for CCPs, including a stronger role for EU-level supervision.²¹⁹ This would help ensure the continuity of the provision of critical financial services like clearing, shield EU market participants from financial stability risks propagating from third-country financial market infrastructures, and enhance the ability of EU authorities to intervene effectively during a crisis.

Thirdly, the Eurosystem's cyber resilience strategy for financial infrastructures has delivered concrete achievements that have strengthened the cyber resilience of the financial sector and, in particular, pan-European financial infrastructures. In December 2020, the European Commission and the High Representative of the Union for Foreign Affairs and Security Policy presented the new EU Cybersecurity Strategy for the Digital Decade, aimed at reinforcing the EU's resilience against cyber threats and ensuring that digital services and tools are trustworthy and reliable (JOIN, 2020). The new strategy proposes, among other

²¹⁵ [European Central Bank](#) (2021b).

²¹⁶ [European Commission](#) (2020l).

²¹⁷ See [Panetta](#) (2022a).

²¹⁸ See [European Commission](#) (2020m).

²¹⁹ A package of legislative measures and the extension of the equivalence decision for UK CCPs to June 2025 were first announced on 10 November 2021 (see [European Commission](#), 2021h).

things, a review of the EU Network and Information Security Directive (NIS Directive)²²⁰ and new measures aimed at strengthening the EU Cyber Diplomacy Toolbox²²¹. The goal of the Directive is to enhance cybersecurity across the EU. Furthermore, with a focus on the financial system²²², in September 2020 the European Commission published a proposal for a regulation on digital operational resilience in the EU's financial services sector (DORA Regulation)²²³ as part of its Digital Finance Package. The proposal covers a range of financial entities regulated at the EU level, including financial market infrastructures such as central securities depositories and CCPs, while payments systems and schemes fall under the oversight of the ECB. The Regulation lays down uniform requirements concerning the security of network and information systems supporting the business processes of financial entities needed to achieve a high common level of digital operational resilience (as well as critical third parties which provide ICT-related services to them, such as cloud platforms or data analytics services). Beyond the regulatory aspect and the fact that cyber risk is cross-border by nature, several coordination structures have been set up at the European level to bring together public and/or private entities.²²⁴ These bodies make it possible to share information on cyber threats and cyber incidents in normal times as well as in times of crisis, and to practice managing large-scale crises through crisis simulation exercises.

Fourthly, the EU is taking steps to prevent abuses stemming from the growing political, social and economic power of big tech companies in the digital sector. In May 2018, the General Data Protection Regulation (GDPR) entered into force, imposing obligations on businesses regarding the collection and processing of EU residents' personal information. To further strengthen the rules governing the EU's digital space, in December 2020 the European Commission presented a digital services package comprising a number of regulatory and supervisory initiatives including the Digital Markets Act (DMA)²²⁵ and the Digital Services Act (DSA)²²⁶. The DMA is one of the first initiatives to globally regulate the market power of large digital

²²⁰ The revised NIS Directive broadens its scope, reinforces its security and incident reporting requirements and strengthens national supervision and enforcement. It also includes proposals for cooperation and information sharing on cyber crisis management ([Proposal for a Directive of the European Parliament and of the Council on measures for a high common level of cybersecurity across the Union, repealing Directive \(EU\) 2016/1148 \[‘NIS Directive’\]](#), COM(2020) 823).

²²¹ The Cyber Diplomacy Toolbox was endorsed by the EU Foreign Affairs Council in 2017 and contains the main principles for a joint diplomatic response to cybercrime. The toolbox consists of several measures aimed at reinforcing prevention and cooperation in the face of malicious cyber activities, including a cyber sanctions regime. The new EU Cybersecurity Strategy proposes looking into additional measures under the Cyber Diplomacy Toolbox, including the possibility of introducing new restrictive measures and exploring qualified majority voting for listings under the horizontal sanctions regime in place against cyberattacks. It also suggests strengthening cooperation with international partners, updating the implementing guidelines of the toolbox and integrating the toolbox into EU crisis mechanisms.

²²² Currently, there is no one single major European cybersecurity norm for the financial system as a whole. Instead, there are multiple European and national regulations and standards that apply to different sub-sectors and in different contexts.

²²³ Proposal for a Regulation of the European Parliament and of the Council on digital operational resilience for the financial sector (DORA) and amending Regulations (EC) No 1060/2009, (EU) No 648/2012, (EU) No 600/2014 and (EU) No 909/2014.

²²⁴ For example, in 2020 the European Cyber Resilience Board (ECRB), coordinated by the ECB, set up a platform called CIISI-EU, bringing together market infrastructures and central banks with the aim of sharing information on cyber incidents and threats.

²²⁵ See [European Commission](#) (2020d).

²²⁶ See [European Commission](#) (2020c).

companies. This regulation seeks to reinforce European authorities' powers to prevent anticompetitive behaviour from certain large companies which provide core platform services ("gatekeepers"), banning certain practices and imposing sanctions for non-compliant behaviour. As for the DSA, it regulates how digital platforms handle illegal products, services and content (including disinformation campaigns, incitement to terrorism and the sale of illegal goods). The DMA and DSA Regulations were adopted in October 2022 and will enter into force in 2023.²²⁷

With regard to digital forms of money, the discussion surrounding central bank digital currencies (CBDCs) in general and the digital euro in particular continues, as does the debate over crypto-assets and stablecoins. In the context of a fast-changing payments landscape, the issuance of a digital euro could preserve the role of public money as the anchor of the payments system, fostering innovation in Europe and strategic autonomy in the EU.

As part of the Digital Finance Package, in 2020 the European Commission introduced a proposal to introduce the Markets in Crypto-Assets (MiCA) Regulation,²²⁸ which will seek to mitigate the risks posed by crypto-assets, while supporting innovation. MiCA transforms the issuance of these assets and related services into reserved activities and its aim is to mitigate the impact of stablecoins on sovereignty, monetary policy, financial stability and the smooth functioning of the payment system. The Regulation is expected to enter into force in 2024. In addition, in November 2021 the ECB implemented its new oversight framework for payment instruments, schemes and arrangements (the PISA framework), which extended oversight to electronic wallets and digital payment tokens (such as stablecoins).

Against this background, the Governing Council of the ECB established a high-level task force in January 2020 to make further progress on CBDCs in the euro area. The digital euro investigation phase is underway in a scenario in which it is essential to ensure that citizens continue to have access to central bank money as they shift increasingly to digital payment. A strong public money anchor is vitally important in order to protect the "singleness" of money, monetary sovereignty and the integrity of the financial system. In addition, with the development of new means of payment, foreign digital solutions could displace existing payment solutions in Europe. This risk would be increased by the expansion of means of payment offered by big techs, with their large customer bases. This could have implications for the EU's autonomy and privacy with regard to payments and could endanger European sovereignty. Moreover, some economies might develop CBDCs that could enhance the role of other international currencies to the detriment of the euro. If this future scenario were to materialise, issuing a digital euro would also contribute to protecting the strategic autonomy of European payments and monetary sovereignty, ensuring that payments in the EU meet the highest standards and providing a fall-back solution if geopolitical tensions intensified (Panetta, 2022b). Furthermore, issuing a digital euro could actively promote innovation by stimulating the supply of new payment services and functionalities and create business opportunities, thus complementing private solutions. To ensure the potential benefits of the digital euro are maximised and to

²²⁷ Regulation (EU) 2022/1925 (Digital Markets Act); and Regulation (EU) 2022/2065 (Digital Services Act).

²²⁸ European Commission (2020n).

manage any risks it might generate, adequate design is of critical importance. The potential impact of a digital euro on monetary policy transmission and financial stability should also be carefully evaluated. It is essential that the digital euro does not crowd out private means of payment and that it achieves the highest standards of privacy, accessibility, robustness, safety and efficiency ([European Central Bank, 2020](#)).

3.2 Trade and financial sources of shocks and OSA

3.2.1 Global value chains and trade

Global value chains (GVCs) — the organisation of production activities by locating different stages of a production process in different countries — are exposed to global, common EU (geopolitical) shocks. During the COVID-19 pandemic they generally seem to have shown resilience. The pandemic saw a sharp contraction of trade flows and GVC-related trade, followed by a fast recovery. This aggregate trend, however, masked substantial heterogeneity. International trade in services – and travel services in particular – collapsed in the first two quarters of 2020 as a result of containment measures and local lockdowns and have remained sluggish. By contrast, goods trade rebounded much more rapidly after its initial decline²²⁹ as companies became more experienced in operating under mobility restrictions.²³⁰ Firms operating in sectors which are more engaged in GVC activities performed better than others during the recovery phase after two major global shocks, namely the 2008 GFC and the COVID-19 pandemic. In both episodes the effect of GVC participation on sectoral revenue growth was similar in magnitude (see Chart 48, panel a). GVCs did not, therefore, collapse, but instead contributed to the sharp rebound in global activity and trade (see Chart 48, panel b).

Nonetheless, some industries can be significantly affected. Notwithstanding GVCs' broad-based resilience during the pandemic, some (strategic) industries marked by particularly complex and geographically dispersed supply chains – such as semiconductors (see Box 7) or, more downstream, the automotive sector²³¹ – did face longer-lasting disruptions as a result of multiple, compounding shocks. From March 2022 onwards, the renewed lockdown of some of China's major manufacturing areas and ports once again intensified pressures on GVCs, as evidenced by increased port congestion, shipping costs and delivery times. During the same period, additional trade-related disruptions were triggered by the Russian invasion of Ukraine and the associated sanctions and corporate actions. While the energy shock is expected to propagate downstream in the EU supply chain, with

²²⁹ See [Arriola et al. \(2021\)](#).

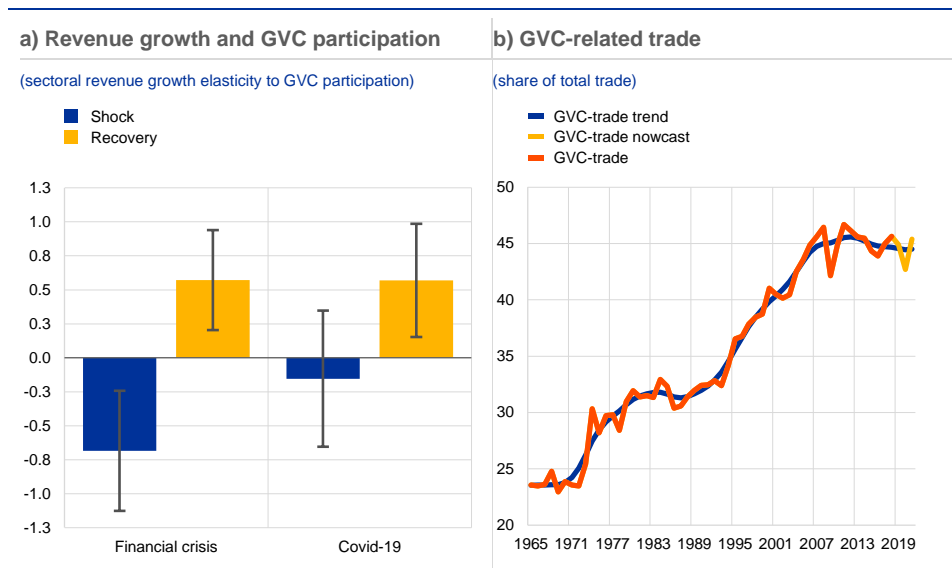
²³⁰ See [Berthou and Stumpner \(2022\)](#), [Espitia et al. \(2022\)](#). Trade in specific GVC-intensive industries such as the automotive, electronics, textiles and medical goods industries was characterised by a larger initial drop early in the pandemic, but also by a quicker recovery than was seen for trade in non-GVC-intensive industries ([IMF, 2022](#)). For the effects of the Chinese lockdown on supply chains early in the pandemic, see Box 9.

²³¹ See [Boranova et al. \(2022\)](#).

heterogeneous effects across countries and sectors²³², the sharp contraction in mid and high-tech imports in Russia will affect its short and long-term growth prospects²³³. In addition, global supply chain linkages could amplify the impact of such trade disruptions²³⁴.

Chart 43

GVCs have been resilient to the COVID-19 shock



Sources: Own elaboration based on firmlevelrisk.com, Thomson Reuters and ADB MRIO (panel a), WIOD Long-Run, OECD (Trade in Value Added), Trade Data Monitor (panel a) and Borin et al. (2022b).
Notes: In panel a we report the coefficient of a regression that estimates over 28 sectors the impact of GVC-related trade share on the change in revenues during the shock and recovery phases of the 2008 GFC and the COVID-19 pandemic. In panel b we report the change in the share of trade in goods crossing more than one border over total trade in goods (i.e. GVC-related trade), as defined in Borin et al. (2022b). From 2018 onwards, we nowcast it using monthly data on trade in intermediates and a business cycle proxy. The GVC-trade trend is obtained using the Hodrick-Prescott high-pass filter.

The recent global shocks on supply chains have reignited the debate over the optimal degree of international integration.²³⁵ At the beginning of the pandemic, reshoring in particular received a great deal of attention from the media and from policymakers.²³⁶ However, there was at first only limited evidence of a wave of reshoring following the COVID-19 outbreak.²³⁷ A three-step survey conducted each year since May 2020 among senior supply-chain executives from several industries

²³² Baqaee et al. (2022).

²³³ Borin et al. (2022a).

²³⁴ Borin et al. (2023) and Knight et al. (2022).

²³⁵ Right before the pandemic, UNCTAD (2020) had listed four possible trajectories for international production configurations: first, reshoring, which would lower both the geographic dispersion and the fragmentation of production; second, regionalisation, which would imply lower geographic dispersion while maintaining high levels of fragmentation; third, replication, corresponding to greater geographic dispersion but less fragmentation within each cluster; and fourth, diversification/redundancy of suppliers. Two years later, strategies that actually appear to be under consideration by multinationals to increase the resilience of GVCs include diversification by increasing the supplier base, the overstocking of inputs and the relocation of production sites (Goldman Sachs, 2022).

²³⁶ In Spring 2020, the Japanese government announced subsidies for its international companies to encourage the diversification or reshoring or supply chains, Australia announced similar measures and the Indian prime minister declared that a new era of economic self-reliance had begun. In January 2021, President Biden signed an executive order aimed at forcing the federal government to buy more goods produced in the United States, as a key part of his Buy American programme aimed at reviving domestic manufacturing.

²³⁷ See firm-level survey evidence in, for example, Allianz Research (2020), Coppens et al. (2021), Di Stefano et al. (2022) and Elfving et al. (2021).

has found that, in contrast to what they initially declared, by the time of the second survey round in 2021 many companies indicated that they had chosen to increase inventories and to dual-source raw materials rather than implement nearshoring or regionalisation strategies (McKinsey, 2021). Even though regionalisation gained momentum in the third wave of the survey conducted in April 2022 (Alicke et al, 2022), higher inventories and dual-sourcing strategies remain the most common measures taken by the firms. This evidence is in line with another recent survey conducted in spring 2022 on Italian firms,²³⁸ which confirms that the share of Italian firms willing to close plants abroad remains very modest, while other strategies – such as supplier diversification and better inventory management – are much more commonly used to increase resilience. At the same time, other recent surveys²³⁹ provide evidence that, at least in some sectors, the momentum of regionalisation may gain traction going forward, so a more substantial shift could represent a noteworthy downside risk to global trade.

The theoretical literature offers some possible explanations as to why internationalised firms may be reluctant to move production sites. One key obstacle is the considerable new investment required when moving to new locations and/or production sites. Investments that require large and fixed initial costs to start production in one location may induce a firm to maintain that location, even if a change in economic conditions means that that particular investment would no longer be as viable if the initial investment had still to be taken.²⁴⁰ Moreover, relocating may not be optimal if a shock is expected to be only temporary.²⁴¹ In such cases firms might prefer to adjust the entire chain along the intensive margin (i.e. reduce volumes) rather than the extensive margin (i.e. relocate a part of the supply chain).

The expectation that the COVID-19 pandemic would represent a strong but temporary shock may also explain why most firms appeared to embrace a wait-and-see strategy. By the same token, expectations that the Russian war against Ukraine will have more permanent implications than the COVID-19 shock may increase firms' motivation to relocate production. As lockdowns, shipping gridlocks and shortages have lingered on in some countries and sectors and as the Russian invasion of Ukraine has raised multinational firms' exposure to significant cost increases and geopolitical risks, firms may start to assess the current supply chain disruptions as not so temporary and begin to reduce their global exposure more actively.²⁴² Indeed, companies are now more actively discussing

²³⁸ See [Di Stefano et al. \(2022\)](#).

²³⁹ See ABB survey cited in [Robotics247 \(2022\)](#).

²⁴⁰ See [Fillat and Garetto \(2015\)](#), [Antràs \(2020\)](#).

²⁴¹ See [Di Stefano et al. \(2022\)](#).

²⁴² A survey conducted among German firms in February 2022 reported that supply bottlenecks were firms' greatest challenge. To overcome the situation, around 60% of companies said they were increasing warehousing and looking for new or additional suppliers of raw materials and other inputs. Only 11% were planning to relocate a part of their production back to the parent company ([DIHK, 2022a](#)). With the war in Ukraine, significant increases in energy prices added to the existing supply bottlenecks but, once again, even among firms directly affected by the war or by the sanctions, only about 8% were considering the relocation of branches or production sites ([DIHK, 2022b](#)).

deglobalisation, reshoring and improving supply chain resilience in their earnings calls.²⁴³

There is a large body of work showing that foreign shocks are transmitted and amplified through trade and GVCs.²⁴⁴ At the same time, international trade openness reduces exposure to domestic shocks as it makes it possible to diversify sources of supply and demand.²⁴⁵ Although shielded from foreign shocks, local production tends to be more exposed to domestic supply and demand disruptions.

On the supply side, reducing dependence on inputs sourced from abroad systematically increases dependence on domestic inputs. Box 12 shows that although this strategy decreases the impact of foreign supply shocks, it also increases potential disruption from local supply shocks such as the domestic lockdowns during the COVID-19 pandemic.²⁴⁶ Resilience to supply shocks could therefore be significantly enhanced by further diversifying inputs away from domestic sources or by increasing the substitutability of inputs across suppliers located in different countries (e.g. by making firms' production technologies more flexible or by standardising inputs internationally).²⁴⁷

On the demand side, building indirect links with foreign markets through GVCs dampens the impact of domestic and direct partners' demand crunches.²⁴⁸ In fact, a higher level of GVC participation is associated with a lower elasticity of output to demand shocks from the domestic market or from direct trade partners (see Chart 46, panel a, red line). However, it is also associated with a higher elasticity of output to demand shocks originating further downstream in the supply chain (see Chart 49, panel a, blue line). Thanks to indirect connections with foreign countries, economies are able to smooth out the impact of idiosyncratic shocks, reducing overall output volatility. Indeed, the volatility of GVC-related demand shocks is lower than the volatility of non-GVC demand shocks for more than 90% of country-sector pairs worldwide (see Chart 49, panel b).

²⁴³ See [Goldman Sachs](#) (2022).

²⁴⁴ For recent literature reviews see [Baldwin and Freeman](#) (2021) and [Di Stefano](#) (2021). See also [Alessandria et al.](#) (2010, 2011), [Kramarz et al.](#) (2020), [Carvalho and Tahbaz-Salehi](#) (2019) and [Ferrari](#) (2022).

²⁴⁵ See [Caselli et al.](#) (2020).

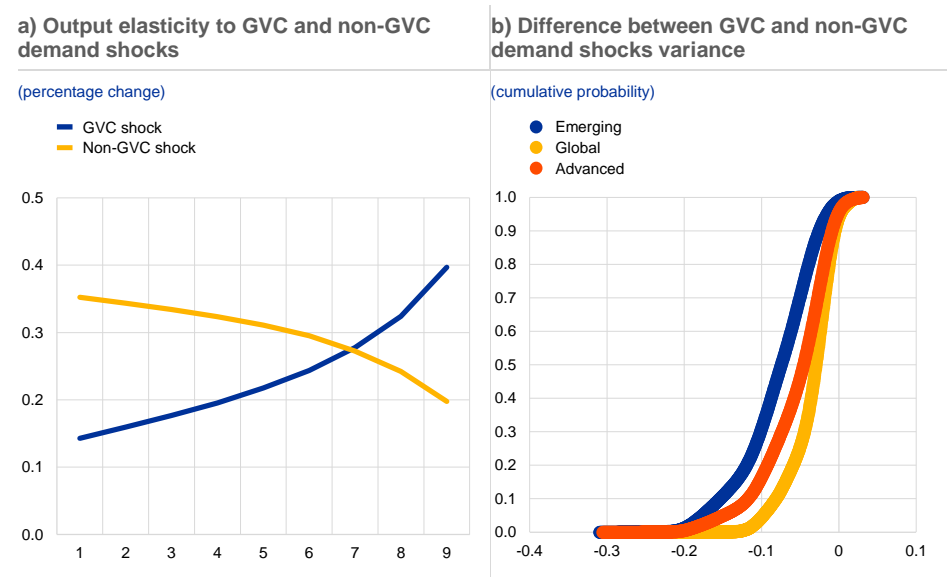
²⁴⁶ See [Bonadio et al.](#) (2021), [Espitia et al.](#) (2022).

²⁴⁷ See [IMF](#) (2022).

²⁴⁸ See [Borin et al.](#) (2021).

Chart 44

GVC participation dampens the impact of domestic and direct partners' demand shocks, reducing overall output volatility



Source: Borin et al. (2022c).

Notes: In panel a, we estimate an equation where changes in output at the country-sector level are regressed on country-sector GVC-forward participation in output, country-sector GVC and non-GVC demand shocks, and a set of interactions and other controls. The blue (yellow) line reports the overall elasticity of gross output to GVC (non-GVC) shocks for different deciles of the GVC-participation distribution. In panel b, we compute the difference between the standard deviation of the GVC and non-GVC shocks at the country-sector level and plot its distribution for emerging and advanced countries. For more details of the estimation of GVC and non-GVC shocks and the measures of GVC participation, see Borin et al. (2022b, 2022c).

All in all, these insights support the view that participating in GVCs reduces overall exposure to economic shocks. From this perspective, therefore, reshoring may not be a valid strategy for increasing resilience. Regionalisation of value chains, through nearshoring or “friendshoring”, presents an intermediate profile of exposure to risk, as geographically (and geopolitically) closer countries are usually exposed to very similar (or highly correlated) supply and demand shocks to the local economy. Instead, an optimal strategy for reducing the potential impact of shocks would be to diversify both the supplier and the customer base. This suggests that, in addition to the trade-off between efficiency and resilience, firms and policymakers should also consider the trade-off between exposure to global and local shocks when evaluating the optimal degree to which GVCs should be globalised and diversified.

Overall, the available evidence indicates that the shock of the COVID-19 pandemic has not – at least so far – resulted in “the end of globalisation”. On the contrary, the health crisis has underlined the relevance of GVCs in driving the recovery. At the firm level, instead of mass reshoring, the pandemic has resulted in strategies being developed which increase the resilience of production chains. There is also a solid body of literature indicating that although GVCs contribute to the transmission of foreign-originated shocks, they are effective in shielding firms from local shocks and, on the whole, tend to reduce risk. At the same time, in contrast to the COVID-19 pandemic which was a common shock dealt with through a certain degree of global cooperation, the war in Ukraine may be a game-changer in terms of the way major powers are likely to look at globalisation going forward. This might pose obstacles to GVC resilience.

From a policy perspective, it is essential to evaluate any policy intervention by comparing its costs, in the form of reduced specialisation and diversification, to its benefits, in the form of greater supply chain resilience.²⁴⁹ From an OSA perspective, one major reason for a policy intervention could be a need to reduce vulnerability to supply disruptions in strategic industries in which the possibilities of diversification are intrinsically limited as suppliers or customers are either few in number or geographically concentrated. A second reason could be moral hazard-type behaviour by private firms that do not fully internalise the impact of their own production-chain decisions on economy-wide risks. Notable industries which may require some form of policy action – such as stockpiling management or sourcing diversification – are medical supplies, food products, semiconductors and CRMs. A third reason relates to informational issues. Some GVCs are so complex that large firms may find it hard to fully control and monitor their own supply structure.²⁵⁰ Small firms, on the other hand, may not have enough resources to investigate their own supply chains in detail. For this reason, a lack of information on input sourcing could lead to misjudgements over the risks implied by a particular supply structure for firms of all sizes. Policies promoting information sharing at the international level and stress testing could enhance firms’ risk evaluation and contribute to informed decision-making.²⁵¹

3.2.2 Financial sanctions

EU financial integration has advanced hand-in-hand with EMU and has improved the EU’s ability to take credible action during episodes of stress. EU financial integration has come a long way since the launch of EMU in 1992. The integration of banking and capital markets, though still incomplete, supported the euro area’s resilience during the pandemic when monetary and prudential policy responses – and the banking system in particular – withstood the fallout. In addition, during Russia’s recent invasion of Ukraine, close cooperation over various aspects of EU financial decision-making made it possible for EU financial sanctions to be adopted swiftly and implemented consistently, while minimising the burden on the financial system.

At the same time, due to its high degree of trade openness but relatively minor role in the international financial system, the EU is vulnerable to secondary sanctions imposed by countries at the centre of key global networks. Sanctions are a legitimate tool of foreign policy. Nevertheless, countries at the centre of key global payment and financial networks (in particular the United States) can use their position to impose extra-territorial sanctions, thus unilaterally affecting EU banks and companies. Farrell and Newman (2019) argue that in asymmetric network structures that centralise power in key nodes, states with effective jurisdiction over such nodes can “weaponise interdependence” for strategic purposes (e.g. to gather valuable information or to deny network access to adversaries). Although the United States

²⁴⁹ See Baldwin and Freeman (2021).

²⁵⁰ See Aliche et al. (2020).

²⁵¹ See D’Aguanno et al. (2021) and Miroudot (2020a, 2020b).

has imposed sanctions with potential extra-territorial effects on many occasions in the past, some of which were counteracted by the EU through diplomatic channels, one case which stands out is the imposition of sanctions on Iran in 2018.²⁵² Faced with the prospect of losing access to US capital markets and US-bank intermediated financial networks, EU banks and companies chose in this case to comply pre-emptively with the sanctions.

The European Commission is currently reviewing its Blocking Statute in a search for additional tools which could further deter and counteract the unlawful extra-territorial application of sanctions to EU operators by countries outside the EU. The EU introduced the Blocking Statute in 1996 in response to US extra-territorial sanctions on Cuba, Iran and Libya (Council Regulation (EC) No 2271/96, further updated in 2018 to include sanctions on Iran). The Blocking Statute stipulates that EU operators should not comply with extra-territorial sanctions, given that the EU does not recognise their applicability to/effects on EU operators. However, the Regulation was never enforced. In a recent communication,²⁵³ the European Commission announced that it would review the Statute to find policy options which could further deter and counteract the application of extra-territorial sanctions. The Commission said it would seek to strengthen international cooperation on sanctions, in particular among G7 countries.

Financial sanctions, such as those imposed in the context of the Russian invasion of Ukraine, may have longer-term consequences for central banks.²⁵⁴ One consequence could be the fragmentation of the international payments and financial system along geopolitical lines. According to some commentators, for example, it is possible that China might renew its efforts to develop its own Cross-Border Interbank Payment System (CIPS) and internationalise its currency. Although the Chinese system is still underdeveloped in comparison with the US or European systems, it could increase its appeal not only to countries that fear western sanctions but also to countries seeking to position themselves in a world dominated by geopolitical blocks.²⁵⁵ Another consequence could be a shift in the international status of currencies (see subsection 3.3.6). The impact of sanctions may also be intertwined with the development of digital financial technologies and digital currencies, including CBDCs and cross-border CBDC payment networks. Finally, the intensive use of financial sanctions could result in the dilution of their power, prompting major countries to seek alternative types of sanction in the future.²⁵⁶

So far the direct effect of sanctions imposed on European banks as a result of the war in Ukraine seems to be contained at aggregate level, although it is still significant for a small number of European banks.²⁵⁷ As a direct manifestation of

²⁵² See [Geranmayeh and Rapnouil](#) (2019) for an account of this episode and a history of EU-US interactions in respect of extra-territorial sanctions. For a legal perspective see [Lohmann](#) (2019).

²⁵³ [European Commission](#) (2021i).

²⁵⁴ See [here](#) for an overview of the sanctions imposed on Russia.

²⁵⁵ See, for example, [Nölke](#) (2022), [Eichengreen](#) (2022) and [Ivanova et al.](#) (2022).

²⁵⁶ See [Harrell and Rosenberg](#) (2019).

²⁵⁷ See [European Central Bank](#) (2022b).

the war, Sberbank Europe AG and its subsidiaries in Croatia, Slovenia²⁵⁸ and the Czech Republic²⁵⁹ have been declared failing or likely to fail, while for Cyprus' RCB Bank, following its decision to voluntarily phase out its banking operations, the ECB has approved several measures including the restriction of business and the appointment of a temporary administrator to closely monitor the bank's liquidity and capital position and oversee the orderly repayment of its depositors. The Amsterdam Trade Bank, for its part, went into resolution. These cases did not produce any contagion effects and were promptly tackled by the ECB, together with the national competent authorities. The fact that potential financial instability has been contained indicates that the substantial progress made by the banking union may make it easier to withstand (geopolitical) shocks and the implementation of OSA policies.

3.3 Strengthening the EU and EMU and OSA

3.3.1 EU banking and capital markets

Further – and more robust – financial integration in the EU is essential in a geopolitical environment producing adverse shocks and, moreover, does not entail notable trade-offs with regard to the EU's openness. Completing the banking union in the appropriate sequence and deepening the capital markets union would improve EU and euro area economic resilience. Together with sustainable domestic fiscal and economic policies, this would in turn make the EU a more attractive landscape for investors. Such integration does not seem to entail notable trade-offs with regard to the openness of the EU/euro area to the rest of the world. Making the EU and the euro area more attractive to foreign capital would instead allow the EU to use its economic weight to steer openness in a rules-based direction and defend its values and standards at home and in relation to other parts of the world. This is something it already does to a certain degree via the so-called Brussels effect.²⁶⁰

A completed banking union would also facilitate sound financing in times of global stress. Establishing the banking union – with the creation of the Single Supervisory Mechanism and the Single Resolution Mechanism – was a key step towards increasing the stability of the euro area financial system.²⁶¹ For example, after the establishment of the Single Supervisory Mechanism, euro area banks' non-performing loans decreased from 8% in 2014 to about 2% at the end of 2021.²⁶² Bank capitalisation has also improved. As a result, euro area banks entered the pandemic crisis in good shape, allowing them to provide credit to companies and

²⁵⁸ Banka Slovenije implemented a solution on 1 March 2022 that allowed all customers to transact as normal and have their funds fully at their disposal as of 2 March 2022. An agreement was reached for the sale of Sberbank banka to the largest banking group in Slovenia, Nova Ljubljanska banka. This ensured that all customers of Sberbank banka in Slovenia were able to use their banking services as normal as of 2 March 2022. For more details see [here](#).

²⁵⁹ See [press release](#).

²⁶⁰ See [Lagarde \(2022a\)](#).

²⁶¹ See [De Guindos \(2021\)](#).

²⁶² See [Enria \(2022\)](#).

households when it was needed. A more efficient and profitable banking sector resulting from cross-border integration as we move towards complete banking union would also have more resources to finance the green and digital transitions and to compete internationally. This policy agenda would allow some of the stated goals of the strategic autonomy agenda to be reached by different means.

The twin transition – accelerated by energy security concerns at the current juncture – is an opportunity to support further EU financial integration and set the standard in green capital markets, where the EU’s presence is already significant. The investment needs associated with the green transition and achieving energy autonomy from Russia are sizable. For example, the European Commission estimates that reducing fossil fuel dependence from Russia to zero will require €33.3 billion to be mobilised per year, on average, until 2030, in addition to the Fit-for-55 objectives. Moreover, the Commission estimates that the energy-related investments needed to achieve the EU’s 2030 climate targets amount to €466 billion per year, on average, until 2030, at 2022 prices.²⁶³ This amount excludes investment in the transport sector as well as “wider environmental investments”. If these additional components are included, the overall volume of green investment for the period 2021-30 reaches €1.2 trillion, on average, per year. This corresponds to a yearly increase of €520 billion on the annual average for the previous decade. A strong and robust domestic financial sector will be key to mobilising private investment to deliver on the twin transition objectives. In addition, further progress on the sustainable agenda would be conducive to maintaining the euro’s lead as the global green currency. The international issuance of green bonds denominated in euro almost doubled in volume to €41 billion in 2021. However, the share of the euro in this market segment declined by 5 percentage points to around 30%, amid a high level of issuance of green bonds denominated in the US dollar and other currencies.²⁶⁴ Additional green bond issuance under the NGEU instrument, also taking the REPowerEU objectives into account, could contribute further to enhancing the EU’s presence in green capital markets.

3.3.2 Safe assets

From an OSA perspective, the availability of an adequate amount of debt in euro considered as safe assets²⁶⁵ could support the smooth transmission of

²⁶³ See [Panetta \(2022a\)](#).

²⁶⁴ See the [European Central Bank \(2022c\)](#).

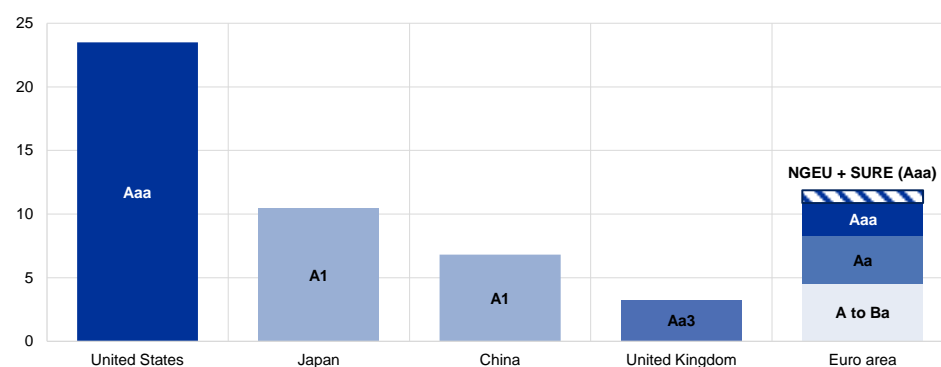
²⁶⁵ The issuance of assets to an extent that makes them unsafe does not comply with the definition of safe assets here, which are assumed to be in high (and possibly increasing) demand in all parts of the world. The debate about that issuance limit (or the impact of debt on growth as per [Reinhart and Rogoff, 2010](#)) is beyond the scope of this report. In general, three factors contribute to making government bonds a safe asset: (i) the quality of the institutions of the issuing economy, (ii) the size of the debt market and, importantly, (iii) whether the asset has behaved as a safe asset in the past ([Habib et al., 2020](#)). For a policy discussion on European safe assets see [ESRB High-Level-Task-Force on safe assets](#). On the potential contribution of safe assets to financial stability and the banking union, see [ECB FIS Special Feature B, March \(2020\)](#). In the broader context of EMU deepening, risk sharing and market discipline, see [Bénassy-Quéré et al. \(2018\)](#). For an overview of the literature on safe assets see, for example, [Leandro and Zettelmeyer \(2018\)](#) and [Codogno and van den Noord \(2019\)](#). From a financial intermediation perspective see, for example, [Golec and Perotti \(2017\)](#). On the interaction of European and national safe assets, see [Bruegel \(2021\)](#) and [Cioffi et al. \(2019\)](#). See also [Caballero et al. \(2017\)](#) on the safe asset shortage conundrum.

monetary policy and the stability of the European financial system, which in turn may boost the confidence of market participants that assets are safe. This implies that not only domestic but also – especially – international investors are likely to maintain if not increase their demand during times of geopolitical stress, thus enhancing financial stability and financial integration.²⁶⁶ This is also because safe assets enjoy, by definition, deep and liquid markets even under times of (severe) stress. With specific regard to government debt, as Chart 45 shows, relatively few national and supranational bonds in the EU are highly rated in comparison with the deepest and most liquid market for US treasuries (although in relation to GDP the difference is smaller).²⁶⁷

Chart 45

Highly rated government bonds in the euro area and other economies

(outstanding general government debt securities, USD trillions)



Sources: BIS, Haver Analytics, Bloomberg, European Commission and ECB calculations. Reproduced from Grynberg and Habib (2021a).

Notes: The data refer to total debt securities issued by the government. Planned issuance for NGEU. The latest Moody's local currency long-term sovereign debt rating is reported for each country and NGEU. The observations are for the third quarter of 2020 for the amount outstanding of debt securities and for March 2021 for credit ratings.

The issuance of safe assets brings mutually reinforcing benefits related to the better functioning and deepening of banking and capital markets. Sustainable and reliable policies implemented by Member States and the EU/euro area are key if their debt is to be assessed by market participants as safe. This makes financing easier and sets a benchmark for the pricing of other assets in the economy. It also helps to increase financial integration and stability and fosters the development of the capital markets union and the banking union.

Safe assets provide the bedrock of international reserves held by central banks. This can imply close ties and welcome dependencies, which may even reduce antagonism – at least to a certain degree – but can also bear risks.

Cross-border investments in safe assets create ties not only between international partners but also between potential adversaries, which could help to minimise

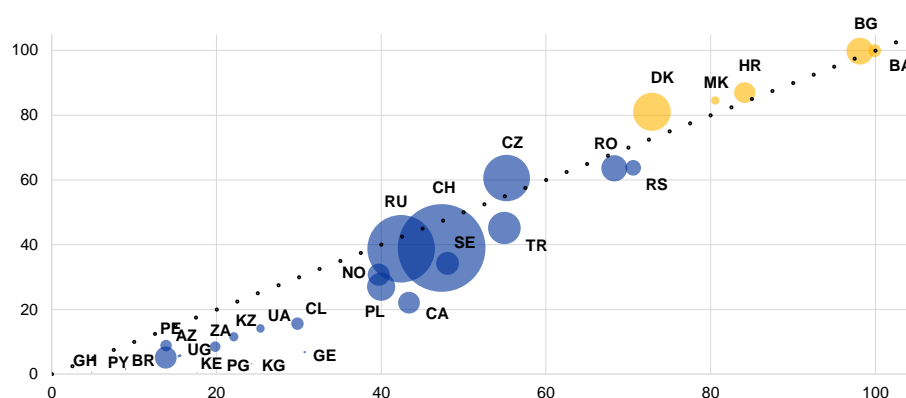
²⁶⁶ See Alogoskoufis et al. (2020).

²⁶⁷ Specifically, at end-2021, euro area government debt totalled €11.7 trillion (or 96% of GDP) while the debt of the most prominent global issuer of government safe assets, namely the US federal government, totalled USD 29.6 trillion (or 123% of GDP). Data are sourced from Eurostat and Federal Reserve Economic Data. The BIS end-2021 USD/EUR exchange rate is used. This does not imply that high debt levels are desirable for the purposes of safety: while debt levels should not raise investors' doubts over the safety of safe assets, depth and liquidity are key aspects of safe asset markets.

antagonism. In this regard it is worth recalling that prior to its invasion of Ukraine Russia was one of the biggest reserve holders of euro-denominated official reserves (see Chart 51) while China is by far the biggest holder of US treasuries. In turbulent times, the willingness of investors to hold such assets may also provide a stabilising incentive for both the issuer and the holder. Certainly, in a scenario in which there has been a breakdown in trust between the issuers and the holders of safe assets because of geopolitical conflict, selling off such assets may lead to instability or to the use of such asset holdings, among others, for the purposes of financial sanctions.²⁶⁸

Chart 46
Evolution of euro-denominated official reserves by country holder

(y-axis: percentage of total reserves in euro, 2018; x-axis: percentage of total reserves in euro, 2004-07)



Sources: COFER, IMF and ECB calculations. Reproduced from Anaya Longaric and McQuade (2021).

Notes: The chart compares the share of reserves in euro by country in 2018 and the average share of the euro in the period 2004-07. The size of the bubbles corresponds to the average amount of reserves held in euro between 1999 and 2018 by each country. The yellow bubbles are countries with exchange rate regimes closely linked to the euro. In 2018, Denmark was part of ERM II, Bulgaria and Bosnia and Herzegovina had a euro-based currency board, Croatia had a tightly managed floating regime and North Macedonia had an established arrangement with the euro as a reference currency. Country ISO codes are used for country names for the sake of readability.

When sovereigns issue assets that are deemed safe they benefit from the best possible financing conditions, thus providing capacity which may also buttress anti-coercion policies. If sovereign debt is seen by market participants as a safe asset, this allows sovereigns to finance themselves under the best possible conditions and to do so for the purposes of pursuing strategic goals, also in combination with and beyond the economic sphere (e.g. to buttress anti-coercion initiatives). In this context, if national or – especially – international investors are convinced of the stability of assets issued in euro, this can encourage them to engage in the European economy as a whole or in Member States individually.

The fact that issuance of debt at the European level is seen as safe has supported the financing of EU-wide initiatives and public goods in OSA-relevant areas. It has, moreover, boosted the confidence of investors in the EU's ability and willingness to intervene promptly and effectively in times of necessity. The

²⁶⁸ For example, Russian reserves rose dramatically from the early 2000s and, despite fluctuations, remained at some USD 600 billion until the annexation of Crimea by Russia in 2014 when they fell to about USD 400 billion. They then rose again to about USD 600 billion when, following the invasion of Ukraine, about half were frozen while the remainder has been decreasing.

fact that common issuance is considered safe has also helped the EU and the euro area in the past to ensure the public good of financial stability and overcome financial instability (e.g. through the *European Financial Stabilisation Mechanism*, the *European Financial Stability Facility* and the *European Stability Mechanism*). Another recent example is the temporary NGEU programme (see Box 15). The programme is being used, for example, to finance projects in EU Member States which are relevant to OSA, including strategic objectives in the context of REPowerEU. Some of these projects have significant spillovers to the whole of the EU and may therefore be underfinanced if this positive externality is not taken into account.²⁶⁹ The related issuance of common debt (for financing such initiatives) increases the supply of euro-denominated safe assets for a predetermined timespan.

The adequate availability of safe assets denominated in euro is a key factor underpinning the role that the euro is able to play as an international currency.

Iizetzki et al. (2020) find that a “comparatively scarce supply of (safe) euro-denominated assets” is the most important element “limiting the euro’s reach”, while they also highlight the lack of a financial centre, limited geopolitical reach, and US and Chinese dominance in technology research. Without the availability of safe assets in a particular currency, the potential use of that currency at international level faces a constraint. As Reinhart (2019) puts it, “investors, central banks and anyone in general who buys a currency isn’t really buying a currency, they buy debt.”

3.3.3 An enhanced international role for the euro?

At their summit in March 2021, euro area leaders acknowledged the role the euro can play in strategic autonomy in economic affairs.

Their conclusions stated: “We support strengthening the international role of the euro with a view to enhancing our strategic autonomy in economic and financial matters while preserving an open economy, contributing to the stability of the global financial system, and supporting European businesses and households.”²⁷⁰

Equally, the international role played by the euro depends partly on the extent to which the EU/euro area is able to achieve OSA and defend and project its interests abroad.

For the moment this ability is limited as the EU is seen by some observers as “an economic giant but a political dwarf”.²⁷¹ This most likely implies a vulnerability from an OSA perspective that cannot easily be overcome and requires the completion of EMU and deep internal institutional changes, even in areas beyond EMU. Moreover, as explained below, the use of currencies for strategic purposes comes with both costs and benefits. The financial (and other) sanctions imposed on Russia in response to the invasion of Ukraine have sparked a debate as to whether

²⁶⁹ Similar projects linked to the issuance of safe assets at the European level include the Support to mitigate Unemployment Risks in an Emergency (SURE) programme which helped to mitigate the risk of very high unemployment during the COVID-19 crisis (see [Grynberg and Habib \(2021b\)](#) for an analysis of non-euro area investor demand for SURE bonds). NGEU bond issuances are expected to come to €807 billion, of which €387 billion is intended as loans. On the safe-asset qualities of EU-issued bonds, see [Bletzinger et al. \(2022\)](#).

²⁷⁰ The summit’s conclusions came on the back of several proposals by the [Commission to foster the openness, strength and resilience of Europe’s economic and financial system](#).

²⁷¹ See [Bini Smaghi \(2006\)](#).

this might be a catalyst for change in respect of the future international role of currencies, because of the response to the sanctions not only of Russia but also other global powers like China. Any change is, however, unlikely in the near term.²⁷²

From an ECB perspective, the cost-benefit balance of international currency status relates to several factors that have evolved over time. These factors include seigniorage, transaction and hedging costs, the “exorbitant privilege” (lower financing costs) or “exorbitant duty” (exchange rate appreciation during global crisis episodes), the degree of monetary policy autonomy, the extent of exchange rate pass-through and the transmission of monetary policy. With rapid financial globalisation, rising challenges to multilateralism and the adoption of new monetary policy frameworks across major central banks, the relevance of some of the traditional effects of international currency status has declined, while other effects have become more apparent (see Chart 52).²⁷³

The international role of the euro can support OSA in times of global financial market stress. There is potential within EMU for sharing and strengthening the “exorbitant privilege” but the role of the “exorbitant duty” should also be considered.²⁷⁴ Enhanced status as an international currency can strengthen the global transmission of domestic monetary policy impulses, with potential reinforcing spillback effects on the domestic economy. In particular, if the currency is seen as a safe haven during times of global stress, the domestic currency would appreciate and the yields on safe assets in that currency would fall. International currency status also implies lower exchange rate pass-through, which helps shield inflation from foreign shocks. Depending on the nature of a global shock and the invoicing currency of imports, international currency status may also attenuate the effects of monetary policy on import prices. In such a scenario the volatility of monetary aggregates as a cost of international currency status would decline in prominence.²⁷⁵

Table 4
Costs and benefits of international currency use

Benefits	Costs
Seigniorage	Blurred monetary aggregate signals (?)
Lower transaction and hedging costs	Capital flow volatility (?)
Exorbitant privilege (lower external financial costs)	Exorbitant duty (stronger exchange rate in global stress episodes)
Greater monetary policy autonomy	
Stronger international transmission of monetary policy with positive spillbacks	
Lower pass-through reduces impact of FX shocks on CPI	Lower effects of monetary policy on import prices
Reduced exposure to unilateral decisions from third countries	

Sources: ECB and Coeuré, B. (2019), “The euro’s global role in a changing world: a monetary policy perspective”, speech at the Council on Foreign Relations, New York City, 15 February.

²⁷² See European Central Bank (2022c), Dooley et al. (2022), Brunnermeier et al. (2022), Eichengreen (2022), Arslanalp et al. (2022) and the discussion in Box 14.

²⁷³ See also Gráb and Mehl (2019).

²⁷⁴ See Panetta (2020).

²⁷⁵ See European Central Bank (2021c).

From an OSA perspective in particular, an important potential benefit of the international role of the euro could be to mitigate the effects of unilateral decisions taken in third countries. According to some commentators, external factors have always formed part of the case for the single currency and it is perhaps no coincidence that the final push towards monetary union took place against the backdrop of the confrontational foreign economic policies of the 1980s.²⁷⁶ While such factors faded in the decade after the introduction of the euro, they have returned to prominence in recent years.²⁷⁷ The growing perception of a shift in global governance, from leadership built on trust and common identities to leadership based on hard power, has sharpened the focus on the potential advantages of international currency status.²⁷⁸ In such an environment, being the issuer of a global reserve currency confers international monetary power, in particular through the capacity to restrict access to the financial and payments systems.²⁷⁹ This consideration may be particularly important for maintaining OSA in circumstances in which the military power of the currency issuer is relatively modest compared to its economic or financial weight.²⁸⁰

The Commission's proposals of January 2021 refer to the possible introduction of a digital euro and suggest that this could strengthen the international role of the currency. The motivations behind the digital euro project are primarily domestic. Looking ahead, if the use of a digital euro in retail cross-border payments were possible and if it were allowed – a decision that is yet to be taken – this could also have implications for the international role of the euro (European Central Bank, 2021c). However, the effects would probably be small, because there are other forces (such as stability of macroeconomic fundamentals including inflation, depth of financial markets, open capital accounts, stable exchange rate and size of the issuing economy) that primarily determine the international use of a currency. In a general equilibrium model, the issuance of a digital currency does not change these fundamental incentives – hence the configuration of the international monetary system. There may be more incentives for currency substitution, but that is primarily a problem for small emerging economies with weak fundamentals.²⁸¹

However, the implications of CBDC issuance for international currency status are not yet clear. A number of countries have recently accelerated their plans for CBDCs, possibly as a means of increasing the global appeal of major currencies. Academic researchers have mixed views, with some suggesting that the creation of CBDCs will enhance the international role of currencies²⁸² and others arguing that this will not be the case.²⁸³ There is therefore an ongoing debate as to whether the creation of a digital version of a currency – and if so which version of it – would

²⁷⁶ See Henning (1998).

²⁷⁷ See Cœuré (2018).

²⁷⁸ See Cœuré (2018).

²⁷⁹ See Cœuré (2019). There are those who argue that this then also implies a greater duty to contribute to safeguarding global financial stability.

²⁸⁰ See Bini Smaghi (2006).

²⁸¹ See Ferrari et al. (2022).

²⁸² See Eichengreen (2021).

²⁸³ See Rey (2021).

strengthen the global reach of that currency, and there are a number of questions still to be answered which require further research.²⁸⁴ The assumption in the Commission's 2021 proposals appears to be that a digital euro would be beneficial for its international role. Be that as it may, even if a CBDC is designed purely for domestic purposes, it may still be a relevant indirect factor in OSA, that is, in terms of the development of the domestic financial infrastructure and regarding the actual or potential public digital currencies or private digital coins used in the euro area.

²⁸⁴ See [Panetta \(2021\)](#).

Box 11

Digitalisation, sectoral spillovers and the role of value chains

In 2021, the European Commission established the “Path to the Digital Decade”, a strategic plan whose goal was to achieve the digital transformation of the EU’s economy and society by 2030. This strategy is based on four pillars: the development of a digitally skilled population, the establishment of performant digital infrastructures and the digital transformation of both businesses and public services (European Commission, 2021j). Key objectives of the strategic digitalisation plan to be met by 2030 include an increase in the EU’s production of semiconductors, a boost to the digital intensity of EU firms and substantial improvements to the EU’s technical infrastructure. The digitalisation plan will be funded by grants and loans through several EU facilities including the Digital Europe Programme, Connecting Europe, Invest EU and a part of the Recovery and Resilience Facility (RRF). All in all, the projects related to digitalisation included in the 2021-27 multiannual financial framework are worth around 1.5% of EU GDP.²⁸⁵

In the first phase, the implementation of the EU’s digitalisation strategy is likely to increase European demand in the computer, electronic and optical equipment sector (“electronics”). In a second phase, these investments are likely to boost the productivity of the electronics sector itself as well as that of related industries. In principle, digitalisation could have a heterogeneous impact among EU countries, as there is substantial heterogeneity in how much value added to the final demand of the electronics sector originates in the different European economies. There is also heterogeneity in the relevance of this value-added to the different source countries (see Chart A). Also, digitalisation could give rise to extra-EU spillovers, since a substantial share of value added included in the final demand of the European electronics sector comes from countries outside the EU such as China, Korea and the United States. Moreover, a demand and subsequent productivity shock to the electronics sector could generate inter-sectoral spillovers across the European value chain, resulting in price or productivity fluctuations in the sectors situated downstream or upstream of the electronics sector.

In order to quantify the possible effects of the implementation of the EU digitalisation strategy, we ran simulations employing the general equilibrium production network model developed by Izquierdo et al. (2022). The calibration of this model relies mainly on Inter-Country Input-Output tables and literature estimates. It features nine countries/areas: Germany, Spain, France, Italy, the rest of the EU, China, Korea, the United States and the rest of the world. Our simulations consider two scenarios which differ in terms of elasticity of substitution between varieties of the same good (trade elasticity). As a first step, we assume that half of the multiannual financial framework digitalisation budget is destined for expenditures in electronics and that these funds are distributed among EU members, depending on the country-specific allocation of RRF grants and based on a country’s GDP. The resulting rise in the demand for electronics is modelled as an exogenous shock in the final demand of each country’s electronics sector and is calibrated in such a way that the increase is proportional to the funds it receives.

In our baseline calibration, which corresponds to a relatively low value of trade elasticity,²⁸⁶ we find that the shock would increase the nominal value-added of the electronics sector both in the EU (by roughly 70%) and outside the EU (by less than 8% in the economies we consider). It would also increase the price of electronics (by 25% inside the EU and less than 5% outside the EU). The

²⁸⁵ See [here](#) for details of the multiannual financial framework.

²⁸⁶ In our baseline calibration we assume a trade elasticity of 2, in line with [Boehm et al. \(2020\)](#).

shock would also transmit inter-sectoral spillovers across the production chain, both upstream and downstream (see Chart B, panel a). In downstream sectors (vehicles, machinery, electrical equipment and telecommunications) higher input prices from electronics would result in lower value-added, while in upstream sectors (basic metals and plastic products) higher demand would tend to increase production.

At the country level, of the four biggest EU economies, Germany and Italy would benefit the most in terms of GDP growth (see Chart B, panel b). This is due to the importance of German inputs to the EU electronics sector, as well as to the relatively large size of this industry in Germany and Italy, as a share of national GDP (see Chart A). In all EU countries the higher demand would result in positive, albeit contained, price pressures. The shock would spill over to extra-EU economies, with a positive GDP impact on Korea and China, given the relatively high importance of European demand for their electronics sectors. For the United States, whose electronics industry represents a smaller share of national production and is less dependent on European demand, the benefits from the shock, in terms of higher demand for electronics, would be outweighed by its costs, in terms of higher input and goods prices, resulting in a small negative GDP impact. Higher substitutability between goods varieties produced in different countries would result in higher extra-EU spillovers.²⁸⁷ In the high elasticity calibration, Asian economies would benefit from the demand shock to the EU electronics sector even more than European countries would themselves.

As a second step, we assume that the initial demand shock is maintained and is followed by a total factor productivity (TFP) shock that increases productivity in the electronics sector as well as in those sectors to which the electronics industry provides the most value-added.²⁸⁸ In particular, we simulate that the TFP of the electronics sector increases by an average 20% in the EU countries under consideration and the TFP of related industries increases by 5%. We also assume that the shock affects EU members differently, proportionally to the size of their initial demand shock to electronics. At the sectoral level, the increase in productivity would result in significant spillovers, in both upstream and downstream parts of the value chain (see Chart C, panel a). At the country level (see Chart C, panel b), the increase in productivity would limit price pressures in the EU and would increase the size of internal GDP gains more than the extra-EU spillovers. External spillovers would still depend on the extent to which goods varieties produced in different countries are substitutable, as measured by the trade elasticity, but this feature would have a smaller impact on EU internal GDP gains than the demand shock alone. As the increase in productivity is assumed to be greater in economies whose demand for electronics rises more, the TFP shock would benefit Spain and Italy relatively more in terms of GDP growth. These countries would receive a larger share of RRF grants related to digitalisation and would, as a consequence, experience a bigger increase in electronics purchases in the first place.

Our simulation analysis suggests that in order to limit possible price pressures stemming from the increase in demand as well as extra-EU spillovers, it is vitally important for the EU digitalisation strategy to support policies that focus on the increase in productivity in the electronics and related sectors.

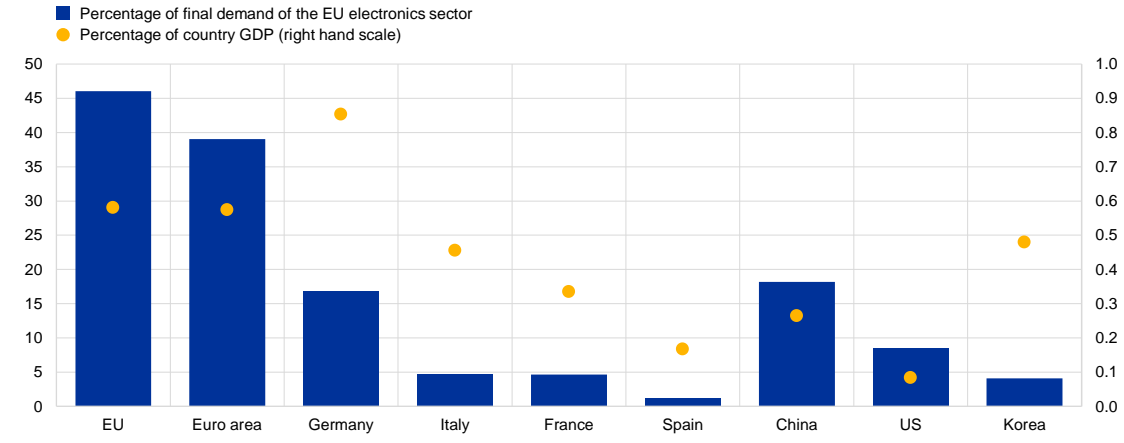
²⁸⁷ In the high elasticity calibration, we use the sector-specific values estimated by [Caliendo and Parro \(2015\)](#), implying an elasticity of 10.6 for the electronics industry.

²⁸⁸ In the EU, we identify electrical equipment, vehicles, other transport, telecommunications, machinery and other manufacturing as the sectors to which the electronics sector provides more than 1% of the value-added embedded in final demand.

Chart A

Sources of value added to the final demand of the EU electronics sector (2018)

(percentages)



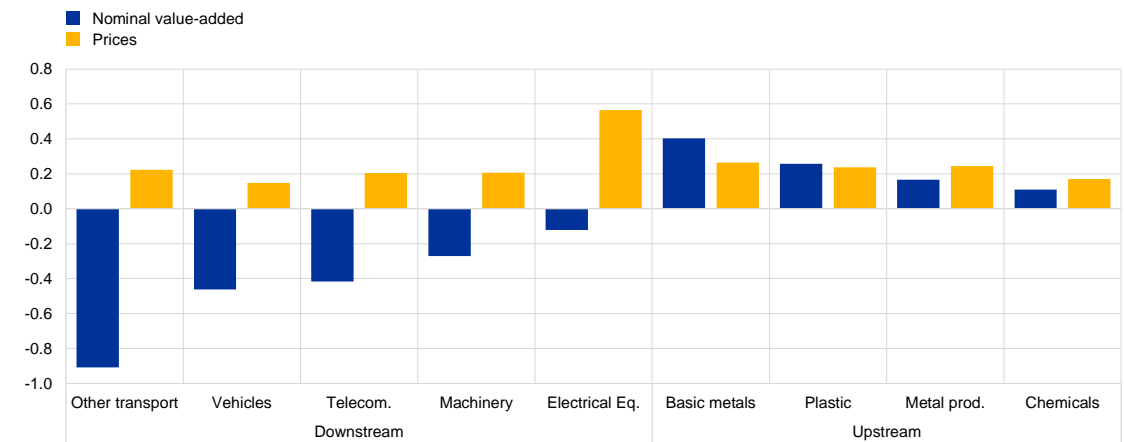
Sources: OECD (Trade in Value Added), Eurostat and IMF World Economic Outlook.

Chart B

Impact of higher demand of the electronics sector

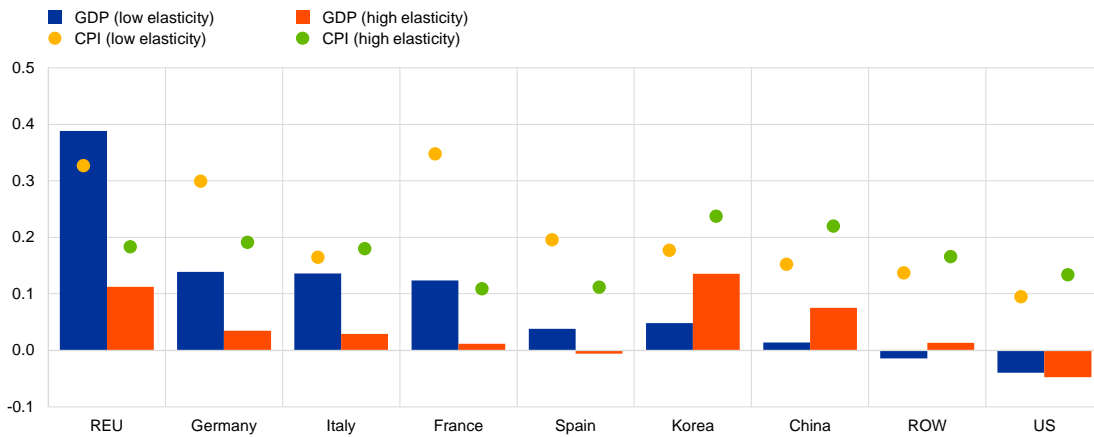
a) Inter-sectoral spillovers in the EU

(percentage deviations from steady state)



b) Country-level impact

(percentage deviations from steady state)



Source: Own calculations based on the Izquierdo et al. (2022) model.

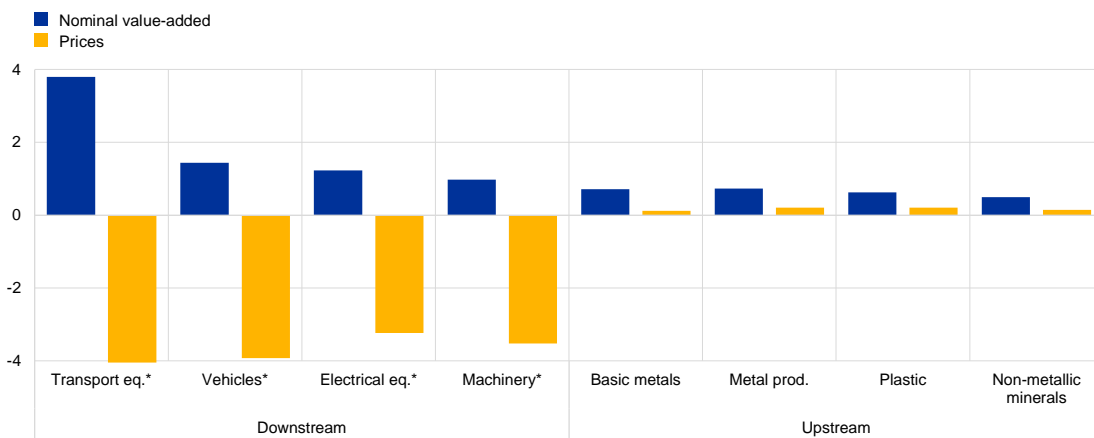
Notes: Impact of an increase in the final demand of the EU electronics sector, as specified in the main text. Downstream denotes sectors with a relatively high share of value-added originating in the electronics sector. Upstream denotes sectors that provide a relatively high value-added to the electronics sector. Panel b: "REU" stands for rest of the EU; "ROW" stands for rest of the world.

Chart C

Impact of the positive demand and productivity shock to the electronics sector

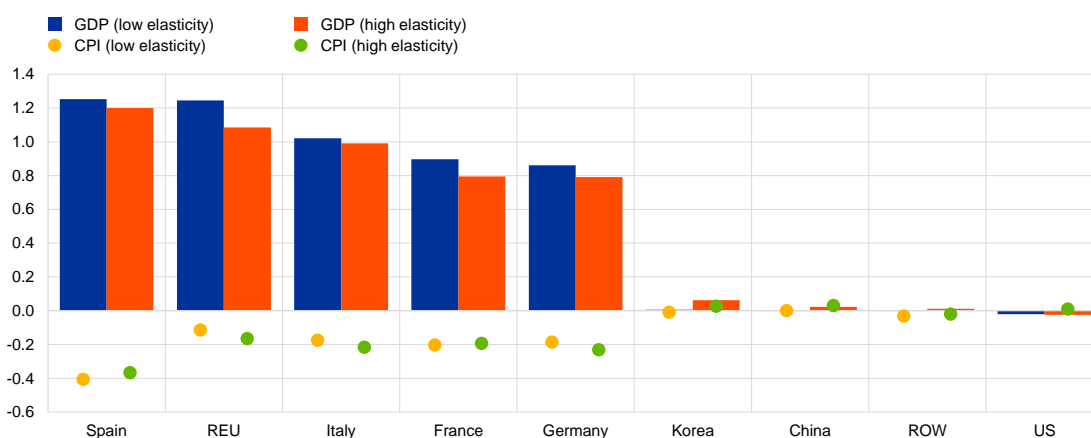
a) Inter-sectoral spillovers in the EU

(percentage deviations from steady state)



b) Country-level impact

(percentage deviations from steady state)



Source: Own calculations based on the Izquierdo et al. (2022) model.

Notes: Impact of an increase in the final demand of the EU electronics sector, as specified in the main text, as well as the impact of an increase in the TFP of the same sector by an average of 20% in EU countries and by 5% in related downstream sectors. These are identified based on the value-added embedded in their final demand that comes from the electronics sector, with a 1% threshold (electrical equipment, vehicles, other transport, telecommunications, machinery and other manufacturing). In panel a, stars indicate sectors featuring both an exogenous productivity rise and endogenous spillovers coming from the electronics sector through the production chain. "Upstream" denotes sectors that provide a relatively high-value added to the electronics sector. "REU" stands for rest of the EU; "ROW" stands for rest of the world.

Box 12

Domestic subsidies and trade through the lens of a gravity model

In its [Communication on a new industrial policy](#), the European Commission argues in favour of "reducing dependence on others for things we need the most" and in favour of developing Europe's own products, markets and services. In practice, fostering domestic production in areas deemed strategic, or in sectors in which no meaningful industrial capacity is available within the EU, might require some form of public support. This is especially the case for sectors such as the semiconductor industry, which is important for EU's twin digital and green transition and in which significant investment in R&D is needed to advance the technology frontier. Although domestic subsidies, or behind-the-border measures more generally, may be an appropriate tool for addressing market failures and reaching domestic policy goals, they may have spillover effects through international trade and may act as a tariff ([Hoekman and Nelson, 2020](#)). This is even more problematic given that the WTO Agreement on Subsidies and Countervailing Measures (ASCM) is considered by several Member States to be insufficient to tackle the use of market and trade-distorting subsidies in certain jurisdictions. However, it has proved hard to reach a consensus on a reform agenda among WTO members. This leaves a loophole in the current set of rules, which may favour the growing use of subsidies by wealthier and more advanced developing countries in ways that may ultimately widen the economic gap between economies.²⁸⁹

²⁸⁹ While there are several aspects to the need for reform of the WTO ASCM, the element that is most representative of the current impasse is the standoff between large trading powers. On the one hand the United States, the EU and Japan have been arguing in favour of more stringent discipline when it comes to the use of certain harmful subsidies. These include: excessively large subsidies, subsidies that prop up uncompetitive firms and prevent their exit from the market, subsidies that create massive manufacturing capacity without private commercial participation, and subsidies that lower input prices domestically in comparison with prices of the same goods when destined for export. On the other hand, China has sought greater recognition for the role of subsidies in pursuing legitimate social and development goals. For more details see [OECD, Reforming industrial subsidies usage through the WTO: process proposals](#).

This box reviews the most recent trends in the use of subsidies and other industrial policies. It also analyses the impact of domestic measures on international trade flows using a state-of-the-art gravity model (Heid et al., 2021; Beverelli et al., 2018).

In the context of the widespread fall in tariffs, measures such as subsidies and other export-oriented policies with similar effects are increasingly being used to support domestic production. The data available since 2009 from the Global Trade Alert indicate that subsidies and other behind-the-border measures have been the major source of countries' trade interventions. Since the GFC in particular, harmful trade measures (i.e. those deemed discriminatory against foreign commercial interests and covering trade in both goods and services) have outnumbered trade-liberalising measures across all types of trade intervention (see Chart A, panel a). Focusing attention on subsidies, 2020 data show that about 50% of the net harmful measures were targeted at the manufacturing sector, followed by services (around 25%) and agriculture (around 18%). However, in terms of their economic significance (i.e. when accounting for each sector's share in global production), the services sector is most prominently hit by subsidies (15%) followed by the manufacturing sector (12%).

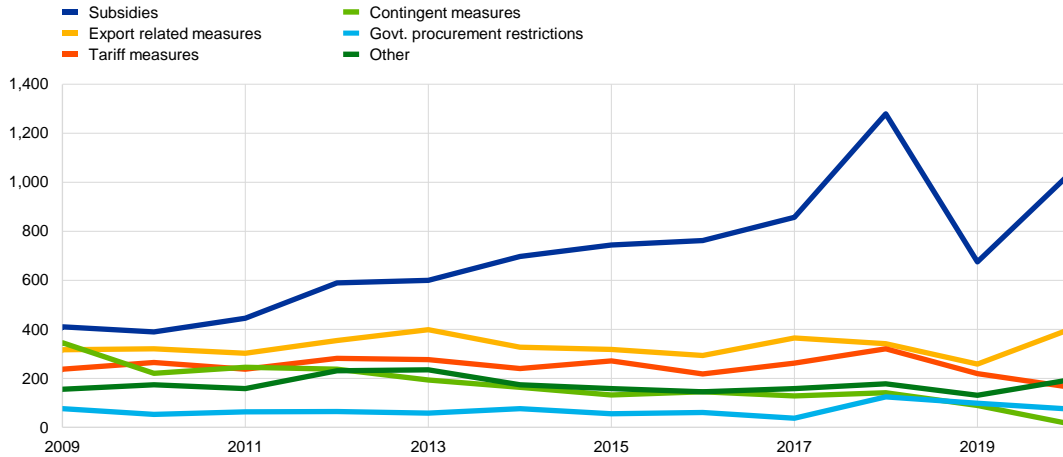
Despite the lack of detailed cross-country data on the use of subsidies, an assessment of the extent to which they may be distortive to trade can be made by relying on (qualitative) information from the Global Trade Alert database. Once these data have been combined with the Inter-Country Input-Output tables from the Asian Development Bank (ADB) and tariff data from the World Bank's World Integrated Trade Solution (WITS) database, we can estimate a state-of-the-art gravity model in the spirit of Beverelli et al. (2018) and Yotov (2022). The final database spans the period from 2009 to 2019 and covers 62 countries and 14 manufacturing sectors. The estimated model, unlike standard gravity models, controls for domestic production flows as well as international trade. In this way the model estimates provide a gauge of the extent to which the imposition of subsidies benefits domestic production to the detriment of international trade. As a result, the model estimates allow us to recover the relative impact of subsidies on trade relative to domestic production, a feat of analysis which is not usually identified in a standard gravity framework. Chart B shows that over the whole period of analysis subsidies have been trade-distortionary by negatively affecting exports in comparison with domestic production, as firms have shown increased tendency to rely less on imported goods and services when awarded more subsidies to encourage domestic production. This result is driven largely by developments during the period 2015-19, which was characterised by a return to inward-looking policies and protectionism (see Box 1).

Chart A

Harmful (net) measures to trade: the increasing use of harmful subsidies resembles protectionism

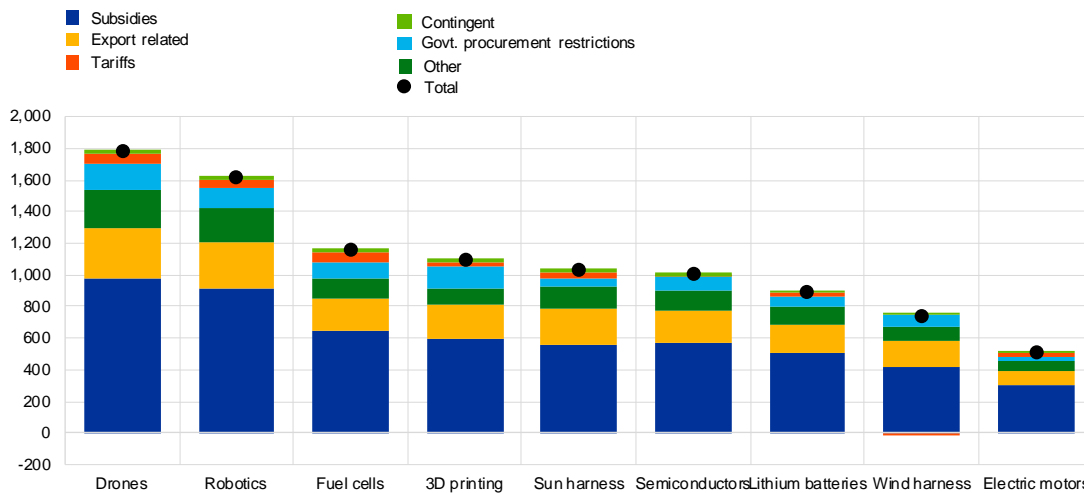
a) Total

(frequency count)



b) Select key technologies during 2008-20

(harmful minus liberalising trade measures)



Sources: Global Trade Alert (GTA), European Commission and ECB staff calculations.

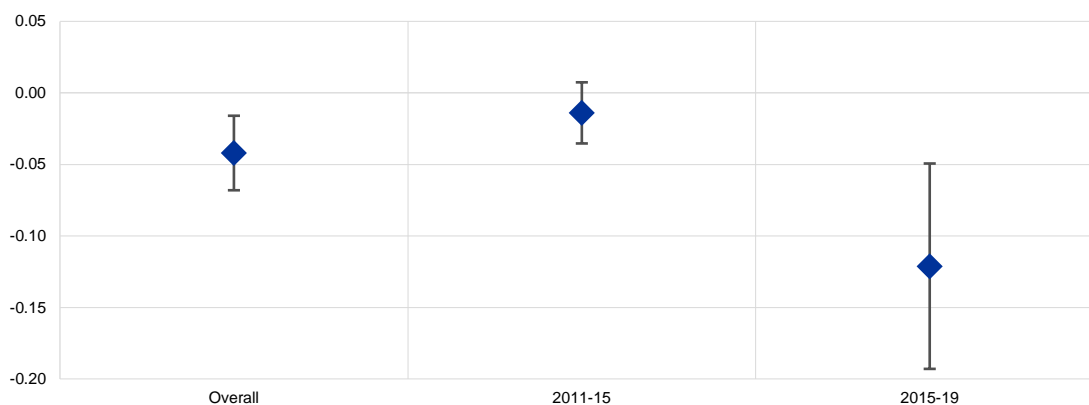
Notes: Frequency count is calculated by subtracting trade liberating (green/non-harmful) measures from trade discriminatory (red/harmful) measures based on the GTA taxonomy. The analysis represents full available country coverage. Other trade measures include capital controls, export quotas, FDI, finance, investment, migration, price controls, quantity controls, sanitary measures and technical barriers. Key technologies and their underlying use of strategic raw materials is defined by the [European Commission](#).

Chart B

Effect on trade from use of domestic subsidy

Relative impact of trade subsidies on domestic production

(percentages; elasticity of trade to domestic subsidies)



Sources: GTA, ADB MRIO, World Bank WITS and ECB staff calculations.

Notes: Vertical lines denote 95% confidence intervals around the point estimates. The structural gravity equation has been estimated using the Poisson Pseudo Maximum Likelihood estimator on two-year intervals, controlling for export-sector-year, importer-sector-year, exporter-importer-sector and exporter-importer-year fixed effects. The subsidy variable is one-year lagged and interacted with a dummy taking a value of 1 for international transactions and 0 for domestic transactions.

It can be seen, therefore, that not only has the use of subsidies increased recently, but the very use of such subsidies has also had harmful and distortionary effects on international trade by encouraging countries to become self-centred. These findings suggest that the case for adopting domestic measures needs to be assessed carefully as, given their detrimental impact on trade, they might have unintended effects (e.g. reducing the degree of GVC participation). This could increase the overall vulnerability of a country/sector to external shocks, with counterproductive consequences. In this regard, a strong case for the use of behind-the-border policies may be justified on efficiency grounds, provided that the measures target specific inputs and raw materials, such as those needed for key technologies. In this case they might have the effect of reducing vulnerabilities without harming overall trade, especially if it is difficult to diversify the sources of these inputs. Looking at the sectors in which subsidies and other types of behind-the-border measures have been applied, this appears to be case. Subsidies have been extensively used to promote the domestic production of inputs into technologies which should facilitate the digital and green transitions, as shown in Chart A, panel b.

Box 13

Initiatives to protect the EU's digital space

The digital economy is rapidly becoming the epicentre of conflicting interests. Over the last decade, economies of scale and scope have allowed a small number of large technology firms to pursue hegemonic strategies by leveraging their market power across the Single Market. Furthermore, competition for control of the European standard-setting processes – which define control over the technology of tomorrow – is intensifying. In both cases, foreign actors play an active and major role, raising concerns over the EU's ability to deliver on its core policy goals. This box provides an account of the main measures the European Commission is pursuing in the digital space from an OSA perspective.

The European Commission has enacted a vast array of measures to ensure that the digital space remains not only contestable and open to innovation but also protected within the EU's jurisdiction. The measures can be classified into two groups: measures to bolster control over technological standards and measures to bolster control over digital markets.

With regard to standards, the definition of a new policy approach on standards aims to strengthen the global role of the European standardisation system while shoring up control over its governance in order to avoid the “undue influence” of foreign actors.²⁹⁰ The importance of the issue goes beyond technical product design as standards governing - critical infrastructure or cybersecurity, to name but a few, come with a significant strategic dimension.²⁹¹ Specifically, in February 2022, the European Commission launched a new standardisation strategy, which was accompanied by a proposal to amend the current regulation.²⁹² This intervention serves to avoid a situation where external corporate interests are unevenly represented within European standardisation organisations, to the detriment of the entire stakeholder community. In the same vein, the Commission also committed to enhancing European leadership in global standardisation initiatives by coordinating with like-minded partners and funding standardisation projects in Africa and in neighbouring EU countries.²⁹³

With regard to digital markets, regulatory action is currently being taken in the fields of competition and data governance with the objective of holding back the monopolistic power of large foreign technology firms.²⁹⁴

As for digital competition, in December 2020 the European Commission proposed two legislative initiatives aimed at setting new rules governing the largest technology platform gatekeepers:²⁹⁵ the Digital Services Act (DSA)²⁹⁶ and the Digital Markets Act (DMA)²⁹⁷. These pieces of legislation address the systemic importance of gatekeeper platforms. The DSA provides for a common set of rules governing intermediaries' obligations and accountability across the Internal Market (including mechanisms for the protection of users' fundamental rights online and for content moderation). The DMA seeks to ensure that gatekeepers do not leverage their economic power and that they behave fairly with third-party businesses operating within the platform. The DMA and DSA Regulations were adopted in 2022 and enter into force in 2023.²⁹⁸

As far as data governance is concerned, the European Commission built on the current personal data protection legal framework by proposing, in November 2020, the Data Governance Act²⁹⁹

²⁹⁰ [European Commission \(2022e\)](#).

²⁹¹ European harmonised standard adopted by a recognised European Standards Organisation (CEN, CENELEC or ETSI) following a request from the European Commission, are part of EU law and provide manufacturers implementing them across the Single Market with a presumption of conformity with the requirements of EU legislation, helping to reduce transaction costs.

²⁹² [European Commission \(2022f\)](#).

²⁹³ [European Commission \(2022g\)](#).

²⁹⁴ [European Commission \(2020o\)](#), [European Commission \(2020p\)](#), [European Commission \(2020q\)](#).

²⁹⁵ Gatekeepers are internet platforms providing services including online intermediation, search engine, social networking and others. According to the Directive, they must also satisfy several qualitative and quantitative criteria. The first category includes the competitive position in internal markets while the second includes market capitalisation and turnover above a certain threshold for the past three years. Platforms like Google, Facebook, Amazon, Apple and Twitter fall into this category.

²⁹⁶ [European Commission \(2020c\)](#).

²⁹⁷ [European Commission \(2020d\)](#).

²⁹⁸ [Regulation \(EU\) 2022/2065 \(Digital Services Act\)](#) and [Regulation \(EU\) 2022/1925 \(Digital Markets Act\)](#).

²⁹⁹ [European Commission \(2020r\)](#).

followed by, in February 2022, the Data Act.³⁰⁰ These proposals set up mechanisms which foster data-enabled innovation (by facilitating business-to-business data sharing), enhanced data access rights, data interoperability, the reuse of certain categories of protected public-sector data, and increased trust in data intermediation services and data altruism across the EU.³⁰¹ At this stage the Data Act does not include provisions that would enable smooth access to data generated by the private sector, which would support the compilation of official statistics. This is why, from the ESCB's point of view, significant strengthening of business-to-government data sharing is required so that official statistics can make appropriate use of privately held data during the compilation of official statistics.³⁰²

Although some of the measures described above predate the concept of OSA, the strong focus on maintaining or bolstering control over critical elements of the digital space naturally places such measures under the logic of OSA. While the logic of autonomy and security may find support both within and outside the economic rationale, openness remains a key feature of digital markets, underscoring the need to take a balanced approach.

Box 14

The international monetary system's transition towards more multipolarity?

The global monetary order established following the 1944 Bretton Woods Conference was a reflection of the geopolitical environment at the time, with the United States as the emerging hegemonic power in the capitalist world and the establishment of the US dollar as the dominant currency in international trade and finance. Since then, more than 75 years have passed in which there have been significant changes in the global balance of power, in particular the establishment of the EU, the fall of the Soviet Union and the rapid rise of China. These changes have also had ongoing implications for the international monetary system.

An overview of the current international monetary system (see Chart A) suggests that: (i) the dollar is particularly dominant in international finance (debt and loans), (ii) the dollar is more or less on an equal footing with the euro as a global payment currency although (iii) the dollar's share in official foreign exchange reserves is far greater than any other reserve currency's share.

³⁰⁰ [European Commission](#) (2022h).

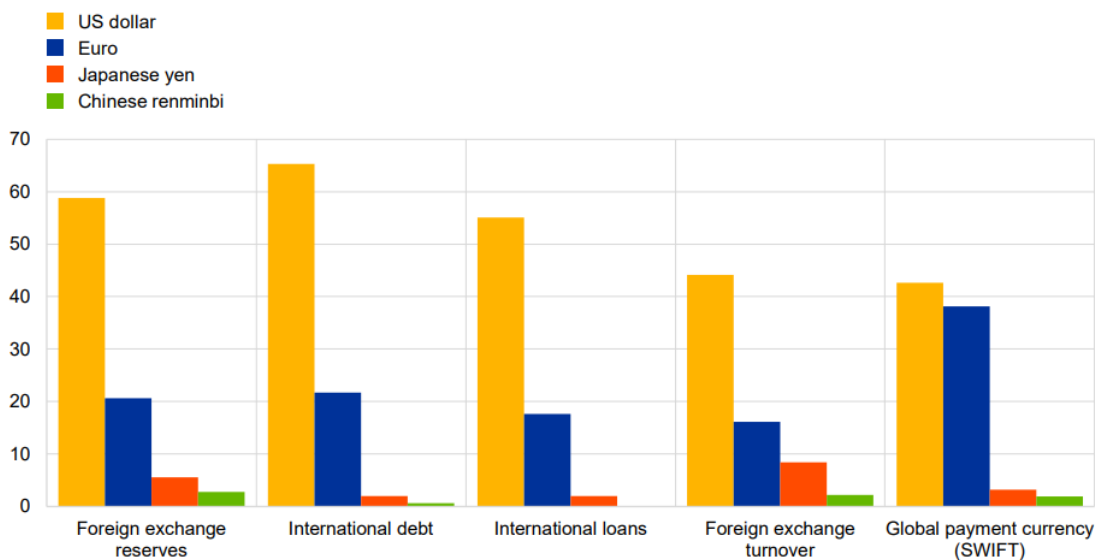
³⁰¹ The term "data altruism" refers to making data available without compensation "for purely non-commercial usage that benefits communities or society at large, such as the use of mobility data to improve local transport" ([European Commission](#), 2020q). See also [Weyzen](#) (2021).

³⁰² See [European Central Bank](#) (2022d).

Chart A

Snapshot of the international monetary system

(percentages)



Source: European Central Bank (2022c).

The persistence of the US dollar's dominant role has much to do with its robust underlying institutions and related policy credibility, deep and liquid financial markets, and free convertibility. At the same time, the dollar's share in foreign exchange reserves has been slowly trending downwards over the past two decades, from 70% at the turn of the century to about 59% in 2021 (see Chart B). Some commentators have suggested that this represents a "stealth erosion of dollar dominance" (Arslanalp et al. 2022) and, possibly, a transition towards a (more) multipolar international monetary system as far as official reserve currency choice is concerned (although not in the other dimensions of a currency's international role). Interestingly, this trend has not been accompanied by an increased share of the euro, pound sterling or yen. Instead, it has been matched by an increase in the share of "non-traditional" reserve currencies such as the Chinese renminbi, the Canadian and Australian dollars, the Swedish krona and the Korean won (Arslanalp et al. 2022).

At the current juncture, there are a number of factors that could accelerate the transition towards a more multipolar international monetary system. For instance, it has recently been argued that the wide-scale implementation of financial sanctions by western allies against the backdrop of the Russian war in Ukraine could provide a fillip to countries seeking to bypass the US dollar and the euro in the international monetary and financial system.³⁰³ Still, it remains to be seen whether the "weaponisation of finance" will put a dent in the dollar's attractiveness in the foreseeable future,³⁰⁴ with several factors in play.³⁰⁵ In the long run, a decline in the size of the US economy relative to

³⁰³ See, for example, [The Economist](#) (2022). For a more detailed discussion, see [Habib and Mehl](#) (2022).

³⁰⁴ See also the two-part FT series on the "weaponisation of finance" in April 2022.

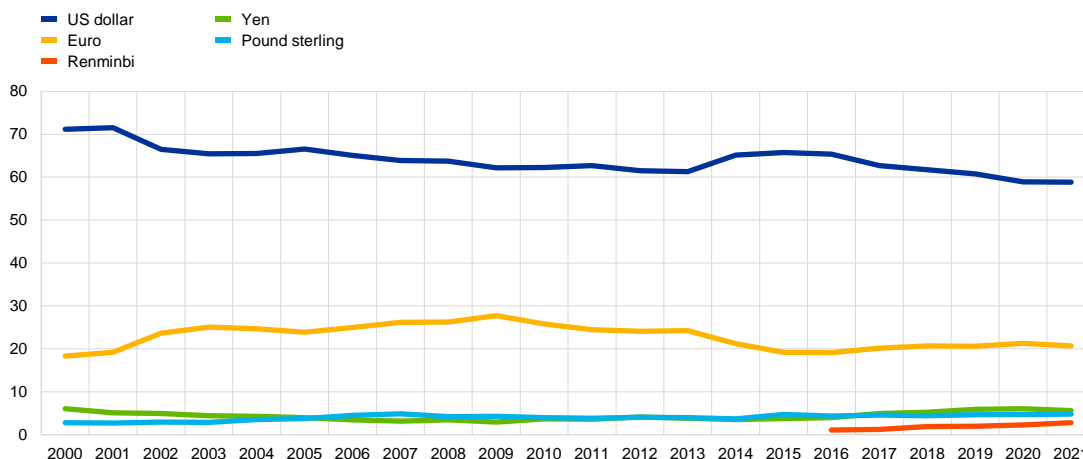
³⁰⁵ For instance, shifts in the currency composition of global reserve portfolios might not in themselves necessarily herald broader changes; alternatives to major international currencies often lack the depth, liquidity or other economic and financial attributes required to appeal to global investors; and, finally, the Russian invasion of Ukraine might serve as a reminder of the relevance of sound institutions, the ability to maintain price stability over the medium term, and geopolitical considerations as determinants of international currency status (see [Habib and Mehl, 2022](#)).

the global economy could reduce the ability of the United States to supply, elastically, a global safe asset that would meet the demands of an expanding global economy. It has been argued that this asymmetry may encourage the emergence of a more diverse international monetary system (Gourinchas et al. 2019).

Chart B

Currency composition of worldwide official foreign exchange reserves

(percentages)



Source: IMF.

The emergence of stronger alternatives to the US dollar could also lead to a more multipolar international monetary system. In terms of existing alternatives, market observers have discussed whether the euro and the renminbi could, potentially, increase their international role. In the EU, the existing impediments to a more prominent international role for the euro are being reviewed.³⁰⁶ China is actively pursuing a strategy to “internationalise” the renminbi through, for example, its swap line network,³⁰⁷ but hindrances such as capital controls and other regulatory issues still have to be addressed (Otero-Iglesias, 2018). Nevertheless, steps have been taken through the “petroyuan” (a yuan-denominated oil futures contract), CIPS (an alternative to SWIFT), and international financing under its “Belt and Road Initiative”. At the same time, the Peoples’ Bank of China is progressing with the development of a digital renminbi, while closely cooperating with regional partners (e.g. the Hong Kong Monetary Authority, the Bank of Thailand and the Central Bank of the United Arab Emirates) to explore ways of incorporating digital currencies into cross-border payment systems (the “multiple CBDC bridge”). Despite these steps, progress in the international use of the renminbi has so far been very limited.³⁰⁸

This shows that the international monetary system is still largely dollar-based, although recent geopolitical factors are engendering a debate as to whether there could be a transition, however slow, towards more multipolarity. From a financial stability perspective, the emergence of a multipolar international monetary system may or may not be a welcome development. On the one hand, a multipolar system could be attractive because of the (competition-driven) disciplinary effect

³⁰⁶ For instance, the institutional foundations of EMU are also slowly being strengthened.

³⁰⁷ The swap line network is, according to Chinese official communication, the main tool used to promote foreign use of the renminbi. The use of the digital yuan internationally is unclear. Renminbi clearing banks are also supporting renminbi payment clearing.

³⁰⁸ See Anaya Longaric and Di Casola (2022).

it could have on the policies of all reserve currency issuers, while it could also, potentially, mitigate the “Triffin problem” (i.e. by providing investors with alternatives in the event of a loss of confidence in the dominant currency) (IMF, 2010; Farhi, 2019). On the other hand, the transition to a multipolar system could itself be a source of (financial) instability (Farhi and Maggiori, 2018).³⁰⁹ For instance, investors might suddenly decide to collectively reallocate their reserve portfolios, which could lead to potential episodes of FX volatility if inadequately managed and unanticipated. Policymakers should therefore remain vigilant and should closely monitor ongoing developments in the international monetary system, while at the same time not becoming complacent over the potential for change. To quote Rüdiger Dornbusch: “In economics things take longer to happen than you think they will, and then they happen faster than you thought they could”.

Box 15

The contribution of Next Generation EU to the EU’s OSA goals³¹⁰

Next Generation EU is the EU’s response to the COVID-19 pandemic shock, although it also seeks to strengthen the EU’s economic and social structures as the Union emerges from the crisis. The short-term objective of the €806.9 billion³¹¹ programme is to support the economic recovery, complementing monetary policy and national policy measures.³¹² At the same time, the package is also intended to improve growth prospects over the medium term through a focus on the green and digital transitions, while strengthening the resilience of the EU’s economies and social systems. Almost two-thirds of RRF funding requested in the euro area is currently allocated to Italy and Spain. With an allocation key favouring vulnerable European countries, NGEU will also contribute to the economic convergence of those EU Member States. The programme is temporary and will run from 2021 to 2026. This box briefly summarises the main elements of the programme, providing insights into how it contributes to the EU’s OSA by bolstering Europe’s energy and digital independence and strengthening, among other things, its resilience and economic cohesion.

The central instrument of NGEU is the Recovery and Resilience Facility (RRF), which Member States use to finance their investment and structural reform plans.³¹³ The RRF has a funding volume of €724 billion in grants and loans – the equivalent of around 5% of the EU’s GDP. RRF funding is made available to Member States on condition that they implement the national recovery and resilience plans (RRPs) agreed with the European Commission.³¹⁴ The investment and structural reform plans detailed in the RRFs contribute to six broad objectives: (i) the green transition (at least 37% of RRF-funded expenditure, including investment in clean technologies and renewables, the energy efficiency of buildings, sustainable transport, etc.); (ii) the digital transition

³⁰⁹ One or a large number of currencies may be stable equilibria while an oligopoly of a few currencies may be unstable (as per Nurkse, 1944).

³¹⁰ The box builds on previous work by the ECB Fiscal Policies Division, the ECB Supply Side, Labour and Surveillance Division and the ECB Working Group on Public Finance.

³¹¹ In 2022 prices: €750 billion in 2018 prices.

³¹² Central banks in the EU introduced monetary policy accommodation in the crisis. For an overview of ECB policies, please see “[Our response to the coronavirus pandemic](#)”. At the same time, governments of Member States implemented a wide range of measures to stabilise the economy during the lockdown including, for example, short-time work schemes.

³¹³ The RRF consists of loans (up to €385.8 billion) and grants (€338.0 billion). The funds from the other six programmes are smaller: REACT-EU (€50.6 billion), Horizon Europe (€5.4 billion), InvestEU (€6.1 billion), Rural Development (€8.1 billion), Just Transition Fund (€10.9 billion) and RescEU (€2 billion).

³¹⁴ Freier et al. (2022).

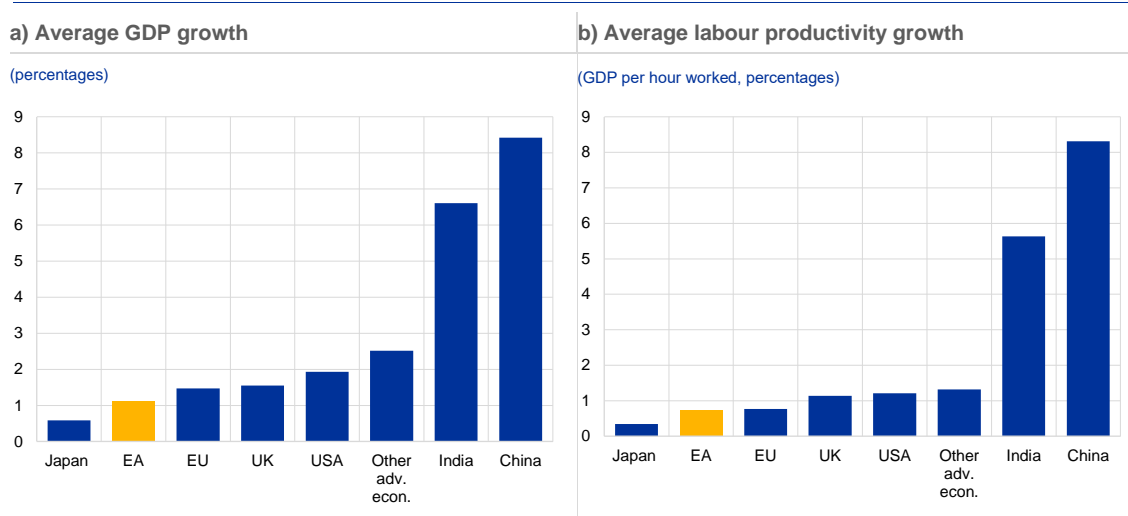
(at least 20% of RRF-funded expenditure, including investment in broadband services, the digitalisation of public administration, data cloud capacities and digital skills, etc.); (iii) economic cohesion, productivity and competitiveness; (iv) social and territorial cohesion; (v) health, economic, social and institutional resilience; and (vi) policies for the next generation.

Following the outbreak of war in Ukraine and the resulting energy crisis, in May 2022 the Commission adopted the REPowerEU plan which, among other things, steers unused NGEU-funding towards the objectives of energy autonomy from Russian fossil fuels and a faster green transition. Measures under the programme include energy saving initiatives, the diversification of energy supplies and the accelerated rollout of renewable energy. The programme will be implemented by making targeted amendments to the [RRF Regulation](#), which will make it possible to append a chapter with additional measures to the national RRFs (expected to be approved by early 2023). Funding will be made available mainly through the unused loans under the RRF, which currently amount to €225 billion.

In terms of OSA, the first and overarching contribution of NGEU is to enhance productivity, resilience and economic convergence in the EU, which has been outperformed by most other geopolitical players over the past two decades (see Chart A).³¹⁵ Real GDP growth in the EU was, on average, around 1.3% in the period 2001-21, around 0.6% lower than in the United States. The size of China’s economy surpassed that of the EU for the first time in 2021. Average labour productivity growth (GDP per hour worked) in the EU was only half of the one observed in United States (0.7% annual growth on average over the period versus 1.4% on the other side of the Atlantic. However, EU data include EU countries in central and eastern Europe, whereas productivity growth in western Europe fell well behind that of the United States. Given their relatively low growth and productivity, several Member States remain vulnerable to economic shocks, which would also have detrimental consequences for the Union as a whole. Successful implementation of NGEU may help in part address these problems.

Chart A

Real GDP and productivity growth in the EU and other major economies 2002-22

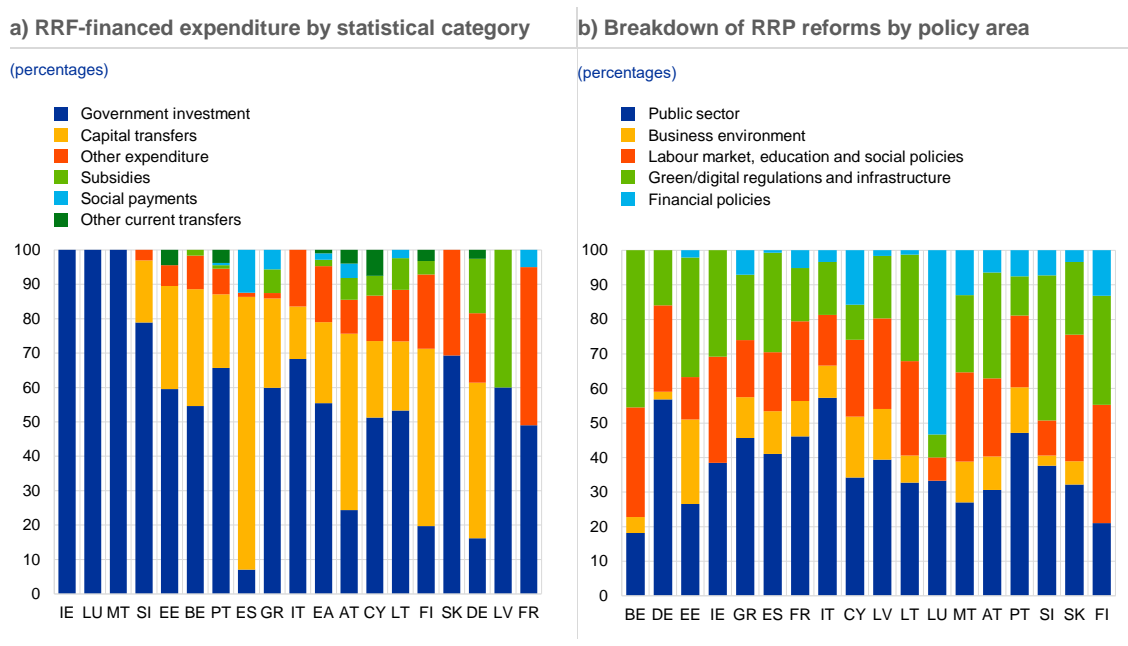


Source: Own calculations based on OECD data.

³¹⁵ For a review of slow productivity growth in the euro area see [Work stream on productivity, innovation and technological progress](#) (2021).

Many of the investment and structural reform measures in the RRFs are geared towards improving the economic prospects of EU Member States. More than 80% of RRF-financed expenditure is expected to be allocated to relatively growth-friendly investments (see Chart B, panel a). Even more importantly, more than 1,000 investment projects are aimed at addressing some of the most pressing structural weaknesses in Member States, including those in the public sector, the labour market and the pension system (see Chart B, panel b). ECB staff have estimated the effects of NGEU on the euro area economy via a risk premium channel, a fiscal stimulus channel and a structural reform channel. Taking all three channels into account and assuming that fiscal and reform measures are fully implemented, the NGEU programme may increase euro area GDP by up to 1.5% by 2026.³¹⁶ The effect is estimated to be significantly stronger for the main NGEU beneficiaries – just below 3% for Spain and 3.5% for Italy. At the same time, the estimated debt-reducing effect of NGEU is moderate for the euro area in general but considerably higher for the main beneficiaries with high levels of public debt. The public debt-to-GDP ratio may be lowered by more than 10 percentage points in Italy and Spain by 2031, thus suggesting some possible fiscal convergence.

Chart B
NGEU fiscal and structural reforms measures



Source: Bańkowski et al. 2022.

Second, the RRF may make an important contribution towards closing the EU’s climate and digital gap and achieving energy autonomy from Russia (see Chart C).

The RRF, and especially its REPowerEU complement, may contribute significantly to the EU’s energy autonomy. It should be noted that the focus of the RRF is the green transition rather than energy autonomy. On average, around 40% of RRF spending contributes to climate action, as outlined in the “Fit-for-55” programme.³¹⁷ In Luxembourg, Malta, Austria and Finland

³¹⁶ Bańkowski et al. (2022).

³¹⁷ The EU’s plan to reach its climate goal of reducing EU emissions by at least 55% by 2030 is in fact a legal obligation.

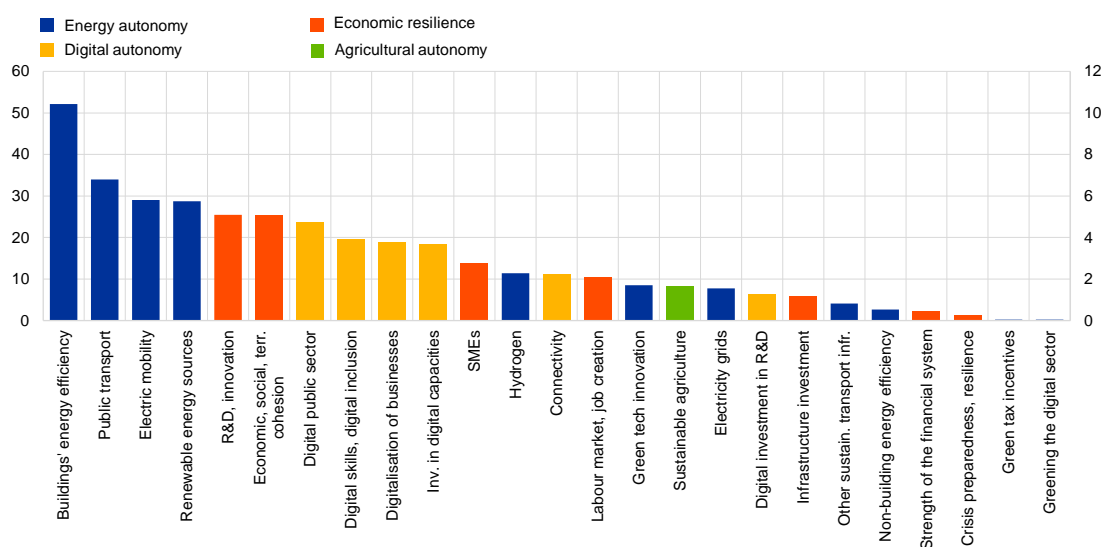
green investment actually accounts for more than half of total RRF expenditure. Measures related to energy efficiency, renewable energy and energy networks also reduce the EU's reliance on fossil fuel imports. Still, certain clean energy measures, such as the decommissioning of coal-powered plants in favour of gas-powered plants, may temporarily act against reducing autonomy. These specific measures, however, are likely to be dwarfed by the net positive impact of NGEU in terms of lower reliance on foreign fossil fuels. Overall, around €197 billion is expected to exert a direct or indirect effect in terms of lowering EU fossil imports. In addition, measures under the REPowerEU programme are explicitly targeted towards achieving energy autonomy, including by cutting gas and oil demand, restraining fossil fuel consumption in industry and transport, and diversifying foreign energy supplies. According to Commission staff estimates, reducing dependence on Russian fossil fuels by 2030 would require €300 billion cumulatively – beyond the Fit-for-55 proposals to which NGEU contributes. By the end of 2027, this would correspond to an investment gap of approximately €210 billion, which REPowerEU aims to close.³¹⁸

NGEU also supports the EU's digital transition. 26% of RRF investment contributes to the second core RRF objective, with the share actually exceeding 50% in Austria and Germany. The largest share of expenditure will be used to digitalise public services, followed by investment in the digitalisation of the corporate sector, digital upskilling, fixed and 5G connectivity, the deployment of advanced technologies and supporting digital-related R&D. Around €80 billion is expected to be used to enhance the digital capabilities of the EU. In the short term, digitalisation may increase demand for extra-EU-produced digital technology. In the longer term, however, a more tech-friendly environment will favour tech start-ups or investment by foreign tech companies in the EU. On balance, these measures are likely to reduce the EU's digital dependency by addressing the structural weaknesses of EU economies in terms of digital infrastructure and skills in both the public and the private sector.

Chart C

Contribution of NGEU to the EU's OSA aims

(EUR billions, left-hand scale; percentage of total RRF, right-hand scale)



³¹⁸ European Commission Staff Working Document entitled "Implementing the REPowerEU action plan: Investment needs, hydrogen accelerator and bio-methane plan", SWD(2022) 230, 18 May 2022.

Third, as a tool aimed at providing EU public goods, NGEU has been financed by a significant volume of debt issuance at the European level, resulting in economies of scale and a notable increase in the supply of EU-wide safe assets. The issuance of new NGEU debt is taking place between mid-2021 and 2026 in the form of bonds of up to €150 billion per year to finance the non-repayable grants and the RRF loans.³¹⁹ This activity reinforces the EU's role in capital markets as a major provider of safe (AAA-rated) assets denominated in euro (see Section 3.3.2). As of October 2022, the Commission had already borrowed almost €235 billion for NGEU financing, of which €160 billion was in bonds and €75 billion in EU bills. The maturity of long-term debt issuance was close to 13 years. The implicit interest rate of these bonds was 1.41%.

Fourth, the NGEU approach may provide new impetus for the EU to reform its system of own resources and contribute to introducing new resources.³²⁰ The current system of EU Member States making direct contributions to the EU budget, also known as gross national income-based contributions, is commonly seen as very inefficient. The EU budget is subject to extensive negotiation and the results are often a compromise that does not necessarily address pressing policy issues and is, in addition, not flexible enough to address policy challenges as they emerge. The RRF regulation foresees that these grants will be repaid by the EU budget via new own resources (i.e. new sources of taxes or levies).³²¹ According to the Commission, these new own resources would include part of the receipts from (i) EU emissions trading, (ii) a carbon border adjustment mechanism, and (iii) the new international corporate taxation framework. The repayment of RRF grants would only be funded through additional contributions by EU Member States if no agreement can be reached between Member States on the proposal made by the Commission at the end of 2021.

The positive impact of NGEU on growth and resilience and, more broadly, on strategic autonomy will depend on the effective implementation of the reform plans. The strong ownership of the measures in many countries and the RRF's performance-based design should, overall, be conducive to such an outcome. At the same time, constraints in the administrative capacity to implement investment and reforms, supply side bottlenecks, inflation and political uncertainty may pose significant risks to national RRFs.

Box 16

EU public goods and military spending

This box provides an overview of developments in EU external security cooperation and defence expenditure, as well as some of the implications for defence capabilities and macroeconomics. First, the box shows briefly that recent advances in cooperation between EU Member States in matters of external security and defence have been driven by OSA considerations. Although there has been some progress in recent years, such cooperation is still very limited. Second, by historical

³¹⁹ After 2026, any NGEU issuance will be solely for refinancing maturing debt (to smoothen the budgetary absorption of liabilities over time) and will be limited in scale.

³²⁰ The RRF loans will, in turn, be repaid by the borrowing Member States with a grace period of ten years from the disbursement date and annual repayments of 5% of the amounts received. They are scheduled to be fully repaid 30 years after disbursement (i.e. between 2051 and 2056).

³²¹ [European Commission](#) (2021k).

and international standards military spending at the EU level is still limited, despite recent announcements of significant increases in expenditure. On average, spending currently stands at 1.3% of GDP, which is below the NATO commitment of 2% of GDP. Although the military industry is quite concentrated in Europe, it remains divided along national lines, and the related EU public procurement market is fragmented. Third, most EU Member States rely on NATO defence capabilities, even though four out of the 27 Member States are either not NATO members or have not applied for NATO membership.³²² Also, command and control structures exist for NATO members but not for the EU as such. This means that the military capability of the EU outside NATO structures amounts to a fraction of what it is for other geopolitical players, although the sum of military expenditure and the total number of military personnel in EU countries are comparable with other geopolitical players. Fourth, the composition of military expenditure in EU Member States is unlikely to be growth or innovation friendly as it is heavily geared towards spending on military personnel rather than towards R&D.³²³

EXTERNAL SECURITY POLICY IN THE EU

Beyond economic policies, the typical functions of a sovereign state (*fonctions régaliennes*) – including home affairs and justice, foreign policy and defence – had already been included in the Maastricht Treaty of 1992. The second pillar of the Treaty was the Common Foreign and Security Policy (CFSP). In the ensuing years, the CFSP has been complemented in various ways.³²⁴ In 2009, the Lisbon Treaty introduced the “Mutual Assistance Clause” in defence (Article 42(7) of the Treaty on the European Union)³²⁵ and established the diplomatic service of the EU (EEAS); the European Security and Defence Policy (companion policy of the CFSP) became the Common Security and Defence Policy (CSDP).³²⁶ Nowadays the CSDP is an integral part of the CFSP and is managed by (the military arm of) the EEAS, which is in turn assisted by a few specialised agencies.³²⁷

The way the CSDP has evolved over the past decade is unprecedented – it is now playing a key role in the broader development of the EU’s OSA. Several recent international developments have led to advances in European integration in the areas of foreign policy and defence. These developments include Brexit, the threat of disengagement by the United States under the Trump

³²² Finland and Sweden have applied for NATO membership. Their NATO Accession Protocols were signed in Brussels on 5 July 2022 and have already been ratified by 28 out of 30 NATO members.

³²³ This box builds on previous work done with Philip Muggenthaler and Marta Rodríguez-Vives, as well as comments from Ettore Dorrucci (all from the ECB).

³²⁴ Key events have been the introduction of the European Security and Defence Policy in 1999; the so-called “Berlin Plus” agreement in 2002, which allowed the use of NATO assets by the EU itself (and not only by its NATO Member States) to carry out ESDP missions; the adoption of the European Security Strategy in 2003; and the establishment of the European Defence Agency in 2004.

³²⁵ Article 42(7) of the Treaty of the European Union provides that in the event of armed aggression against an EU Member State all other Member States are obliged to aid and assist that state “by all the means in their power”, without prejudice to certain Member States’ specificities (i.e. neutral status) and NATO membership (“which remains the foundation of their collective defence and the forum for its implementation”). At the current juncture, where hybrid (conventional and cyber) threats are increasingly common, the EU Council concluded on 20 November 2017 that particularly serious cyber incidents or crises could trigger the activation of the Mutual Assistance Clause. The major difficulties in this context are evaluating the severity of the attack and identifying the actors and their sponsors with a reasonable degree of certainty: this is even more difficult for cyberattacks than it is for conventional attacks. The clause has so far been invoked once, by France in the aftermath of the deadly terrorist attacks in Paris on 13 November 2015. For general background information, see the EU’s [External Action Service](#) (EEAS).

³²⁶ The defence solidarity clause completed the de facto transfer of competences from the Western European Union of 1954 to the European Union. The Western European Union ceased to exist in 2011.

³²⁷ The CFSP agencies are the European Defence Agency (EDA), the EU Satellite Centre and the EU Institute for Strategic Studies. The latter two are former Western European Union agencies.

presidency and its calls for European countries to increase their military spending in the context of NATO, the inability of EU armies to operate without US logistical support and intelligence in Afghanistan after the withdrawal of US troops and, more recently, the Russian war in Ukraine.³²⁸ Three key initiatives mark this acceleration.

First, the Permanent Structured Cooperation (PESCO), established in December 2017, is a framework for Member States to jointly develop defence capabilities, invest in shared projects and enhance the operational readiness and contribution of the armed forces.³²⁹ The key difference between PESCO and other forms of cooperation is that Member States' commitments made in PESCO are legally binding. PESCO is an intergovernmental process: the Council is responsible for the overall policy direction and decision-making (usually with unanimity). At the beginning of 2022, 60 PESCO projects were active in seven domains (land, sea, air, cyber, space, training and education). For the first time ever, a PESCO project was launched at the beginning of the Russian-Ukrainian crisis following a request received from Ukraine. The "Cyber Rapid Response Teams and Mutual Assistance in Cyber Security" project assists Ukraine to defend itself against Russian cyberattacks.

Second, a new Commission Directorate General for Defence Industry and Space (DG DEFIS) was created in 2021 to support industrial development and competitiveness in the defence and space sectors. DEFIS also manages the European Defence Fund (EDF). The EDF focuses on developing defence research and capability and has a budget of €8 billion over seven years, consisting of €2.7 billion from the EU budget (for collaborative research to address emerging and future challenges and threats) and €5.3 billion from co-financing by Member States (for collaborative capability development projects complementing national contributions). In July 2021, 61 collaborative defence research and development projects, with a total EU support of almost €1.2 billion, were approved for funding, of which €339.2 million was in the aerospace sector. Almost 700 entities are involved, including 178 from France, 156 from Italy, 147 from Spain and 113 from Germany.

Third, in March 2022 the EU approved the Strategic Compass, which is intended to act both as a guide to shape the CSDP and as a measurement tool to assess progress made in providing greater direction and a common vision for the EU's efforts in security and defence in the years to come. The Strategic Compass consists of a detailed roadmap that identifies a set of common EU political and strategic goals along the key dimensions ("baskets") of EU security (crisis management, resilience, investment and partnership) in order to enhance EU strategic autonomy (including a "shared threat landscape" and regional priorities). Some features are worth noting: building up a capability to rapidly mobilise 5,000 troops by 2025, a new emphasis on maritime cooperation, and the recognition of the military dimension of new technologies. However, the total number of troops attached to the EU Rapid Deployment Capacity is quite small by any measure, taking troop rotation and reserves into account.

In May 2022, the European Commission published an analysis of the defence investment gaps in the EU, which include a defence industry that is divided along national borders and tends to discourage cooperation. There are both short-term and medium-to-long-term gaps in all domains of military capability – air, sea, land, space and cyber.³³⁰ To cope with the short-term gaps, the

³²⁸ In relation to recent developments and the EU's capacity to react see, for example, Cladi (2022).

³²⁹ 25 out of 27 EU Member States participate in PESCO. Denmark and Malta have opted out, although Denmark abolished the EU defence opt-out in its June 2022 referendum.

³³⁰ Short-term gaps include replenishing stockpiles used to support Ukraine, replacing Soviet-era equipment and reinforcing air and missile defence systems.

Commission will coordinate procurement (voluntarily). It has also proposed an instrument which will incentivise Member States to participate, and which will amount to €500 million over the next two years. Looking ahead, European defence capability consortia will be established that will jointly procure defence capabilities developed in partnership within the EU and will benefit from VAT exemption and other financial support. In the long term, planning and joint procurement will be conducted by EU Joint Defence Strategic Programming and Procurement, involving the Member States, the EDA and the Commission. These will contribute to channelling demand for the EU's defence industry, which is supported by the EDF.

During the war in Ukraine, the European Peace Facility (EPF) has taken centre stage by funding the common costs of the CSDP military missions and operations. The EPF has an implicit solidarity dimension and fosters burden-sharing among Member States. By strengthening the capacity for peace support operations and for cooperating with third countries and partner organisations in military and defence matters, the EPF is helping to increase the effectiveness of the EU's external action. Since war broke out in the Ukraine, the EU has decided to use the EPF to fund emergency assistance measures, disbursing six tranches of about €500 million to Ukraine for lethal military equipment and other supplies such as fuel, protective equipment and emergency medical items, amounting to a total of €3.1 billion. Additionally, the EPF has also granted €40 million to Moldova, providing non-lethal equipment, supplies and services.

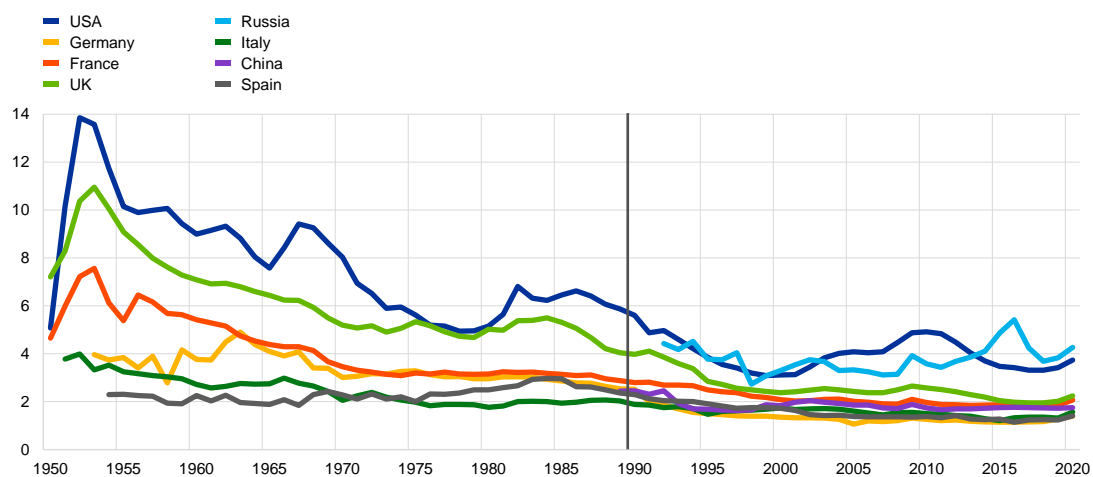
DEFENCE SPENDING IN THE EU

Military spending more or less halved in western countries after the end of the Cold War. The Stockholm International Peace Research Institute produces long time series of total defence spending for all nations (see Chart A). According to this source, the United States spent an average of 7.8% of GDP per year on defence during the years of the Cold War (1950-89), a figure which fell to around 4% of GDP after 1989. The largest five European countries (Germany, Spain, France, Italy and the United Kingdom) spent on average around 4% of GDP on defence in the Cold War era. In Germany, Spain and Italy, military expenditure fell below 2% of GDP shortly after the fall of the Berlin Wall in 1989, while it remained above 2% of GDP in the United Kingdom and France until more recently (see below for details for other EU Member States). Russia's total military expenditure has ranged between 4% and 6% of GDP since 2014 (the annexation of Crimea), while it was below 4% in the period 1998-2013.

Chart A

Long-run trends in military expenditure according to the Stockholm International Peace Research Institute

(percentage of GDP)



Source: Stockholm International Peace Research Institute, Military Expenditure Database 2021.
Note: Vertical line marks the year of the fall of the Berlin Wall, also associated with the end of the Cold War.

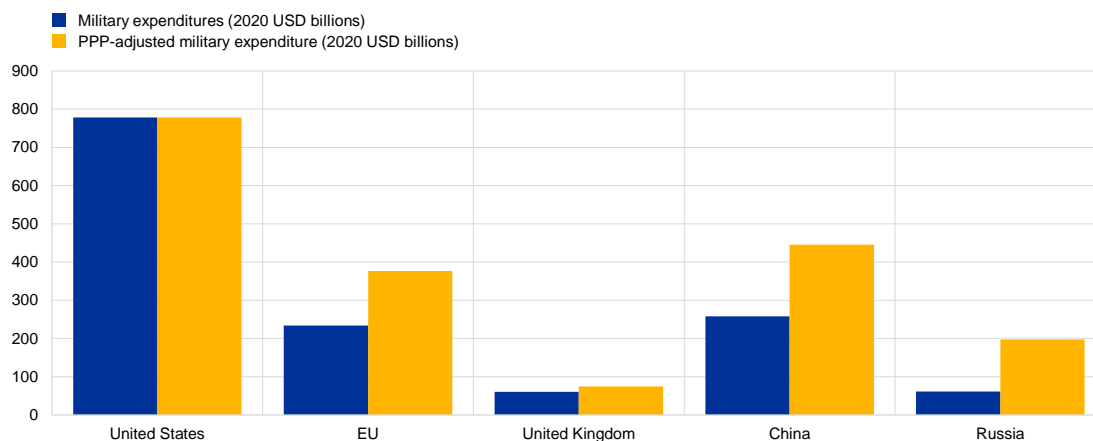
In volume terms US military expenditure dwarfs the expenditure of other countries (see Chart B). As an aggregate and measured at market exchange rates, the combined military expenditure of EU Member States in current US dollars stands at USD 232.8 billion, in third place after the United States and China, which spent almost USD 800 billion and USD 250 billion respectively in 2020. However, given the differences in defence sector input levels across countries, measuring in “military-PPP” (military purchasing power parity) terms suggests that the combined military expenditure of the EU Member States, as well as that of China, Russia and the United Kingdom, is somewhat higher. In 2020, taking the US defence budget as a point of reference for military PPP, the EU spent around USD 400 billion, China spent around USD 450 billion, Russia spent around USD 200 billion and the United Kingdom spent around USD 90 billion.³³¹

³³¹ ECB estimations based on Robertson (2021).

Chart B

Expenditure on defence, nominal and in military PPP

(USD and USD adjusted for military PPP)



Sources: Stockholm International Peace Research Institute, own estimations based on Robertson (2021).

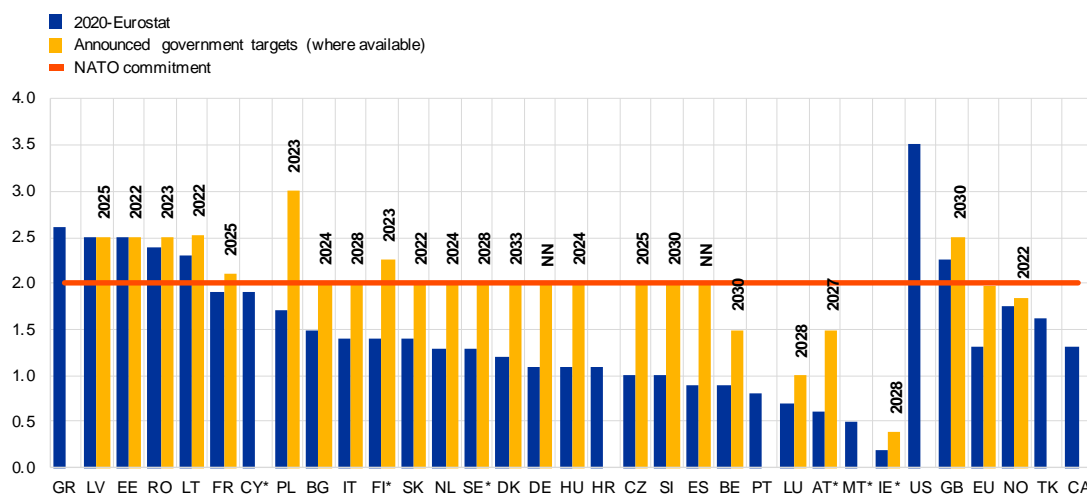
As a percentage of GDP, the EU's average expenditure on defence amounted to 1.3% in 2020, well below NATO commitments (see Chart C). According to official government finance statistics data, the EU shows an expenditure gap of around 0.7% of GDP for 2020 in comparison with the 2% of GDP NATO target (i.e. the minimum defence spending agreed by NATO members in 2006). However, four of the EU countries are not NATO members or have not applied to join NATO and have not, therefore, committed to the 2% target (Ireland, Cyprus, Malta and Austria), while Finland and Sweden have recently applied to join NATO. The highest levels of expenditure on defence in the EU are recorded in Greece, the Baltic States and Romania (all above 2.3% of GDP), followed by France and Cyprus (both at 1.9 % of GDP). By contrast, the non-NATO members had comparatively low levels of expenditure (e.g. Ireland at 0.2 % of GDP, Austria at 0.6 % of GDP). The United States has the highest level of expenditure among western countries (3.2% of GDP, or 8.5% of total government expenditure), followed by the United Kingdom (2.2% of GDP).

The Russian invasion of Ukraine on 24 February 2022 may mark a turning point in the decline of defence spending in Europe, most prominently in Germany. On 27 February 2022, Germany announced a historical turnaround in its security and defence policy, committing significant fiscal resources to strengthening its military capabilities. First, the government announced a €100 billion federal fund to modernise the country's defence forces, equivalent to almost 3% of Germany's 2019 GDP or 0.8% of euro area GDP. The fund is expected to be established this year. It remains to be seen how quickly the additional funds can be used, but media reports indicate that the aim is to spend the money over the next five to eight years. Second, and in addition to the federal fund, the government announced that it will increase its military expenditure to 2% of GDP, in line with the 2006 NATO commitments.

Chart C

Defence expenditure in 2020 and announced spending targets

(percentage of GDP)



Sources: Category 2 in COFOG data (Eurostat, OECD, IMF).

Notes: Ordering is according to defence spending as a percentage of GDP. * denotes the countries that are not NATO members (although Finland and Sweden are in the process of joining). Announced spending targets according to media reports in October 2022. Spending targets may be subject to frequent revisions. NN indicates unknown time horizon.

Other EU countries have also opened a policy debate or taken concrete initiatives on defence spending, which will take EU defence spending to 2.2% of GDP. Poland aims to reach 3% of GDP defence spending by 2023 while Estonia, Latvia, Lithuania and Romania have set an objective of 2.5% of GDP. France and Finland have also set targets of above 2% of GDP. Bulgaria, Czech Republic, Denmark, Germany, Spain, Italy, Hungary, the Netherlands, Slovenia, Slovakia and Sweden are all aiming for a target of 2% of GDP, albeit over very different time horizons. Finally, Belgium, Ireland, Luxembourg and Austria have announced more modest targets of below 2% of GDP.

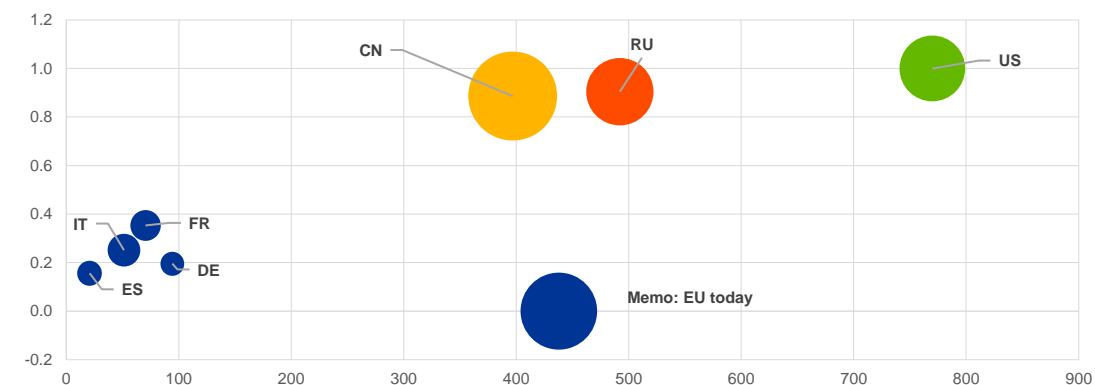
DEFENCE SPENDING AND MILITARY CAPABILITY

In view of the EU's fragmented defence structures, its military capacity is below that of other global players, despite comparable expenditure levels and personnel. Chart D shows military capacity in relation to defence expenditure. The aggregated defence expenditure and the number of personnel in EU Member States is comparable with that of other major geopolitical players such as China and Russia (the memo item in the chart). However, in the absence of integrated defence structures the EU has no military capacity per se. Military capacity remains national in nature and even the capacity of the large Member States is a long way behind that of other major geopolitical players.

Chart D

Defence spending and military capacity

(x-axis: military spending in USD billions; y-axis: military capacity; military personnel: balloon size)



Source: Global firepower ranking, Robertson (2021).

First, the EU does not have integrated command and control structures. These structures remain based in EU Member States and – for NATO members – are integrated into the defence alliance. As a result, it is difficult to determine the precise military capacity of the EU as such. Capacity remains relatively limited outside NATO structures, even when the Strategic Compass initiatives are taken into consideration.³³²

Second, despite all the efforts that have been made to increase multinational defence cooperation, EU Member States' security spending is still divided into 146 different defence systems. By way of comparison, the United States has 34. This suggests that resource allocation is fragmented, which could hinder the construction of an efficient and effective European defence force. While cooperation has improved in recent years, the EU's Coordinated Annual Review on Defence reports that "national approaches to capability development continue to prevail". As a consequence, EU Member States continue to rely heavily on non-EU arms manufacturers instead of in-house R&D capabilities. At this stage, the Member States and the EU overall are taking stock of recent operational cooperation in supporting Ukrainian armed forces, mainly in the areas of interoperability and procurement.

Beefing up an integrated defence policy at the EU level may involve reshuffling industrial capabilities across Member States and could require some downsizing of national strategic autonomy. This is likely to impact the biggest industrial players the most. The defence industry in the EU is highly concentrated: it consists of a small number of companies based in an even smaller number of countries. In turnover terms, the EU's top defence firm is Leonardo (Italy). Airbus (a French-German-Spanish consortium), whose defence turnover is, however, less than one-fifth of the total, is the second-largest player, and Thales (France) is the third. BAE Systems (whose defence turnover is higher than that of Leonardo and Airbus combined) is, following Brexit, now based outside the EU. The aerospace industry plays a special role in the EU defence industry: Europe has the second-largest aerospace industry in the world, with over 231,000 employees and a turnover of about €58 billion per year. In the space sector, satellites play a central role in supporting

³³² Defence spending and structures depend on national policy priorities and needs, which remain heterogeneous among EU Member States. Without a unified approach, which the Strategic Compass aims to introduce, it will be difficult to build an effective defence capability.

defence systems and military operations and are also key civilian infrastructures. Galileo, the EU-owned and operated global navigation satellite system, which went live in 2016 with Italy and Germany playing a leading role, is both a forerunner and a milestone in the EU's strategic autonomy. Finally, PESCO currently includes many space-related projects.

MACROECONOMIC EFFECTS OF DEFENCE SPENDING

Military expenditure can be an important tool for macroeconomic stabilisation and a driver of technological change. Military expenditure can be concentrated in regions with weak economic structures, helping to create employment and infrastructure. In addition, military R&D is a driver of innovation in aerospace and digital technology. The internet, for example, was developed by the US military during the Cold War and is, perhaps, the most striking example of military R&D generating high social returns.

Although several empirical studies on the effects of military spending on economic growth are inconclusive, many point to small positive or even negative effects. Examining data from 1960 to 2014, Dunne and Tian (2016) find that military expenditure has significant negative effects on economic growth for a large sample of countries.³³³ A meta-study of 169 estimates of the military spending multiplier by Alptekin and Levine (2012) suggests positive but small growth effects, decreasing with size of military budget (0.06 to 0.1).³³⁴

The growth effects of military R&D spending are found to be considerably higher, possibly exceeding unity. Becker and Dunne (2021) find considerable heterogeneity in the effects of the different components of military expenditure on growth.³³⁵ They show that the “aggregate is driven primarily by a negative effect of personnel expenditure, with some more limited evidence of a negative effect of operating and maintenance expenditures”. Moretti et al. (2019) find high crowding-in of private R&D on account of R&D defence expenditure. According to the authors, crowding-in may occur when (i) public R&D covers high fixed costs and makes some marginal private sector projects profitable, (ii) government-funded R&D generates technological spillovers that benefit private firms, and/or (iii) firms face credit constraints.³³⁶

It is believed that increases in defence spending mostly increase inflation. Some early empirical studies from the 1980s find no relationship between defence spending and inflation (Vitaliano, 1984), while others find that increased demand in an economic environment with relatively inelastic supply leads to price pressures (Nourzad, 1987).³³⁷ Apart from the conventional demand channel, higher defence spending can also impact prices through the supply channel. Because of the national and oligopolistic structure of the defence industry, higher demand can lead to supply bottlenecks. Looking at historical time series for the United States and the United Kingdom, Wang (2022) finds empirical evidence in support of positive bilateral effects of defence budget growth on inflation.³³⁸

From an economic point of view, military expenditure in the EU could be more productive (see Chart E). Almost 90% of EU defence spending directly or indirectly funds maintenance of the defence

³³³ Dunne and Tian (2016).

³³⁴ Alptekin and Levine (2012).

³³⁵ Becker and Dunne (2021).

³³⁶ Moretti et al. (2019).

³³⁷ Nourzad (1987) and Vitaliano (1984).

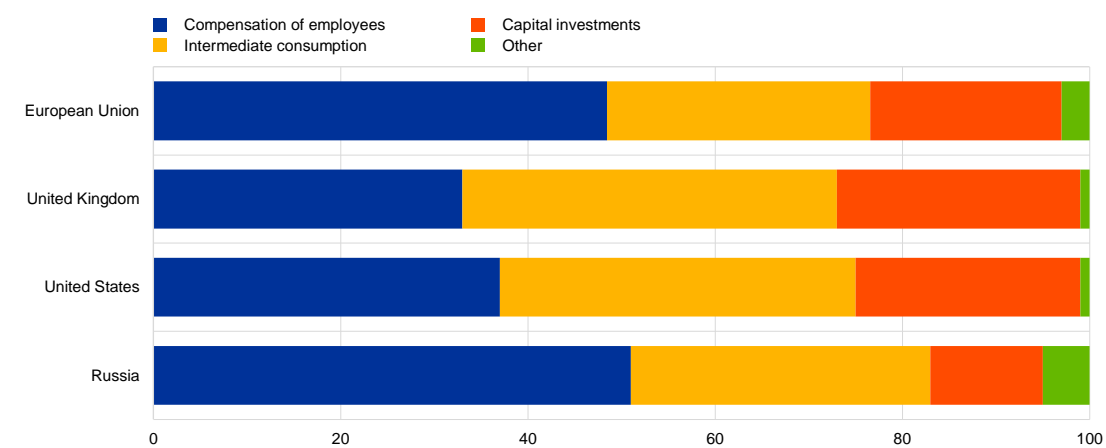
³³⁸ Wang (2022).

forces (1.2% of GDP in 2020). Expenditure on military R&D is very low in the EU, at less than 0.05% of GDP in the large EU Member States excluding France. US expenditure on military R&D, at around 0.4% of GDP in 2020, is much higher than the EU average. Almost half (48%) of total EU defence expenditure in 2020 was directly allocated to compensation of employees, followed by intermediate consumption (28%) and capital investments (20%). The United States and the United Kingdom showed a lower weight for compensation of military employees, in favour of intermediate consumption and capital investment. Data for Russia also show a high share of compensation of employees and intermediate consumption, to the detriment of capital investment.

Chart E

General government expenditure on defence by type of transaction (2020)

(percentages)



Source: Calculations based on COFOG data (Eurostat, OECD, IMF).

Notes: "Compensation of employees" is wages and salaries as well as employers' actual or imputed social contributions; "Intermediate consumption" is government purchases of goods and services; "Capital investments" is capital formation, including purchases of new equipment. Pension schemes for military personnel are excluded and recorded under social protection (COFOG category 10.2).

The growth effects of higher EU defence spending are likely to be contained at the current juncture, given the relatively small multipliers for public wages. ECB staff simulations using the ESCB's Basic Model Elasticities for the euro area, for example, suggest that the short-run demand effects of an increase in defence expenditure in EU Member States in line with NATO commitments could raise GDP growth by 0.2 percentage points by 2024. This scenario assumes that defence spending will be increased by all EU members (irrespective of whether they are NATO members or not) to reach the NATO target of 2% of GDP after five years. The assumption, then, is that EU Member States will increase their defence expenditure by 0.7 percentage points by 2026. This implies additional expenditure at the euro area level of 0.15% of GDP, on average, per year over the period, or additional financing needs of €427 billion in volume terms. The growth effects may be even more muted, given that at least part of defence procurement may be from outside the euro area. The picture, however, could change if military expenditure in EU Member States were to shift towards R&D and capital expenditure.

As for the impact of a higher level of defence expenditure on prices, increases in defence spending are believed to increase inflation mostly via the demand channel and to be limited in size – although the effects are probably underestimated. According to preliminary estimates based on the ESCB's Basic Model Elasticities for the euro area, the result of an increase in defence expenditure in EU Member States in line with NATO commitments will result in a very small estimated uptick in HICP inflation of less than 0.05 percentage points by 2024. This is likely to

underestimate the impact of an increase in defence expenditure on prices, particularly in the current economic environment (the effect is likely to be amplified by the oligopolistic structure of the defence industry). It may, in addition, significantly underestimate the importance of post-pandemic global supply bottlenecks at the current juncture, particularly for investment goods. Such bottlenecks may be exacerbated in an environment of generalised increased security concerns. Finally, a concurrent increase in defence expenditure may exhaust the existing global supply of these goods, thus accelerating price inflation for military equipment.

4 Implications for monetary policy and other central bank tasks

As this report has explained, the landscape in which central banks need to operate is being increasingly influenced by geopolitical considerations.

Geopolitical shocks can represent a challenge to macroeconomic and financial stability, given that they have the potential to produce greater economic uncertainty and volatile disruptions to trade and financial flows. The impact and persistence of such shocks are greater the higher the nodal importance of the countries in which the shocks originate, particularly with regard to critical goods and services such as energy, foodstuffs, raw materials and financial services. As discussed in Section 1 and Section 3, OSA-related EU policies could be interpreted as policies intended to address vulnerabilities to geopolitical risks such as those arising from key trade dependencies, integration into GVCs or reliance on foreign providers of financial market infrastructure services. EU OSA policies are also a response to the strategic autonomy policies of other major economies around the world. In some cases, these policies will imply costs and second-best solutions that the ECB will need to take into account.

Effective OSA policies require common EU action. However, the EU's differentiated vertical and horizontal integration may lead to differentiated national policy responses, which may hinder the effectiveness of EU-wide initiatives.

Differing degrees of integration in terms of competence and governance in different EU policy areas (horizontal), and for different Member States (vertical), impact the efficiency and effectiveness of an OSA policy that is consistent with the EU's openness and economic performance. For example, while monetary policy is an exclusive competence of the EU, EMU-related policies, such as financial or fiscal policies, are less integrated. Trade policy is also an exclusive competence of the EU but faces obstacles in terms of governance (see, for example, EU domestic obstacles to the adoption of bilateral trade agreements with the United States and China). Energy, migration and foreign and security policies are extremely relevant from an OSA perspective but are far less integrated at the EU level. In such cases, and unless national policies and EU-wide action work in the same direction, decision-making and implementation of OSA-related policies may not proceed in unison, introducing divergences between Member States. This may have implications for the ECB's policies.

4.1 Changes in international trade and financial integration

As trade integration tends to be positively related to productivity, a retrenchment in global trade flows may have consequences for this key variable. Productivity is a key driver of long-run economic growth and, as such, is crucial for monetary policy. It shapes an economy's potential supply capacity and is critical for real interest rates, given its implications for firms' investment and

households' saving decisions. In addition, changes in productivity have repercussions for firms' prices and mark-ups.³³⁹ Two channels through which trade integration affects productivity are the sourcing of intermediate goods and import competition.

Trade integration positively affects productivity through import competition, the sourcing of intermediate goods and export opportunities. For this reason, OSA-motivated policies including state aid, industrial policies, investment screening and export control may limit the gains from trade and may have implications for the level of competition and the structure of the market in EU/euro area countries. As Box 17 shows, OSA policies aimed at reducing import dependencies must take the effect on domestic competition into account. This, in turn, has implications for mark-ups and price setting behaviour. If OSA policies were to reduce competition or give rise to tensions between social partners, this could flatten the Phillips curve (Andrés et al., 2021) and decrease the effectiveness of monetary policy. At the same time, however, the interplay between larger economic openness and the increased reluctance of firms to invest in relatively risky intangible assets and digital technologies tends to favour “winner-takes-all” market dynamics. This could have implications for firms' incentives to engage in productivity-enhancing investments.

European OSA policies, as well as strategic autonomy policies implemented by other countries around the globe, may have implications for interest rates.

It is important to ascertain whether OSA policies could lead to lower EU trade openness or higher diversification, and whether they are implemented unilaterally or as part of a global shift (see Box 17). Lower trade openness may have a depressing effect on interest rates as it could erase productivity gains from international trade. However, higher import diversification, if focused on reducing key import dependencies on some countries, such as emerging Asia or oil producers, may have a positive effect on global interest rates, as savings in these countries, channelled through international markets, have had an important effect on depressing global interest rates.³⁴⁰

A retrenchment of globalisation and OSA policy responses could also affect the recent common downward trend in the natural rate of interest. Some authors suggest that the common decline in the natural rate estimated in the pre-COVID-19 period 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, including the role

³³⁹ See Box 4 in the ECB strategy review ([Work stream on globalisation](#), 2021), or [Goldin et al.](#) (2020).

³⁴⁰ See the ECB strategy review ([Work stream on globalisation](#), 2021).

of financial integration³⁴¹ and trade globalisation.³⁴² OSA-type policy actions at the global level (not only at the EU level) that reduce the level of financial and trade integration, the free movement of people and the diffusion of technology across economic areas may alter the pre-COVID-19 downward trend in natural interest rates. This has implications for central banks' monetary policy space.

A wider and more persistent reversal of globalisation trends through geopolitical shocks and OSA policies could have notable implications for domestic labour markets and could, thereby, also directly affect the conduct of monetary policy. For example, barriers to the free movement of labour and trade in goods and services or a major rebalancing of GVCs could reverse some of the domestic labour market trends of the past few decades, leading to rises in wages and production costs. The impact of migration in particular is multifaceted – it is both theoretically ambivalent and empirically unclear. Central banks should therefore consider carefully whether it will lead to significant changes in the supply of labour.

OSA policies that target specialisation across EU/euro area countries could impinge on the transmission of monetary policy. OSA-like policies that target near or reshoring could foster either economic convergence or economic divergence across EU/euro area countries. This would depend, for instance, on the types of goods and technological processes at stake. If OSA-like policies targeted the reshoring of products with significant economies of scale or which benefit from a high concentration of workers and processes, then such policies might support or accelerate intra-EU/euro area divergence. The policies would therefore have implications for the smooth transmission of the single monetary policy across the euro area, as the ECB would have to cope with heightened challenges resulting from large, negative, asymmetric supply shocks that are, to some extent, “nurtured” or “intended” by the EU.

A certain degree of “de-globalisation” may imply a lower impact of the spillovers underpinning a global financial cycle but an amplification of domestic shocks. As discussed in the ECB work stream on globalisation (2021), 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

³⁴¹ 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).

³⁴² See Comin and Johnson (2020) and Natal and Stoffels (2019). From a theoretical perspective, the impact of greater trade openness is ambiguous. As discussed in the ECB strategy review (*Work stream on globalisation*, 2021), in the early phase of globalisation increased trade integration may have accentuated competition between 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 reason for the hump-shaped pattern shown by long-term real rates (i.e. the rise in rates until the 1970s and the subsequent decline).

economies,³⁴³ the euro area may also be affected at times.³⁴⁴ 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.³⁴⁵ These facts could change in a world in which financial openness is reduced.

Strategic trade dependencies for key products increase vulnerability to some of the most recent geopolitical shocks. In a world in which geopolitics play an increasing role, these strategic dependencies have an impact on inflation developments including price levels, volatility and relative price movements.

Shorter production networks can have a bearing on price setting mechanisms. Decisions to reshore or shorten/regionalise value chains in response to geopolitical risks could alter price levels, along with the price setting behaviour of firms and the bargaining power of workers. Localising production could increase demand for factor inputs, driving up costs and prices. Depending on how such a process evolves, enhanced public support for local firms could also give such firms greater market power, facilitating a rise in markups that puts further upwards pressure on prices (see Box 17).

The greening of the economy makes it possible to reduce energy dependencies but requires time and introduces elements that impact inflation, inflation volatility and relative prices within the energy mix. In the current geopolitical context, the twin transitions of greening and digitalising the economy will help reduce dependencies and increase resilience in the long run. However, in the short run they may have implications for inflation and inflation volatility.

Transitory but long-lasting changes in the price level pose additional challenges to the conduct of monetary policy. If geopolitical shocks or OSA policy responses result in a sustained period of higher inflation or price volatility, the ECB could find itself exposed to additional policy trade-offs. The conclusions of the ECB's 2021 monetary policy strategy review offer a sound policy basis as they clarify the concept of the medium-term orientation of monetary policy. As stated in [European Central Bank \(2021d\)](#), the medium-term orientation provides the policy flexibility required to assess the origin of shocks and look through temporary shocks that may dissipate of their own accord, thus avoiding unnecessary volatility in activity and employment. In particular, supply shocks can create a temporary trade-off by moving inflation and real economic activity in different directions.

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, even though persistent and large global energy and food price shocks may end up affecting more stable components of inflation through indirect and second-round effects. A domestically driven greening of the economy and more diversified external energy dependence could, potentially,

³⁴³ See [Rey \(2016\)](#), [Passari and Rey \(2015\)](#), [Gerko and Rey \(2017\)](#) and [Miranda-Agrippino and Rey \(2020\)](#).

³⁴⁴ 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](#)).

³⁴⁵ See [Ca' Zorzi et al. \(2020\)](#), [Jarociński \(2020\)](#) and [Obstfeld \(2020\)](#).

mitigate exposure to commodity shocks originating in third countries, in particular with regard to more integrated markets (e.g. oil markets) and if substitution is effected out of more segmented markets (e.g. natural gas markets). Moreover, common EU action, such as an “energy union”,³⁴⁶ could be central to reducing unwarranted price increases and volatility.

Geopolitical factors also influence capital flows and the smooth functioning of financial market infrastructures, thereby posing risks to financial stability. The euro area is more financially open than other major economies and is also home to a number of major investment hubs. As discussed earlier in this report, it is difficult to map financial exposures for a number of reasons. The current overreliance of EU market participants on third-country payment and clearing services, with the EU authorities having only limited reach in the event of a crisis, is a potential source of financial stability risks. Moreover, potential disruptions to clearing operations, as well as certain CCP clearing risk management decisions, could affect the functioning of markets for euro-denominated financial instruments which are relevant for monetary policy implementation. Also, the dominant position of non-EU payment-related service providers in intermediating European payment transactions raises concerns as to the resilience of EU payment markets, while the activities of non-European “Big Tech” companies in EU financial services entails financial stability and operational risks.

Some OSA policies may impact the international status of currencies including the euro. Depending on the form they take, OSA policies could impact the international role of the euro and, therefore, the transmission of external shocks and the degree of monetary policy autonomy. In relation to this, a deeper and more complete EMU, including further progress with the capital markets union, could strengthen the international role of the euro.

It is essential for Member States to pursue sound economic policies if market participants are to continue to view their sovereign debts as safe assets. In addition, assets created through common debt issuance, such as those used to meet time-limited challenges, broaden the universe of safe assets denominated in euro. Both can have several benefits for OSA. As explained in Section 3.3.5, safe assets denominated in euro can buttress financial stability and integration. As common EU debt is considered safe and, therefore, attracts favourable financing conditions it is of assistance in the provision of public goods directly related to OSA. For example, several OSA policies, such as those associated with changes in the energy mix (see Section 2) and the green and digital transition (see Box 11), or those potentially strengthening European external security (see Box 16) are likely to imply large-scale investments. Lower financing costs imply – all things being equal – favourable deficit and debt dynamics, which could support the transmission of monetary policy and price developments in the EU/euro area.

³⁴⁶ See Michel (2022).

4.2 Economic and policy uncertainty

Geopolitically induced shocks, also of a transitory nature, may blur the picture for monetary policy by increasing economic uncertainty. More frequent shocks of this nature have the potential to increase output and inflation volatility, which may generate persistent dynamics that, even if transitory, would pose a challenge to the conduct of monetary policy, its communication and its transmission.

Spillovers from economic uncertainty shocks might become more prominent and might alter the macroeconomic environment in which central banks operate. A more significant role for geopolitical factors in world economic affairs might lead to more frequent spikes in global uncertainty. This could have direct effects on the EU/euro area when the uncertainty shocks originate in areas/countries with which strong trade and/or financial ties exist. However, indirect effects could also arise insofar as conflict and social tensions in areas less economically connected to the EU/euro area could generate spillovers through other regions³⁴⁷ or by affecting, for example, migration trends (e.g. the Syrian refugee crisis or migration induced by global food crises).

OSA policies enacted in response to geopolitical shocks may themselves increase economic policy uncertainty³⁴⁸ and therefore need to be well defined and calibrated. Some OSA policies are of a structural nature insofar as they are aimed at changing some basic feature of the economy (e.g. the energy mix). At the same time, climate-change goals also represent one of the EU's strategic objectives. In this case the two goals coincide, albeit with a different time horizon, so longer-term energy transition plans are influenced by significant geopolitical (but more transitory) shocks such as the war in Ukraine. The war has led to an acceleration of the reduction of dependency on Russian gas, oil and coal. This acceleration in meeting the goal of changing the energy mix implies sharper price increases than previously expected and possibly warrants changes in the taxonomy of "green versus brown" energy sources. Necessary as they may well be, these policy actions introduce a higher degree of uncertainty with regard to the future direction of energy policy in the EU/euro area with, for example, implications for long-term private investments. Beyond energy policy, OSA may also require, in other cases, regulatory changes to state aid, industrial policies, investment screening and export controls. Once again, the horizon of such policies and the interaction between short and long-term effects should be weighed up appropriately to minimise distortions in the smooth functioning of the Single Market and in investment decision-making.

Box 17

The macroeconomic implications of re-orientating global supply chains

Policymakers around the world are (re)considering the trade-off between efficiency and resilience inherent in GVCs. Many have introduced legislation, such as the EU Chips Act or the US Science

³⁴⁷ See, for example, [Ghirelli et al. \(2021\)](#) and the references quoted therein.

³⁴⁸ Economic policy uncertainty affects economic decisions. See, for example, the seminal work of [Baker et al. \(2016\)](#), [Ahir et al. \(2022\)](#) and [Al-Thaqeb and Algharabali \(2019\)](#) and the references quoted therein.

and Chips Act, seeking to encourage the local production of key manufacturing inputs and reduce excessive dependencies on external suppliers. Proponents argue that more localised production would provide greater security of supply and would imply lower uncertainty for consumers and businesses.

Using an extended version of the dynamic general equilibrium Euro Area Global Economy (EAGLE) model (Gomes et al., 2012; Clancy et al., 2016), we analyse the macroeconomic effects of several types of localisation policies. We show that the macroeconomic implications depend on whether localisation policies are unilateral or part of a global shift, and on the extent to which they lead to an increase in local firms' market power. We also demonstrate that a (non-targeted) reorientation of global supply chains does not improve resilience against global shocks, and substantially reduces resilience against domestic shocks. Finally, we show that fiscal policy, the primary macroeconomic stabilisation instrument available to small open economies in a customs and/or currency union, can play an important role in mitigating some of the negative side effects of localisation policies.

First, we examine the implications of euro area exporters permanently reducing their preference for imported intermediate inputs and, instead, favouring the use of regionally-produced inputs (i.e. reshoring production). Our analysis assumes a partial reshoring, whereby the decrease in preferences gradually reduces imported intermediate inputs by 1% of GDP over the long run. This relatively limited reshoring is in line with localisation policies focusing on only the most essential goods and European policymakers' stated desire to remain as economically open as possible while boosting strategic autonomy.

If the euro area pursues reshoring unilaterally and other parts of the world keep their trade preferences unchanged, aggregate output falls over the medium term while the economy adjusts (see Chart A, panel a, blue line). Increased costs and prices arising from greater demand for local factor inputs result in higher inflation and a real effective exchange rate (REER) appreciation that worsens external competitiveness. In the long run, the shift in preferences towards domestic goods is sufficient to boost aggregate output.

If all regions of the world engage in reshoring, the reduction in euro area output is initially larger but the adjustment is much faster (see Chart A, panel a, yellow line). This is because costs and prices rise abroad and the REER depreciates, despite increased euro area inflation, supporting tradable sector production. Importantly, in the likely scenario that reshoring policies lead to a reduction in domestic competition and local producers use the resulting increase in their market power to raise markups, output is permanently lower (see Chart A, panel a, red line).

Next we examine the effects of reorientating supply chains towards "trusted partners", a policy known as friend-shoring. We model this as a gradual increase in euro area preferences for intermediate-good imports from the United States over the long run, which is offset by a reduction in preferences for such imports from the rest of the world.

When friend-shoring is pursued unilaterally, a loss of external competitiveness drags euro area aggregate output down for an extended period via the tradable sector (see Chart A, panel b, blue line). When there is reciprocation, whereby the United States increases its preference for imported inputs from the euro area, the worsening of competitiveness and the initial output loss is greater but less persistent. Friend-shoring is somewhat more beneficial over the medium term if the rest of the world retaliates by pursuing similar friend-shoring policies with its allies.

A key motivation for reorientating supply chains is to boost economic resilience. We analyse whether this is the case by comparing the response of the euro area economy with current trade linkages (the status quo) and the euro area economy after (partially) reshoring production against regional and global shocks to export firm price markups. These shocks proxy the post-pandemic and post-war supply chain disruptions which, at least partly, motivated the increased focus on boosting resilience. We find that reshoring production does not achieve this goal. The reshored economy has almost the same sensitivity to global shocks (dashed compared to solid blue line, Chart A, panel c), while it is substantially more exposed to regional shocks (dashed compared to solid red line, Chart A, panel c). This is in line with smaller economies (as aggregate output is lower in a reshored economy it is smaller in terms of share of global output) generally being less resilient to shocks.

Our analysis highlights the fact that localisation policies can worsen external competitiveness via increased costs and prices. Individual euro area member countries can mitigate this side effect using fiscal policy, which remains a national competency. In particular, a budget-neutral substitution of imported goods with local tradable goods helps support domestic demand in the short run while increasing public investment (and reducing government consumption expenditure), mitigates cost and price rises and boosts external competitiveness in the medium to long run (see Chart A, panel d, yellow line).³⁴⁹ The combined positive effects of such an approach may even be sufficient to counteract an increase in local firms' market power (see Chart A, panel d, red line).

While localisation policies are rooted in concerns over and beyond economics, policymakers need to consider ways to reduce adjustment costs. Given that crowding-out effects are prevalent in our analysis, focusing on only the most essential goods would minimise cost and price pressures and maintain external competitiveness. While public investment is, potentially, a powerful tool in facilitating this transition, increasing the local production of goods for which the euro area lacks a comparative advantage could require considerable public support to reach the technological frontier. If the technological frontier is not reached, euro area firms could end up using an inferior good, which would also be damaging for output. Finally, friend-shoring assumes a continuous period of unchanged trade policies amongst partners. With many countries seeking to boost the local production of key goods, there is the potential for future trade tensions. Policymakers should therefore seek to friend-shore the production of goods to regions that are not potential competitors for those same goods.

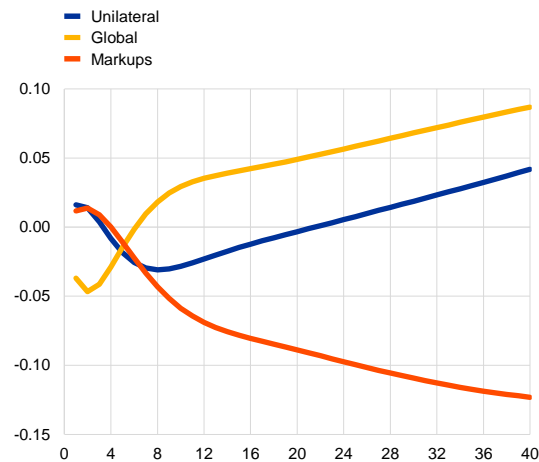
³⁴⁹ As an example of a small open economy in the euro area, we calibrate our model to Ireland.

Chart A

Impact on aggregate domestic output from selected OSA-type policies and resilience of reshored economies to regional and global shocks

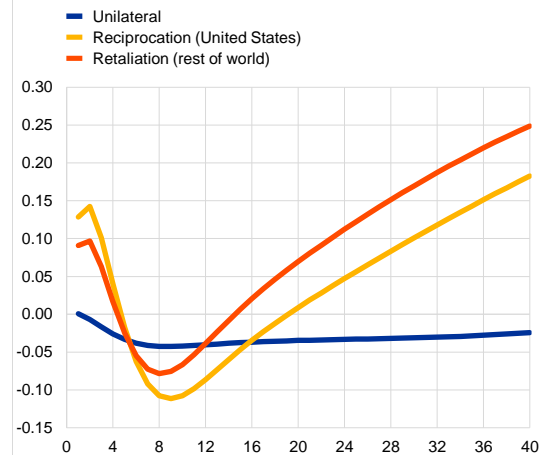
a) Partial reshoring euro area

(percentage deviations from steady state, quarters)



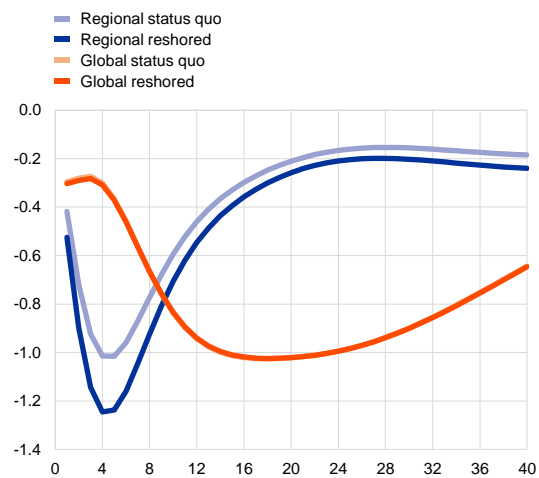
b) Partial friend-shoring euro area

(percentage deviations from steady state, quarters)



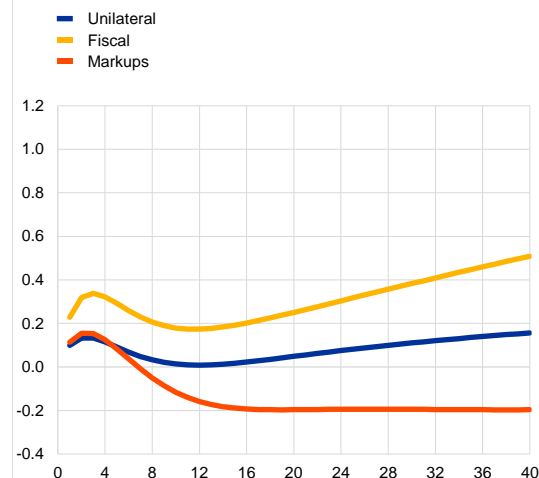
c) Resilience to shocks euro area

(percentage deviations from steady state, quarters)



d) Reshoring in a small open economy

(percentage deviations from steady state, quarters)



Source: Own calculations, based on simulations in Clancy et al. (2023a, 2023b).

Notes: Panel a displays the effect on aggregate euro area output of a permanent increase in euro area preferences for regionally-produced inputs for export goods, scaled to gradually substitute 1% of GDP of intermediate-goods imports over the long run. For the blue line this policy is implemented unilaterally, while for the yellow line it is part of a global shift (i.e. all other regions implement a similar policy). The red line shows what the impact will be if such a partial reshoring raises markups due to an increase in euro area tradeable firms' market power. Panel b displays the effect on aggregate euro area output of a permanent increase in euro area preferences for intermediate-goods imports from the United States, scaled to substitute 1% of GDP of intermediate-good imports from the rest of the world (RoW). For the blue line this policy is implemented unilaterally, while for the yellow line it is reciprocated by the United States (i.e. the United States increases its preference for imports of intermediate goods from the euro area at the expense of imports from the RoW). The red line shows the effects of the RoW retaliating by reshoring production equivalent to 1% of GDP. In Panel c, the blue lines show the effects on aggregate euro area output of an increase in euro area exporters' markups. The dashed blue line represents current trade linkages while the solid blue line represents euro area trade linkages after completion of a partial reshoring. The red lines show the effects on aggregate euro area output of an increase in US and RoW exporters' markups. The dashed red line represents current trade linkages while the solid red line represents euro area trade linkages after completion of a partial reshoring. Panel d displays the effects on Irish aggregate output of unilateral reshoring (blue line), unilateral reshoring coupled with an increase in Irish tradable firms' markups (red line), and unilateral reshoring coupled with an increase in Irish tradable firms' markups and counteracting ex ante budget neutral fiscal policy measures that reorientate public spending towards domestic tradables and investment (yellow line).

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