



EUROPEAN CENTRAL BANK

EUROSYSTEM

The international role of the euro

June 2023



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Foreword



Despite a succession of new shocks, the international role of the euro remained resilient in 2022. This was a year that saw the onset of Russia's war in Ukraine, a rise in economic sanctions and a substantial increase in geopolitical risks – all with potential repercussions for the international monetary system. However, the share of the euro across various indicators of international currency use continued to average close to 20%. The euro remained the second most important currency globally.

This resilience was noteworthy in a context of rising inflationary pressures worldwide – in part owing to war-related energy and food price increases – which led to tighter monetary policies across major economies and higher interest rates on the main international currencies.

But there are developments ahead to monitor for the euro as an international currency. This year's report discusses the future of the international monetary system following Russia's invasion of Ukraine, reviewing the available evidence. So far, the data do not show substantial changes in the use of international currencies. However, they do suggest that international currency status should not be taken for granted.

This new landscape increases the onus on European policymakers to create the conditions for the euro to thrive. Its international role is primarily supported by a deeper and more complete Economic and Monetary Union (EMU), including advancing the capital markets union, in the context of the pursuit of sound economic policies in the euro area. The Eurosystem supports these policies and emphasises the need for further efforts to complete EMU. Further European economic and financial integration will be pivotal in increasing the resilience of the international role of the euro in a potentially more fragmented world economy.

The ECB will continue to monitor developments and publish information on the international role of the euro on a regular basis.

Christine Lagarde
President

1 Main findings

This 22nd annual review of the international role of the euro presents an overview of developments in the use of the euro by non-euro area residents. The report covers developments in 2022. This was a year that saw the onset of Russia's war in Ukraine and a substantial increase in geopolitical risks with potential repercussions for the international monetary system. Rising inflationary pressures globally – in part coming from war-related energy and food price increases – and tighter monetary policies in major economies led to higher interest rates on the main international currencies.

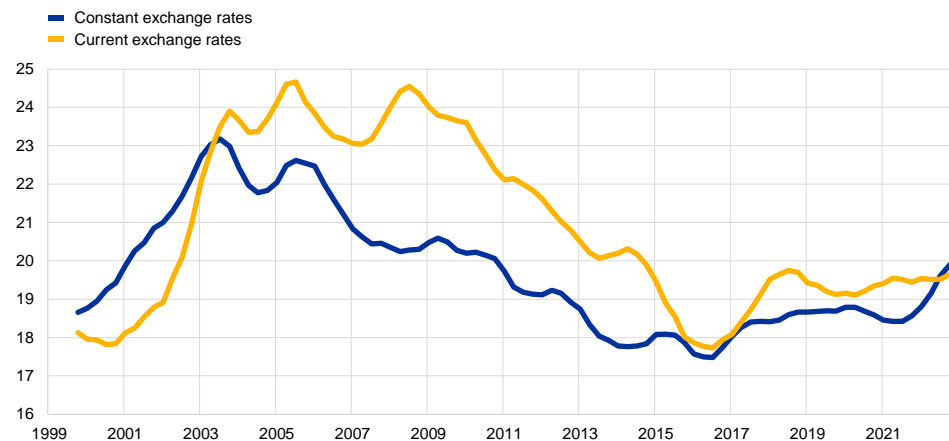
Against this challenging background, a composite index of the international role of the euro remained resilient over the review period (**Chart 1**). Adjusting for exchange rate valuation effects, the index increased by around 1.3 percentage points. At current exchange rates, it remained largely unchanged. The share of the euro across various indicators of international currency use averaged close to 20%. The euro remained the second most important currency in the international monetary system (**Chart 2**).

Chart 1

The international role of the euro was resilient in 2022

Composite index of the international role of the euro

(percentages; at current and constant Q4 2022 exchange rates; four-quarter moving averages)



Sources: Bank for International Settlements (BIS), International Monetary Fund (IMF), CLS Bank International, Ilzetzi, Reinhart and Rogoff (2019) and ECB calculations.

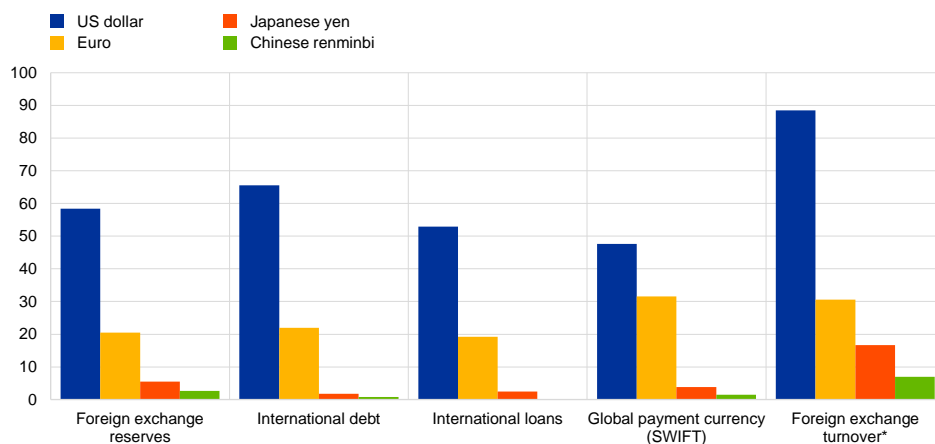
Notes: Arithmetic average of the shares of the euro at constant (current) exchange rates in stocks of international bonds, loans by banks outside the euro area to borrowers outside the euro area, deposits with banks outside the euro area from creditors outside the euro area, global foreign exchange settlements, global foreign exchange reserves and global exchange rate regimes. The estimates for the share of the euro in global exchange rate regimes are based on IMF data for the period post-2010; pre-2010 shares were estimated using data from Ilzetzi, E., Reinhart, C. and Rogoff, K. (2019), "Exchange Arrangements Entering the 21st Century: which anchor will hold?", *Quarterly Journal of Economics*, Vol. 134, Issue 2, May, pp. 599-646. The latest observation is for the fourth quarter of 2022.

Chart 2

The euro remained the second most important currency in the international monetary system

Snapshot of the international monetary system

(percentages)



Sources: BIS, IMF, Society for Worldwide Interbank Financial Telecommunication (SWIFT) and ECB calculations.

Notes: The latest data for foreign exchange reserves, international debt and international loans are for the fourth quarter of 2022. SWIFT data are for December 2022. Foreign exchange turnover data are as at April 2022. *Since transactions in foreign exchange markets always involve two currencies, shares add up to 200%.

The share of the euro in global official holdings of foreign exchange reserves increased in 2022 by 0.5 percentage points to 20.5%, when measured at constant exchange rates (**Table 1**). The share of the US dollar declined by more than 2 percentage points, while the share of the renminbi was substantially unchanged. **Box 1** examines whether the renminbi could play a stronger role as an international reserve currency despite China's lack of full financial account openness. A strong dollar and large changes in the price of bonds issued by major economies encouraged official reserve managers to manage their portfolios actively in 2022. Net official purchases of assets denominated in currencies other than the US dollar increased, offsetting valuation effects arising from the dollar's appreciation – which mechanically raised the share of the US dollar in official reserve portfolios at current exchange rates. Whether inflation developments influenced the decisions of official foreign exchange reserve investors is unclear, as shown by the poor correlation between changes in the share of major currencies in global foreign exchange reserves and inflation rates in the issuing economies. **Box 3** discusses how these developments are not exceptional and reflect conventional reserve management strategies by central banks. Interest rates are another factor which can influence the management of reserve portfolios. While interest rates in the euro area returned to positive territory, they remained lower than in other major economies, which could have discouraged rebalancing to euro-denominated assets. **Box 2** shows that interest rate differentials are important determinants in the active rebalancing of the government debt portfolios of a sample of US mutual fund managers, much as they influence investment decisions of official reserve managers.¹ Finally, heightened

¹ See Arslanalp, S., Eichengreen, B. and Simpson-Bell, C. (2022), "The Stealth Erosion of Dollar Dominance and the Rise of Nontraditional Reserve Currencies", *Journal of International Economics*, Vol. 138, No 103656.

geopolitical risks might have played a role in the investment decisions of official reserve managers in some countries. **Special Feature** [Error! Reference source not found.](#) shows that the accumulation of gold as an official reserve asset was especially strong in countries that are geopolitically close to China and Russia. This may be because such countries are looking to reduce their exposure to the risk of financial sanctions. Higher inflation globally might confound these developments, however, insofar as gold is traditionally seen as a hedge against inflationary risks.

Other indicators of the international role of the euro tracked in this report also point to a noteworthy resilience in the attractiveness of the euro (**Table 1**). The share of the euro in the outstanding stock of international debt securities increased by more than 1 percentage point to 22.0% in 2022 compared with the previous year, when measured at constant exchange rates. The shares of the euro in the outstanding stocks of international loans and international deposits rose by around 2.4 and 1.5 percentage points, respectively, in 2022. The share of the euro in foreign exchange settlements also increased by almost 3 percentage points to around 38%, when measured at constant exchange rates, over the review period. However, the latest BIS Triennial Survey points to a decline in the share of the euro in global foreign exchange turnover of around 1.8 percentage points since 2019, to 30.5%, owing to the relatively stronger growth of trading in other currencies, such as the US dollar and the renminbi. **Box 4** shows that the City of London remained the main venue for foreign exchange trading in euro and that the United Kingdom's importance for international financial activities in euro did not change materially after Brexit, albeit with a few exceptions. The international role of the euro in foreign currency bond issuance, including the issuance of international green bonds, was substantially stable. Finally, the share of the euro in the invoicing of extra-euro area imports and exports did not change significantly. The impact of Russia's war in Ukraine on the international role of the euro was particularly visible in the form of a temporary surge in net shipments of euro cash outside the euro area, presumably for precautionary reasons (**Box 5**). This reversed in the second half of 2022 on the back of higher interest rates and opportunity costs of holding cash (**Section 2.5**).

As stressed in last year's edition of this report, the European Union's economic and financial resilience to the current geopolitical challenges underlines the strength of the international role of the euro. The international role of the euro is primarily supported by a deeper and more complete Economic and Monetary Union (EMU), including advancing the capital markets union, in the context of the pursuit of sound economic policies in the euro area. The Eurosystem supports these policies and emphasises the need for further efforts to complete EMU.

This year's report includes **three special features**. The **first special feature** sheds light on the debate surrounding the future of the international monetary system following Russia's invasion of Ukraine, reviewing the available evidence. Shortly after the invasion, several packages of sanctions were imposed on Russia, including the freezing of nearly half of the Russian central bank's foreign exchange reserves and the exclusion of several Russian banks from SWIFT, the dominant financial messaging system for cross-border payments. Some observers noted that these sanctions may encourage countries that are not fully aligned with the United States

geopolitically to cut their exposures to the currencies of sanctioning countries, while others were more sceptical and pointed to challenges in moving away from the major international currencies. The special feature shows that evidence of a potential fragmentation of the international monetary system since Russia's invasion is so far mainly restricted to announcements and specific cases and is not indicative of broader trends. Anecdotal evidence, including official statements, points to the intention of some countries to develop the use of alternatives to the sanctioned currencies, such as the renminbi, the rouble and the Indian rupee, for the invoicing of international trade – notably in commodities. There is also evidence that Russia has been using the Chinese renminbi to a significantly greater extent for international invoicing and cross-border payments in the past few months. However, on the whole, the available data do not show substantial changes in the use of international currencies. One noteworthy development is evidence of diversification into gold by countries that are geopolitically close to China and Russia, perhaps in an attempt to reduce their risk of exposure to sanctions.

The **second special feature** aims to give a broader perspective to ongoing discussions on the future of the international monetary system and reviews the evidence – both old and new – on how one leading international currency is replaced by another. The conventional historical narrative is that inertia in international currency use is substantial – it takes a long time for a challenger currency to replace the incumbent unit as the presence of network externalities gives rise to lock-in effects. However, one interesting exception is the invoicing of trade by countries neighbouring the euro area, where the euro overtook the US dollar in the space of a few years, i.e. between 1999 – the year of the euro's creation – and 2019. Two competing hypotheses may explain these developments: a trade shock – in which stronger trade links with the euro area tilted invoicing towards the euro – and an exchange rate volatility shock – in which growing use of the euro as an exchange rate anchor spilled over to invoicing. New evidence from ECB staff research gives support to the first hypothesis, finding that a trade shock is a key determinant of the stronger role of the euro for invoicing international trade in countries neighbouring the euro area. In countries where trade links with the euro area increased, the shock accounts for almost 40% (on average) of the rise in the share of exports invoiced in euro between 1999 and 2019. By contrast, the impact of greater exchange rate stability against the euro is found to be statistically insignificant. Moreover, the estimates point to significant cross-country effects – the fact that countries' invoicing currency choices are not just impacted by their own trade patterns and exchange rate volatilities, but also by those of their trade partners and competitors. These findings have implications for policy. They suggest that in response to the pandemic shock and the war in Ukraine, the reshoring or “friendshoring” of production chains could lead to stronger regional trade, notably on the European continent and, in turn, to a stronger role of the euro for invoicing international trade, with the caveat that such a reversal in global economic integration would bring other economic costs.

The **third special feature** looks at the role of international currencies in global finance. It provides insights into determinants of currency choice in cross-border bank lending, including bilateral distance, measures of linkages to the issuer countries through finance, trade and the use of vehicle currencies for trade invoicing.

The special feature pinpoints several new facts. It highlights the centrality of the City of London for euro-denominated loans, albeit with tentative signs of adverse Brexit effects. It shows that offshore financial centres play a pivotal role in the international network of cross-border loans denominated in US dollars, which largely reflects lending to non-bank financial intermediaries (such as investment banks, finance companies, mutual funds, pension funds and insurance companies) in the Cayman Islands. Moreover, empirical estimates suggest that euro-denominated loans are driven by gravity effects, pointing to a stronger role of the euro in the immediate vicinity of the euro area, in contrast to US dollar loans which have a more global outreach. Finally, there is evidence that complementarity effects between trade invoicing and bank lending decisions – which are predicted to be significant according to recent theoretical models of international currency use – are stronger for the euro than for the US dollar.

Table 1

The international role of the euro from different perspectives

Summary of data in this report

Indicator	Share of the euro (percentages at constant exchange rates, unless otherwise indicated)			Total outstanding amounts (at current exchange rates)			
	Latest	Comparison period	Difference (% points)	Latest	Comparison period	Unit	Difference (%)
Stock of global foreign exchange reserves with known currency composition	20.5 (Q4 2022)	20.0 (Q4 2021)	0.5	11,963 (Q4 2022)	12,919 (Q4 2021)	USD billions	-7.4
Outstanding international debt securities: narrow measure, i.e. excluding home currency issuance	22.0 (Q4 2022)	20.8 (Q4 2021)	1.2	17,698 (Q4 2022)	17,767 (Q4 2021)	USD billions	-0.4
Outstanding international loans: by banks outside the euro area to borrowers outside the euro area	19.2 (Q4 2022)	16.8 (Q4 2021)	2.4	2,747 (Q4 2022)	2,880 (Q4 2021)	USD billions	-4.6
Outstanding international deposits: with banks outside the euro area from creditors outside the euro area	17.7 (Q4 2022)	16.1 (Q4 2021)	1.6	3,115 (Q4 2022)	3,262 (Q4 2021)	USD billions	-4.5
Foreign currency-denominated bond issuance, at current exchange rates	24.7 (2022)	24.6 (2021)	0.1	1,608 (2022)	2,323 (2021)	USD billions	-30.8
Euro nominal effective exchange rate (broad measure against 41 trading partners)	119.9 (30 Dec. 2022)	118.9 (31 Dec. 2021)	1.0				
Daily foreign exchange trading (settled by CLS), as a percentage of foreign exchange settlement	37.7 (Q4 2022)	34.8 (Q4 2021)	2.9				
Invoicing of goods exported from the euro area to non-euro area countries, at current exchange rates	59.3 (2022)	59.7 (2021)	-0.4				
Invoicing of goods imported to the euro area from non-euro area countries, at current exchange rates	51.6 (2022)	52.1 (2021)	-0.5				
Cumulative net shipments of euro banknotes to destinations outside the euro area (seasonally adjusted)				141.3 (Dec. 2022)	158.0 (Dec. 2021)	EUR billions	-10.5

Sources: BIS, CLS Bank International, Dealogic, IMF, national sources and ECB calculations.

Notes: An increase in the euro nominal effective exchange rate indicates an appreciation of the euro. For foreign exchange trading, currency shares add up to 200% because transactions always involve two currencies.

Box 1

Internationalisation of the renminbi and capital account openness

Prepared by Barry Eichengreen (UC Berkeley), Camille Macaire (Banque de France), Arnaud Mehl, Eric Monnet (Paris School of Economics) and Alain Naef (Banque de France)

Why doesn't the currency of the second largest economy in the world play a more consequential reserve currency role? The share of the Chinese renminbi in global reserve portfolios, at about 3%, pales in comparison with those of the US dollar (about 60%) and the euro (about 20%).² What explains the difference?

A common answer is that the renminbi cannot develop as an international reserve currency without full liberalisation of China's capital account.³ This view assumes that countries will not hold reserves in renminbi if they cannot easily purchase and sell them on international markets. It is supported by the history of the rise of the pound sterling and then the US dollar as leading international currencies in the twentieth century, both of which were traded on deep and liquid markets. However, recent research suggests that it cannot be excluded that the internationalisation of the renminbi may unfold differently.⁴ Even without full financial liberalisation, the renminbi might play a more important international role in the future, notably as a form of central bank reserves.

Despite gradual financial liberalisation and the explicit objective of internationalising the renminbi, China is cautious about moving to full capital account convertibility. The People's Bank of China characterises its approach as affording a "balance between development and security".⁵ However, unlimited access to deep and liquid Chinese capital markets may not necessarily be essential provided that the renminbi can strengthen its international role through its use in invoicing and settling China's foreign trade and payments.

Historically, currencies first acquired a role in trade invoicing and settlement before also assuming reserve currency status.⁶ The renminbi might similarly acquire a more important international reserve currency role via China's trade links. Invoicing transactions and accepting payment in renminbi, the currency that is the natural habitat of Chinese banks and firms, is a way of encouraging Chinese entities to do business with a country's domestic counterparts. Indeed, the ratio of total renminbi reserves to trade invoiced in renminbi at the global level is close to the ratio of total euro reserves to total trade invoiced in euro (**Chart A**). This observation is striking, given China's low degree of capital account openness.

² See also Anaya Longaric, P. and Di Casola, P. (2022), "[The internationalisation of the renminbi: regaining strength?](#)", The international role of the euro, European Central Bank, June.

³ See Frankel, J. (2011), "The rise of the renminbi as international currency: Historical precedents", *VoxEU*, 10 October and Prasad, E. (2021), *The Future of Money: How the Digital Revolution is Transforming Currencies and Finance*, Harvard University Press.

⁴ See Eichengreen, B., Macaire, C., Mehl, A., Monnet, E. and Naef, A. (2022), "Is capital account convertibility required for the renminbi to acquire reserve currency status?", *CEPR Discussion Paper*, No DP17498.

⁵ See People's Bank of China (2021), *Renminbi internationalisation report*, p.37. This policy choice has been interpreted as trading off building reputation as a country capable of providing the global store of value and risking a disruptive foreign capital flight. Letting in foreign investors helps build reputation for the issuer in global capital markets, but letting in too many foreign investors, particularly flighty ones, can be counterproductive and exacerbate crises if investors pull out in times of stress (see Clayton, C., Dos Santos, A., Maggiori, M. and Schreger, J. (2022), "[Internationalizing like China](#)", *NBER Working Paper*, No 30336).

⁶ See Eichengreen, B., Mehl, A. and Chițu, L. (2017), *How global currencies work: past, present, and future*, Princeton University Press.

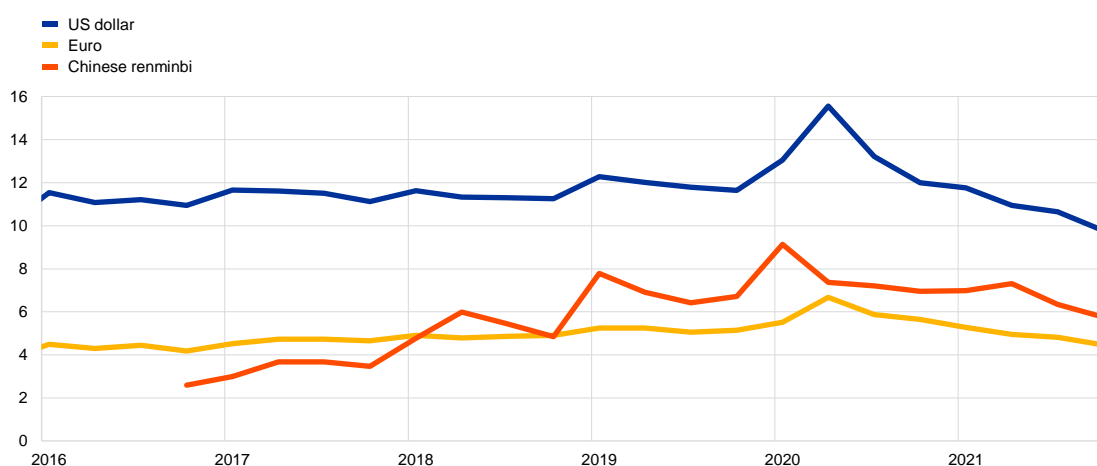
More evidence of this pattern is shown in **Chart B**. Using a dataset on trade invoicing in renminbi, the figure juxtaposes reserves held in renminbi in months of imports invoiced in renminbi against China's share in the imports of the countries in question. The pattern is clear: countries that trade more with China hold more renminbi reserves, measured in terms of months of imports invoiced in renminbi. This suggests that the share of renminbi in total reserves might increase in the future along with invoicing and settlement in the currency.

Chart A

The renminbi might acquire a more important international reserve currency role via China's trade links

Global reserves-to-imports ratio for selected currencies

(percentages)



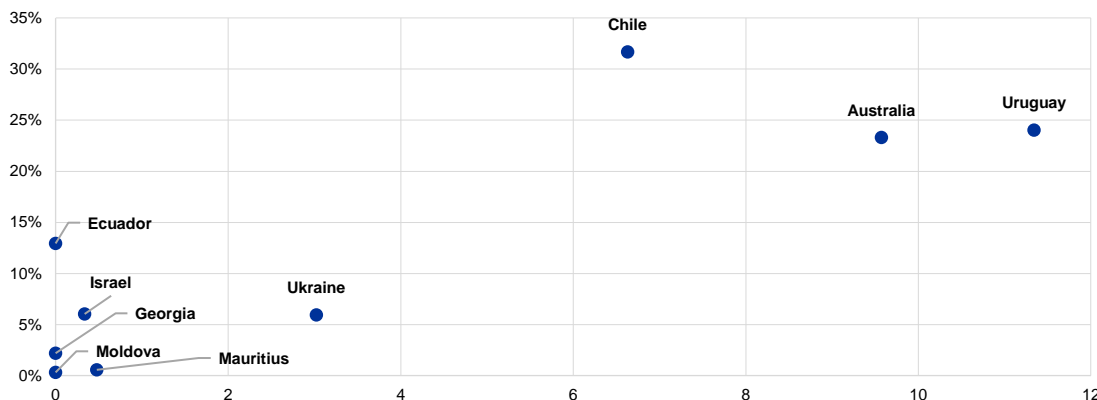
Source: Eichengreen, B., Macaire, C., Mehl, A., Monnet, E. and Naef, A. (2022), "Is capital account convertibility required for the renminbi to acquire reserve currency status?", *CEPR Working Paper*, No DP17498.
 Notes: Global imports denominated in US dollars and euro are estimated by aggregating country-level observations from the dataset of Boz, E., Casas, C., Georgiadis, G., Gopinath, G., Le Mezo, H., Mehl, A. and Nguyen, T. (2022), "Patterns of invoicing currency in global trade: New evidence", *Journal of International Economics*, Vol. 136, No 103604.

Chart B

Countries that trade more with China hold more renminbi reserves

Reserves-to-imports coverage – country-level evidence

(y-axis: percentages; x-axis: months)



Source: Eichengreen, B., Macaire, C., Mehl, A., Monnet, E. and Naef, A. (2022), "Is capital account convertibility required for the renminbi to acquire reserve currency status?", *CEPR Working Paper*, No DP17498.
 Notes: The chart plots the share of bilateral imports from China on the y-axis against the ratio of reserves held in renminbi to months of imports invoiced in renminbi on the x-axis for selected economies for which data on both variables are available in 2019.

However, the willingness to accumulate renminbi-denominated reserves may be restrained if there are limits to the ability to deploy them and if they are not sufficiently liquid when needed – for instance in times of stress. For the latter, central bank swap lines and offshore renminbi markets are important. Swap lines engender confidence that renminbi units can be obtained from the Chinese central bank even in the absence of liquid markets in renminbi securities.⁷ The People’s Bank of China has negotiated bilateral currency swap agreements with at least 39 central banks, totalling some RMB 3.7 trillion (about USD 550 billion). Admittedly, these are not permanent lines available in unlimited amounts, nor is there much evidence that they have been used to date.⁸ Yet these swap lines represent a significant share of output of the countries involved.

A stronger international role of the renminbi requires, in addition, that central bank reserve managers and other investors can convert renminbi into US dollars at stable and predictable rates. This is where offshore markets for exchanging renminbi in financial centres outside mainland China come in. Since 2010, when China first authorised renminbi trading in Hong Kong, offshore markets have opened in 24 other cities. As of July 2021, some RMB 1.25 trillion (about USD 200 billion) was deposited in offshore accounts. So far, these markets remain small compared with offshore markets for dollars, in Europe and elsewhere. Offshore dollar deposits (or eurodollars) are estimated at USD 14 trillion in 2016. The comparison suggests that offshore markets in renminbi still have a long way to go. But it also suggests that central banks that hold reserves in renminbi can expect to be able to convert them into dollars on offshore markets at predictable and stable prices – provided that not all of them decide to do so at the same time, that is, given the limited liquidity available offshore. In order to pursue stability and predictability, the Chinese authorities have tended to manage the RMB/USD exchange rate, which in turn requires the holding of dollar reserves.

This suggests that an enhanced role for the renminbi as a reserve currency will not necessarily eliminate that of the US dollar. Rather, China might have to hold dollar reserves in order for other countries to willingly hold reserves in renminbi. The two reserve currencies would be complements, not substitutes. A historical precedent is the US dollar in the 1950s and 1960s. Then, convertibility of dollars into gold was restricted by US monetary law under the Bretton Woods system, while convertibility of renminbi into US dollars today is limited by capital account restrictions. Under the Bretton Woods system, the dollar was backed by gold and was inconvertible into the yellow metal in the United States. The offshore gold market in London then and the offshore renminbi market today are products of a similar phenomenon, namely the imperfect convertibility of an international currency (the dollar then, the renminbi now) into the ultimate reserve asset (gold then, the dollar now).

All in all, lack of capital account openness may not necessarily fully prevent the renminbi from playing a stronger role as an international and reserve currency. This is not to deny that, to assume a stronger role as an international and reserve currency, China would have to further liberalise its capital account, nor that other factors – such as geopolitical developments – are relevant. As long as China’s capital account is not fully open, the renminbi is unlikely to become the dominant

⁷ Bahaj, S. and Reis, R. (2020), “Jumpstarting an international currency”, *Hong Kong Institute for Monetary and Financial Research Paper*, No 19/2020.

⁸ Recent evidence suggests, however, that borrower drawdowns on these currency swap facilities are more frequent and substantial than is widely assumed; nearly two dozen countries would have recently made use of them (see Horn, S., Parks, B., Reinhart, C. and Trebesch, C. (2023), “China as an International Lender of Last Resort”, *NBER Working Paper*, No w31105).

currency and will still require dollar backing. But with the help of trade invoicing, currency swap lines and offshore markets, the renminbi can gain a more important role.

2 Key developments

2.1 Use of the euro as an international reserve and investment currency

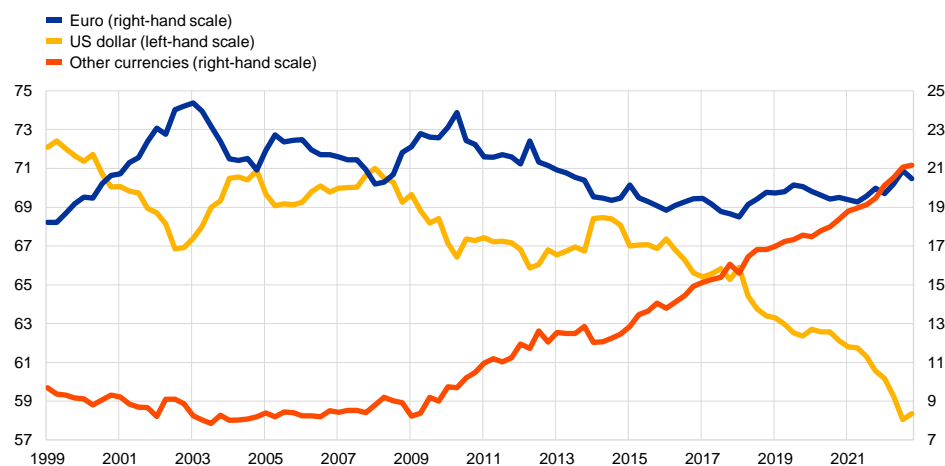
The share of the euro in global official holdings of foreign exchange reserves increased in 2022 when measured at constant exchange rates. At the end of 2022, official investors held about €11.4 trillion (USD 12.0 trillion) in foreign exchange reserves. Total foreign exchange reserves declined by more than 7 percentage points, when measured at current exchange rates, compared with the previous year (Table 1). The share of the euro in global official holdings of foreign exchange reserves increased by 0.5 percentage points to 20.5% in 2022 when measured at constant exchange rates (Chart 3). By contrast, the share of the euro remained broadly stable, declining by about 0.1 percentage points, when measured at current exchange rates (Chart 5). Overall, in the past seven years the share of the euro in global official holdings of foreign exchange reserves has remained within a relatively narrow range.

Chart 3

The share of the euro in global official holdings of foreign exchange reserves increased in 2022

Shares of the euro, US dollar and other currencies in global official holdings of foreign exchange reserves

(percentages; at constant Q4 2022 exchange rates)



Sources: IMF and ECB calculations.
Note: The latest observation is for the fourth quarter of 2022.

Interest rates and fixed-income yields on highly-rated euro area government bonds turned positive in 2022, although they remained lower than in other major economies. Interest rate differentials with other major advanced economies widened over the course of 2022, except with Japan. For instance, euro area long-term interest rates remained lower by around 200 basis points compared with the United States and about 150 basis points compared with the United Kingdom, which

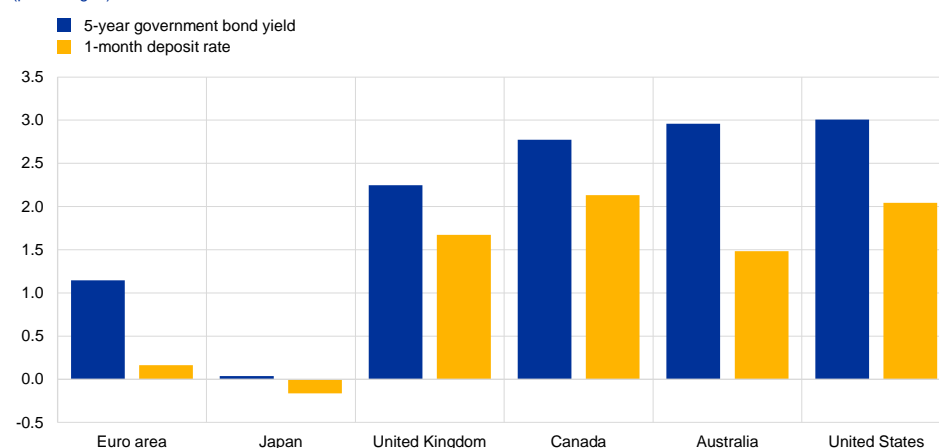
could have discouraged rebalancing to euro-denominated assets (**Chart 4**). **Box 2** shows how interest rate differentials are important determinants of active rebalancing for US mutual fund managers across currencies within their portfolios of government debt securities,⁹ which is consistent with evidence from the literature for official reserve managers.¹⁰

Chart 4

Average interest rates in the euro area in positive territory but lower than in several advanced economies in 2022

Five-year and one-month interest rate in the major economies in 2022

(percentages)



Sources: Refinitiv Datastream, BIS, S&P Global and ECB calculations.

Note: The five-year government yield for the euro area is calculated as a debt-weighted average of five-year euro area yields of sovereigns with a Standard & Poor's credit rating of at least AA.

A strong dollar and rising policy interest rates encouraged official reserve managers to manage their portfolios actively in 2022, to a large extent offsetting the valuation effects arising from exchange rate and bond price movements.

In 2022 the share of the US dollar – the major global reserve currency – remained stable at around 58.4%, when measured at current exchange rates, although it declined by about 2.2 percentage points at constant exchange rates. Reserve managers sold an estimated USD 293 billion of US dollar assets in the review period. Net purchases of currencies other than the US dollar largely offset the impact of valuation effects stemming from the US dollar's appreciation – which mechanically raises the share of the US dollar in official reserve portfolios. Net purchases of euro-denominated reserves by official investors reached an estimated €50 billion (USD 53 billion) in the review period.¹¹ Not only did the share of the euro increase at constant exchange rates but also the share of currencies other than the

⁹ Estimates presented in **Box 2**, for example, show that an increase of 100 basis points in the yields of highly-rated euro area debt securities relative to yields on the debt of other reserve currency issuers leads to an increase in the share of the euro area of over 1 percentage point on average across funds. This corresponds to a total reallocation of around USD 300 million in each quarter.

¹⁰ See Arslanalp, S., Eichengreen, B. and Simpson-Bell, C. (2022), "The Stealth Erosion of Dollar Dominance and the Rise of Nontraditional Reserve Currencies", *Journal of International Economics*, Vol. 138, No 103656.

¹¹ Purchases were derived from changes in holdings over the review period. The estimates account for valuation effects arising from exchange rate and bond price changes that influence nominal amounts of reserves denominated in euro and reported in US dollar terms. See **Box 3** for a detailed review of the methodology used.

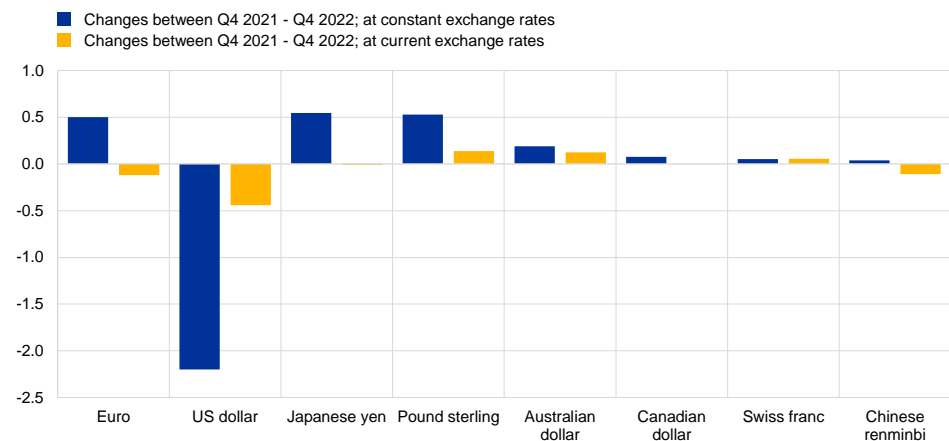
euro and the US dollar – by about 1.7 percentage points in the review period (**Chart 3**). In particular, the share of official reserve assets denominated in Japanese yen and pound sterling both increased by 0.5 percentage points, while the share of other major reserve currencies remained broadly stable (**Chart 5**). These developments are not exceptional and reflect conventional reserve management strategies by central banks. During periods of strong dollar appreciation reserve managers tend to stabilise the composition of their portfolios by selling dollar assets and purchasing assets in other major currencies, such as the euro (**Box 3**). In addition, foreign exchange interventions aiming at stabilising the exchange rate of the domestic currency against the US dollar or limiting its volatility become more likely when the US dollar appreciates, particularly in emerging markets, explaining net sales of US dollar-denominated reserve assets. According to a regular survey conducted by the investment bank UBS, rising interest rates in the US and inflation represented one of the main concerns for the investment of foreign exchange reserves.¹² The extent to which current inflation developments influenced the decisions of official foreign exchange reserve investors is not entirely clear as shown by the limited correlation between changes in the share of major currencies in global foreign exchange reserves and inflation rates in the issuing economies in 2022 (**Chart 6**).

Chart 5

Official reserve managers tried to manage their portfolios actively to offset the effects of a strong US dollar

Change in the share of selected currencies in global official holdings of foreign exchange reserves

(percentage points; at current and constant Q4 2022 exchange rates)



Sources: IMF and ECB calculations.

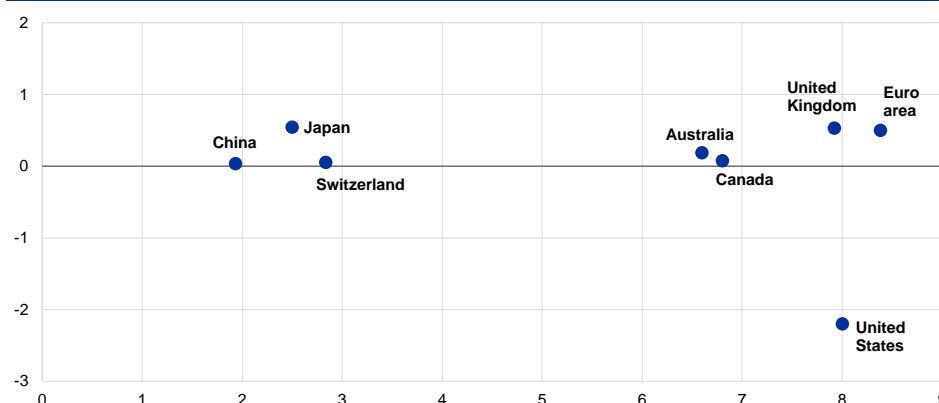
¹² See UBS (2022), “UBS Annual Reserve Manager Survey”, Zurich, June

Chart 6

Inflation developments are uncorrelated with changes in the currency composition of foreign exchange reserves

Correlation between changes in the share of selected currencies in global official holdings of foreign exchange reserves and inflation in 2022

(x-axis: annual percentage changes in consumer price indices in 2022; y-axis: percentage point changes in currency shares of foreign exchange reserves, at constant exchange rates)



Sources: IMF and ECB calculations.

Note: The latest observation of the foreign exchange reserve data is for the fourth quarter of 2022.

Box 2

Investment funds and search for yield within the sovereign debt market of highly-rated issuers

Prepared by Tamar den Besten, Marco Graziano¹³ and Maurizio Michael Habib

To what extent do investors reallocate their portfolios of safe assets across major currencies in search for higher returns? In previous years, survey evidence suggested that relatively low yields in euro area fixed-income markets might have been a factor in moderating the global appeal of the euro as a reserve and investment currency.¹⁴ The empirical evidence presented in this box indicates that investors tend to reallocate their portfolio of safe assets in response to changes in yields across major currencies.

The analysis focuses on demand for euro area government debt securities by US mutual funds, which are largely representatives of US and global private investors.¹⁵ The US mutual fund industry has grown rapidly in the past 20 years. Total assets managed by the industry rose from little over USD 5 trillion at the turn of the century to more than USD 16 trillion at the end of 2022.¹⁶ US mutual funds therefore play an important role in intermediating savings from the world's largest economy to

¹³ University of Lausanne. The analysis was prepared when Marco Graziano was a trainee at the ECB.

¹⁴ See Section 2.1 of [The international role of the euro](#), European Central Bank, June 2021.

¹⁵ The literature attributes an important role to currency and country excess returns in explaining changes in mutual funds' portfolio shares. See, for example, Raddatz, C. and Schmukler, S. (2012), "On the international transmission of shocks: micro-evidence from mutual fund portfolios", *Journal of International Economics*, Volume 88, No 2, pp. 357-374, and Camanho, N., Hau, H. and Rey, H. (2022), "Global portfolio rebalancing and exchange rates", *The Review of Financial Studies*, Vol. 35, No 11, pp. 5228-5274.

¹⁶ Source: Financial Accounts of the United States, Table L.122, Federal Reserve Board. The expansion of the US mutual fund industry relative to the US banking sector has also been notable; see Financial Stability Board, [Global Monitoring Report on Non-Bank Financial Intermediation 2022](#).

the rest of the world. They are also a growing source of finance in the sovereign debt markets of advanced economies.¹⁷

The empirical analysis makes use of portfolio data for a panel of US-domiciled mutual funds available at quarterly frequency from Refinitiv Lipper from the first quarter of 2011 to the second quarter of 2022. The analysis focuses on the share of highly-rated euro area government debt¹⁸ in portfolios of advanced economy government debt with similar ratings, as one measure of the global appeal of the euro as an investment currency.¹⁹ The countries included in these global portfolios almost exclusively issue debt denominated in domestic currency – the country of issuance and currency denomination therefore largely overlap.²⁰ The aim is to gauge the importance of incentives of mutual fund managers to invest in debt securities issued in the euro area by highly-rated sovereigns relative to other issuers in the market for safe assets. The sample is restricted to geographically well-diversified funds, thereby excluding funds with a domestic investment mandate to minimise *home bias*.²¹ This reduces the aggregate share of US Treasuries in the portfolio of highly-rated sovereign debt securities in the sample from almost 83% to 45% on average, bringing it closer to its theoretical benchmark, according to an international Capital Asset Price Model (CAPM).²² Eventually, the panel of observations includes 186 funds that operate internationally, excluding passive and benchmark-linked funds, with assets under management of USD 1.1 trillion in the second quarter of 2022. This captures about a quarter of total financial assets held by all US-based mutual funds investing in the fixed-income market.

As expected, euro-denominated government debt securities issued by highly-rated euro area sovereigns represent a non-negligible share of the portfolios of safe debt securities of globally active US mutual funds, even though it varies significantly over time. That share stands on average at around 15%, ranging from a peak of 30% in 2011 to lows of around 7-8% in several instances (**Chart A**). Developments in the share of highly-rated euro area government debt securities are poorly correlated with returns on those debt securities relative to those issued in other countries.²³ This might reflect non-pecuniary factors, such as limits to rebalancing imposed by the necessity to target country shares in benchmark indices, or valuation effects from exchange rate and bond price

¹⁷ See Fang, X., Hardy, B. and Lewis K. (2022), “Who holds sovereign debt and why it matters”, *NBER Working Paper*, No 30087.

¹⁸ Euro area highly-rated government debt is defined as debt issued by euro area countries with a Standard & Poor’s credit rating of AA or above between 2011 and 2022. Countries include Austria, Belgium, France, Germany and the Netherlands.

¹⁹ The other countries in the portfolios are Australia, Canada, Japan, New Zealand, Switzerland, the United Kingdom and the United States.

²⁰ With only the possible exception of Canada, where the share of foreign currency debt was about 10% of total general government debt in 2021; see Bogdanova, B., Chan, T., Micic, K. and von Peter, G. (2021), “Enhancing the BIS government bond statistics”, *BIS Quarterly Review*, pp. 15-24, June.

²¹ Funds with a domestic investment mandate are identified as those funds that hold a share of a particular currency in excess of 90% of the total portfolio on average over the sample period; see Hau, H. and Rey, H. (2008), “Home bias at the fund level”, *American Economic Review*, Vol. 98, No 2, pp. 333-338.

²² In the international version of a capital asset pricing model, a country’s portfolio share should equal the market capitalisation of debt issued by that country relative to the global market capitalisation in equilibrium.

²³ The excess return for the euro area is defined as the average yield of government debt issued by Austria, Belgium, France, Germany and the Netherlands, weighted by their market capitalisation based on outstanding central government debt according to data from the BIS debt securities statistics, minus the weighted average of yields of other countries in the portfolio. Formally, the excess return on euro area highly-rated government debt is defined as: $r_t^{x,EA} = r_t^{EA} - \sum_k s_{t-1}^k r_t^k$, where s_{t-1}^k is the lagged portfolio share of government debt issued by other sovereigns, indexed by k , excluding euro area countries, and r_t^k is the relative average government debt yields for the three-month, one-year, two-year and five-year maturities for sovereign k .

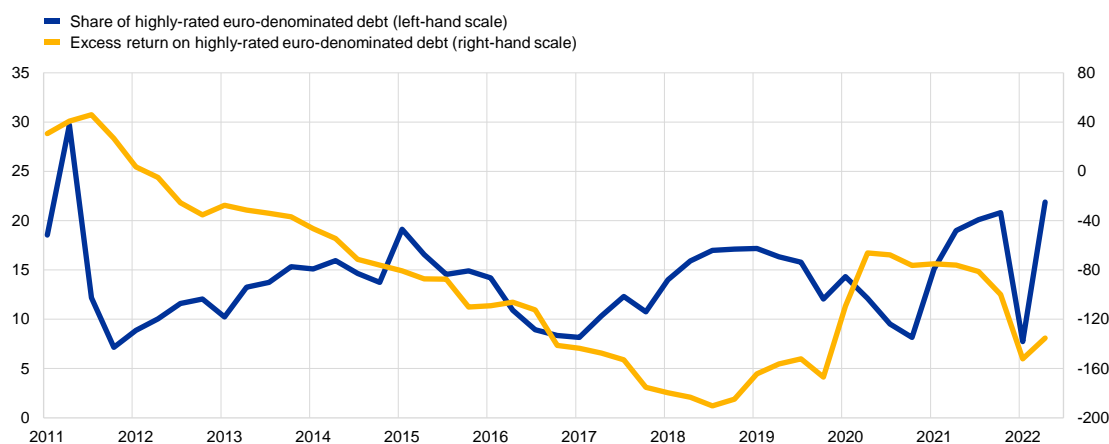
movements.²⁴ Netting out these effects is important to identify *active* portfolio rebalancing by fund managers, which gives rise to actual sales or purchases of debt securities. The resulting measure can then be used to estimate the sensitivity of portfolio rebalancing decisions to changes in relative yields.

Chart A

The share of euro-denominated government debt securities issued by highly-rated euro area sovereigns in the portfolio of globally active US mutual funds is imperfectly correlated with excess returns on these debt securities

Share of highly-rated euro-denominated government debt securities in total fund portfolio of safe assets and excess return on highly-rated euro area government debt securities

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



Sources: BIS, Refinitiv Lipper, Refinitiv Eikon and ECB calculations.

Notes: The share of highly-rated euro-denominated debt is computed for the full sample of mutual funds as the aggregate amount of Austria, Belgium, France, Germany and the Netherlands in funds' portfolios, divided by the aggregate amount of all sovereign debt securities issued by Australia, Austria, Belgium, Canada, France, Germany, Japan, the Netherlands, New Zealand, Switzerland, the United Kingdom and the United States in the portfolios of the funds in the sample. The excess return for the euro area is defined as the average yield (averaged across different maturities up to five years) of debt securities issued by Austria, Belgium, France, Germany and the Netherlands, weighted by debt market capitalisation, minus the weighted (by portfolio shares) average of yields of other countries in the portfolios.

To investigate whether search for yield influences *active* portfolio rebalancing by fund managers, an empirical model is estimated. It consists of regressing the share of euro-denominated government debt securities issued by highly-rated euro area sovereigns on its own lag, excess returns, and valuation effects caused by changes in bond prices and exchange rate movements against the US dollar, the reference currency of the portfolio.²⁵ According to the estimates, an increase by 100 basis points in the yields of highly-rated euro area debt securities relative to yields on debt of other

²⁴ See, for example, Bubeck, J., Habib, M. and Manganelli, S. (2018), "The portfolio of euro area fund investors and ECB monetary policy announcements", *Journal of International Money and Finance*, Vol. 89, Issue C, pp. 103-126 and Bacchetta, P., Tièche, S. and van Wincoop, E. (2023), "International portfolio choice with frictions: evidence from mutual funds", *Review of Financial Studies*.

²⁵ All the explanatory variables are fund-specific and weighted relative to the shares of other countries in the portfolio of each fund. We include fund and time fixed effects to capture the idiosyncratic component of euro area excess returns, purged from aggregate demand shocks that might bias the coefficient of interest. The estimated model equation is $s_{i,t}^{EA} = \alpha_i + \gamma_t + \beta_1 s_{i,t-1}^{EA} + \beta_2 r_{i,t}^{x,EA} + \beta_3 \Delta s_{i,t}^{EA,P,R} + \beta_4 \Delta s_{i,t}^{EA,P,RR} + \varepsilon_{i,t}$. The variable $s_{i,t}^{EA}$ denotes fund i 's share of euro area highly-rated government debt in quarter t ; α_i and γ_t denote fund and time fixed effects, respectively; $r_{i,t}^{x,EA,unh}$ denotes the excess return of highly-rated euro area government debt with respect to the weighted average return of other countries in the advanced economy sovereign debt portfolio; $\Delta s_{i,t}^{EA,P,R}$ and $\Delta s_{i,t}^{EA,P,RR}$ denote changes in the euro area portfolio share caused by price and exchange rate valuation effects respectively; and $\varepsilon_{i,t}$ denotes the error term. Finally, it is assumed that exchange rates follow a random walk so that expectations regarding their future path equal their current value and do not influence the currency allocation.

reserve currency issuers leads to an increase in the euro area share of over 1 percentage point on average across funds (**Chart B**). This amounts to a total reallocation of around USD 300 million in each quarter, corresponding to almost 2 percentage points of total foreign flows into highly-rated euro area government debt securities in the sample, according to balance of payments – a non-negligible effect, bearing in mind that the analysis abstracts from transactions by retail and institutional investors.²⁶

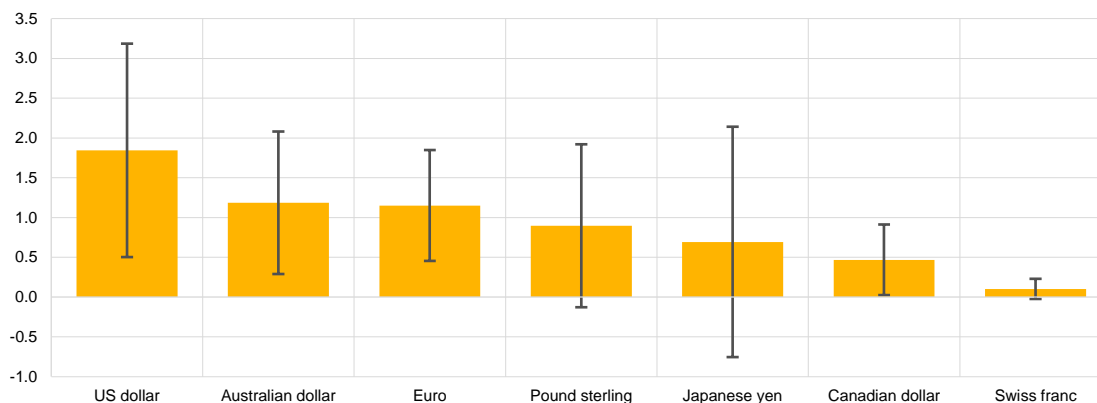
The empirical analysis can be extended to the share of other currencies in the funds’ portfolio of government debt securities issued by highly-rated issuers. **Chart B** shows that the effect of yields on government debt securities on active portfolio rebalancing by fund managers differs across currencies. Higher relative returns on US Treasuries result in rebalancing decisions that are 60% stronger than for euro-denominated government debt. There is also statistically significant evidence of search for yield in government debt denominated in Australian dollars and Canadian dollars. This is in line with evidence from a recent study on the determinants of portfolio rebalancing decisions of official reserve managers – i.e. not mutual funds as in this box – possibly suggesting that they are increasingly following similar investment strategies.²⁷ Finally, estimated coefficients of the impact of excess returns on the share of government debt securities denominated in Japanese yen, pound sterling and Swiss francs are not statistically significant.

Chart B

Excess returns lead to active reallocations into government debt denominated in US dollars, Australian dollars and euro

Estimated coefficients from panel regression

(regression coefficients)



Sources: BIS, Lipper for Investment Management, Refinitiv Lipper Global Data Feed, Refinitiv Eikon and ECB calculations.

Notes: Estimates of the coefficient β_2 from the regression $s_{i,t}^j = \alpha_i + \gamma_t + \beta_1 s_{i,t-1}^j + \beta_2 r_{i,t}^{X,j} + \beta_3 \Delta s_{i,t}^{j,P,R} + \beta_4 \Delta s_{i,t}^{j,P,XR} + \varepsilon_{i,t}$ estimated separately for $j \in \{\text{Australian dollar, Canadian dollar, euro, Japanese yen, pound sterling, Swiss franc and US dollar}\}$. The error bars represent 95% confidence intervals based on Driscoll-Kraay standard errors, which account for heteroskedasticity and cross-section and time series correlation in the error term.

To conclude, US mutual funds have non-negligible exposures to euro-denominated government debt securities issued by euro area sovereigns that are highly-rated, which underscores their importance as safe asset vehicles for US and global investors. Exposures change substantially over time as fund managers actively rebalance their holdings in response to changes in relative yields in

²⁶ Mixed funds, investing in both equity and debt securities, are not covered in this analysis. Their inclusion would further expand the portfolio of debt securities held by US mutual funds.

²⁷ See Arslanalp, S., Eichengreen, B. and Simpson-Bell, C. (2022), “The Stealth Erosion of Dollar Dominance and the Rise of Nontraditional Reserve Currencies”, *Journal of International Economics*, Vol. 138, No 103656.

their portfolios. This suggests that yield differentials have an influence on the global appeal of the euro as an investment currency.²⁸

Box 3

Valuation effects and rebalancing of official foreign exchange reserves

Prepared by Tamar den Besten, Massimo Ferrari Minesso and Maurizio Michael Habib

Movements in the exchange rates of major reserve currencies as well as in the market prices of securities held by central banks may have a significant impact on the currency composition of official foreign exchange reserves, when measured at current exchange rates. For instance, a broad US dollar appreciation, as was the case in 2022, mechanically increases the share of the US dollar, as other currencies lose value against that currency. Similarly, if yields increase, the market value of bonds falls, leading to a stronger decline in the value of reserve assets denominated in currencies experiencing the largest decreases in bond prices. These developments, as noted by Chinn et al. (2022)²⁹, confound active reserve management strategies through changes in the value of the underlying assets. This box reviews the evidence of the importance of these valuation effects for the adjustment of currency portfolios by reserve managers against the background of large fluctuations in exchange rates and bond prices seen in the past year.

In 2022 the tightening monetary policy stance across advanced economies markedly increased risk-free rates at the global level and was associated with higher volatility in exchange rates and lower bond prices. The Federal Reserve System increased its policy rate by 4.5 percentage points, contributing to the marked appreciation of the US dollar of 8 percentage points in nominal effective terms. Higher policy rates transmitted to the longer end of the yield curve, leading to higher yields and lower prices of US bonds. For example, the yield on the US Treasury bond with a three-year maturity – the typical duration of bonds held as official reserves by central banks – increased by 2.6 percentage points, while the total return index for the corresponding maturity fell sharply for the first time in two decades (**Chart A, panel a**).³⁰ Monetary policy decisions in other advanced economies also helped increase bond yields elsewhere, with three-year yields increasing by more than 2 percentage points on average across G7 countries, with the exception of Japan, which kept its yield curve control policy unchanged over most of the review period.

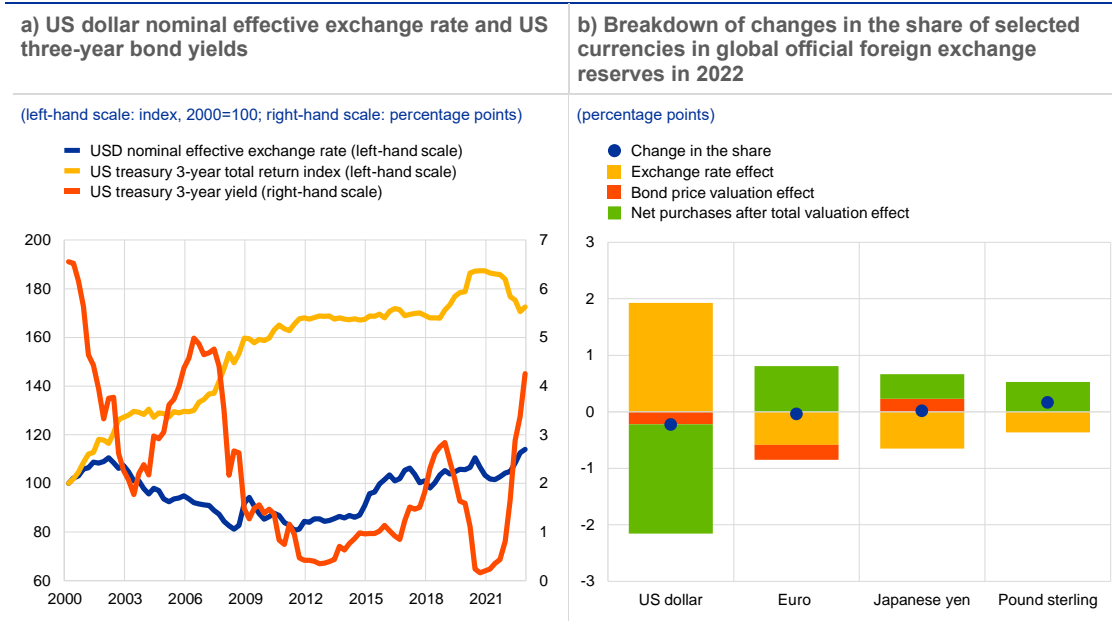
²⁸ See, for example, Du, W., Im, J. and Schreger J. (2018), “The U.S. Treasury Premium”, *Journal of International Economics*, Vol. 112, pp. 167-181 and Krishnamurthy, A. and Vissing-Jorgensen, A. (2012), “The Aggregate Demand for Treasury Debt”, *Journal of Political Economy*, Vol. 120, No 2, pp. 233-267.

²⁹ Chinn, M.D., Ito, H. and McCauley, R.N. (2022), “Do central banks rebalance their currency shares?”, *Journal of International Money and Finance*, Vol. 122, No 102557.

³⁰ According to the latest UBS Annual Reserve Manager Survey (June 2022), 70% of the respondents indicated an investment horizon of between one and five years for their portfolios.

Chart A

US interest rates rose sharply and the exchange rate of the US dollar appreciated in 2022, leading to significant valuation effects in the currency share of official foreign exchange reserves



Sources: IMF, Federal Reserve Board and ECB calculations.

Notes: See footnote 31 for an explanation of the underlying calculations of the valuation effects and net purchases. The latest observation in panel a is for 31 December 2022.

Because of the significant swings in bond prices and exchange rates that took place in 2022, changes in currency shares of global foreign exchange reserves measured at current exchange rates are influenced by large valuation effects.³¹ **Chart A, panel b** shows the breakdown of changes in the share of major reserve currencies by bond valuation effects, exchange rate valuation effects and net purchases in 2022.³² The strengthening of the dollar exchange rate against other currencies contributed to an increase in the share of the US dollar of almost 2 percentage points. Other key reserve currencies experienced large negative exchange rate valuation effects as the US dollar strengthened across the board. By contrast, the share of the euro and the Japanese yen in global foreign exchange reserves declined by around half a percentage point owing to these exchange rate valuation effects. Moreover, bond price valuation effects were negative for the US

³¹ Specifically, we account for valuation effects by netting out the change in bond valuations, interest rates and exchange rates from the total change in the value of official reserves. For currency i the valuation effect between period t and $t - 1$ can be expressed as: $V_t = \frac{R_{i,t-1}}{FX_{i,t}} (1 + k_{i,t-1}g_{i,t}) - \frac{R_{i,t-1}}{FX_{i,t-1}}$ where R denotes reserve assets held, FX denotes the bilateral exchange rate against the US dollar, k denotes the share of reserves held as securities and g denotes the average total return on the security portfolio between periods $t - 1$ and t . Subtracting these valuation effects from the change in the value of the stock of official reserves will result in the approximate net purchases in period t .

³² A detailed currency breakdown of reserve holdings is required to calculate valuation effects and estimate net purchases. The IMF COFER dataset provides details for eight major currencies (USD, EUR, JPY, GBP, CHF, AUD, CAD, and CNY) and reports the share of the remaining currencies as a residual component, which accounts for about 3% of total allocated reserves. As the precise currency composition of this residual is not public, it is excluded from the calculations. As a result, the magnitudes of the changes in the shares reported in this box differ slightly from those reported in the main text.

dollar and the euro, as yields on bonds denominated in both currencies rose faster than on those denominated in other official reserve currencies.³³

Official reserve managers tried to manage their portfolios actively to offset the effect of exchange rate movements in 2022. The green bars in **Chart A, panel b** suggest that the impact of the appreciation of the US dollar on foreign reserve shares was offset by net sales of US dollar assets and by net purchases of reserve assets denominated in currencies other than the US dollar. In fact, official reserve managers were net *sellers* of assets in US dollars in 2022 to the tune of around USD 293 billion, the largest net sales (in value terms) since 2000.³⁴ These sales would have translated into a decline of almost 2 percentage points in the share of the dollar in global official foreign exchange reserves in the absence of other effects. Foreign exchange interventions, where central banks use their foreign exchange reserves to influence the level or volatility of their exchange rate, accounted for a fraction of the net sales of US dollars in the review period. For instance, between September and October 2022, the Japanese authorities sold dollar reserves to purchase around JPY 9.2 trillion (more than USD 60 billion) in the foreign exchange market in a context of depreciation and volatility in the Japanese yen exchange rate against the US dollar, which they regarded as excessive. In the case of the euro, net purchases were positive, amounting to approximately €50 billion and contributing to a change in the share of the euro of almost 1 percentage point in 2022.

Developments in 2022 are illustrative of conventional reserve management strategies used by central banks. On a longer-term perspective, exchange rate fluctuations are the main drivers of valuation effects, while bond price changes play a much smaller role. **Chart B, panel a** shows the decomposition of changes in the share of euro-denominated reserves since 2000. Exchange rate effects, the yellow bars in the chart, account for most of the valuation effects and contributed to large increases in the share of the euro in 2002-03 and the significant decline in 2014-15. Valuation effects have been partially offset by net purchases of foreign currency reserves held in euro on 16 occasions over the past 23 years. However, the effects of exchange rate and bond price movements have rarely been fully offset. Developments for the US dollar are similar: exchange rate effects have been a major factor driving US dollar reserve shares and net purchases have partially offset these valuation effects.³⁵

Patterns in active management of reserve currencies shown so far are generally in line with the available evidence for US dollar reserves. Chinn et al. (2022) show that central banks tend to reduce (increase) their holdings of US dollar assets following a dollar appreciation (depreciation), although this only partially offsets the impact of exchange rate movements on their portfolios.

IMF COFER quarterly data can be used to extend the analysis of Chinn et al. (2022) to other major reserve currencies since 1999. The analysis also includes the impact of exchange rate and bond

³³ Note that for the contribution to changes in currency share, the direction of the valuation effects and net purchases depends on the *relative* strength of these effects across currencies. It may be the case that net purchases are positive for all currencies, say currencies A, B and C, but much stronger for currency A than for currency B or C. In relative terms, the contribution of net purchases to the change in the currency share will be positive for currency A and negative for currencies B and C.

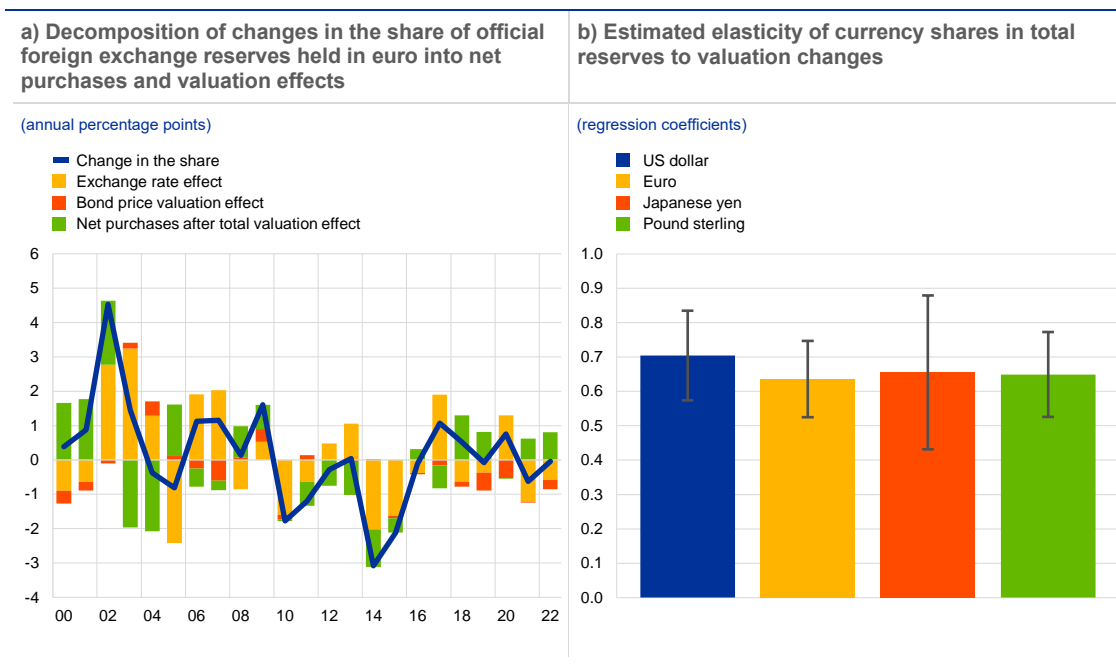
³⁴ Annual net sales of US dollar reserves have been quite rare historically. Since 2000, central banks sold dollar reserves over one calendar year only on four occasions. In relative terms, having been scaled by the stock of reserves in the previous year, the recent dollar sales in 2022 are second only to the depletion of dollar reserves in 2008 during the global financial crisis.

³⁵ The chart showing the decomposition of the annual changes in the US dollar share since 2000, not reported here, is to a large extent the mirror image of the chart for the euro, as these two currencies account for most global reserves and the bilateral EUR/USD exchange rate moves the euro and dollar shares in opposite directions.

valuation effects.³⁶ The average elasticity of reserve currency shares to these valuation effects can be estimated by regressing changes in reserve currency shares on changes in valuation effects. An estimated unity coefficient suggests that central banks let the currency composition of their reserve holdings move freely in response to valuation effects. A zero coefficient, instead, implies that central banks rebalance their portfolios fully to keep currency shares constant.

Chart B

Evolution of the share of euro in global reserve holdings and elasticity of reserve currencies to valuation effects



Source: IMF and ECB calculations.

Notes: See footnote 31 for an explanation of the underlying calculations of the valuation effects and net purchases. Elasticities are computed following Chinn et al. (2022) by estimating for each major reserve currency i the regression: $\Delta Reserve_{i,t} = \alpha + \beta \Delta V_{i,t} + \varepsilon_{i,t}$, where $\Delta V_{i,t}$ is a proxy for the change of the currency share owing to valuation effects. We use data from the first quarter of 1999 to the fourth quarter of 2022. The latest observation in both panels is for the fourth quarter of 2022.

Overall, the estimates suggest that patterns for the US dollar extend to other major reserve currencies, including the euro. Official reserve managers partially rebalance their reserves in US dollars as well as reserves in euro, pound sterling and Japanese yen. As shown in **Chart B, panel b**, all coefficients are statistically different from zero and from one, meaning that rebalancing further to changes in the value of reserve assets is only partial. We find no evidence that the elasticity significantly differs across major reserve currencies, as confidence intervals overlap across all currencies considered. The coefficients range between 0.6 and 0.7, implying that valuation effects largely explain quarterly changes in currency shares, while 30% to 40% of these are offset by active portfolio management.

All in all, valuation effects tend to exert a dominant influence on changes in the shares of major reserve currencies at short frequencies. The developments observed in 2022 were in line with

³⁶ We define the change in the total valuation effect for country c as: $\Delta V_t = \frac{R_{i,t-1}(1+k_{i,t-1}\theta_{i,t})}{\sum_c^c \frac{R_{c,t-1}}{FX_{c,t}}(1+k_{c,t-1}\theta_{c,t})} - \frac{R_{i,t-1}}{FX_{i,t-1}} - \frac{R_{c,t-1}}{\sum_c^c \frac{R_{c,t-1}}{FX_{c,t-1}}}$. We consider the period between the first quarter of 1999 and the fourth quarter of 2022.

historical regularities: the strong appreciation of the US dollar was offset by net sales of US dollar assets and net purchases of assets denominated in other major reserve currencies.

2.2 The euro in global foreign exchange markets

The euro remained the second most actively traded currency in global foreign exchange markets after the US dollar. The share of the euro in global foreign exchange settlements increased slightly in 2022, according to data from the CLS system, standing at almost 38% in the fourth quarter of 2022 ([Chart 7, panel a](#)) – an increase of almost 3 percentage points from the previous year when measured at constant exchange rates.³⁷ By contrast, the share of the US dollar decreased by more than 6 percentage points, although the US dollar remained the leading currency in global foreign exchange settlements – being involved in almost 90% of all settlements in the fourth quarter of 2022.³⁸ Volumes of euro settlements increased by over 20% in the fourth quarter of 2022 compared with the previous year, consistent with trends in the past few years ([Chart 7, panel b](#)).

The latest evidence from the Triennial Central Bank Survey of foreign exchange and over-the-counter (OTC) derivatives markets, conducted by the BIS in April 2022, showed that the share of the euro decreased by 1.8 percentage points compared with the previous survey conducted in 2019 ([Chart 8, panel a](#)).³⁹ Global foreign exchange turnover increased by 14% compared with 2019, reaching USD 7.5 trillion. Overall, the US dollar remained the most used currency, being on one side of almost 90% of total OTC transactions, a share that is broadly stable compared with earlier surveys. Meanwhile, the euro was used in 31% of all trades, thereby remaining the second most actively traded currency.⁴⁰ Volumes of OTC trade in euro increased by USD 167 billion (or about 8%) relative to 2019, compared with even stronger increases for the US dollar and the Chinese renminbi of USD 830 billion (or about 14%) and USD 241 billion (or about 85%) respectively. The Chinese renminbi thus exhibited the largest increase in market share since the 2019 survey, being on one side of 7% of all trades in 2022 (up from 4% in 2019) to become the fifth most traded currency. The Japanese yen and pound sterling were on one side of 17% and 13% of all trades respectively, largely unchanged compared with the previous survey. Global foreign exchange trading activity involving the euro is concentrated in the United Kingdom, which accounts for more than 42% of total trading, as well as in the United States, the euro area, Hong Kong SAR, Singapore and Switzerland ([Chart 8](#),

³⁷ CLS is operated by CLS Bank International, a specialised financial institution providing settlement services for its members in the foreign exchange market. Although not all foreign exchange transactions are settled in CLS, which partly reflects the fact that the foreign exchange market is largely decentralised, it has been estimated that over 50% of eligible global foreign exchange transactions are settled in CLS. This suggests that data on activity in CLS might be indicative of broader market trends.

³⁸ Since transactions in foreign exchange markets always involve two currencies, shares add up to 200%.

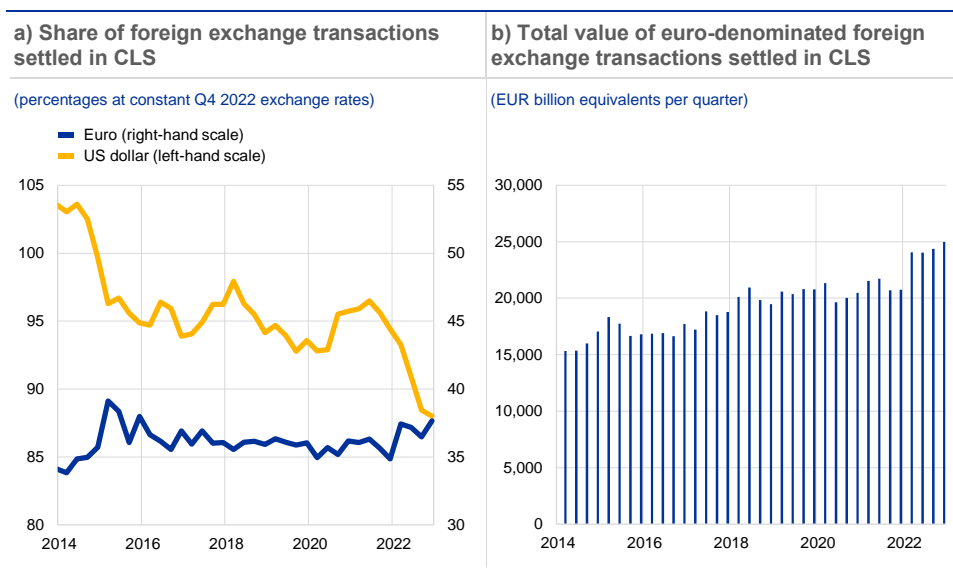
³⁹ See the BIS [Triennial Central Bank Survey: OTC foreign exchange turnover in April 2022](#), October 2022. Compared with CLS data, which cover 18 major currencies, the BIS triennial survey is more comprehensive and includes, among others, the trading of the Chinese renminbi, which is not covered by CLS. The strong growth in renminbi trading could explain differences in the relative shares of currencies in CLS data and the BIS Triennial Survey.

⁴⁰ The USD/EUR is the most liquid currency pair, accounting for around 23% of all transactions.

panel b). Relative to the 2019 survey, euro foreign exchange (FX) trading activity in the United Kingdom contracted by 6 percentage points, standing close to the level prevailing at the time of the 2016 Brexit referendum.

Chart 7

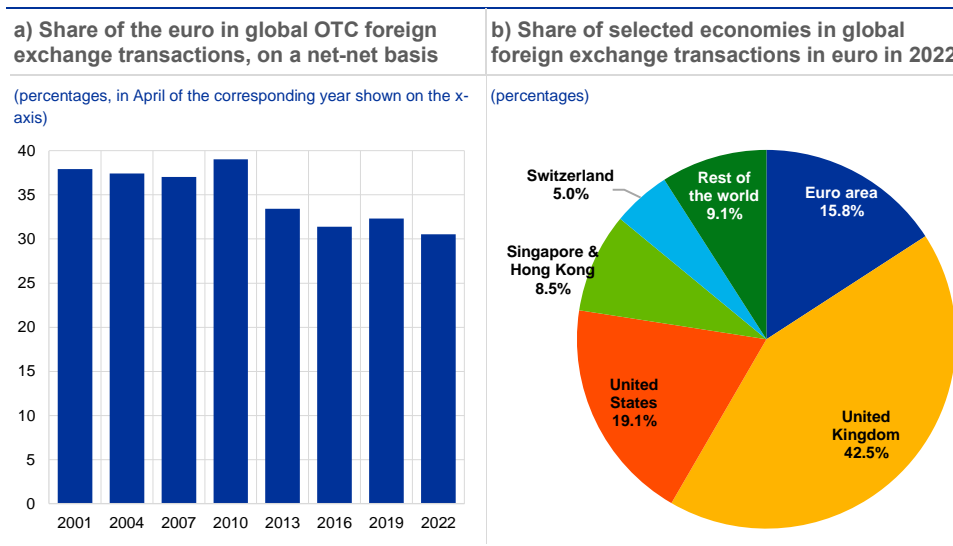
The euro remained the second most important currency in global foreign exchange settlements



Sources: ECB calculations based on CLS Bank International data.
 Note: As two currencies are involved in each transaction, the sum of the percentage shares of individual currencies totals 200% instead of 100%. The latest observation is for the fourth quarter of 2022.

Chart 8

The share of the euro in global OTC transactions decreased slightly in the latest BIS Triennial Survey compared with the previous survey



Sources: BIS and ECB calculations.
 Notes: As two currencies are involved in each transaction, the sum of the percentage shares of individual currencies totals 200% instead of 100%. Adjusted for local and cross-border inter-dealer double-counting (i.e. on a "net-net" basis). The data on geographical locations include spot transactions, outright forwards, foreign exchange swaps, currency swaps, options and other products. They are adjusted for local inter-dealer double-counting (i.e. on a net-gross basis) and may differ slightly from national survey data owing to differences in aggregation procedures and rounding. The BIS uses several criteria to determine the location of a foreign exchange transaction, notably the location of the initiating sales desk.

2.3 Use of the euro in international debt and loan markets

2.3.1 The euro in international debt markets

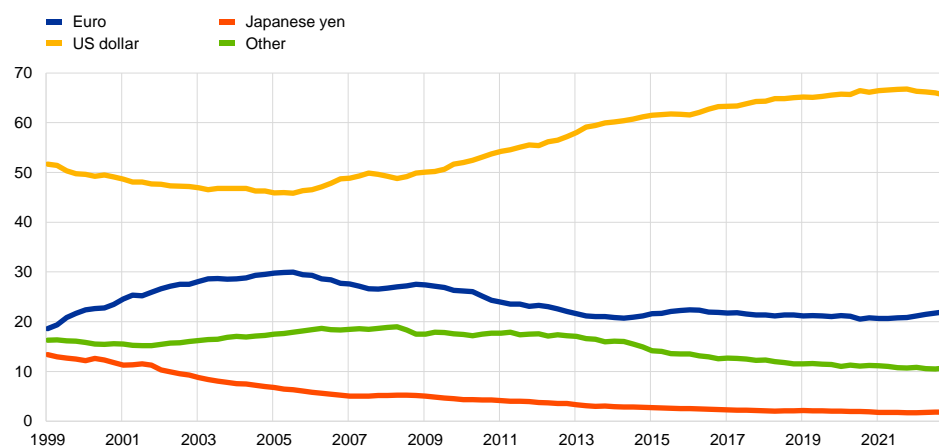
The share of the euro in the stock of international debt securities increased in 2022.⁴¹ When measured at constant exchange rates, the share of the euro in the stock of international debt securities stood at 22%, increasing by 1.2 percentage points in the review period. The share of the euro remains about 8 percentage points lower than its peak in the mid-2000s. By contrast, the share of the US dollar declined by about 1.2 percentage points, although it remains the leading currency in the international debt security markets, accounting for more than 65% of the global stock (Chart 9 and Table A4).

Chart 9

The share of the euro in the stock of international debt securities increased in 2022

Currency composition of outstanding international debt securities

(percentages; at constant Q4 2022 exchange rates)



Sources: BIS and ECB calculations.

Notes: Narrow measure. The latest observation is for the fourth quarter of 2022.

Granular data on international issuance of foreign currency-denominated bonds suggest that the volume of international bond issuance decreased markedly in 2022.⁴² In 2022 the total volume of foreign currency-denominated bond issuance contracted by more than USD 700 billion, corresponding to a decline of 30% in relative terms over the review period. This decline occurred amid market concerns about the economic outlook, tighter financial conditions in advanced economies and geopolitical fragmentation risks (Special Feature A). In particular,

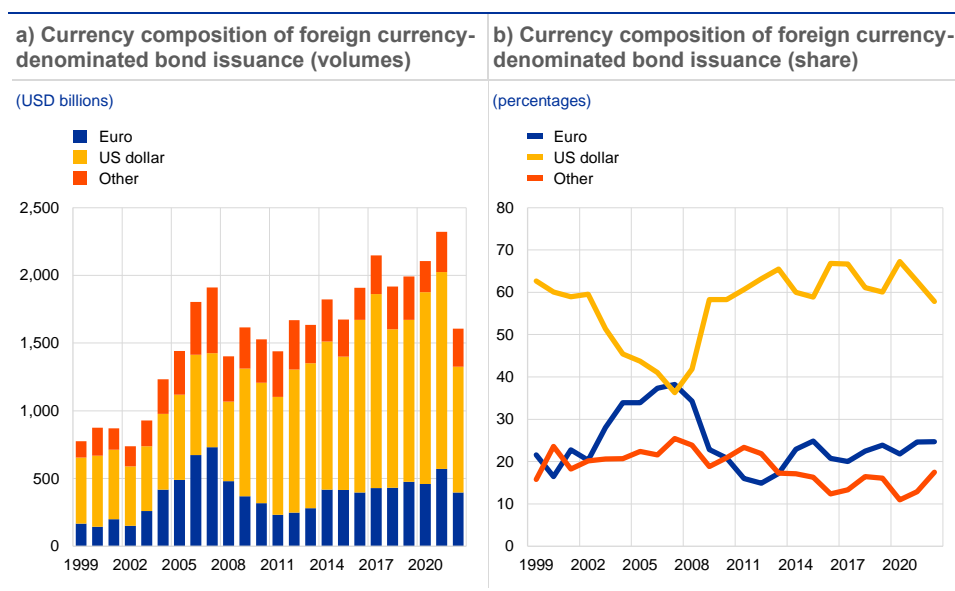
⁴¹ The discussion here is based on the “narrow” definition of international debt issuance, which focuses on the foreign currency principle. This definition therefore excludes all domestic currency issuance, i.e. all securities denominated in the currency of the economy in which the issuer resides, from the standard (also known as “broad”) definition of international debt issuance. For instance, the narrow definition excludes a euro-denominated bond issued by a German company, whether issued outside the euro area (e.g. in the United States) or inside the euro area (e.g. in France).

⁴² The fact that the data on the share of the euro in foreign currency-denominated bond issuance reveal a different pattern to the data on the stock of international debt securities may be because the latter also depend on net redemptions and developments in money market instruments.

the issuance of euro-denominated bonds decreased by about 30% in 2022 compared with the previous year, standing at €377 billion (USD 397 billion). However, the share of the euro in foreign currency-denominated bond issuance remained stable, at around 25% (**Chart 10, panel a**). Issuance of US dollar-denominated bonds (USD 930 billion in 2022) fell more markedly, by around 36% year on year, reducing the share of the dollar in international bond issuance by 5 percentage points.⁴³ Despite these developments, the US dollar remains by far the leading currency for international issuance of foreign currency-denominated bonds, accounting for more than 57% of total issuance in the review period (**Chart 10, panel b**). Notably, the share of currencies other than the US dollar and the euro increased to around 17%.

Chart 10

The share of the euro in international issuance of foreign currency-denominated bonds remained stable in 2022



Sources: Dealogic and ECB calculations.
Note: The latest observation is for end-2022.

The retrenchment in euro-denominated international bond issuance was mainly driven by lower issuance in the United Kingdom, the United States and emerging markets. Issuance of euro-denominated international bonds contracted by 72% among emerging market economies in 2022 and by more than 40% in the United States, the United Kingdom and Japan (**Chart 11, panel b**). At the same time, in non-euro area EU Member States and other advanced economies, issuance of euro-denominated bonds increased by 6 and 8 percentage points respectively. Issuance of US dollar-denominated bonds in emerging market economies declined by 55% (**Chart 11, panel a**).⁴⁴ The retrenchment might have arisen from higher interest rates and financing costs in advanced economies, combined with heightened volatility in bond markets. This might have in turn dampened demand for foreign

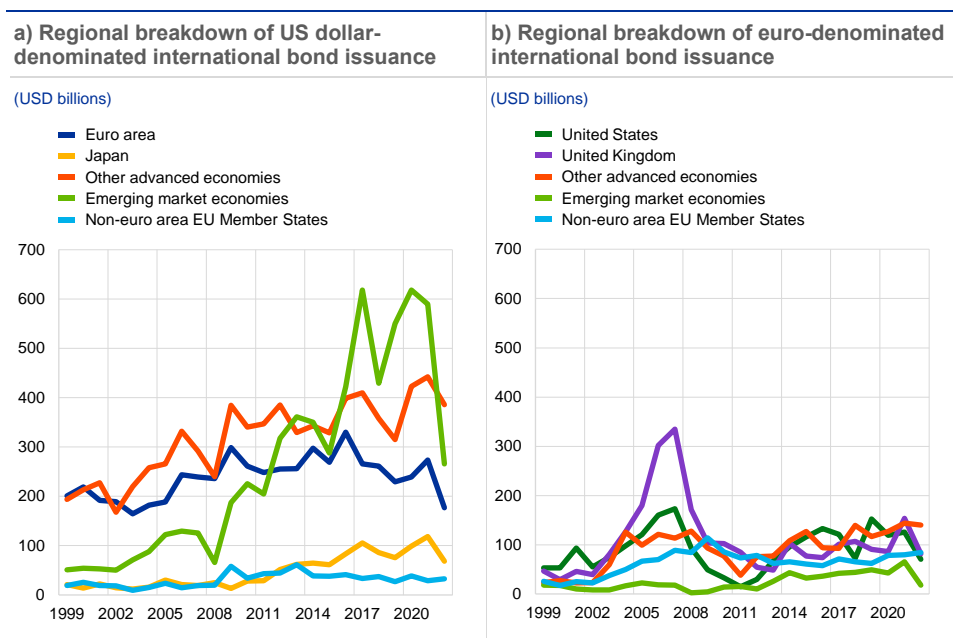
⁴³ Issuance in currencies other than the US dollar and the euro also decreased by about 6 percentage points (USD 17 billion).

⁴⁴ Issuance of US dollar-denominated bonds also declined in the euro area (-35%), Japan (-42%) and across other advanced economies (-13%).

currency-denominated debt issued by emerging market economies. The impact of Brexit on the role of the City of London as a centre for the intermediation of foreign currency-denominated funding might also explain the lower issuance of euro and US dollar-denominated debt in the United Kingdom (**Box 4**).

Chart 11

Issuance of euro and US dollar-denominated bonds declined in emerging market economies in 2022



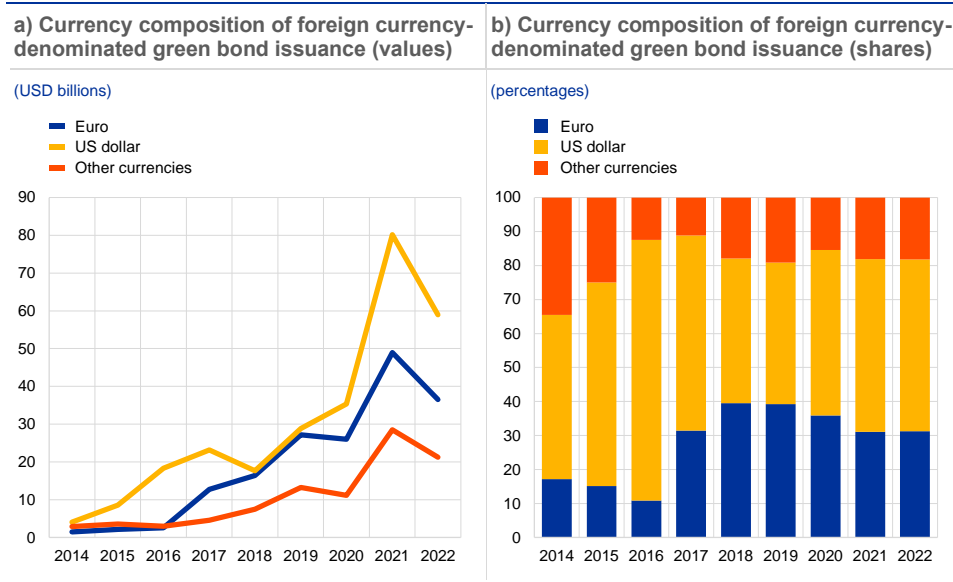
Sources: Dealogic and ECB calculations.
Note: The latest observation is for end-2022.

International issuance of green bonds also decreased substantially in the review period.⁴⁵ In absolute terms, the amount of international green bonds issued in major currencies contracted by about USD 41 billion (**Chart 12, panel a**). Issuance of green bonds denominated in euro decreased by €11 billion (USD 12 billion) for a total issuance of about €34 billion (USD 36 billion) in 2022. US dollar-denominated issuance also fell from USD 80 billion to USD 59 billion. In relative terms, the shares of euro and US dollar-denominated green bonds remained stable, with the two currencies accounting for about 31% and 51% of total issuance respectively.

⁴⁵ International issuance of green bonds refers to issuance in a foreign currency based on the nationality of the issuer or the parent entity of the issuer.

Chart 12

International green bond issuance retrenched in 2022, although the share of the euro in total issuance remained stable



Sources: Dealogic and ECB calculations.

Notes: Annual totals are based on the aggregation of individual deals. The latest observation is for end-2022.

2.3.2 The euro in international loan and deposit markets

The share of the euro in the outstanding stock of international loans continued to increase in 2022. Euro-denominated international loans increased by about 2.4 percentage points in the review period, when measured at constant exchange rates (**Chart 13** and **Table A6**).⁴⁶ The share of the euro in 2022, at around 19%, is close to its historical peak of about 20% seen in 2005. By contrast, the share of the US dollar in international loan markets continued to decline, although the US dollar remains the leading currency in international loan markets by a large margin, accounting for about 53% of total loans. Geographical distance or complementarities with trade invoicing patterns tend to affect demand for euro-denominated and, to a lesser extent, dollar-denominated international loans (**Special Feature C**).

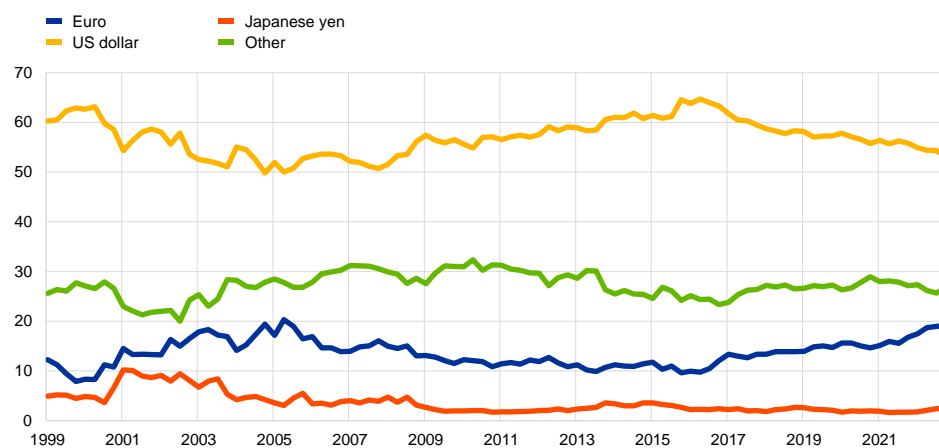
⁴⁶ International loans are defined as loans by banks outside the currency area to borrowers outside the currency area. For instance, "international loans in euro" refers to all euro-denominated loans by banks outside the euro area to borrowers outside the euro area.

Chart 13

The share of the euro in outstanding international loans remained close to historical peaks

Currency composition of outstanding amounts of international loans

(percentages; at constant Q4 2022 exchange rates)



Sources: BIS and ECB calculations.

Notes: The latest observation is for the fourth quarter of 2022. International loans are defined as loans by banks outside the currency area to borrowers outside the currency area.

The share of outstanding international deposits denominated in euro

continued to increase in 2022. The share of the euro rose by about 1.5 percentage points over the review period, when measured at constant exchange rates, standing at almost 18% (**Chart 14** and **Table A7**).⁴⁷ By contrast, the share of US dollar-denominated deposits declined by about 1.4 percentage points in 2022 as investors reduced holdings of dollar-denominated deposits accumulated as liquid balances during the pandemic.⁴⁸ However, despite a marginal decline in 2022, the share of US dollar-denominated international deposits remained close to pre-pandemic levels, at around 52% of total international deposits.

⁴⁷ The definition of international deposits is equivalent to the definition of international loans. International deposits are defined as deposits with banks outside the currency area made by creditors from outside the currency area. For instance, international deposits in euro correspond to all euro-denominated deposits with banks outside the euro area made by creditors from outside the euro area.

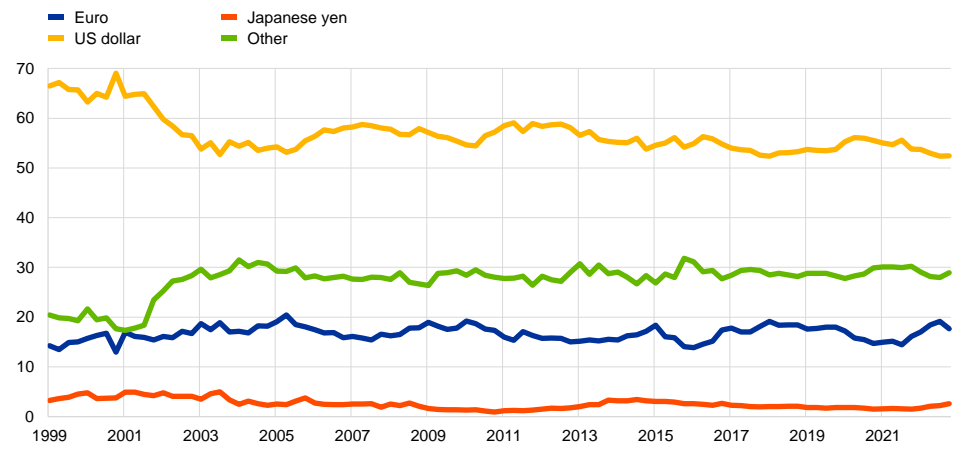
⁴⁸ See “[International role of the euro](#)”, European Central Bank, Frankfurt am Main, June 2022.

Chart 14

The share of the euro in outstanding international deposits increased further in 2022

Currency composition of outstanding amounts of international deposits

(percentages; at constant Q4 2022 exchange rates)



Sources: BIS and ECB calculations.

Notes: The latest observation is for the fourth quarter of 2022. International deposits are defined as deposits with banks outside the currency area from creditors outside the currency area.

Box 4

Impact of Brexit on the international role of the euro

Prepared by Matthias Rau-Goehring

This box presents an early assessment of the changing role of the City of London for euro-denominated financial activities since Brexit.⁴⁹ Since its introduction in 1999, the City of London has been the leading financial centre for the international use of the euro in several market segments.⁵⁰ The decision of the United Kingdom in June 2016 to leave the EU was therefore seen as the portent of a potential change in the central role of the City of London for global financial markets.⁵¹ This event was particularly relevant for euro financial activities that benefit from a harmonisation of rules and standards with the EU, such as trading in foreign exchange and OTC derivatives and banking

⁴⁹ This box draws on and updates some of the data first discussed in BIS (2022), “London as a financial centre since Brexit: evidence from the 2022 BIS Triennial Survey”, *BIS Bulletin*, No 65. The author is grateful to Jakub Demski, Robert N. McCauley and Patrick McGuire for discussions and assistance regarding the data, as well as Guy-Charles Marhic, Alexandra Born and Claudia Lambert for discussions and helpful comments.

⁵⁰ See “The euro’s contribution to financial market activity in the City of London” in ECB (2003), “Review of the international role of the euro”.

⁵¹ The most important milestones in the Brexit timeline include the United Kingdom’s vote to leave the EU on 23 June 2016, the agreement on a transition phase on 19 March 2018, the EU’s approval of postponing the Brexit date on 29 October 2019 and the end of the Brexit transition period on 31 December 2020.

services.⁵² Data on these activities thus far, however, show no major shifts in the importance of the City of London for euro-denominated financial market segments, with some exceptions.⁵³

In international banking, the expiry of the Brexit transition phase at the end of 2020 implied the discontinuation of the passporting regime. This directly impacted cross-border financial services – including euro-denominated services – provided to the EU single market. From a regulatory perspective, the United Kingdom’s exit from the EU in early 2021 implied its immediate reclassification as a non-EU country. This meant that UK-based banks wanting to provide services in the EU could no longer do this via passporting. Instead, they either would need to set up a subsidiary within the EU or alternatively rely on non-EU branches operating under national supervisory regimes, which cannot, however, provide services across the EU. In addition, the EU-UK Trade and Cooperation Agreement includes very limited commitments on financial services. The United Kingdom and UK-based international banks and financial service providers set up new subsidiaries in the EU-27, some of which fall under the direct supervision of European banking supervision, and to a lesser extent rely on third-country branches.⁵⁴ In that context, European banking supervision strictly follows its set of supervisory expectations, developed in 2018, on the relocation of international banks to the euro area.⁵⁵ This particularly concerns the “no empty shell” policy, under which foreign banks are requested to have suitable risk management capacities in line with their subsidiary’s level of risk.

More generally, in areas where an equivalence framework exists, cross-border financial services depend on unilateral equivalence decisions. Currently the EU has only granted temporary equivalence for UK central counterparties (CCPs) until June 2025, in line with the 2019 European Commission’s Communication on equivalence and based on recommendations by the European Supervisory Authorities.⁵⁶ In the future, further relocation of euro-denominated clearing activities from London to the EU can be expected in relation to measures aimed at reducing dependence on systemic non-EU CCPs and building EU-based clearing capacity.⁵⁷

Banks that are resident in the United Kingdom continue to play a major role. **Special Feature C** signals that UK-resident banks remain central to the international network of loans denominated in euro, with potential signs of a Brexit effect in lending to non-bank financial intermediaries. In addition, they account for the largest share of euro-denominated cross-border assets and liabilities outside the euro area (see **Chart A, panel a**). The latest observation gives UK-resident banks a

⁵² See EY Financial Services (2017): “Brexit Tracker”, PricewaterhouseCoopers (2016): “What does Brexit mean for London, the UK and Europe?” and New Financial (2016) “[The potential impact of Brexit on European capital markets](#)”. Estimates predicted that the removal of passporting rights and the loss of regulatory equivalence could lead to a 30% shift in operations, the moving of 13% of staff (of a total of 400,000) and an additional 13,000 financial sector jobs at risk in London.

⁵³ In early 2021, equity trading of EU-listed corporates saw an abrupt relocation from the City of London, mainly to Amsterdam. This was the result of the European Commission not recognising UK exchanges as having the same supervisory status as EU exchanges. The implications of Brexit for the real economy, particularly for trade and labour markets, have been more pronounced (see the article entitled “[The impact of Brexit on UK trade and labour markets](#)” in Issue 3/2023 of the ECB Economic Bulletin).

⁵⁴ See blog post by Andrea Enria: “[The desks mapping review – integrating Brexit banks into European banking supervision](#)”, *The Supervision Blog*, Frankfurt am Main, May 2022.

⁵⁵ See [Supervisory expectations on booking models](#).

⁵⁶ See the European Commission’s Communication: “[Equivalence in the area of financial services](#)”, Brussels, 29 July 2019.

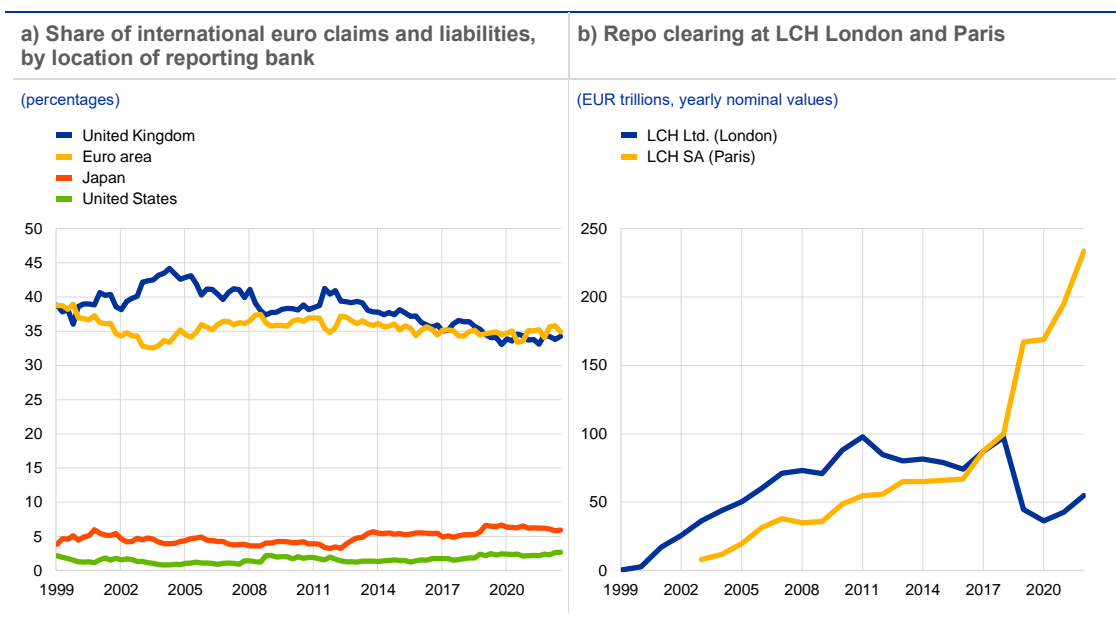
⁵⁷ See the European Commission’s proposal for a Directive: “[Capital markets union: clearing, insolvency and listing package](#)”, December 2022.

34% share of euro-denominated international positions, only slightly (2 percentage points) below the level observed at the time of the Brexit vote in 2016.

However, euro area countries combined outstripped London in 2019, which can be attributed to the shift in euro repo clearing from London’s LCH Ltd. to its French subsidiary LCH SA in Paris (**Chart A, panel b**). This move is largely motivated by commercial considerations to consolidate euro repo and bond clearing in Paris to leverage on synergies with TARGET2-Securities.⁵⁸ In addition, following the decision of London’s ICE Clear Europe Ltd. to close down its clearing service for credit default swaps, a significant migration of euro-denominated credit default swaps to LCH SA in Paris has taken place.⁵⁹

Chart A

Evidence on the impact of Brexit on international banking and euro-denominated repo clearing



Sources: BIS locational banking statistics, LCH Group and ECB calculations.

Notes: Banks' cross-border and local (in euro) claims and liabilities combined, including loans and debt securities, but excluding derivatives. Figures have been adjusted to remove the impact of a break in series in the first quarter of 2018, when LCH SA joined the population of reporting institutions.

Turning to foreign exchange transactions, the latest BIS Triennial Central Bank Survey confirmed London’s dominant position in euro foreign exchange trading (**Chart B, panel a**). The UK financial markets accounted for around 42% of total transactions involving the euro in 2022. That is 6 percentage points lower than in the 2019 survey, but close to the level prevailing at the time of the 2016 Brexit referendum. This points to the City of London’s strengths in foreign exchange markets in terms of liquidity, legal system, market infrastructure and time zone. The United Kingdom remains more important for euro-denominated foreign exchange trading than the next five most significant financial centres (the United States, Singapore, Switzerland, Hong Kong and Japan) combined. The combined share of euro area financial centres in foreign exchange trading involving the euro increased from 13% in 2019 to 16% in 2022, in third position after the United Kingdom and the United States in this market segment.

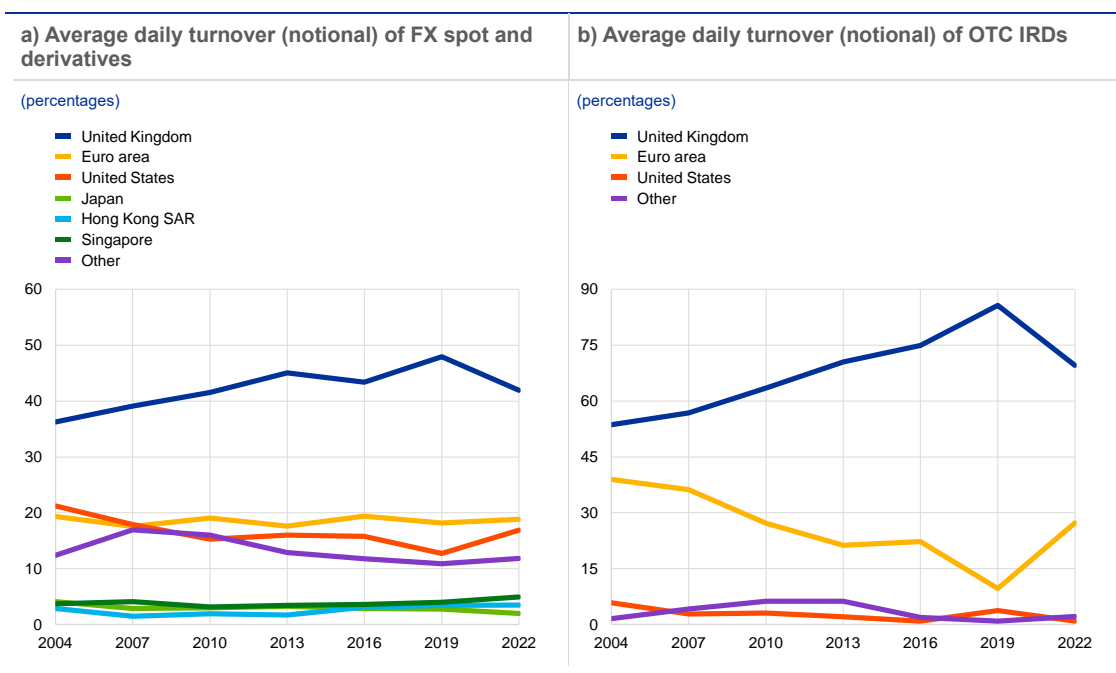
⁵⁸ See LCH press release: “[Corentine Poilvet-Clediere appointed Head of RepoClear and Collateral Management, LCH SA](#)”, January 2019.

⁵⁹ See ICE Clear Europe press release: “[Circular C22/076 Cessation of clearing of CDS Contracts](#)”, June 2022.

One market segment which has seen notable decreases in euro-denominated activity since Brexit is the trading of OTC interest rate derivatives (IRDs). In line with its leading role in global foreign exchange markets, the City of London is still the principal trading centre for euro-denominated IRDs (mainly swaps and options; **Chart B, panel b**). However, its share in global trading of these instruments declined by almost one-fifth between the 2019 and 2022 surveys, to a level last seen ten years ago.⁶⁰ To a large extent, euro area financial centres have replaced the United Kingdom in this segment, increasing their share by the same margin.

Chart B

Average daily turnover (notional) of euro-denominated foreign exchange (FX) and over-the-counter (OTC) interest rate derivatives (2004-22)



Sources: BIS Triennial Central Bank Survey of foreign exchange and OTC derivatives markets and ECB calculations.
 Notes: Foreign exchange transactions are net of local inter-dealer double-counting. Panel a shows the share of the average daily turnover (notional) in the total, on a net-gross basis, of foreign exchange spot, swaps, forwards and options. Panel b shows OTC IRDs including forward rate agreements, interest rate swaps and options. Corrected for local but not cross-border inter-dealer double-counting (i.e. "net-gross" basis).

To conclude, the role of the City of London for the international role of the euro is likely to evolve over the coming years, driven by future regulatory considerations both in the United Kingdom and the EU.⁶¹ So far, there seem to be no major changes in market segments in which the United Kingdom is the largest non-euro area financial centre for the euro, with the potential exceptions of equity trading of EU-listed corporates, cross-border bank lending to non-bank financial intermediaries and euro OTC IRDs. This might, as regards central clearing, reflect the temporary regulatory arrangements which remain in place, such as the temporary regulatory equivalence for CCPs until June 2025. Future developments will depend (i) on the outcome of the ongoing EU legislative process that aims to reduce excessive reliance on UK CCPs and build up EU clearing capacity, (ii) on the extent to which EU and UK regulators can move towards more formal

⁶⁰ In contrast to OTC derivatives, the geography of exchange-traded IRDs has not changed after Brexit, with the United Kingdom accounting for about 82% of total transactions involving the euro.

⁶¹ See also Bergbauer, S. et al. (2020), "Implications of Brexit for the EU financial landscape", in ECB (2020), "Financial Integration and Structure in the Euro Area".

cooperation, and (iii) on the degree of divergence by EU and UK legislators with respect to regulatory changes ahead.

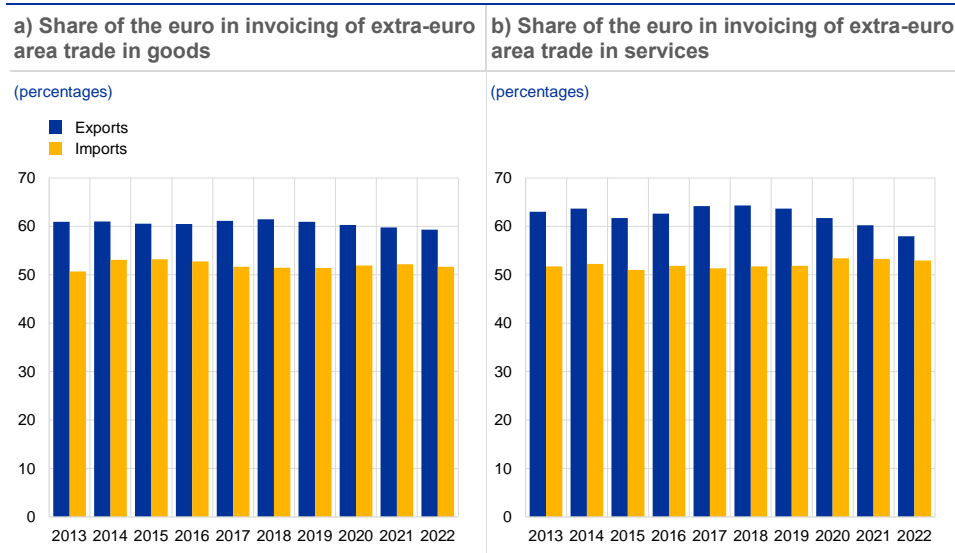
2.4 Use of the euro as an invoicing currency

The share of the euro as an invoicing or settlement currency for extra-euro area trade, in particular services exports, remained broadly stable in 2022.

Extra-euro area exports of goods invoiced in euro declined by half a percentage point in 2022 to around 59%, while the share of extra-euro area imports of goods invoiced in euro also dropped by half a percentage point to below 52% (Chart 15, panel a and Table A8). However, such changes remain marginal and, from a long-term perspective, the role of the euro as an invoicing currency for trade in goods remains by and large unchanged. Almost 58% of extra-euro area services exports were invoiced in euro in 2022, down from around 60% in the previous year. The share of exports of services invoiced in euro, similar to the euro-invoiced share of exports of goods, also reached a historical low, continuing the downward trend seen since 2018. Likewise, just below 53% of extra-euro area imports of services were invoiced in euro in 2022, down by about 0.3 percentage points compared with the previous year (Chart 15, panel b).

Chart 15

The share of euro as an invoicing currency of extra-euro area trade in goods and services was broadly stable in 2022



Sources: National central banks and ECB calculations.
 Note: The computation of the euro area aggregate is based on the latest observation reported by each Member State.

2.5 Use of euro banknotes outside the euro area

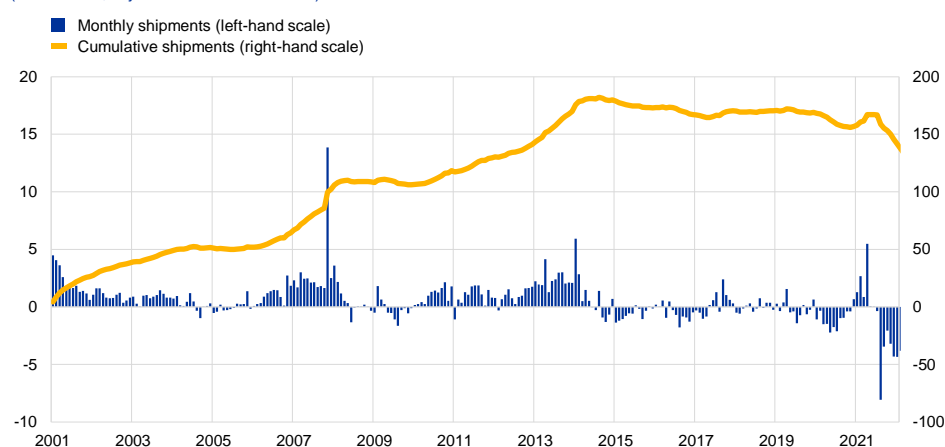
Cumulative shipments of euro banknotes to destinations outside the euro area decreased to a ten-year low in 2022. The value of net registered shipments of euro banknotes to destinations outside the euro area declined by about 11% over the review period, the largest year-on-year decline since the launch of the euro (see **Chart 16**).

Chart 16

Net extra-euro area shipments of euro banknotes saw an unprecedented decline in 2022

Net monthly shipments of euro banknotes to destinations outside the euro area

(EUR billions; adjusted for seasonal effects)



Source: Eurosystem.

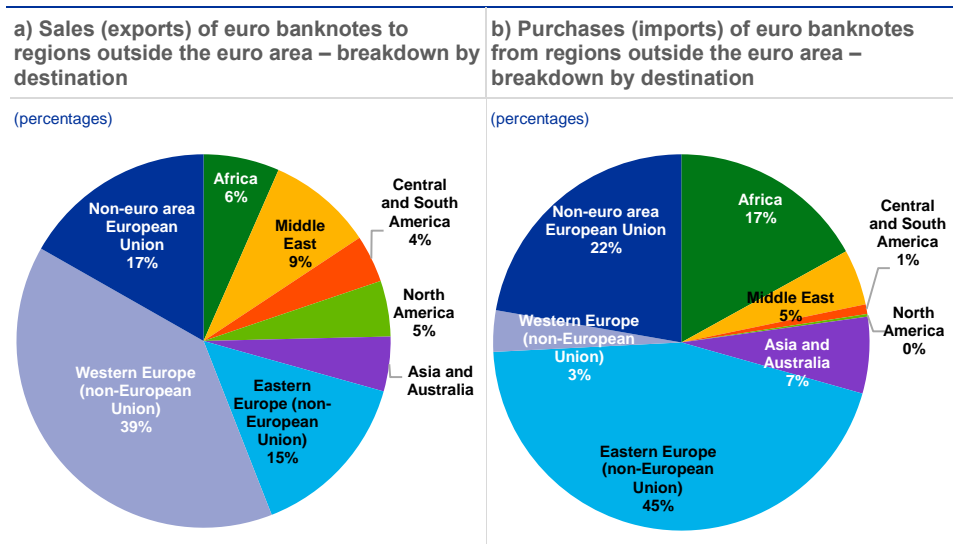
Notes: Net shipments are euro banknotes sent to destinations outside the euro area minus euro banknotes received from outside the euro area. The latest observation is for December 2022.

However, developments in shipments of euro banknotes outside the euro area differed markedly between the first half and second half of 2022. In the first half of the year, the value of net registered shipments of euro banknotes to destinations outside the euro area increased by around 8%. This surge in demand for euro cash was likely caused by the outbreak of Russia's war in Ukraine which spurred precautionary demand for euro banknotes in a number of central and eastern European countries outside the euro area neighbouring Ukraine (**Box 5** on the impact of Russia's war in Ukraine on foreign demand for euro cash).

In the second half of 2022, net shipments of euro banknotes to destinations outside the euro area decreased markedly as a result of two factors. First, the beginning of monetary policy normalisation by the ECB led to an associated rise in opportunity costs of holding cash and may have encouraged decreases in cash holdings. In anticipation of the increase in ECB policy rates in July 2022, net shipments decreased by around 4% month-on-month – an unprecedented deceleration – followed by significant banknote purchases in the subsequent months. Second, geopolitical developments likely reduced sales of euro banknotes to eastern European countries outside the EU significantly. These countries accounted for 15% of total sales in 2022, compared with almost 30% in 2021 (**Chart 17, panel a**).

Chart 17

In 2022 euro banknotes were mainly exported to and imported from countries neighbouring the euro area



Source: ECB calculations based on data from international banknote wholesalers.
Note: The data are for 2022.

Box 5

The impact of war: extreme demand for euro cash in the wake of Russia’s invasion of Ukraine

Prepared by Elisabeth Beckmann and Alejandro Zamora-Pérez

Proximity to war boosts foreign and domestic demand for euro cash

Geopolitical conflicts can have a significant impact on the demand for euro cash outside the euro area, as illustrated by Russia’s invasion of Ukraine in February 2022. **Chart A, panel a**, compares the deviation of demand for euro banknotes from historical averages, both from non-euro area countries (blue line) and from countries within the euro area (dotted grey lines) between January 2021 and May 2022 – immediately after demand returned to near-average levels. In the months before the invasion, foreign demand for euro cash remained below its historical average. However, it rose far above its historical average just after the invasion (in March 2022), to an extent greater than in most euro area countries in that period. This suggests that precautionary motives were a determinant of demand for euro cash from non-euro area countries, mainly driven by high-value denominations (€100 and €200) which are mostly used for store-of-value purposes.⁶²

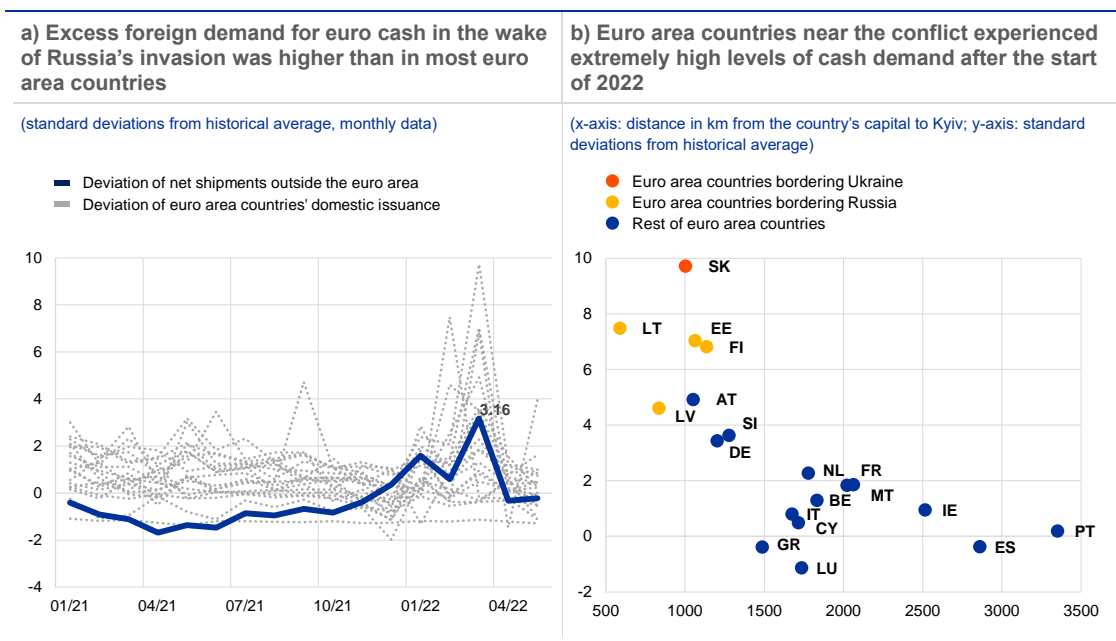
Precautionary demand for euro cash is most likely related to the impact of the war, with distinct regional effects. Additional data on euro area countries offer indirect evidence that geographical proximity to the conflict could be an important determinant of precautionary demand in non-euro area countries – i.e. that demand was driven by the standard law of gravity. **Chart A, panel b**, shows how in the wake of the invasion monthly banknote issuance deviated exceptionally from

⁶² Significantly large increases in precautionary cash demand were observed globally in past financial, technological or natural disaster-related crises. See “The paradox of banknotes: understanding the demand for cash beyond transactional use”, *Economic Bulletin*, Issue 2, ECB, Frankfurt am Main, 2021.

historical averages in euro area countries geographically located near Ukraine, while issuance levels in countries geographically further from the conflict remained within the historical regularities. Some euro area countries bordering Ukraine or Russia (such as Estonia, Lithuania, Slovakia and Finland) saw extremely elevated demand levels, ranging from six to ten standard deviations from their respective historical average. Other countries, which are relatively close to but do not share a border with Ukraine also saw unusual excess demand for cash, with deviations of up to five standard deviations from the mean (e.g. Austria, Germany, Latvia and Slovenia).

Chart A

Russia's war and precautionary cash demand: evidence from outside and within the euro area



Sources: ECB.

Notes: On the x-axis of both panels, the time series data on banknote issuance were seasonally adjusted for each country and standardised. Net shipments abroad from each euro area country were removed to avoid double-counting. Panel a shows each country's maximum standard deviation in February or March 2022, as some countries reacted more rapidly than others after Russia's invasion on 24 February 2022. On the y-axis of panel b, the physical distance in kilometres from each country's capital to Kyiv is measured using straight lines.

The absence of other clearly identified events to explain these cross-country differences suggests that extreme precautionary demand in countries close to the conflict area could be attributed to geopolitical risks. In line with demand from the euro area, foreign demand may have been unusually higher in countries near the war zone, as data provided by wholesaler banks suggest. In particular, euro banknote gross outflows to central, eastern and south-eastern European (CESEE) countries from the European Union more than trebled in 2022 compared with 2021.

Foreign demand in CESEE countries – further evidence from the OeNB Euro Survey

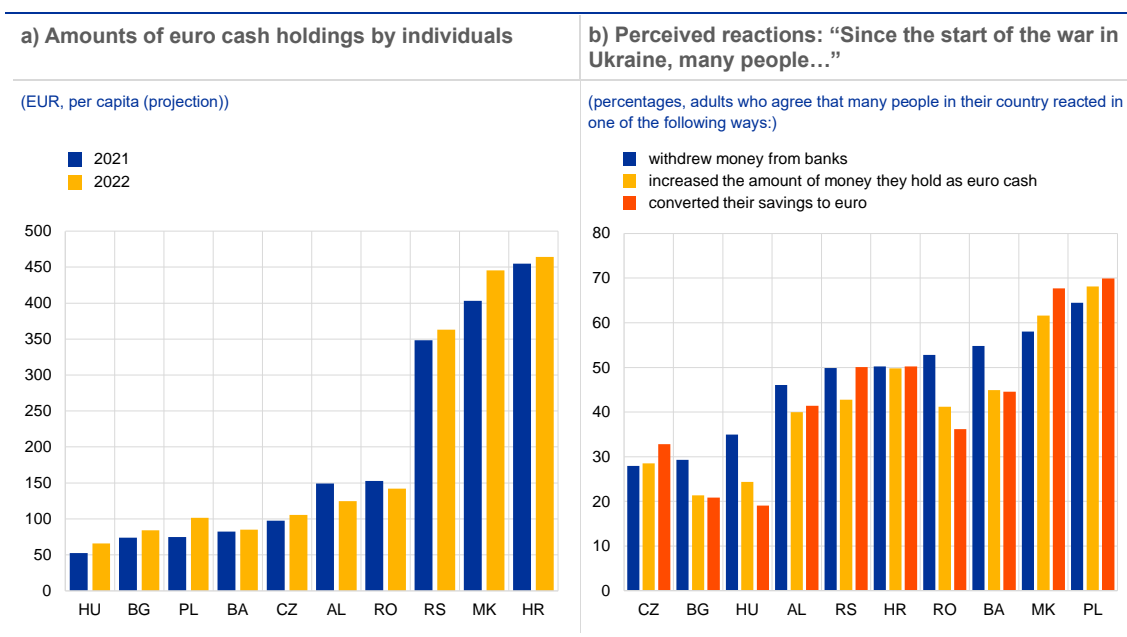
Data from a regular survey conducted by the Oesterreichische Nationalbank (OeNB) shed further light on foreign demand for euro cash.⁶³ The OeNB Euro Survey data – collected in the autumn of 2022 – investigate how widespread the use of and demand for euro cash is in CESEE countries that do not have the euro as legal tender. **Chart B, panel a**, shows that per capita euro cash holdings increased slightly in most countries in 2022 compared with 2021. The increase seems

⁶³ The OeNB Euro Survey has collected information about individual euro cash holdings, saving and borrowing decisions using a nationally representative sample and looked into respondents' economic opinions, expectations and experiences since autumn 2007.

moderate compared with the surge in foreign demand in March 2022 shown in **Chart A, panel a**. This is probably in part because the survey was conducted in October 2022, i.e. after euro banknote shipments normalised to pre-war levels and saw a further strong decline after the ECB increased policy interest rates. In addition, the survey also asked individuals about their perceived reaction to the war (**Chart B, panel b**).⁶⁴ Between 30% and 60% of CESEE citizens report observing withdrawals of cash from banks, increases in euro cash holdings and conversions of savings into euro. The substantial differences across countries notwithstanding, the survey results provide further evidence of strong demand for euro cash from CESEE countries in response to the war.

Chart B

OeNB Euro Survey results on central, eastern, and south-eastern European countries' euro cash holdings and reactions to Russia's war in Ukraine



Source: OeNB Euro Survey.

Notes: In panel a, per capita values are extrapolated for the entire population aged 14 years and over. In panel b, bars indicate the share of respondents that "strongly agree", "agree" or "somewhat agree" that adults in their countries reacted by either withdrawing money from banks, increasing their euro cash holdings or converting savings to euro.

The determinants of individuals' perceptions of changes in euro cash holdings in response to the war, and how these perceptions vary across countries, can be identified using statistical analysis.⁶⁵ The results suggest that, in line with broader demand for euro cash,⁶⁶ network effects play an important role: individuals living in regions where euro cash usage is common were more likely to report increases in cash withdrawals, euro cash holdings and euro savings after the start of the war. Moreover, those who were affected by the economic fallouts of the transition to a market economy, or those expecting that their local currency would depreciate relative to the euro, also tended to report perceived increases in euro cash holdings. Finally, lower trust in the domestic central bank

⁶⁴ The indirect question regarding observed behaviour has the advantage of not being very personal, in contrast to asking about personal cash holdings in a face-to-face interview where the incentive not to respond or to underreport is high. Results for perceived behaviour are positively and significantly correlated with reported personal behaviour.

⁶⁵ The estimates reported are marginal effects from probit regressions.

⁶⁶ See Stix, H. (2013), "Why do people save in cash? Distrust, memories of banking crises, weak institutions and dollarization", *Journal of Banking & Finance*, Vol. 37, No 11, pp. 4087-4106.

and government affects people's perceptions of increases in euro cash holdings, while lower trust in European institutions seems to be uncorrelated with the perceptions in question.

3 Special features

A Geopolitical fragmentation risks and international currencies

By Tamar den Besten, Paola Di Casola, Maurizio Michael Habib

Shortly after Russia invaded Ukraine, several packages of unprecedented sanctions were imposed on Russia, including the freezing of nearly half of the Russian central bank's foreign exchange reserves and the exclusion of a number of Russian banks from SWIFT, the dominant financial messaging system used to facilitate cross-border payments. Several observers noted that these sanctions may have far-reaching consequences for the role of the currencies of the sanctioning countries – including the US dollar and the euro – in the international monetary and financial system. According to these observers, countries that are not fully aligned geopolitically with the United States might reduce their exposures to the currencies of sanctioning countries going forward. However, other observers have been more cautious and pointed to challenges involved in diversifying from the major international currencies. This special feature sheds light on this debate by reviewing the available evidence on the effects of geopolitical fragmentation risks on the use of international currencies. It shows that evidence of potential fragmentation in the international monetary system since Russia's invasion has so far been mainly restricted to announcements and specific cases rather than pointing to broader trends. Anecdotal evidence, including official statements, points to intentions of some countries to develop the use of alternatives to major traditional currencies, such as the Chinese renminbi, the Russian rouble or the Indian rupee for invoicing international trade. There is also evidence that Russia has been using the Chinese renminbi to a significantly greater extent for international invoicing and cross-border payments in the past few months. However, the available data do not show substantial changes in the use of international currencies as yet. One exception is evidence of increased accumulation of gold as an alternative reserve asset, possibly driven by countries geopolitically closer to China and Russia.

Overview of the debate on the impact of geopolitical fragmentation risks on the international monetary system

Russia's invasion of Ukraine might represent a watershed for the future of globalisation and the international monetary system. Several observers have argued that Russia's invasion has opened a new chapter for the global economy and geopolitics, contributing *inter alia* to geo-economic fragmentation – a reduction in the degree of economic and multilateral integration and cooperation.⁶⁷ Supply chain

⁶⁷ See Aiyar, S. et al. (2023), "[Goeconomic Fragmentation and the Future of Multilateralism](#)", *Staff Discussion Note*, No 2023/001, International Monetary Fund, Washington. See also ECB/ESCB International Relations Committee Work stream on Open Strategic Autonomy (2023), "[The EU's Open Strategic Autonomy from a central banking perspective](#)", European Central Bank, March.

networks could be re-oriented towards geopolitical allies (a process known as friendshoring), affecting patterns of global trade and finance.⁶⁸ Whether these developments might have consequences for the international monetary system, which is centred on the US dollar, is the subject of intense debate.

Some observers have argued that sanctions imposed on Russia might have eroded confidence among countries that are not geopolitically aligned with the United States in the safety of dollar reserves and payment rails. Following the freezing of nearly half of the Russian central bank's reserves, some countries might reduce the insurance value they assign to foreign exchange reserves if they fear facing sanctions in the future.⁶⁹ Financial sanctions applied to foreign-owned US dollar assets – it has been argued – reduce their usability and thereby liquidity.⁷⁰ Some countries might then be incentivised to diversify their reserves into non-traditional currencies, physical gold, or reduce their level of exposure to foreign exchange reserves. Countries with strong trade relationships could be inclined to collaborate and form fragmented currency blocs.⁷¹

Anecdotal evidence, including official statements, points to the intention of some countries to develop the use of alternatives to the currencies of countries that applied sanctions. The past year has seen several announcements of new trade agreements to develop the use of local currencies for trade invoicing, notably of commodities, and the potential creation of new common currencies, as an alternative to the US dollar, the euro and other currencies of countries applying the sanctions (**Table A.1**). Increasing use of non-traditional currencies in trade invoicing would in turn create incentives to hold larger shares of foreign exchange reserves in non-traditional currencies in a positive feedback loop.⁷² This could fragment the international monetary system along geopolitical lines.⁷³

The implications of a more fragmented international monetary system would be potentially significant. For instance, recent research suggests that a 1% reduction in China's US dollar reserves could translate into an increase of five-year and ten-year yields of up to 25 basis points in the short run.⁷⁴ Furthermore, lower demand for foreign exchange reserves could contribute to increasing exchange rate volatility.⁷⁵

⁶⁸ See C. Lagarde, (2022), "[A new global map: European resilience in a changing world](#)", Speech delivered at the Peterson Institute for International Economics, April.

⁶⁹ One example is Russia, which cut its US dollar exposures significantly after the seizure of Crimea and the imposition of international sanctions in 2014.

⁷⁰ See McDowell, D. (2021), "Financial sanctions and political risk in the international currency system", *Review of International Political Economy*, Vol. 28, No 3, pp. 635-661 and Bianchi, J. and Sosa-Padilla, C. (2023), "International Sanctions and Dollar Dominance", *Working Paper*, No 31024, National Bureau of Economic Research for a model containing this channel.

⁷¹ See the [interview with Gita Gopinath in the Financial Times](#), 31 March 2022.

⁷² Gopinath, G. and Stein J.C. (2021), "[Banking, Trade, and the Making of a Dominant Currency](#)", *Quarterly Journal of Economics*, Vol. 136, No 2, pp. 783-830.

⁷³ See [N. Roubini's views in the Financial Times](#), 5 February 2023.

⁷⁴ See Ahmed R. and Rebucci, A. (2022), "[Dollar Reserves and U.S. Yields: Identifying the Price Impact of Official Flows](#)", *Working Paper*, No 30476, National Bureau of Economic Research, September.

⁷⁵ See Brunnermeier, M., James, H. and Landau, J.-P. (2022), "[Sanctions and the international monetary system](#)", *VoxEU*, April.

Table A.1**Anecdotal evidence on the intentions of some countries to use alternative units to the major international currencies****Overview of selected news and statements**

Date	News and statements	Source
13/07/2022	The Reserve Bank of India introduces a new mechanism for international trade settlements in rupees using Special Rupee Vostro Accounts (SRVA).	Reuters
18/07/2022	Russia seeks payment in United Arab Emirates dirhams for oil exports to Indian customers.	Reuters
06/09/2022	Gazprom and China National Petroleum Corporation (CNPC) sign agreements to start paying for gas supplies to China in Russian roubles and Chinese yuan, instead of US dollars and euro, reflecting increased efforts to move trade out of "unfriendly" currencies.	Bloomberg L.P.
11/09/2022	Customs data show that Indian steelmakers and cement manufacturers move towards non-dollar settlements as they bought Russian coal using the Chinese renminbi, United Arab Emirates dirham, Hong Kong dollar and euro.	Reuters
16/09/2022	V. Putin and R. Erdoğan agree to pay 25% of Russian natural gas supplies to Türkiye in roubles in the near future.	Markets Insider
16/09/2022	Leaders at the Shanghai Cooperation Organisation (SCO) summit in Uzbekistan adopt a roadmap to increase the use of national currencies in mutual settlements.	Reuters
09/12/2022	In a speech at the China-GCC summit, China's President Xi Jinping encourages the Gulf nations to make use of the Shanghai Petroleum and Natural Gas Exchange as a platform to carry out settlement of oil and gas trade using Chinese renminbi in the future.	Reuters
17/01/2023	Russia and the Central Bank of Iran discuss the creation of a gold-backed stablecoin digital currency for foreign trade settlements in a special economic zone.	Central Banking
20/01/2023	The United Arab Emirates and India discuss settlement of trade in non-oil commodities in Indian rupees.	Reuters
22/01/2023	Argentina and Brazil start preparations to create a common currency, inviting other countries in Latin America to join the currency bloc.	Financial Times
31/01/2023	Iran and Russia plan to link their interbank payment messaging systems to boost trade and financial transactions, having been disconnected from SWIFT.	Central Banking
04/02/2023	Indian refiners start purchasing Russian oil from Dubai-based traders using United Arab Emirates dirhams instead of US dollars.	Reuters
13/04/2023	Brazil's president Luiz Inácio Lula da Silva called on BRICS countries to work towards replacing the US dollar with their own currencies in international trade.	Financial Times

Sources: Reuters, Bloomberg L.P., Markets Insider, Central Banking and the Financial Times.

By contrast, several economic arguments support, a priori, the resilience of the global role of the US dollar to geopolitical shocks.⁷⁶ First, sound institutions and macroeconomic fundamentals – to which the United States and other major reserve currency issuers are committed – are essential determinants of the currencies used as a global safe asset. Second, there is no obvious alternative to deep and liquid financial markets in debt securities in US dollars, which are open to both domestic and foreign investors. The international role of the Chinese renminbi has progressed but remains limited. Limited capital account convertibility and limited exchange rate flexibility hinder the development of the renminbi's role which, to develop through trade, investment and policy support, requires continued dollar backing (**Box 1**). Gold provides safety but is not remunerated and is supplied inelastically; it also needs to be stored domestically at a cost or face risks of remaining within the reach of sanctions.⁷⁷ Crypto-assets, either unbacked or presumably backed, such as stablecoins, remain too volatile and opaque to qualify

⁷⁶ See the discussion in Box 1 entitled "The Russian invasion of Ukraine and international currencies", *The international role of the euro*, European Central Bank, June 2022.

⁷⁷ Gold held domestically is within the direct reach of foreign sanctions to a lesser extent and can only be exchanged for domestic currency, thus nullifying its role as a reserve asset.

as reserve currency assets as the repeated crashes in crypto-asset markets illustrate.⁷⁸

Geopolitical considerations could also favour the status quo. Recent research suggests that approximately 50% to 60% of foreign-held US short-term assets are in the hands of governments with strong geopolitical relations with the United States and are thus unlikely to be divested for geopolitical reasons.⁷⁹ Signalling effects are other factors: by accumulating foreign assets in sanctionable currencies such as the US dollar and the euro, countries signal their commitment to international law and good governance principles, which cement their credibility with foreign investors. Through this channel, imposing sanctions on a country that breaks international law could in fact enhance the role of currencies of major economies that are compliant with the sanctions.⁸⁰

Preliminary evidence on geopolitical fragmentation risks for official reserve holdings

There is no significant evidence that geopolitical fragmentation risks have led to a reduction in the level of demand for major reserve currencies. Admittedly, the stock of global foreign exchange reserves declined in 2022, but this was largely driven by valuation effects and foreign exchange interventions – and not the result of more limited appetite for foreign exchange reserves denominated in the major currencies. Total allocated foreign exchange reserves increased from approximately USD 1.4 trillion in 1999 to USD 12.0 trillion in 2021, before declining by almost USD 1 trillion in 2022. Valuation effects accounted for a large portion of this decline as bond prices fell and the major reserve currencies depreciated against the US dollar (**Box 3**). Furthermore, exchange rate interventions by central banks of a number of countries, such as Japan, Hong Kong, India and Singapore, resulted in large sales of US dollars in exchange for domestic currency amid broad dollar strength in 2022.

In terms of composition of foreign exchange reserves, diversification into non-traditional currencies continued in 2022, but at a slower pace compared with previous years. Since the global financial crisis of 2007-09, reserve diversification into non-traditional reserve currencies, i.e. the Chinese renminbi and currencies that are not part of the IMF's Special Drawing Rights (SDR) basket has intensified.⁸¹ This shift reflects active portfolio diversification decisions by central bank reserve managers in both emerging and advanced economy countries who, in a search for

⁷⁸ For example, the crash of the algorithmic stablecoin TerraUSD in May 2022, the collapse of the cryptocurrency exchange FTX in November 2022 or the de-pegging of the stablecoin USD Coin in March 2023.

⁷⁹ Weiss, C. (2022), "Geopolitics and the U.S. Dollar's Future as a Reserve Currency", *International Finance Discussion Papers*, No 1359, Board of Governors of the Federal Reserve System, October.

⁸⁰ See Folkerts-Landau, D., Garber, P. and Dooley, M. (2022), "Seizures of foreign exchange reserves will not weaken the dollar's role as dominant reserve currency", *VoxEU*, May.

⁸¹ Currencies that are part of the IMF's Special Drawing Rights (SDR) basket are the US dollar, euro, Japanese yen, pound sterling and the Chinese renminbi, the latter since October 2016. All other reserve currencies are referred to as non-SDR currencies.

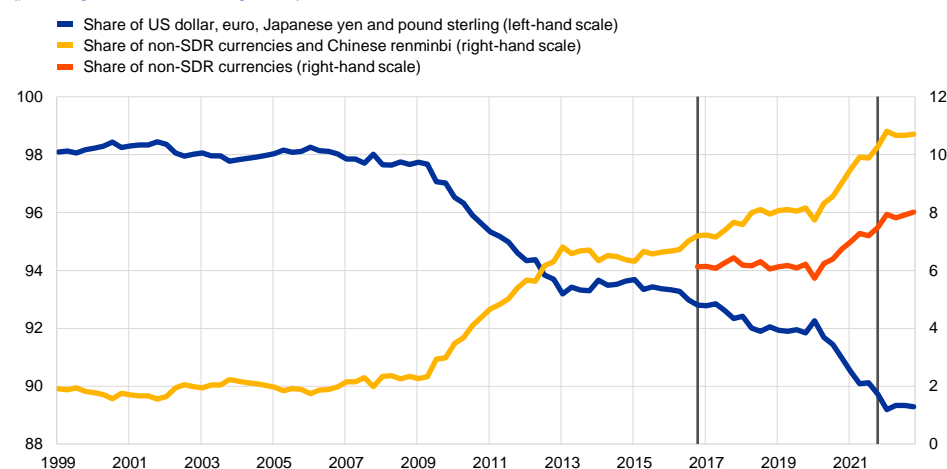
higher returns, leverage on the growing liquidity of non-standard currencies.⁸² However, this trend has not accelerated visibly since Russia invaded Ukraine. The share of non-SDR currencies increased in 2022 by 0.5 percentage points, a slower pace than in previous years (**Chart A.1**). The share of the Chinese renminbi in global foreign exchange reserves remained stable.⁸³

Chart A.1

Diversification into non-traditional reserve currencies has not accelerated visibly since Russia's invasion of Ukraine

Evolution of the share of the main reserve currencies and non-traditional reserve currencies in total allocated foreign exchange reserves

(percentages, at current exchange rates)



Sources: IMF and ECB calculations.

Notes: The main reserve currencies are the US dollar, the euro, the Japanese yen and the pound sterling. Although COFER provides separate data on reserves held in the Australian dollar, Canadian dollar, Chinese renminbi and the Swiss franc, Arslanalp et al. (2022) estimate that the remaining reserve currencies are the Swedish krona, Norwegian krone, Danish krone, Korean won, Singapore dollar, New Zealand dollar and the Hong Kong dollar. The share of non-SDR currencies comprises all currencies other than the main four currencies mentioned above together with the Chinese renminbi, as the latter was added to the SDR basket in 2016. The first vertical line from the left-hand side marks the introduction of the Chinese renminbi to the SDR basket, while the second vertical line indicates the beginning of 2022.

The role of gold as a reserve asset has increased in the last decade. Amounts of gold held as official reserve assets have increased steadily since the global financial crisis. Moreover, the share of gold in total reserves has risen in the past decade to reach almost 13% of total reserves in 2022, close to its 1999 peak (**Chart A.2, panel a**). Accumulation was mainly driven by emerging market economies, possibly as a result of low yields on major reserve currencies and, therefore, lower opportunity costs of holding unremunerated assets such as gold.⁸⁴

Gold accumulation by central banks increased noticeably in the wake of Russia's invasion of Ukraine. According to estimates by the World Gold Council (WGC), 2022 saw the highest purchases of gold by central banks on record (**Chart A.2, panel b**). The official numbers reported to the IMF, however, paint a different

⁸² See Arslanalp, S., Eichengreen, B. and Simpson-Bell, C. (2022), "The Stealth Erosion of Dollar Dominance and the Rise of Nontraditional Reserve Currencies", *Journal of International Economics*, Vol. 138, No 103656, September.

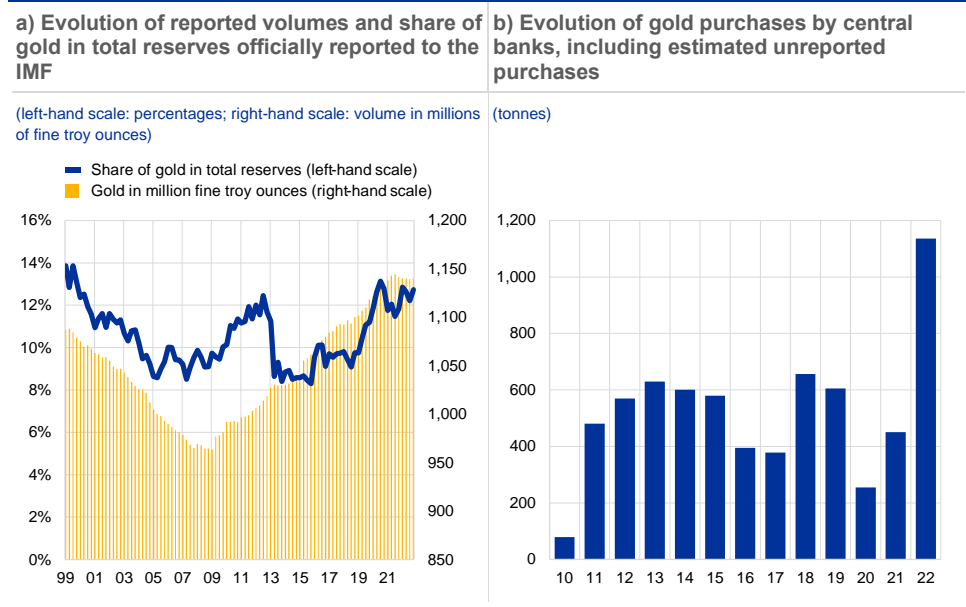
⁸³ Since in this special feature shares are reported at current exchange rates, valuation effects stemming from the broad-based appreciation of the US dollar may be an additional explanation.

⁸⁴ See Arslanalp, S., Eichengreen, B. and Simpson-Bell, C. (2023), "Gold as International Reserves: A Barbarous Relic No More?", *IMF Working Paper*, No 2023/014, Washington, January.

picture. They indicate that the share of gold in global official reserves increased by a modest 0.9 percentage points in 2022 and that gold held as reserve assets decreased in volume. The difference can be explained by large amounts of “unreported purchases” by central banks estimated by the WGC – which are not reported in official IMF figures.⁸⁵ Among the reporting countries, gold purchases were mainly from central banks in emerging markets. Türkiye was the largest purchaser (with 148 tonnes), bringing its gold reserves to a record level. The People’s Bank of China reported an increase in its gold reserves for the first time in three years and bought a total of 62 tonnes in the last two months of 2022. Other central banks that increased their gold holdings significantly included India, Egypt, Qatar, Iraq, the United Arab Emirates and Oman.

Chart A.2

Central bank demand for gold hit a record high in 2022 according to some estimates



Sources: IMF International Financial Statistics, Metals Focus, Refinitiv GFMS and World Gold Council.
 Notes: Panel a shows the volume of gold in fine troy ounces and the share of gold in total reserve assets officially reported to the IMF. The share is calculated using gold at market prices and total reserve assets in US dollars, using current exchange rates. Panel b shows the demand for gold by central banks and other institutions reported by the World Gold Council, including estimates of unreported purchases.

Estimating the role of geopolitical factors in explaining developments

Whether the recent geopolitical factors explain developments in official reserve portfolios remains an open question that needs to be addressed. One way to identify the effect is to examine to what extent cross-country developments

⁸⁵ See World Gold Council (2023), “Gold Demand Trends Full Year 2022”, January. For example, the Central Bank of Russia stopped reporting its gold purchases one month before the sanctions were imposed, although it is expected to have been a large purchaser in 2022. Data are reported to the IMF on a voluntary basis. The WGC complements IMF data with other proprietary data sources, such as Metals Focus and Refinitiv GFMS metals research, to obtain estimates on gold purchases.

depend on geopolitical alliances using an index of geopolitical alignment with China-Russia versus the United States developed by ECB staff (**Box A**).

Box A

An index of geopolitical alignment

Prepared by Tamar den Besten, Paola Di Casola and Maurizio Michael Habib

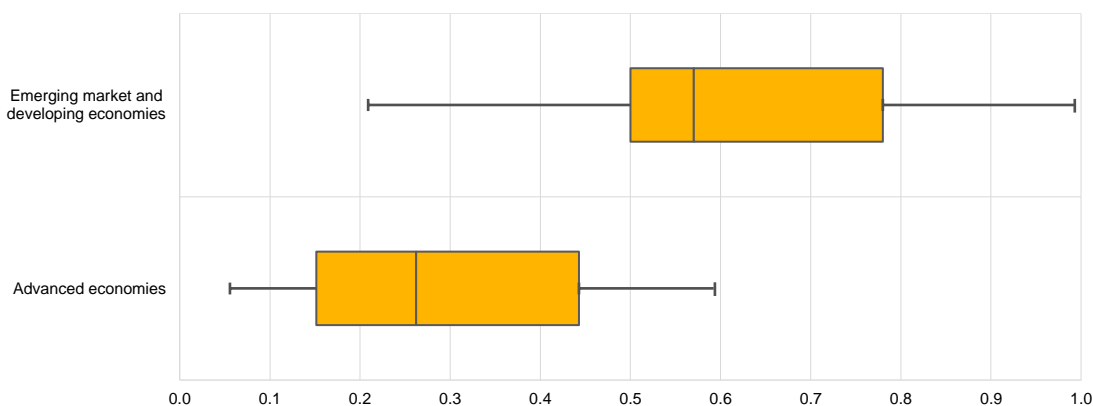
This box details the construction of a new index of geopolitical alignment, which is used to gauge whether geopolitics might be one of the factors explaining recent developments in the composition of official reserve holdings. The index provides a summary assessment of the closeness of a country to two spheres of geopolitical influence, one being the United States and the other Russia and China.

Chart A

Patterns of geopolitical alignments vary between advanced economies and emerging market economies

Distribution of the geopolitical index for advanced economies and emerging market and developing economies

(x-axis: geopolitical index)



Sources: ECB calculations based on the Global Sanctions Database (GSDB), SIPRI Arms Transfers Database, Green Finance & Development Center and the United Nations.

Notes: The boxplots show the distribution of the geopolitical index, including the minimum and maximum values and the 25th, 50th and 75th percentiles for each group of countries. A higher value of the index indicates that a country is geopolitically closer to China and Russia than to the United States.

The geopolitical index is based on four different proxies of political alignment between countries, measured for the past decade. The first variable is the number of times a country has been sanctioned by China and Russia minus the number of times it has been sanctioned by the United States, using data from the Global Sanctions Database.⁸⁶ This database was used in related scholarly research linking historical patterns in the evolution of the share of gold in foreign exchange reserves and sanctions.⁸⁷ The second variable is the share of military imports from Russia and China minus the share of imports from the United States, obtained from the SIPRI Arms

⁸⁶ Felbermayr, G., Kirilakha, A., Syropoulos, C., Yalcin, E. and Yotov, Y.V. (2020), "The Global Sanctions Data Base", *European Economic Review*, Vol. 129, October; Felbermayr, G., Kirilakha, A., Syropoulos, C., Yalcin, E. and Yotov, Y.V. (2021), "The Global Sanctions Data Base: An Update that Includes the Years of the Trump Presidency", *School of Economics Working Paper Series*, No 2021-10, LeBow College of Business, Drexel University; and Felbermayr, G., Kirilakha, A., Syropoulos, C., Yalcin, E. and Yotov, Y.V. (2022), "The Global Sanctions Data Base – Release 3: COVID-19, Russia, and Multilateral Sanctions", *School of Economics Working Paper Series*, No 2022-11, LeBow College of Business, Drexel University.

⁸⁷ Arslanalp et al. (2023), op. cit.

Transfers Database on bilateral military imports. The third variable indicates whether a country participates in the Belt and Road Initiative (BRI) – a Chinese-led project which was launched in 2013 with the initial aim of expanding trade links between Asia, Africa and Europe, but is increasingly seen as a tool for projecting China’s influence globally.⁸⁸ The fourth variable is country voting on the resolution of the Eleventh Emergency Special Session of the United Nations General Assembly adopted on 2 March 2022 on Russia’s invasion of Ukraine, in the spirit of other studies that used data on UN votes as a proxy for political alignment.⁸⁹ Each variable is scaled and normalised to vary from zero to one, and averaged out to create an index for which increasing values indicate closer geopolitical alignment with China and Russia compared with the United States.

Chart A reports the distribution of countries according to the index, split between advanced economies and emerging or developing economies. Advanced economies tend to be more closely aligned with the United States compared with China and Russia, unlike emerging and developing economies. However, the geopolitical alignment of the latter economies is more dispersed than that of advanced economies.

There is no evidence that diversification of official reserves into non-SDR currencies in the review period was directly related to geopolitical considerations. Chart A.3, panel a plots the changes in the share of non-SDR currencies in total foreign exchange reserves and the geopolitical index for a restricted set of countries that actively diversified into non-SDR units in 2022.⁹⁰ The lack of correlation between the two variables is apparent from the chart. This suggests that the accumulation of non-SDR currencies does not seem to be directly related to geopolitical factors.

By contrast, there are signs that geopolitical considerations were a motive behind diversification into gold in 2022 in some cases. Chart A.3, panel b plots changes in the share of gold in total reserve assets in 2022 against the geopolitical index for a restricted set of countries that diversified actively into gold in that year.⁹¹ It is possible to identify a positive correlation between these two variables.⁹² In other words, the closer countries are geopolitically to China and Russia compared with the United States, the more they increased the share of gold in their official foreign

⁸⁸ Bhattacharya, A., Dollar, D., Doshi, R., Hass, R., Jones, B., Kharas, H., Mason, J., Solis, M. and Stromseth, J. (2019), “China’s Belt and Road: The New Geopolitics of Global Infrastructure Development; A Brookings Interview”.

⁸⁹ The resolution deplored Russia’s invasion of Ukraine and demanded full withdrawal of Russian forces and a reversal of Russia’s decision to recognise the self-proclaimed “people’s republics” of Donetsk and Luhansk. See, for example, Dreher, A., Fuchs, A., Parks, B., Strange, A. and Tierney, M.J. (2021), “Aid, China, and Growth: Evidence from a New Global Development Finance Dataset”, *American Economic Journal: Economic Policy*, Vol. 13, No 2, pp. 135-174, May.

⁹⁰ Active diversifiers are countries with above-average increases in the share in question, in the spirit of Arslanalp et al. (2022 and 2023), op. cit.

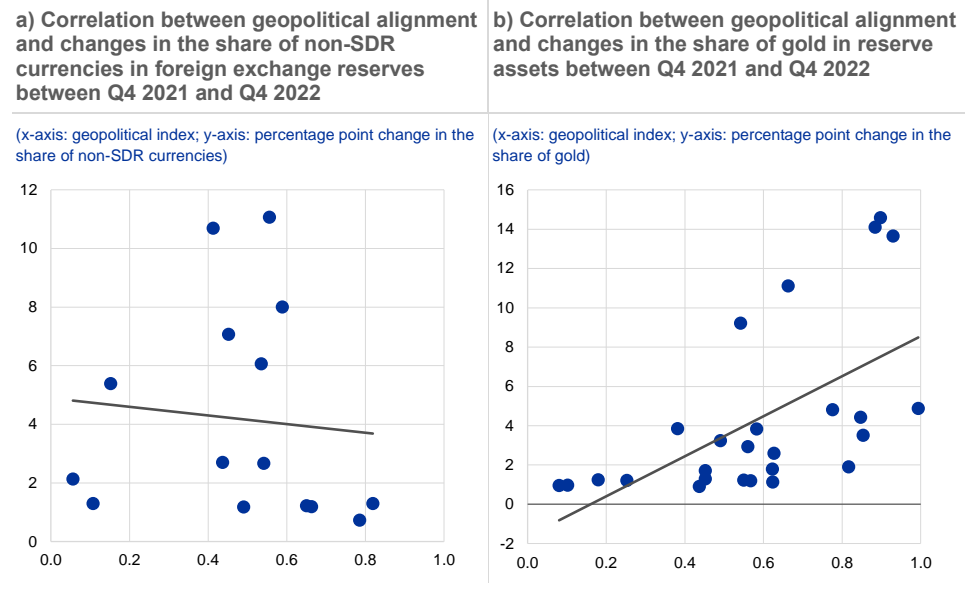
⁹¹ Active diversifiers are countries with above-average increases in the share of gold.

⁹² This positive coefficient is statistically significant and robust to outliers. Robustness checks show that constructing the geopolitical alignment index with respect to China versus the United States or with respect to Russia versus the United States, as separate dependent variables, produces similar results. Finally, the results are also robust to the inclusion of inflation in 2022 as an additional control variable.

reserves – a pattern that was particularly apparent in Belarus and some central Asian economies.⁹³

Chart A.3

Gold accumulators in 2022 tended to be geopolitically aligned with China and Russia



Sources: ECB calculations based on the Global Sanctions Database (GSDB), SIPRI Arms Transfers Database, Green Finance & Development Center, the United Nations, World Gold Council and the IMF.
 Notes: The scatterplot includes countries that increased the share of gold or non-SDR currencies in their official foreign reserves more than the average change across all countries. The share of gold in total reserves is calculated using World Gold Council data. The geopolitical index measures the closeness of a country to the country pair China-Russia versus the United States. A higher value of the index indicates that a country is closer to China-Russia than to the United States. See **Box A** for further details on the construction of the index.

Finally, China’s holdings of US Treasury securities significantly declined in 2022, reaching their lowest level since 2010; nevertheless, it is not obvious to what extent this decrease was the result of attempts to decouple from the dollar or of other factors. Chart A.4 plots the changes in holdings of US Treasury securities for the 20 largest holders. As of January 2023, the holdings by China declined by almost USD 200 billion or by around 10 percentage points relative to December 2021. Valuation effects owing to the fall in US bond prices may partly explain this large drop. Foreign exchange interventions to stem the broad appreciation of the US dollar in the course of 2022 might be another tentative explanation. The decline in the holdings of US Treasuries by Japan – the largest holder, politically aligned with United States – is of a similar magnitude to that of China. In addition, among the top holders of US Treasuries, there are no other countries that are geopolitically aligned with Russia or China whose holdings of US Treasuries significantly declined.

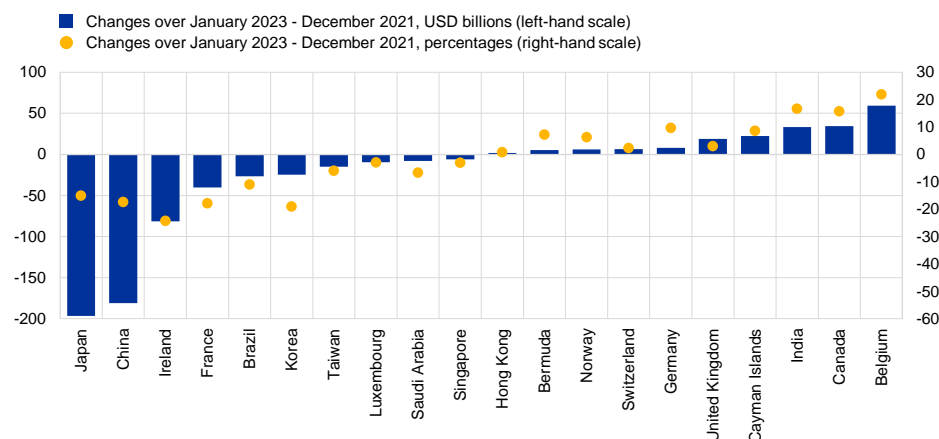
⁹³ For instance, Kyrgyzstan, Tajikistan and Uzbekistan. These countries, together with Belarus, have been identified as geopolitically close to Russia in a [similar index developed by The Economist](#) (March 2023).

Chart A.4

There has been a large fall in the value of US Treasury securities held by China, but also by Japan

Change in the holdings of US Treasury securities between December 2021 and January 2023

(USD billions and percentages)



Sources: US Treasury International Capital System and ECB calculations.
Note: The chart includes the 20 largest holders of US Treasury securities in December 2021.

Preliminary evidence for other dimensions of international currency use

Heightened geopolitical fragmentation risks could impact not only the composition of foreign exchange reserves but also other dimensions of international currency use. The ban of selected Russian banks from SWIFT – which was part of a package of sanctions imposed on Russia following the invasion of Ukraine – has fuelled speculation that Russia and other countries that are not geopolitically aligned with the United States could move their international payments to systems alternative to SWIFT.⁹⁴ One such alternative could be China’s cross-border interbank payment system (CIPS), launched in 2015, which clears payments in renminbi, although volumes – at roughly 1% of those handled by the SWIFT system – remain small. Russia’s own alternative to SWIFT, the System for Transfer of Financial Messages (SPFS), was developed in 2014 after Russia annexed the Crimean Peninsula. Although the system has grown over the past year, with foreign participants joining, its scope is still limited and it faces several challenges, such as higher transaction costs compared with SWIFT. More generally, countries might seek to reduce their dependence on currencies issued by sanctioning countries by reducing their cross-border payments in these currencies. There is inconclusive evidence that this is happening, however. **Chart A.5** shows how the shares of currencies issued by countries that have not sanctioned Russia have marginally increased. However, the shares of currencies of most sanctioning countries, which are not shown in **Chart A.5**, such as the US dollar, Japanese yen and pound

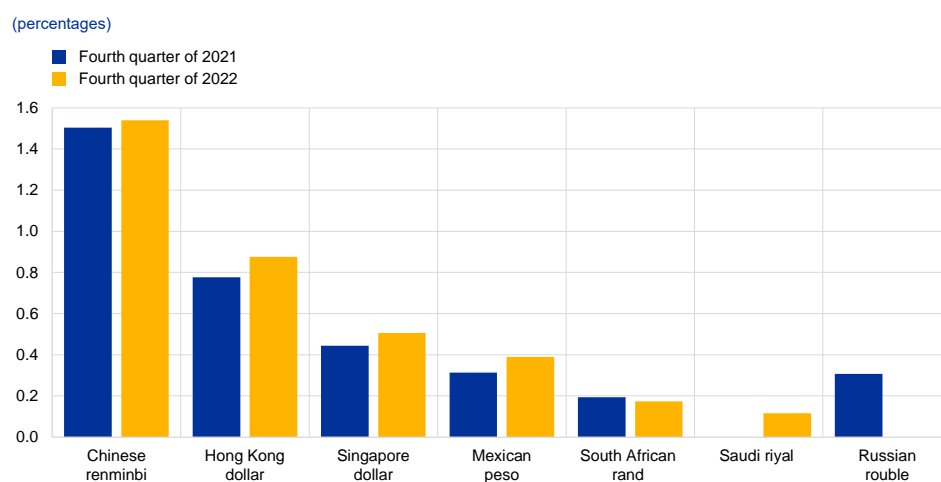
⁹⁴ SWIFT is a global messaging network through which international payments between banks are conducted.

sterling, also increased, with the exception of the euro. The share of the rouble collapsed, reflecting the ban on Russian banks in the SWIFT system.

Chart A.5

The evidence on whether non-standard currencies are increasingly used in global payments to avoid sanctions is inconclusive so far

Share of global payments in SWIFT of selected currencies, excluding payments within the euro area



Sources: SWIFT and ECB calculations.

Notes: The data refer to the currency shares of messages exchanged on SWIFT in the total value of selected currencies, excluding payments within the euro area. Data on the top 20 currency shares are available, meaning that if a currency does not make this cut-off point, the value of the currency will be zero in the chart.

Anecdotal evidence, including official statements, pointing to the intention of some countries to use alternative currencies for invoicing international trade was more ample in 2022.

Press reports published after Russia's invasion of Ukraine provide additional anecdotal evidence about the intentions of officials in Russia, China, India, Türkiye and Saudi Arabia to reduce the weight of the US dollar and the euro in bilateral trade transactions, including commodities transactions, as shown in **Table A.1**. Implementation is not without challenges, however. For example, press reports suggest that after Russia requested Indian refineries to settle trade in Russian oil in United Arab Emirates dirhams in July 2022, this did not occur until January 2023 as one intermediary bank declined to facilitate transactions.⁹⁵ Similarly, although the Reserve Bank of India applied a new mechanism to settle international transactions in rupees in July 2022, press reports suggest that Russian counterparts indicated that Indian banks have only used the system to a limited extent, owing to concerns about secondary sanctions.⁹⁶ Finally, recent research suggests that sanctions imposed on Russia at the time of the annexation of Crimea in 2014 led to increases in trade invoicing in roubles at the expense of US dollars in some cases.⁹⁷ Additional evidence suggests that the share of Russia's trade in goods invoiced in roubles and in Chinese renminbi rose substantially in 2022, mainly at the expense of the US dollar and the euro. In particular, the share of Russia's

⁹⁵ See "Indian refiners pay dollars for Russian oil after dirham attempts fail", Reuters, September 2022.

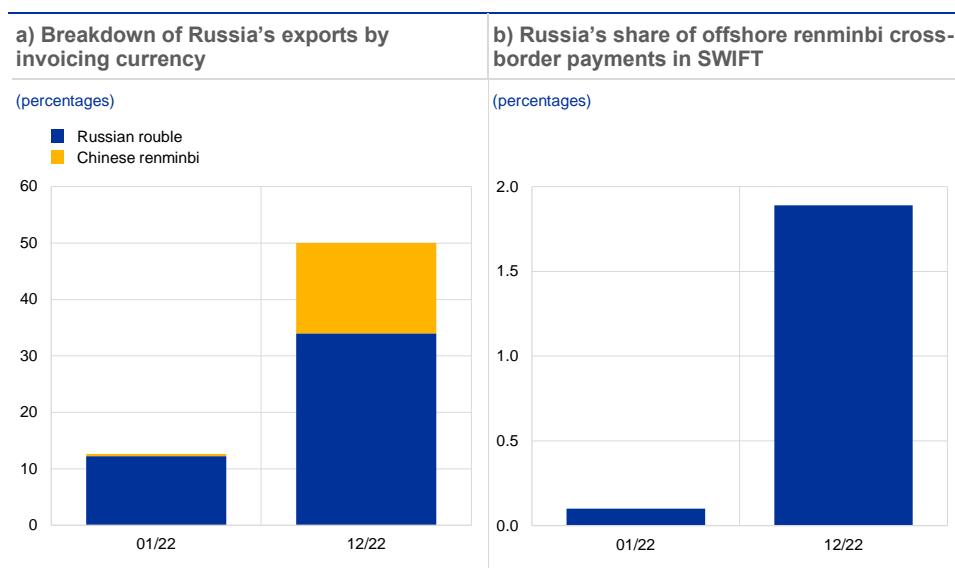
⁹⁶ See news article on concerns at Indian banks surrounding US sanctions.

⁹⁷ The evidence is available for French firms (see Berthou, A. (2023), "International sanctions and the dollar: Evidence from trade invoicing", mimeo).

trade invoiced in renminbi increased to 16% in December 2022 from virtually zero just before the invasion of Ukraine (**Chart A.6, panel a**). In parallel, use of the renminbi in cross-border payments by Russia increased sizeably – Russia was among the top six countries for offshore renminbi payments in December 2022, with a share of almost 2% (**Chart A.6, panel b**).⁹⁸ In the last quarter of 2022, the share of the renminbi in global trade finance doubled to around 4% compared with the last quarter of the previous year.

Chart A.6

There is evidence of a stronger role of the Chinese renminbi in Russia's international trade invoicing and cross-border payment patterns



Sources: Central Bank of Russia and SWIFT.

Notes: Panel b shows the share of Russia in total offshore renminbi cross-border payments excluding China. In January 2022 Russia was not in the top 15 countries for renminbi offshore payment volumes and for this reason its share is not reported by SWIFT. For that period Russia's share is approximated using the smallest share reported by SWIFT.

Finally, there is scant evidence of diversification of private and official Russian investments into cryptocurrencies, defying earlier speculation that these would be a pre-eminent conduit to evade sanctions.

In the immediate aftermath of Russia's invasion of Ukraine observers speculated that sanctions could usher in a diversification of private and official assets into cryptocurrencies as a vehicle to circumvent the sanctions.⁹⁹ Although Iran uses cryptocurrencies to pay for some of its imports¹⁰⁰, the size of Russia's imports is too large in comparison with the liquidity of global cryptocurrency markets.¹⁰¹ Nevertheless, as reported in **Table A.1**, Russia and Iran are discussing the possibility of introducing a gold-backed stablecoin for

⁹⁸ As of March 2023, Hong Kong accounts for the bulk of renminbi offshore payments (73% of total payments excluding China) as reported by SWIFT. In the ranking of major centres for offshore renminbi payments, Russia holds fifth place after the United Kingdom, Singapore and the United States.

⁹⁹ See [news report speculating that Russia could use cryptocurrencies to evade sanctions](#).

¹⁰⁰ See [news report on Iran using cryptocurrency to pay for imports](#).

¹⁰¹ See the [Center for Strategic and International Studies Q&A on the implications for Russia regarding cryptocurrencies and US sanctions evasion](#). See also Ahari, A., Duong, J., Hanzl, J., Lichtenegger, E.M., Lobnik, L. and Timel, A. (2022) "Is it easy to hide money in the crypto economy? The case of Russia", *OeNB Focus on European Economic Integration Q4/22*, Oesterreichische Nationalbank, December.

foreign trade settlements, and the two countries plan to link their interbank payment messaging systems after being disconnected from SWIFT.¹⁰²

Concluding remarks

So far, the geopolitical shock triggered by Russia’s invasion of Ukraine has not challenged the conventional view that the global appeal of currencies is subject to substantial inertia effects, which benefit incumbent currencies such as the US dollar and the euro. Evidence of fragmentation risks materialising in the international monetary system remains so far mainly restricted to announcements and specific cases – such as the invoicing of Russia’s international trade – rather than pointing to broader trends. Evidence that some countries intend to develop the use of alternatives to major traditional reserve currencies, notably for international trade, remains anecdotal. Apart from significant gold accumulation in official reserve holdings, the available data do not point to substantial changes in the international monetary system. Overall, Russia’s invasion has revealed the lack of obvious alternatives to the major international currencies, at least in the near future.

¹⁰² There is evidence that the Russian private sector faced challenges in finding alternatives to the western financial system to park assets for the first half of 2022. A recent study found that Russian firms had accumulated approximately USD 100 billion in foreign assets up to June 2022 and that the bulk of these funds were located in sanctioning jurisdictions (see Cocozza, E., Corneli, F., Della Corte, V. and Savini Zangrandi, M. (2023), “[In search of Russia’s foreign assets](#)”, *VoxEU*, January).

B How is a leading international currency replaced by another? Old versus new evidence

By A. Mehl, M. Mlikota (University of Pennsylvania) and I. Van Robays

This special feature reviews the evidence – both old and new – on how a leading international currency is replaced by another. The conventional historical narrative is that inertia in international currency use is substantial – it takes a long time for a challenger currency to replace the incumbent owing to the existence of network externalities that give rise to lock-in effects. The US dollar remains the leading currency for global trade and finance today, despite the decline in the United States' share of global output and trade, which testifies to the importance of inertia. However, one interesting exception is the currency invoicing of trade of countries neighbouring the euro area between 1999 – the year of the euro's creation – and 2019, when the share of the euro increased by more than 20 percentage points on average, at the expense of the US dollar.

Two competing hypotheses may explain these developments: a trade shock – where stronger trade links with the euro area tilt invoicing towards the euro – and an exchange rate volatility shock – where growing use of the euro as an exchange rate anchor spills over to invoicing. Recent evidence from ECB staff research empirically tests the relative importance of these two shocks. The estimates give support to the view that a trade shock is a key determinant of the stronger role of the euro for invoicing international trade in countries neighbouring the euro area. In those countries where trade links with the euro area increased, the shock explains on average almost 40% of the rise in the share of exports invoiced in euro between 1999 and 2019. By contrast, the impact of greater exchange rate stability against the euro is statistically insignificant. Countries' invoicing currency choices are not just impacted by their own trade patterns and exchange rate volatilities but also by those of their trade partners and competitors. These effects operate mainly via bilateral trade linkages rather than strategic complementarities in export price setting, which underscores the relevance of changes to input-output linkages as determinants of invoicing currency patterns.

These findings have implications for policy. They suggest that, in response to the pandemic shock and the war in Ukraine, reshoring or friendshoring of production chains could lead to stronger regional trade, notably on the European continent. That in turn could strengthen the future role of the euro for the invoicing of international trade.

The historical record thus far

Why is a leading international currency replaced by another? The conventional historical narrative suggests that it took between 30 and 70 years from when the United States overtook Britain as the leading economic and commercial power and the US dollar overtook the pound sterling as the dominant international currency, depending on the aspects of economic and international currency status considered.

The United States had already surpassed Britain in terms of absolute economic size in the 1870s and had become the leading commercial power, gauged by the value of foreign trade, in 1913. It was the leading creditor nation by the end of the First World War, and yet, according to the conventional narrative, the pound sterling remained the dominant international currency until after the Second World War. The view that inertia in international currency use is substantial is rooted in theoretical models where international currency choice is characterised by network externalities, giving rise to lock-in and persistence effects, which benefit the incumbent unit.¹⁰³

The conventional account of how long it takes for one international currency to replace another has been challenged to some extent.¹⁰⁴ Evidence suggests that the dollar had in fact already overtaken the pound sterling as the leading reserve currency in the late 1920s (**Chart B.1, panel b**).¹⁰⁵ What was true of reserve currencies was also true of the use of currencies for financing international trade.¹⁰⁶ The dollar had already overtaken the pound sterling as the leading form of trade credit (as the currency of denomination for what were known as “trade acceptances” or “bankers’ acceptances”) in the mid-1920s, not after World War II. Financial market development and policy support – with the Federal Reserve System as a market maker in the New York market for bankers’ acceptances – were instrumental in helping the dollar rival and overtake the pound sterling. Finally, additional evidence suggests that the dollar also emerged as the pre-eminent international currency in global bond markets as early as 1929 (**Chart B.1, panel a**).¹⁰⁷ Financial development was the main factor that helped the dollar to overcome the pound sterling’s head start.

¹⁰³ See, for example, Krugman, P. (1980), “Vehicle currencies and the structure of international exchange”, *Journal of Money, Credit and Banking*, Vol. 12, No 3, pp. 513-526; Krugman, P. (1984), “The international role of the dollar: theory and prospects” in *Exchange Rate Theory and Practice*, edited by Bilson, J. and Marston, R. (Chicago: University of Chicago Press); Matsuyama, K., Kiyotaki, N. and Matsui, A. (1993), “Toward a theory of international currency”, *Review of Economic Studies*, Vol. 60, No 2, pp. 283-307; Zhou, R. (1997), “Currency exchange in a random search model”, *Review of Economic Studies*, Vol. 64, No 2, pp. 289-310; Rey, H. (2001), “International trade and currency exchange”, *Review of Economic Studies*, Vol. 68, No 2, pp. 443-464.

¹⁰⁴ For an overview see Eichengreen, B., Mehl, A. and Chițu, L. (2017), *How global currencies work: past, present, and future*, Princeton University Press.

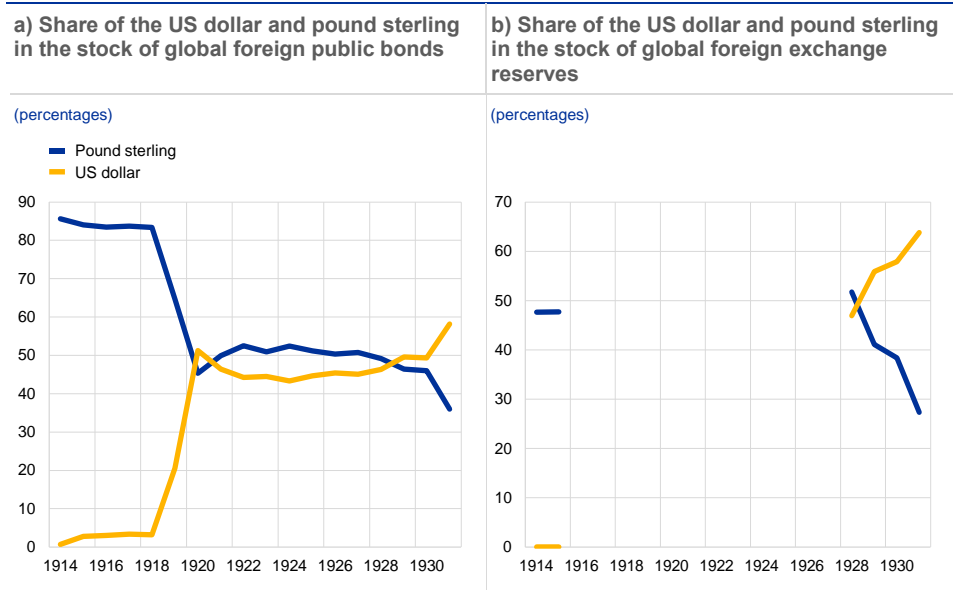
¹⁰⁵ See Eichengreen, B. and Flandreau, M. (2009), “The rise and fall of the dollar (or when did the dollar replace sterling as the leading reserve currency?)”, *European Review of Economic History*, Vol. 13, No 3, pp. 377-411.

¹⁰⁶ See Eichengreen, B. and Flandreau, M. (2012), “The Federal Reserve, the Bank of England, and the rise of the dollar as an international currency, 1914-39”, *Open Economies Review*, Vol. 23, No 1, pp. 57-87.

¹⁰⁷ See Chițu, L., Eichengreen, B. and Mehl, A. (2014), “When did the dollar overtake sterling as the leading international currency? Evidence from the bond markets”, *Journal of Development Economics*, Vol. 111, Issue C, pp. 225-245.

Chart B.1

The US dollar had already overtaken the pound sterling as leading international currency in the 1920s



Sources: Eichengreen, B. and Flandreau, M. (2009), "The rise and fall of the dollar (or when did the dollar replace sterling as the leading reserve currency?)", *European Review of Economic History*, Vol. 13, No 3, pp. 377-411; Chițu, L., Eichengreen, B. and Mehl, A. (2014), "When did the dollar overtake sterling as the leading international currency? Evidence from the bond markets", *Journal of Development Economics*, Vol. 111, Issue C, pp. 225-245.
 Notes: The stock of global foreign public bonds excludes Commonwealth countries. No data are available on global foreign exchange reserves between 1915 and 1927. The latest observation is for 1931.

The conventional narrative remains largely valid today. The US dollar remains the main currency for global trade and finance despite claims that the euro or the renminbi would dethrone it.¹⁰⁸ It accounts for between 50% and 90% of global trade and financial transactions, depending on the metric considered, far more than the United States' global economic and financial weight.¹⁰⁹ About half of global trade is invoiced in dollars – a share that has been broadly stable over the past two decades.¹¹⁰ If the share of the dollar in international reserves has declined since 1999, it is mainly to the benefit of non-traditional reserve currencies other than the euro.¹¹¹

¹⁰⁸ On the euro see Chinn, M. and Frankel, J. (2007) "Will the euro eventually surpass the dollar as leading international reserve currency?" in *G7 Current Account Imbalances: Sustainability and Adjustment* (Chicago: University of Chicago Press); on the renminbi see Subramanian, A. (2011), "Renminbi rules: the conditional imminence of the reserve currency transition", *Peterson Institute for International Economics Working Paper*, No 11-14.

¹⁰⁹ See Maggiori, M., Neiman, B. and Schreger, J. (2019), "The rise of the dollar and fall of the euro as international currencies", *AEA Papers and Proceedings*, Vol. 109, pp. 521-526; Ilzetki, E., Reinhart, C. and Rogoff, K. (2019), "Exchange arrangements entering the twenty-first century: Which anchor will hold?", *Quarterly Journal of Economics*, Vol. 134, No 2, pp. 599-646.

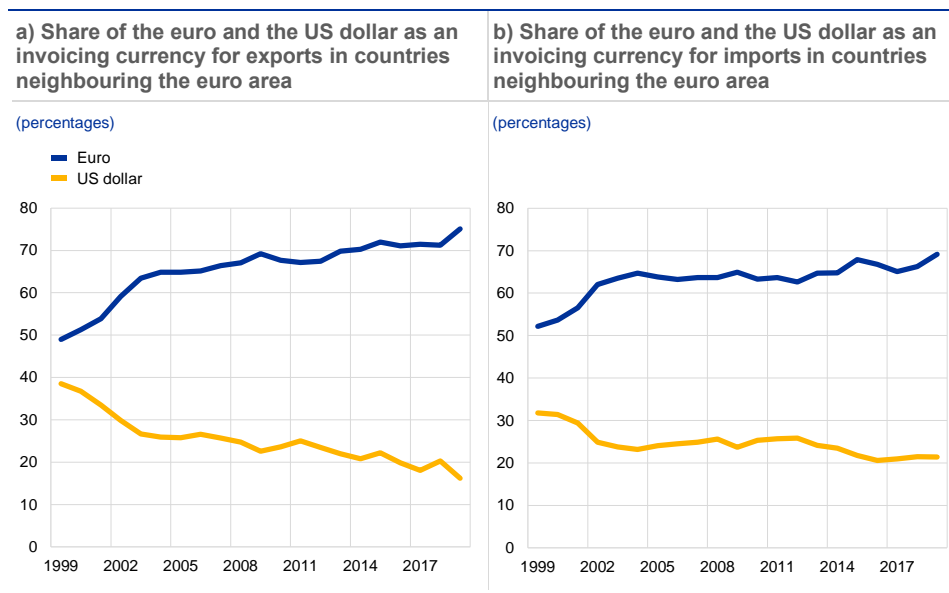
¹¹⁰ See Boz, E., Casas, C., Georgiadis, G., Gopinath, G., Le Mezo, H., Mehl, A. and Nguyen, T. (2022), "Patterns of invoicing currency in global trade: New evidence", *Journal of International Economics*, Vol. 136, No 103604.

¹¹¹ The shift out of dollars has been in two directions: one quarter into the Chinese renminbi and three quarters into the currencies of smaller countries that have played a more limited role as reserve currencies. See Arslanalp, S., Eichengreen, B. and Simpson-Bell, C. (2022), "The Stealth Erosion of Dollar Dominance and the Rise of Nontraditional Reserve Currencies", *Journal of International Economics*, Vol. 138, No 103656.

A noteworthy exception is the invoicing of international trade in countries neighbouring the euro area. Countries that joined the euro area or the EU after the euro's creation in 1999, EU candidate countries and other European countries have experienced marked increases in the use of the euro as an invoicing currency for international trade at the expense of the US dollar. The share of the euro as an invoicing currency for exports has increased on average by more than 20 percentage points since the turn of the millennium in these countries, while the share of the US dollar has declined by about the same magnitude (**Chart B.2, panel a**). Patterns for imports are similar, although the euro had more of a head start here (**Chart B.2, panel b**). Importantly, the rise in euro invoicing is not just a mechanical implication of euro adoption by some of these neighbouring countries.¹¹² This suggests that, under certain circumstances, a leading international currency might be replaced – or dwarfed in importance – by another.

Chart B.2

Use of the euro for invoicing by countries neighbouring the euro area increased after 1999 at the expense of the US dollar



Source: Boz, E., Casas, C., Georgiadis, G., Gopinath, G., Le Mezo, H., Mehl, A. and Nguyen, T. (2022), "Patterns of invoicing currency in global trade: New evidence", *Journal of International Economics*, Vol. 136, 103604.

Notes: Cross-country averages of individual observations of a sample of countries neighbouring the euro area which were not inaugural members of the euro area in 1999 (Bulgaria, Czech Republic, Estonia, Croatia, Latvia, Lithuania, Hungary, North Macedonia, Norway, Poland, Romania and Slovakia). The latest observation is for 2019.

New hypotheses and mechanisms

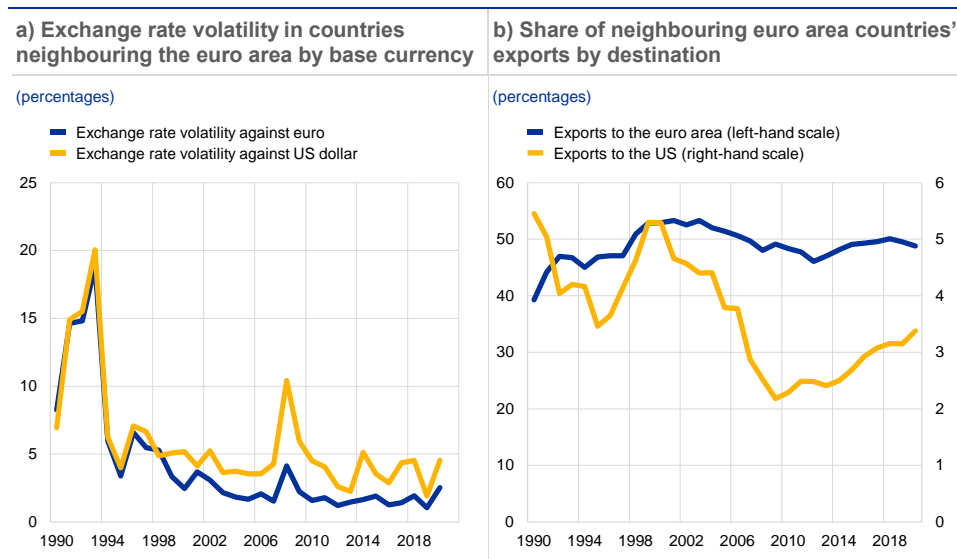
Recent theory points primarily to two hypotheses that could explain these developments. One hypothesis is a trade shock: the occurrence of a large, positive shock – or unexpected change – to the challenger's role in international trade, which then feeds through self-reinforcing complementarities between a currency's roles in

¹¹² Slovenia joined in 2007, Slovakia in 2009, Estonia in 2011, Latvia in 2014, Lithuania in 2015 and Croatia in 2023, in other words, several years after the share of the euro had increased. Moreover, invoicing in legacy currencies of the countries in question was limited before the adoption of the euro, while invoicing in major global currencies was widespread.

global trade and finance.¹¹³ Accordingly, as Europe took up a sufficiently large share of global exports relative to the United States, dynamics eventually got to a point where a euro-dominant equilibrium became inevitable. **Chart B.3, panel b** shows that exports of countries neighbouring the euro area to euro area countries increased significantly between the early 1990s and the mid-2000s, which is consistent with this hypothesis. Countries neighbouring the euro area transitioned towards market economies and were integrated into regional value chains and, in some cases, the EU. In parallel, the share of exports to the United States declined notably since the early 1990s. Another hypothesis emphasises a shock to exchange rate volatility: a stronger role of the challenger’s currency as a reference unit against which other economies manage their respective exchange rates.¹¹⁴ A switch from US dollar to euro invoicing hence requires enough central banks to shift their exchange rate management policy away from the US dollar towards the euro.¹¹⁵ In line with this hypothesis, exchange rate volatility against the euro declined significantly throughout the 1990s (**Chart B.3, panel a**). Exchange rate policies in many countries neighbouring the euro area turned to the euro as a nominal anchor, with some countries eventually adopting the euro. At the same time, exchange rate volatility against the US dollar declined as well, albeit to a lesser extent.

Chart B.3

Trade of countries neighbouring the euro area was re-oriented towards the euro in the 1990s, in tandem with a greater stability in their exchange rates vis-à-vis the euro



Sources: IMF Direction of Trade Statistics, BIS and ECB calculations.
Notes: Cross-country averages of individual observations of a sample of countries neighbouring the euro area which were not inaugural members of the euro area in 1999 (Bulgaria, Czech Republic, Estonia, Croatia, Hungary, Lithuania, Latvia, North Macedonia, Norway, Poland, Romania and Slovakia). The latest observation is for 2020.

¹¹³ This hypothesis is developed by Gopinath, G. and Stein, J.C. (2021), “Banking, trade, and the making of a dominant currency”, *Quarterly Journal of Economics*, Vol. 136, No 2, pp. 783-830.
¹¹⁴ This is the hypothesis developed in Mukhin, D. (2022), “An equilibrium model of the international price system”, *American Economic Review*, Vol. 112, No 2, pp. 650-688.
¹¹⁵ The model put forward by Mukhin contains several other determinants, including trade-size shocks as discussed by Gopinath and Stein. However, the author’s counterfactual simulations suggest that the abandonment of US dollar pegs is required for the US currency to lose its dominant currency role in trade invoicing.

Both recent and earlier theoretical models underline the importance of network effects. Network effects include bilateral trade links between countries in the form of input-output linkages and value chains, strategic complementarities in price setting among competitors and suppliers and economies of scope in alternative uses of a currency, all of which link the invoicing currency choices of different firms, both within and across countries. The resulting cross-country effects suggest that a switch in international invoicing currency that overcomes lock-in and inertia forces is a joint – rather than a unilateral – phenomenon affecting multiple countries.

Recent research by ECB staff takes these hypotheses to the data.¹¹⁶ The study shows how theory maps itself into a network which links invoicing currency choices across countries. It uses a panel vector autoregression (or panel VAR) model that analyses invoicing currency choices, exchange rate volatility and trade developments jointly in a sample of 13 countries neighbouring the euro area between 1999 and 2019.¹¹⁷ This framework allows various cross-country effects emphasised in theory to be explicitly modelled, and network effects to be accounted for – for example, the fact that countries’ invoicing currency choices are not just impacted by their own trade patterns and exchange rate volatilities but also by those of their trade partners and competitors, those of the trade partners and competitors of the latter. Moreover, the model investigates the dynamics underlying invoicing currency choices rather than merely static determinants. This is relevant in view of the significant heterogeneity in the timing, speed and extent of increases in euro invoicing across countries of the sample.¹¹⁸ A trade shock and an exchange rate volatility shock can be identified within the model using sign restrictions on impact. Identification is achieved by limiting cross-country effects to those emphasised in the theory¹¹⁹ and using a well-known puzzle in the international finance literature: the exchange rate disconnect. This refers to the lack of short-run correlation between the exchange rate and other macroeconomic fundamentals. Therefore, the identification assumption is that exchange rate volatilities are not impacted by contemporaneous trade developments.¹²⁰

¹¹⁶ See Mehl, A., Mlikota, M. and Van Robays, I., “How does a dominant currency replace another? Evidence from European trade”, *CEPR Discussion Paper*, forthcoming. The sample includes the same countries as those shown in [Chart B.1](#) and [Chart B.2](#).

¹¹⁷ Euro (or euro area) variables in the model are defined relative to the US dollar (or United States) to analyse the determinants of the switch of the use of the euro for trade invoicing at the cost of the US dollar. The results are robust to only considering euro (or euro area) variables.

¹¹⁸ The euro either strengthened its lead (Croatia, Czech Republic, Hungary), caught up (Norway) or replaced the US dollar as the main invoicing unit (Bulgaria, Lithuania, Poland).

¹¹⁹ Specifically, to capture strategic complementarities in export price setting, the model allows a country’s share of exports invoiced in euro to depend on contemporaneous and lagged values of other countries’ exports invoiced in euro. Similarly, it allows exchange rate volatility of a given country to depend on exchange rate volatilities of other countries. By including country-specific data on exchange rate volatility and country-specific effects, different currency regimes are accounted for. Finally, the model captures bilateral trade links and input-output linkages by allowing a country’s share of imports invoiced in euro to depend on exports invoiced in euro of countries for which the country is the destination market. As stressed above, all variables are expressed in relative terms vis-à-vis the US dollar (United States).

¹²⁰ See Obstfeld, M. and Rogoff, K. (2000), “The six major puzzles in international macroeconomics: is there a common cause?”, *NBER Macroeconomics Annual*, Vol. 15, pp. 339-390 and Itskhoki, O. and Mukhin, D. (2021), “Exchange rate disconnect in general equilibrium”, *Journal of Political Economy*, University of Chicago Press, Vol. 129, No 8, pp. 2183-2232.

New empirical evidence

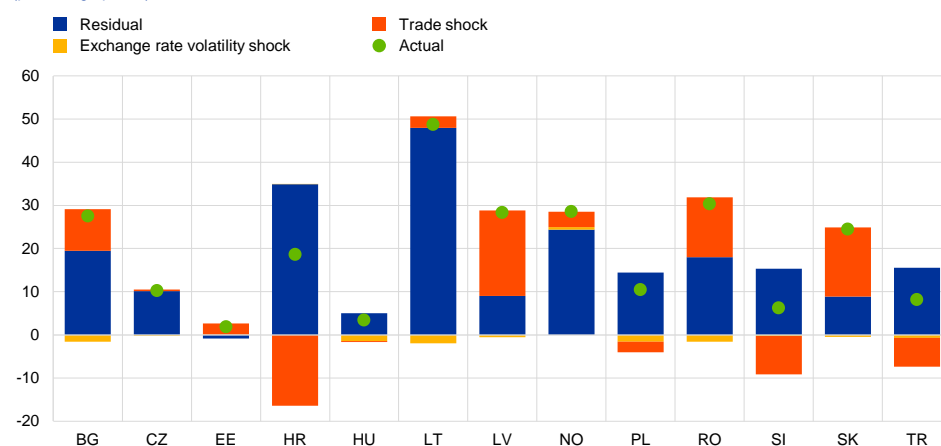
The model estimates provide significant evidence in support of the trade shock hypothesis. Estimated impulse responses to a trade shock suggest that stronger trade with the euro area relative to trade with the United States leads to a significant and persistent increase in euro invoicing. By contrast, the impact of an exchange rate volatility shock (i.e. greater exchange rate stability against the euro) is found to be statistically insignificant. Importantly, the effect of the trade shock is economically relevant – in countries where trade links with the euro area increased, the shock accounts for almost 40% of the rise in the share of exports invoiced in euro between 1999 and 2019 on average.

Chart B.4

Model estimates point to trade shocks as important drivers of increases in euro invoicing

Historical decomposition of the share of export invoicing across countries

(percentage points)



Source: Mehl, Mikota and Van Robays, "How does a dominant currency replace another? Evidence from European trade", *CEPR Discussion Paper*, forthcoming.

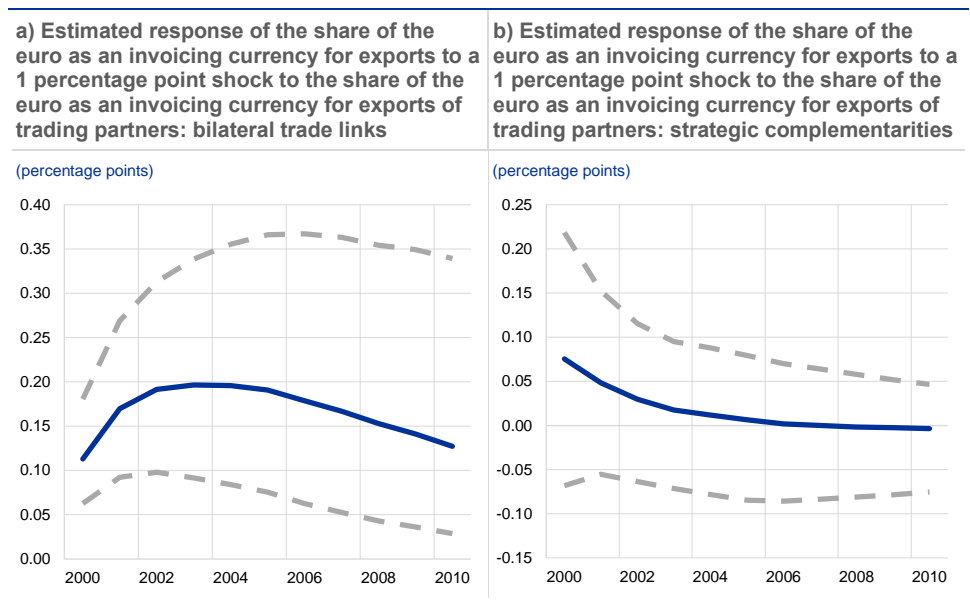
Notes: For each country, the green dot indicates the actual increase in the share of the euro as an invoicing currency for exports between 2000 and 2019. The red (yellow) bars indicate the estimated contribution of the trade (exchange rate volatility) shock, while the blue bar is the residual. The residual component encapsulates other important determinants of invoicing currency choice that are not explicitly modelled, such as changes to the economic fundamentals of the dominant currency issuer (e.g. higher inflation, geopolitical shocks or policy support).

However, the importance of the trade shock differs across countries. For some countries, such as Bulgaria, Latvia, Romania and Slovakia, between one-third to two-thirds of the increase in the share of the euro for export invoicing can be ascribed to stronger export orientation towards the euro area (see the red bars in **Chart B.4**). It is these countries that experienced the strongest increases in export shares to the euro area relative to the United States and, in turn, some of the largest increases in euro invoicing. Moreover, there is evidence that cross-country effects are relevant. For instance, in countries where the share of the euro area in total exports remained more stable, such as Estonia, stronger trade links between the euro area and the trade partners of the countries in question resulted in a slight rise in the share of the euro for export invoicing. Finally, in countries such as Croatia, Slovenia and Türkiye – where the share of the euro area in total exports declined to the benefit of the United States – model estimates pick up the fact that weaker trade

linkages discouraged the use of the euro for export invoicing. However, residual factors more than offset these effects, thereby leading to an increase in euro invoicing even in these economies.¹²¹

Chart B.5

Cross-country effects operate mainly via bilateral trade linkages, such as input-output linkages



Source: Mehl, Mlikota and Van Robays, "How does a dominant currency replace another? Evidence from European trade", *CEPR Discussion Paper*, forthcoming.

Notes: Panel a shows the part that relates to bilateral trade links – measured as the estimated effect of increases in the share of the euro as an invoicing currency for foreign exports on the share of the euro as an invoicing currency for domestic imports. Panel b shows the part that relates to strategic complementarities – measured as the estimated effect of changes in the share of the euro as an invoicing currency for foreign exports on the share of the euro as an invoicing currency for domestic exports.

Further estimates suggest that cross-country linkages are relevant

determinants of changes in invoicing currency patterns. Impulse response estimates suggest that a one standard deviation shock to the share of the euro area in total trade of countries neighbouring the euro area increases the share of the euro as an invoicing currency for domestic exports by about 1 percentage point. The effect takes time to unfold but is significant, persistent and economically meaningful in magnitude. Other estimates further suggest that such cross-country effects operate mainly via bilateral trade linkages, including input-output linkages, that is, the use of imported goods in export goods production, rather than strategic complementarities in price setting – the fact that firms coordinate on a particular invoicing currency to align their price with the prices of suppliers and competitors.

Chart B.5 provides evidence of the strength of these two channels. It shows the effect of a joint 1 percentage point increase in the share of the euro as an invoicing currency for foreign exports on the share of the euro as an invoicing currency for domestic exports. **Chart B.5, panel a** shows the part that relates to bilateral trade links – measured as the estimated effect of increases in the share of the euro as an

¹²¹ Examples include changes to the economic fundamentals of the dominant currency issuer (e.g. much higher inflation in the United States, as discussed in Mukhin (2022)), geopolitical shocks (as discussed in Eichengreen, B., Mehl, A. and Chitu, L. (2019), "Mars or Mercury? The geopolitics of international currency choice", *Economic Policy*, Vol. 34, No 98, pp. 315-363), or policy support (e.g. the availability of currency swap lines in the challenger currency, as discussed in Bahaj and Reis (2020)).

invoicing currency in the exports of a country's trading partners on the share of the euro as an invoicing currency for domestic imports, which, in turn, affects domestic exports. **Chart B.5, panel b** shows the part that relates to strategic complementarities – measured as the estimated effect of changes in the share of the euro as an invoicing currency for foreign exports on the share of the euro as an invoicing currency for domestic exports. The estimates underscore the relevance of bilateral trade linkages, which translate into a significant and persistently higher share of the euro as an invoicing currency for domestic exports. By contrast, the estimates for strategic complementarities are statistically insignificant.

Concluding remarks

New evidence on the importance of trade shocks for currency invoicing has important implications for policy. It suggests that in response to the pandemic and the war in Ukraine, the reshoring or friendshoring of production chains could lead to stronger regional trade, notably on the European continent. That, in turn, could strengthen the future role of the euro for export invoicing and its importance for the international transmission of shocks and the pass-through of global exchange rate movements, with the caveat that such a reversal in global economic integration would bring other economic costs.

C Determinants of currency choice in cross-border bank loans

By Lorenz Emter, Peter McQuade, Swapan Kumar Pradhan (BIS)¹²² and Martin Schmitz

Dominant currencies confer important economic, financial and strategic advantages on the issuer, so it is important to understand why some currencies have a more prominent international role than others. This special feature provides insights into various potential determinants of currency choice in cross-border bank lending, such as bilateral distance, measures of financial and trade linkages to issuer countries of major currencies, and invoicing currency patterns. Cross-border bank lending in US dollars, and particularly in euro, is highly concentrated in a small number of countries. The United Kingdom is central in the international network of loans denominated in euro, although there are tentative signs that this role has diminished for lending to non-banks since Brexit, with such loans now possibly booked by newly-established US (or euro area) subsidiaries. Offshore financial centres are pivotal for US dollar loans, reflecting, in particular, lending to non-bank financial intermediaries in the Cayman Islands, possibly as a result of regulatory and tax optimisation strategies of large multinationals and high net worth individuals. An empirical analysis suggests that euro-denominated loans face the “tyranny of distance”, in line with predictions of standard models of trade, as captured by a variety of variables, in contrast to US dollar loans. Complementarities between trade invoicing and bank lending are found for both the euro and the US dollar. Overall, the analysis suggests that the euro tends to be more of a regional currency, while use of the US dollar in cross-border bank lending is global.

Introduction

Dominant currencies confer important economic, financial and strategic advantages on the issuer, so it is important to understand why some currencies have a more prominent international role than others. This special feature provides insights into various potential determinants of currency choice in cross-border bank lending, showing that currency choice is affected by geographical distance to the currency issuer and the scale of financial and trade linkages to issuer countries, as well as invoicing currency patterns.

International economics provides a theoretical account of how the use of a currency for trade invoicing is complementary to its role as a safe asset. This special feature contributes to the well-established literature on dominant currencies, particularly Gopinath and Stein (2021).¹²³ A key point made in Gopinath and Stein’s model is that only dominant currency deposits can be truly considered safe, as they

¹²² The views expressed here are those of the authors. They do not represent the views of the Bank for International Settlements, the ECB or the Eurosystem.

¹²³ Gopinath, G. and Stein, J.C. (2021), “Banking, Trade, and the Making of a Dominant Currency”, *Quarterly Journal of Economics*, Vol. 136, Issue 2, pp. 783-830. For an overview of the literature see Gopinath, G. and Itskhoki, O. (2022), “Dominant Currency Paradigm: a review”, *Handbook of International Economics*, Vol. 6.

are the only guarantee of purchasing power for imports invoiced in that currency.¹²⁴ The greater the share of trade invoiced in the dominant currency, the greater the desire of the economic agents to hold their assets denominated in that currency in banks. At the same time, a bank promising to repay a depositor in the dominant currency in the future should also hold matching assets denominated in the same currency, implying that it will lend in that currency too, even if the revenues of the borrowing firm are not in the dominant currency. This in turn would incentivise the borrowing firm to invoice in the dominant currency, creating a positive feedback mechanism or *strategic complementarities* that support the emergence of a dominant currency in trade invoicing and global banking.

This article presents empirical analysis that tests whether this economic mechanism is supported by recent and comprehensive data. The granular data provided by the bilateral BIS locational banking statistics make it possible to conduct analysis that provides robust and nuanced supporting evidence of the complementarities described above.

As well as confirming the globally dominant role of the US dollar in cross-border banking, this special feature points to several new stylised facts related to the euro. While the descriptive analysis shows the centrality of the United Kingdom for euro-denominated loans, it also highlights tentative signs of negative Brexit effects (**Box 4**). Offshore financial centres are pivotal in the network of cross-border loans denominated in US dollars, mainly as a result of lending to non-bank financial intermediaries located in the Cayman Islands, possibly due to regulatory and tax optimisation strategies of large multinationals and high net worth individuals. The outsized role of the United Kingdom and offshore financial centres is one reason why euro- and US dollar-denominated cross-border bank lending appears so geographically concentrated.

The regression analysis suggests that euro-denominated loans are affected by the “tyranny of distance”, in line with predictions of standard models of trade, as captured by a variety of variables, in contrast to US dollar-denominated loans. Complementarities between trade invoicing and bank lending are found for both the euro and the US dollar. Overall, the analysis confirms that the role of the euro in cross-border bank lending is more regional, while use of the US dollar is global.

Descriptive analysis

The analysis employs the bilateral BIS locational banking statistics.¹²⁵ The data are dyadic, meaning that each observation refers to a country pair, providing information collected from the 48 BIS reporting countries vis-à-vis more than 200 counterparty countries. This extensive data coverage allows for substantially improved descriptive and empirical analysis compared with earlier studies.

¹²⁴ Special Feature B also provides a discussion on determinants of invoicing currency.

¹²⁵ The bilateral data were compiled and analysed in the BIS system.

The data record cross-border positions in loans by banks residing in the reporting countries, which can be broken down by currency composition. The data provide information on loans denominated in euro and US dollars, as well as in three other major global currencies (pound sterling, Japanese yen and Swiss franc).¹²⁶ The baseline analysis examines cross-border bank loans aggregated vis-à-vis all sectors, while more disaggregated data by counterparty sector are used to examine whether patterns differ across counterparty banks, non-bank financial intermediaries and non-financial sector borrowers. This allows us to shed additional light on the mechanisms underlying currency choice in international bank lending.

Examining the entire network of euro-denominated loans highlights the important role of the United Kingdom, including for loans vis-à-vis the euro area. Chart C.1, panel a shows the network of cross-border bank loans denominated in euro, with the node sizes and edges proportional to the stock of loans. An arrow originating from a node represents loans by banks located in the country/region to the country/region where the arrow ends. Intra-euro area loans are excluded, but links to and from the euro area are included.¹²⁷ The network chart shows that the network of euro-denominated loans is highly centralised in the euro area. It also illustrates that despite Brexit, the United Kingdom continues to play a key role in intermediating euro-denominated loans with the euro area, as well as with the United States and offshore centres. There is a relatively large amount of loan flows from banks located in the United Kingdom to residents in the United States and offshore centres, whereas flows in the opposite direction, i.e. from banks located in the United States and offshore centres to the United Kingdom, are considerably smaller. Euro area-resident banks have substantial euro-denominated loans to emerging market economies.

The network of US dollar-denominated loans is less centralised in the currency issuer than for euro-denominated loans. Chart C.1, panel b shows the network of US dollar-denominated loans. The US dollar is the main vehicle currency in that it exhibits more substantial linkages between countries other than the issuer (i.e. the United States), although the United States remains the most important player. Banks located in offshore centres play a key role in intermediating US dollar-denominated loans to the United States and emerging economies (mainly in Asia).

¹²⁶ Although available, information on lending in domestic currency (other than the above-mentioned currencies) is not used, as the aim is to compare lending in major international currencies, particularly the euro and the US dollar.

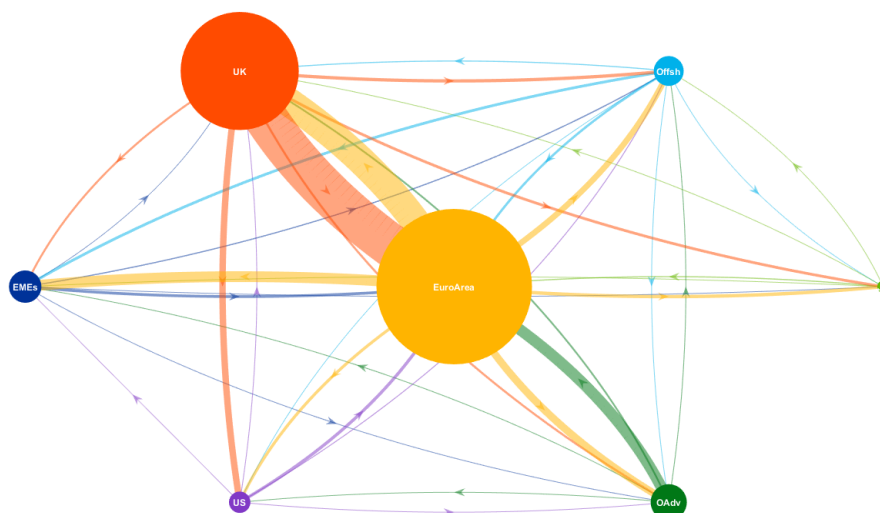
¹²⁷ The narrow measure used in the rest of the report on the international role of the euro is what would be left if the euro area and all the arrows touching it were removed.

Chart C.1

The United Kingdom plays a central role in the network of euro-denominated cross-border bank loans, while offshore centres play an outsized role for US dollar loans

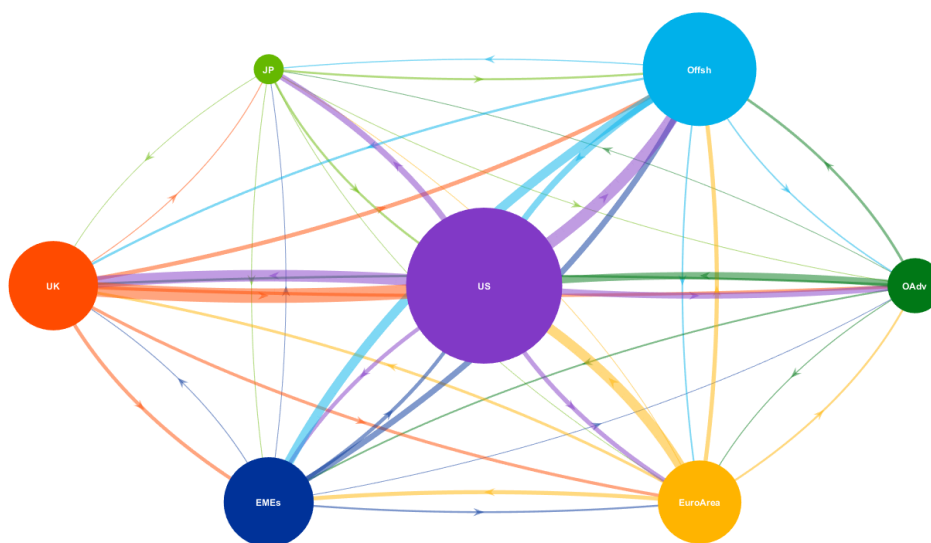
a) Network of euro-denominated cross-border bank loans

(scaled in proportion to % of total euro-denominated loans)



b) Network of US dollar-denominated cross-border bank loans

(scaled in proportion to % of total US dollar-denominated loans)



Sources: BIS locational banking statistics (by residence) and ECB/BIS calculations.

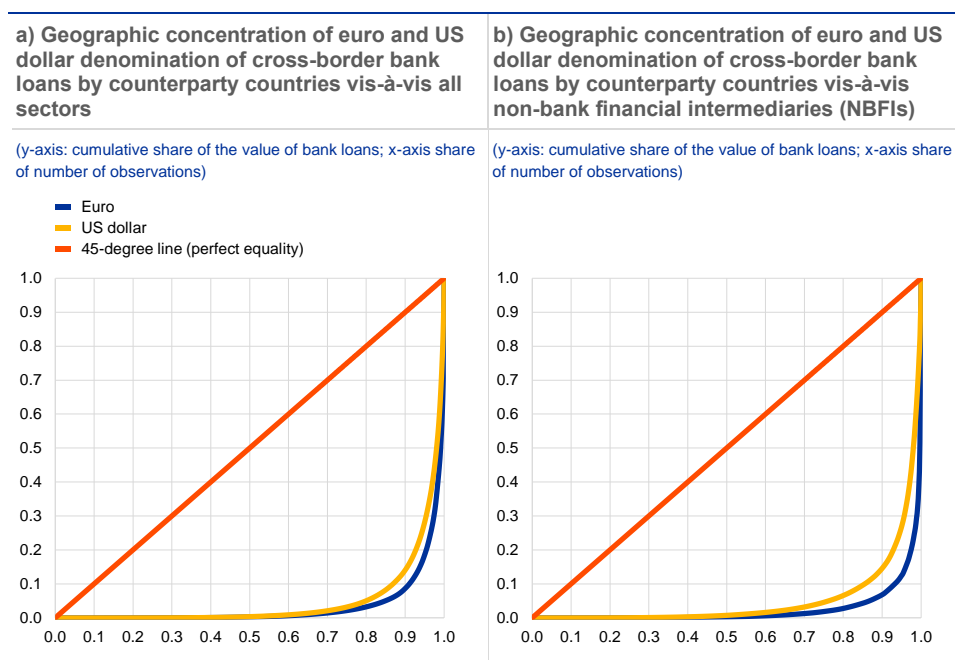
Notes: *Offsh* denotes offshore financial centres, *OAdv* are other advanced economies. Arrows originating from a node represent loans by banks located in the country/region to the country/region where arrow ends. Edges (arrows) of a size of less than USD 1 billion have been omitted in the calculations. The node size is proportional to the total and shows relative importance (e.g. banks in the United Kingdom are the largest non-euro area providers of euro-denominated loans, followed by those in offshore centres, the United States, Japan, other advanced economies, Switzerland and emerging market economies). Loans between countries in the same region are excluded. Data reported are the average of quarterly observations for 2021.

Euro-denominated cross-border bank loans excluding direct links to the euro area are more geographically concentrated than those denominated in US dollars. Although the US dollar and – to a lesser extent – the euro are used for cross-border lending by countries all over the world, most of the volume of lending in both currencies is concentrated in a small number of countries. The high degree of

concentration in the distribution of cross-border bank links can also be visualised using the Lorenz curve (Chart C.2), following Aldasoro and Ehlers (2019).¹²⁸ This curve plots the cumulative share of the number of observations (on the x-axis) versus the cumulative share in associated volumes (on the y-axis). The 45-degree lines in the panels represent the benchmark of perfectly equally distributed volumes, which would occur if all bilateral country-level links were of the same size.¹²⁹ Chart C.2 indicates an extremely unequal distribution of both euro and US dollar-denominated lending.¹³⁰ Comparing across currencies, euro-denominated cross-border bank loans are slightly more concentrated than US dollar-denominated claims for loans to all sectors (Chart C.2, panel a) and somewhat more for claims on non-bank financial intermediaries (Chart C.2, panel b).

Chart C.2

Euro-denominated cross-border bank loans are somewhat more concentrated than those denominated in US dollars



Sources: BIS locational banking statistics (by residence) and authors' calculations.

Notes: Loans made by non-resident counterparties of the currency area and non-resident banks. For example, euro-denominated loans related to cross-border claims by banks located outside the euro area on non-residents of the euro area. The curves plot the cumulative share of the number of observations (x-axis) versus the cumulative share in associated volumes (y-axis). The 45° lines in the panels represent the benchmark of perfectly equally distributed volumes, which would occur if all bilateral country-level links were of the same size. Based on quarterly average amounts outstanding in 2021.

Euro-denominated international loans (a more restricted definition than cross-border loans) mainly originate from banks based in the United Kingdom, while offshore centres play a central role in the international network of cross-border loans denominated in US dollars. In Chart C.3 the concept of international loans excludes loans where either the source or the destination of the loan is the

¹²⁸ See Aldasoro, I. and Ehlers, T. (2019), "Concentration in cross-border banking", *BIS Quarterly Review*, June.

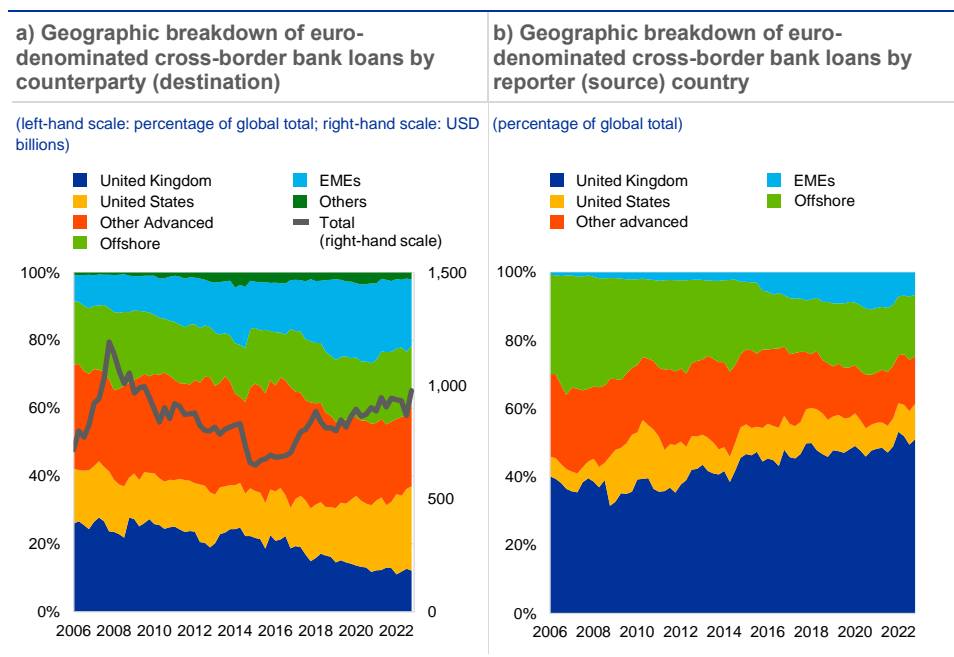
¹²⁹ Chart 2 excludes loans to and from the euro area. The United States is excluded from the equivalent depiction of US dollar-denominated lending.

¹³⁰ For example, euro-denominated loans from banks resident in the United Kingdom to residents of the United States and Japan account for more than one quarter of total bilateral euro-denominated lending.

currency issuer, in this case countries in the euro area. Examining the geographic breakdown of euro-denominated cross-border loans reveals that the United Kingdom is a major, albeit declining destination (**Chart C.3, panel a**), but steadily growing source (**Chart C.3, panel b**), of euro-denominated loans. The share of banks in the United Kingdom as originators has continued to increase steadily from around 45% in the fourth quarter of 2015 to over 50% in the fourth quarter of 2022. By contrast, the share of the United Kingdom as a recipient country has declined, from around 23% in the fourth quarter of 2015 to below 12% in the fourth quarter of 2022. This is driven by a decline in the euro borrowing of non-bank financial institutions since Brexit, which may be partly related to these institutions relocating to other countries. While this decline has been a persistent trend, the share of the United States has exhibited a marked increase since 2015 (**Chart C.3, panel a**). This could indicate that US banks and non-bank groups have responded to the outcome of the Brexit referendum and the consequent withdrawal of the United Kingdom from the EU by moving euro-denominated borrowing away from their offices located in the United Kingdom, with such loans now possibly booked by newly-established US (or euro area) subsidiaries.

Chart C.3

The United Kingdom remains a major source and destination of cross-border euro-denominated bank loans



Sources: BIS locational banking statistics (by residence) and authors' calculations.

Notes: Excluding loans to and from the euro area. The discontinuity in the share of emerging markets in 2016 visible in panel b is a consequence of the inclusion of Russia and China as BIS reporting countries.

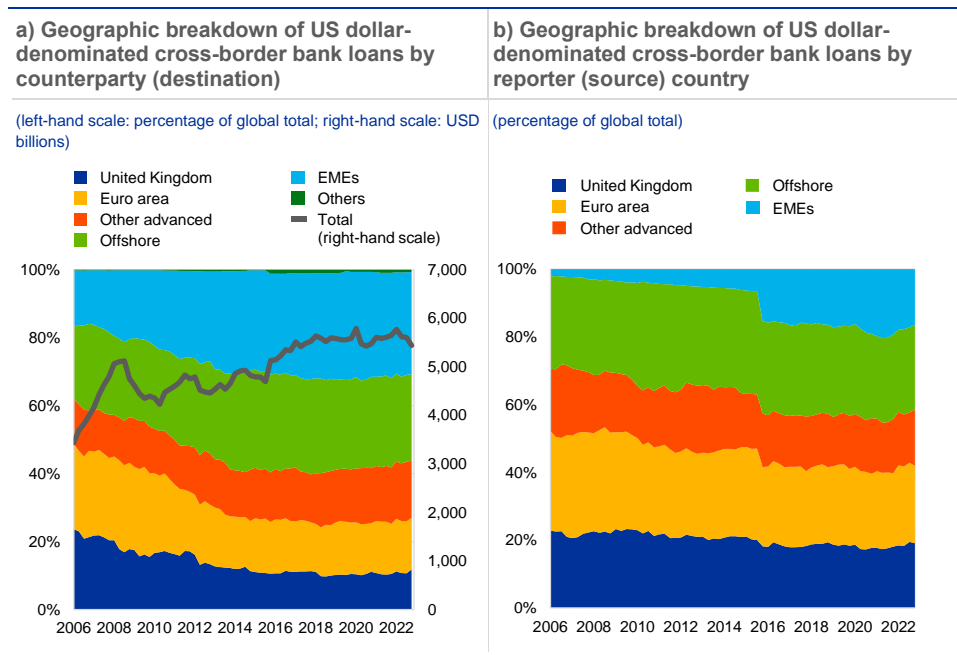
Offshore financial centres play a sizeable role in intermediating US dollar-denominated loans (**Chart C.4**).

The large share of offshore centres (especially the Cayman Islands) for US dollar-denominated bank loans may be partly related to the regulatory and tax optimisation strategies of large multinational corporations and high net worth individuals (McCauley, McGuire and Wooldridge, 2021; Coppola et

al., 2021; Bénétrix, Emter and Schmitz, 2022).¹³¹ The share of offshore centres in US dollar-denominated bank loans to non-bank financial institutions is even larger at around 40%. The share of emerging markets also increased markedly following the global financial crisis and European sovereign debt crisis, but has stabilised in recent years.

Chart C.4

Offshore financial centres such as the Cayman Islands play a sizeable role in intermediating US dollar-denominated loans



Sources: BIS locational banking statistics (by residence) and authors' calculations.
Notes: Excluding loans to and from the United States. The discontinuity in the share of emerging markets in 2016 visible in panel b is a consequence of the inclusion of Russia and China as BIS reporting countries.

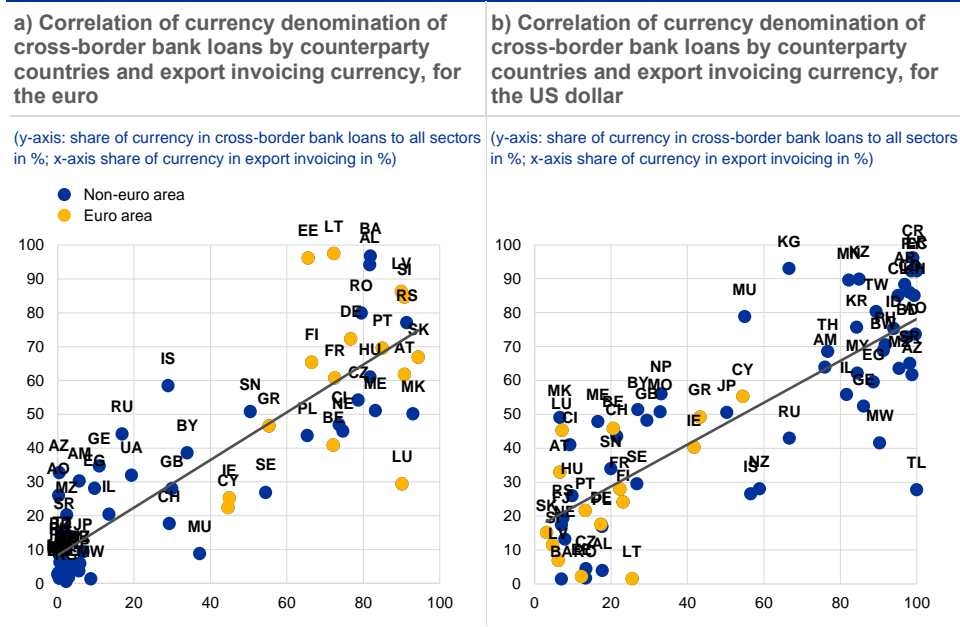
Euro or US dollar-denominated cross-border bank lending is positively correlated with trade invoicing denominated in the same currency. Chart C.5

replicates the key empirical chart of Gopinath and Stein (2021), but for the euro (Chart C.5, panel a) as well as the US dollar (Chart C.5, panel b), and expands considerably on the number of countries by combining the BIS locational banking statistics with the trade invoicing data collected by Boz et al. (2022).¹³² The chart confirms the positive correlation between the counterparty country's share of trade invoicing denominated in a currency and the share of cross-border lending denominated in the same currency for both the euro and the US dollar. This points to complementarities between the role of a currency in trade and finance.

¹³¹ McCauley, R.N., McGuire, P. and Wooldridge, P. (2021), "Seven decades of international banking", *BIS Quarterly Review*, September; Coppola, A., Maggiori, M., Neiman, B. and Schreger, J. (2021), "Redrawing the map of global capital flows: The role of cross-border financing and tax havens", *Quarterly Journal of Economics*, Vol. 136, No 3, pp. 1499-1556; Bénétrix, A., Emter, L. and Schmitz, M. (2021), "Automatic for the (tax) people: information sharing and cross-border investment in tax havens", *Trinity Economics Papers*, No 1321, Trinity College Dublin, Department of Economics.
¹³² Boz, E., Casas, C., Georgiadis, G., Gopinath, G., Le Mezo, H., Mehl, A. and Nguyen, T. (2022), "Patterns in invoicing currency in global trade", *Journal of International Economics*, Vol. 136.

Chart C.5

Euro or US dollar-denominated cross-border bank loans are positively correlated with trade invoicing patterns



Sources: BIS locational banking statistics (by residence) and authors' calculations.
Notes: The data displayed are for counterparty/destination countries in the BIS data. Euro area countries are included but intra-euro area bank loans are excluded. Reported values are for the 2016-2019 average.

Empirical analysis

The empirical analysis investigates how the determinants of cross-border bank lending vary across different currencies. The analysis employs cross-sectional regressions using the following specification:

$$XB \text{ claims}_{ijc2019} = \beta'X_{ij2019} + \gamma'X_{ijc2019} + FE_i + FE_j + FE_c + \epsilon_{ijc}$$

where $XB \text{ claims}$ are cross-border claims (i.e. log stocks) between source country i and destination country j denominated in currency of issuer c in 2019, where $i \neq c$ and $j \neq c$. FE_i are country-source fixed effects, FE_j are country-destination fixed effects, and FE_c are currency-denomination fixed effects.¹³³ The regressions include up to 28 of the 45 BIS reporting countries and 170 of the 213 counterparty countries. In line with the convention followed in the rest of the report, the results below exclude intra-euro area positions and exclude observations where either the source or the destination of the loan is the currency issuer. The tables presented below only report results for the euro and the US dollar, but the regressions simultaneously include the three other major global currencies mentioned above.

The key explanatory variables are the distance to the currency-issuer country or a variety of measures of linkages to those countries. X_{ij} is the vector of bilateral controls measured in 2019. As the regression includes reporter and

¹³³ We use data based on the average of quarterly values for 2019 to ensure that our results are not driven by the pandemic and geopolitical shocks that took place in the following years.

counterparty-country fixed effects, for the most part, the key explanatory variables are bilateral indicators measured vis-à-vis the issuer. For instance, in the baseline specification a variable is included that measures how far away both the source and destination countries are from the issuer.¹³⁴ This variable can then be interacted with the currency fixed effects to see if distance to the issuer matters more for some currencies than others. There is a large body of research that finds a crucial role for distance in the international trade of goods and services as well as in international investment and lending, which partly reflects informational frictions.¹³⁵ To the extent that such frictions affect cross-border trade and financial interactions, they are likely to also have a bearing on the international use of a currency. Subsequent specifications include variables to control for the share of bilateral foreign direct investment (FDI), portfolio investment and trade linkages of the source and destination country with the currency-issuer country. Euro area countries are not included individually, rather the values of the share of trade and financial linkages of these countries are aggregated to give a single observation for the euro area. The trade invoicing data from Boz et al. (2022) are reported at the country level. However, this variable is interacted with the currency fixed effects to empirically test whether there is any variation across currencies in the correlation between the share of trade that a counterparty country invoices in a particular currency and the volume of lending denominated in that currency this country receives.

Examining the results, the more distant the source and destination countries are from the currency issuer, the less they engage in cross-border lending denominated in the currency of the issuer. In the baseline specification, we find that the more distant the source and the destination countries are from each other, the less they lend cross-border, consistent with the results of the broader literature. Importantly, the results also show that the greater the distance to the currency issuer (e.g. the euro area or the United States), the lower the volume of lending in the currency of the issuer. The coefficient estimates imply that a 1% increase in distance to the issuer is associated with around a 1% decrease in cross-border bank claims in the currency of the issuer (**Table C.1, Column 1**).

¹³⁴ Distance between the most populated cities in kilometres.

¹³⁵ See Anderson, J. and van Wincoop, E. (2003), "Gravity with Gravitas: A Solution to the Border Puzzle", *American Economic Review*, Vol. 93, No 1, pp. 170-192; Okawa, Y. and van Wincoop, E. (2012), "Gravity in International Finance", *Journal of International Economics*, Vol. 87, No 2, pp. 205-215; Mehl, A., Schmitz, M. and Tille, C. (2019), "Distance(s) and the volatility of international trade(s)", *CEPR Discussion Paper*, No 13630.

Table C.1

The effect of distance is stronger for euro-denominated claims than for US dollar claims

Baseline regression including log distance to issuer – USD and EUR

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All	All	All	Banks	Banks	NBFI	NBFI	Non-finance	Non-finance
Log distance	-0.976** (0.213)	-0.988** (0.232)	-0.981** (0.259)	-0.979*** (0.196)	-0.970*** (0.205)	-0.358* (0.132)	-0.376 (0.189)	-0.825** (0.283)	-0.823** (0.281)
Log distance to issuer	-1.057*** (0.217)	-1.262*** (0.195)	-0.667** (0.207)	-1.246*** (0.167)	-0.826** (0.228)	-1.131*** (0.198)	-0.627* (0.236)	-1.214*** (0.241)	-0.504** (0.161)
Distance to issuer*USD		1.175** (0.333)		1.023** (0.284)		1.096 (0.530)		1.515* (0.560)	
Distance to issuer*EUR			-1.134** (0.293)		-0.667** (0.236)		-0.776*** (0.165)		-1.253** (0.290)
Observations	5,470	5,470	5,470	3,463	3,463	1,303	1,303	3,594	3,594
R-squared	0.52	0.53	0.53	0.56	0.56	0.53	0.53	0.49	0.49
Time period	2019	2019	2019	2019	2019	2019	2019	2019	2019
Source country FE	yes	yes	yes	yes	yes	yes	yes	yes	yes
Host country FE	yes	yes	yes	yes	yes	yes	yes	yes	yes
Currency FE	yes	yes	yes	yes	yes	yes	yes	yes	yes
Reporters	32	32	32	32	32	24	24	24	24
CPs	178	178	178	158	158	108	108	175	175

Sources: BIS locational banking statistics, CEPII and authors' calculations.

Notes: Cluster-robust standard errors (reporter, counterpart, currency level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1. "All" refers to bank loans to all sectors, "Banks" refers to bank-to-bank loans, "NBFI" refers to bank loans to the non-bank financial intermediary sector and "Non-finance" refers to banks loans to the non-financial sector. FE indicates the inclusion of fixed-effects.

Euro-denominated loans decline with increased distance from the euro area, in contrast to loans denominated in US dollars.

When the distance to issuer is interacted with the currency fixed effect, the effect of distance is estimated to be statistically significant and larger for euro-denominated claims than for other international currencies. By contrast, the estimated interaction effect of distance is the opposite in the case of the US dollar.¹³⁶ This implies that if both the source and destination countries are far away from the euro area they are likely to lend less bilaterally in euro, whereas this effect is negligible for bilateral lending in US dollars. Across sectors, the coefficient on the interaction between distance to the issuer and the euro is smallest for claims on banks and largest for the non-financial sector.¹³⁷ The stronger effect observed for the euro is consistent with previous research, such as Boz et al. (2022), showing that while the euro may be a regionally dominant currency, the US dollar is a global currency, unaffected by geographic proximity.

Stronger trade and financial links to the currency issuer are associated with greater cross-border bank claims denominated in that currency (Table C.2).

The estimated effects of trade linkages are somewhat larger than financial linkages.

¹³⁶ That is, the sum of the coefficient on distance to the issuer and the coefficient on the interaction term with the US dollar is generally close to zero and not statistically significant.

¹³⁷ If we then use the US dollar as the reference currency and compare the euro to the other major currencies, we generally find that the effect of distance is largest for the euro, but that the effect of distance is consistently greater for the pound sterling, Japanese yen and Swiss franc.

A 1 percentage point increase in the share of trade links with the currency issuer is associated with a 10% increase in cross-border bank claims in that currency ([Table C.2, Column 1](#)). This implies, for example, that more trade with the euro area by the source and counterparty countries is associated with a larger volume of bilateral bank lending denominated in euro. Looking across sectors for the euro, the coefficients on linkages to the currency issuer matter for all sectors, but the effect of trade and financial linkages appear stronger for non-financial sectors ([Table C.2, Column 8](#)) than for banks and NBFIs ([Table C.2, Columns 4 and 6](#)). Comparing currencies, the coefficient on interaction with the euro is positive and statistically significant, while the negative coefficient on the US dollar suggests that the effects of linkages to the United States are either negligible or smaller compared with other international currencies. Overall, these results suggest that trade linkages to the euro area have a stronger effect for the euro, reflecting the relative importance of trade and global value chain participation for the euro area and euro-denominated lending.

Table C.2

Stronger trade and financial linkages with the currency issuer are associated with more cross-border bank loans denominated in its currency

Trade and financial linkages to the issuer								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All	All	Banks	Banks	NBFI	NBFI	Non-finance	Non-finance
FDI	0.055*** (0.004)	0.033 (0.029)	0.047*** (0.002)	0.039 (0.025)	0.053** (0.012)	0.037 (0.020)	0.065** (0.018)	0.039 (0.034)
FDI*USD	-0.045 (0.042)		-0.016 (0.034)		-0.025 (0.029)		-0.066 (0.068)	
FDI*EUR		0.017 (0.025)		0.005 (0.028)		0.013 (0.026)		0.018 (0.041)
Portfolio investment	0.080*** (0.010)	0.020 (0.016)	0.069*** (0.012)	0.012 (0.019)	0.085*** (0.015)	0.005 (0.016)	0.097*** (0.016)	-0.006 (0.028)
Portfolio investment*USD	-0.073** (0.020)		-0.061** (0.020)		-0.095** (0.021)		-0.121** (0.037)	
Portfolio investment*EUR		0.054* (0.021)		0.056 (0.027)		0.072* (0.028)		0.093* (0.035)
Trade	0.104*** (0.009)	0.010 (0.011)	0.078*** (0.011)	0.007 (0.014)	0.084*** (0.016)	-0.008 (0.018)	0.119*** (0.017)	-0.004 (0.013)
Trade*USD	-0.098*** (0.008)		-0.072** (0.016)		-0.094** (0.024)		-0.128*** (0.021)	
Trade*EUR		0.095*** (0.014)		0.073** (0.017)		0.093** (0.021)		0.123*** (0.023)

Sources: BIS locational banking statistics, CEPII, IMF Coordinated Portfolio Investment Survey, Coordinated Direct Investment Survey, Direction of Trade Statistics and authors' calculations.

Notes: Cluster-robust standard errors (reporter, counterpart, currency level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1. "All" refers to bank loans to all sectors, "Banks" refers to bank-to-bank loans, "NBFI" refers to bank loans to the non-bank financial intermediary sector and "Non-finance" refers to banks loans to the non-financial sector.

Consistent with Gopinath and Stein (2021), the currency denomination of cross-border bank lending and trade currency invoicing are complementary, but more so for the euro than the US dollar (Table C.3). This is consistent with the descriptive analysis presented above. However, the estimated coefficients for the euro are generally somewhat larger than for the US dollar (e.g. [Table C.3, Columns](#)

1 and 2), as a 1 percentage point increase in the share of the euro in a country's trade invoicing is associated with 3% higher cross-border bank loans denominated in euro, compared with around 2% for the US dollar.¹³⁸ This could point to the importance of path dependency and network effects in sustaining the dominant role of the US dollar.¹³⁹

Table C.3

The choice of trade invoicing currency is a complement to both euro and US dollar-denominated loans.

Invoicing currency and currency denomination of loans – USD and EUR								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All	All	Banks	Banks	NBFI	NBFI	Non-Finance	Non-Finance
Distance to issuer	-1.452*** (0.293)	-1.374*** (0.278)	-1.592*** (0.264)	-1.481*** (0.275)	-1.410** (0.326)	-1.293** (0.305)	-1.361*** (0.183)	-1.243*** (0.148)
USD*USD Invoicing share	0.020** (0.006)		0.024*** (0.004)		-0.007* (0.003)		0.014 (0.008)	
EUR*EUR Invoicing share		0.033*** (0.003)		0.030*** (0.005)		0.009 (0.006)		0.034*** (0.004)
Observations	2,391	2,408	1,561	1,578	547	547	1,585	1,599
R-squared	0.50	0.50	0.55	0.55	0.55	0.55	0.47	0.48
Time period	2019	2019	2019	2019	2019	2019	2019	2019
Source country FE	yes	yes	yes	yes	yes	yes	yes	yes
Host country FE	yes	yes	yes	yes	yes	yes	yes	yes
Currency FE	yes	yes	yes	yes	yes	yes	yes	yes
Reporters	32	32	32	32	22	22	23	23
CPs	65	65	62	62	46	46	65	65

Sources: BIS locational banking statistics, CEPII, IMF Coordinated Portfolio Investment Survey, Coordinated Direct Investment Survey, Direction of Trade Statistics and authors' calculations.

Notes: Cluster-robust standard errors (reporter, counterpart, currency level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1. "All" refers to bank loans to all sectors, "Banks" refers to bank-to-bank loans, "NBFI" refers to bank loans to the non-bank financial intermediary sector and "Non-finance" refers to bank loans to the non-financial sector.

Moreover, these results vary considerably across bank lending to different sectors, as the coefficients are smaller and less significant for the NBFI sector (Table C.3, Columns 5 and 6). This could indicate that the mechanism outlined in Gopinath and Stein (2021) (i.e. the need to match the currency of imports with the currency of deposits) may not be the key factor at play in explaining the choice of currency denomination in bank to NBFI sector lending. In turn, this suggests that additional mechanisms could be at play for lending to the NBFI sector, such as regulatory arbitrage or tax optimisation.¹⁴⁰

¹³⁸ In unreported regressions, when the euro and US dollar interactions are included simultaneously, a Wald test confirms that the euro coefficient is statistically significantly larger (at the 10% level) than the US dollar coefficient in the regression on all counterparties, as well as NBFIs and non-financial counterparties but not in the case of bank counterparties.

¹³⁹ Eichengreen, B., Chițu, L. and Mehl, A. (2016), "Network effects, homogeneous goods and international currency choice: New evidence on oil markets from an older era", *Canadian Journal of Economics*, Vol. 49, No 1; Krugman, P. (1980), "Vehicle Currencies and the Structure of International Exchange", *Journal of Money, Credit and Banking*, Vol. 12, No 3, pp. 513-526.

¹⁴⁰ Galstyan, V., Maqui, E. and McQuade, P. (2021), "International debt and special purpose entities: Evidence from Ireland", *Journal of International Money and Finance*, Vol. 115, July.

Concluding remarks

Overall, the analysis in this special feature confirms certain aspects of the role of the euro in global finance and uncovers new facts.

It confirms that the euro tends to be more of a regional currency, while use of the US dollar in cross-border bank lending is global. Moreover, the results suggest that the effect of distance is much stronger for the euro than the US dollar, reflected in the fact that euro-denominated lending is more geographically concentrated. Indeed, the effect of distance and linkages is often found to be negligible for the US dollar, such that its use transcends distance. Consistent with economic theory, the choice of currency for cross-border bank loans and trade invoicing appears to be complementary. However, additional factors are at play, such as the centrality of offshore financial centres in the international network of cross-border loans in US dollars, which largely reflects lending to NBFIs. Moreover, the United Kingdom remains a hub for euro-denominated bank lending, though there are some signs that Brexit has affected lending to NBFIs. The United Kingdom continues to play an outsized role in euro-denominated bank lending, above and beyond what can be explained by its proximity and continued strong trade and financial linkages to the euro area. This probably also reflects the key role of the City of London in the global financial system, as also suggested by the prominence of the United Kingdom in the global network of US dollar-denominated loans.

These results have implications for policy. To the extent that stronger trade and financial links to the euro area foster international use of the euro, preserving the openness of international trade and the financial markets could be supportive of the global appeal of the euro.

4 Statistical annex

See [more](#).

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