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Reserve Currencies in an Evolving International Monetary System

Prepared by an IMF team led by Alina Iancu and comprising Gareth Anderson, Sakai Ando, Ethan Boswell, Andrea Gamba, Shushanik Hakobyan, Lusine Lusinyan, Neil Meads, and Yiqun Wu

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Executive Summary

Despite major structural shifts in the international monetary system over the past six decades, the US dollar remains the dominant international reserve currency. Using a newly compiled database of individual economies' reserve holdings by currency, this departmental paper finds that financial links have been an increasingly important driver of reserve currency configurations since the global financial crisis, particularly for emerging market and developing economies. The paper also finds a rise in inertial effects, implying that the US dollar dominance is likely to endure. But historical precedents of sudden changes suggest that new developments, such as the emergence of digital currencies and new payments ecosystems, could accelerate the transition to a new landscape of reserve currencies.

CHAPTER

1 Introduction

The international monetary system has evolved over the past decades in response to major structural shifts in the global economy prompted by trade and financial integration, technological developments, and geopolitical events. More recently, the sustained growth and rapid integration of emerging market and developing economies (EMDEs) have increased their economic heft and created a less-concentrated structure of global output and trade and a more multipolar global economy (IMF 2016).

Yet the currency composition of international reserves has remained remarkably stable. The US dollar has been the dominant reserve currency for the past 60 years, notwithstanding the collapse of the Bretton Woods system in the 1970s and the emergence of new reserve currencies such as the euro and the renminbi over the past two decades. The dollar's reserve currency status has been supported and reinforced by its global use for trade invoicing and cross-border investment, among others, and as an exchange rate anchor.

This paper investigates the drivers of reserve currencies at the global and country level, how these drivers have changed over time, and how they differ across advanced economies (AEs) and EMDEs. In addition to aggregate data from the IMF Currency Composition of Official Foreign Exchange Reserves (COFER) database, the paper compiles and uses a novel database of individual economies' reserve holdings by currency.[1] The paper finds that inertia and financial links are important drivers of reserve currency shares, and their importance has increased since the global financial crisis (GFC) of 2008–09.

The paper complements the empirical analysis with a discussion of ongoing trends and uncertainties that could accelerate the transition to new reserve

[1]In this paper, the terms "country" and "economy" do not in all cases refer to a territorial entity that is a state as understood by international law and practice. These terms cover some territorial entities that are not states but for which statistical data are maintained on a separate and independent basis.

currencies. A number of possible factors could lead to an eventual change in the status quo. For instance, the COVID-19 pandemic could yet alter the global economic landscape; rising geopolitical tensions could trigger strategic shifts in reserve holdings; or technological advances, in particular the emergence of digital currencies and advances in payment systems, could speed up the transition to alternative, and perhaps less stable, configurations of reserve currencies.

The paper is structured as follows. Chapter 2 outlines what constitutes a reserve currency and provides a short description of current and past trends. Chapter 3 introduces the conceptual framework underpinning the empirical analysis and presents the findings using both global and country-level data. Chapter 4 considers potential triggers for future shifts, and Chapter 5 offers conclusions.

CHAPTER

2 Current and Past Reserve Currencies

Countries hold foreign exchange reserves to finance balance of payments needs, intervene in foreign exchange markets, provide foreign exchange liquidity to domestic economic agents, and for other related purposes, such as maintaining confidence in the domestic currency and facilitating foreign borrowing. As such, reserves are generally denominated in currencies widely used for international payments and widely traded in global foreign exchange markets.[1,2]

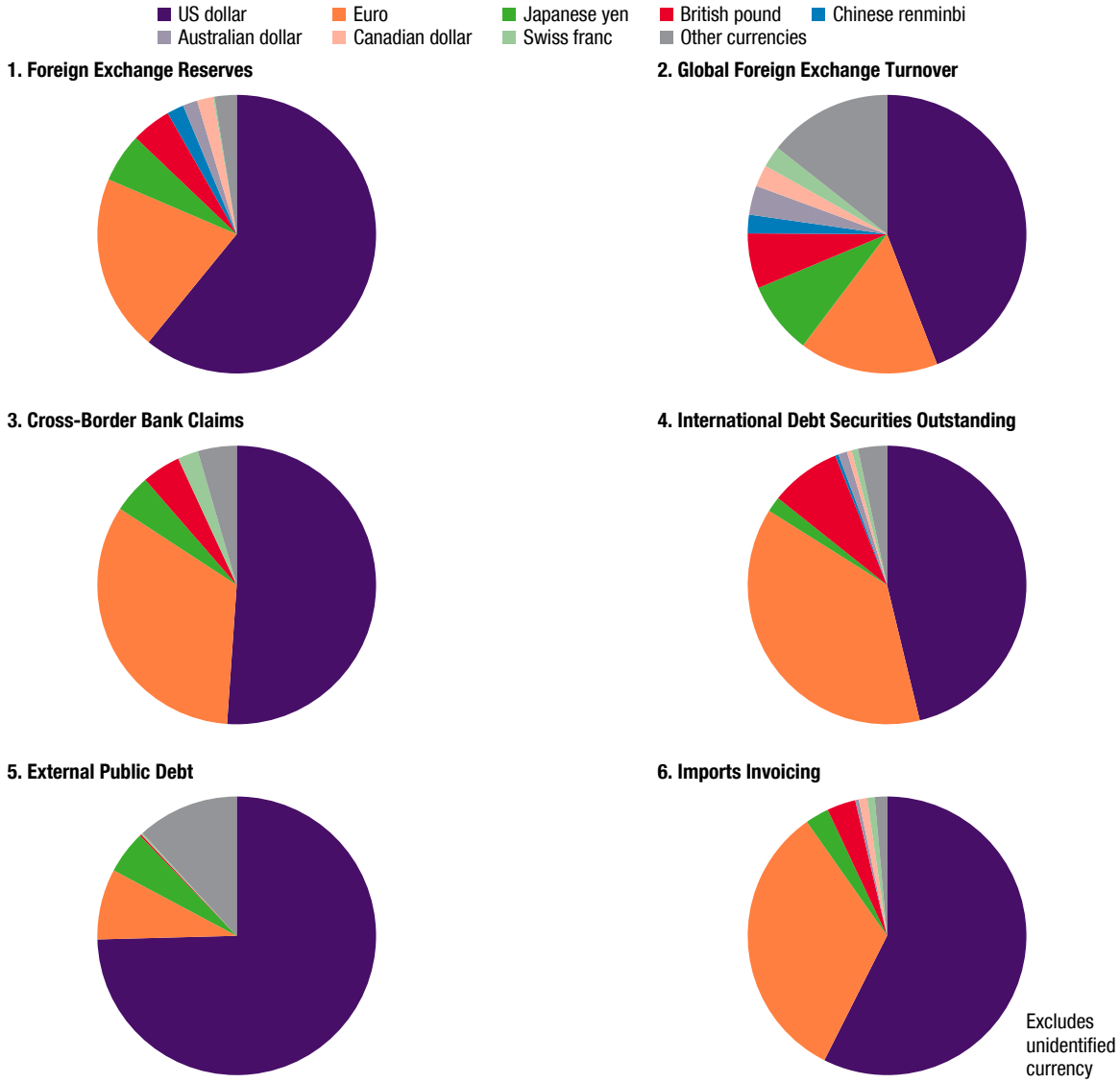
The accumulation of foreign exchange reserves by the official sector is but one of many examples of the international use of currencies. Other countries' currencies can be also used by the private sector for external trade invoicing and settlement, cross-border investment, and as a vehicle for financial transactions. Different international uses are complementary and tend to reinforce each other. For instance, widespread use by the private sector for trade invoicing and financial transactions often goes hand-in-hand with official sector use as exchange rate anchor and reserve currency, which, in turn, can bolster credibility and reinforce private sector use. Also, more trade invoicing is often associated with a greater denomination of financial claims (Gopinath and Stein 2018; Chahrour and Valchev 2017).

The US dollar is currently the dominant reserve currency, with a share of 61 percent of global reserves at the end of 2019. The euro comes second with 21 percent of reserves, and other currencies' shares are much smaller still (Figure 1). The dollar's leading role as a reserve currency is consistent with

[1]IMF Balance of Payments and International Investment Position Manual, sixth edition (BPM6).

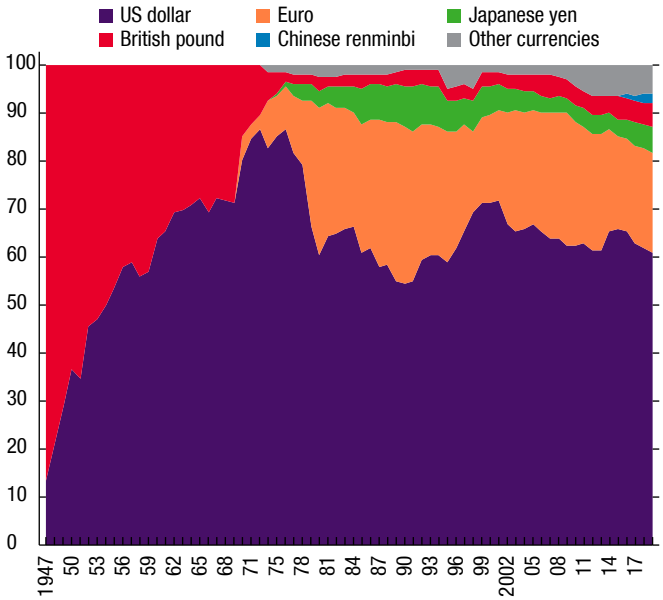
[2]"Reserve currencies" for the purpose of this paper are the currencies separately identified and reported in the IMF COFER database: eight currencies currently in use (the SDR currencies—US dollar, euro, Japanese yen, British pound, and Chinese renminbi, plus the Swiss franc, Canadian dollar, and Australian dollar—comprising 97 percent of total allocated reserves), and three currencies preceding and later replaced by the euro (the Deutsche mark, French franc, and Dutch guilder).

Figure 1. Currency Composition of Reserves, Foreign Exchange Turnover, Financial Claims, and Trade Invoicing, 2019 or Most Recent
(Percent)



Sources: Bank for International Settlements; Gopinath (2015); IMF, Currency Composition of Official Foreign Exchange Reserves (COFER) database; World Bank, International Debt Statistics; and IMF staff calculations.
Note: External public debt data are for the end of 2018 and include only emerging market and developing economies; foreign exchange turnover comes from the BIS Triennial Central Bank Survey conducted in April 2019; invoicing data are averaged across all years for which data are available between 1999 and 2014 for 49 economies (Gopinath 2015). Using more recent data on currency shares in invoicing from Boz and others (2020) and currency breakdown of external debt liabilities from Bénétrix and others (2019) yields broadly similar shares for US dollars and euros in imports invoicing and international debt securities outstanding, respectively. The remaining figures use data for the end of 2019. Panel 1 shows the shares in allocated reserves reported under COFER, with unallocated reserves being the difference between the total foreign exchange reserves in the IMF's International Financial Statistics database and the total allocated reserves in COFER. A further breakdown of currencies is not available for external public debt and cross-border bank claims.

Figure 2. Currency Composition of Allocated Reserves, 1947–2019
(Percent of total)



Sources: IMF, Currency Composition of Official Foreign Exchange Reserves (COFER) database; and IMF staff calculations.
Note: Excludes unallocated reserves. European Currency Unit and legacy currencies are included in the euro prior to 1999.

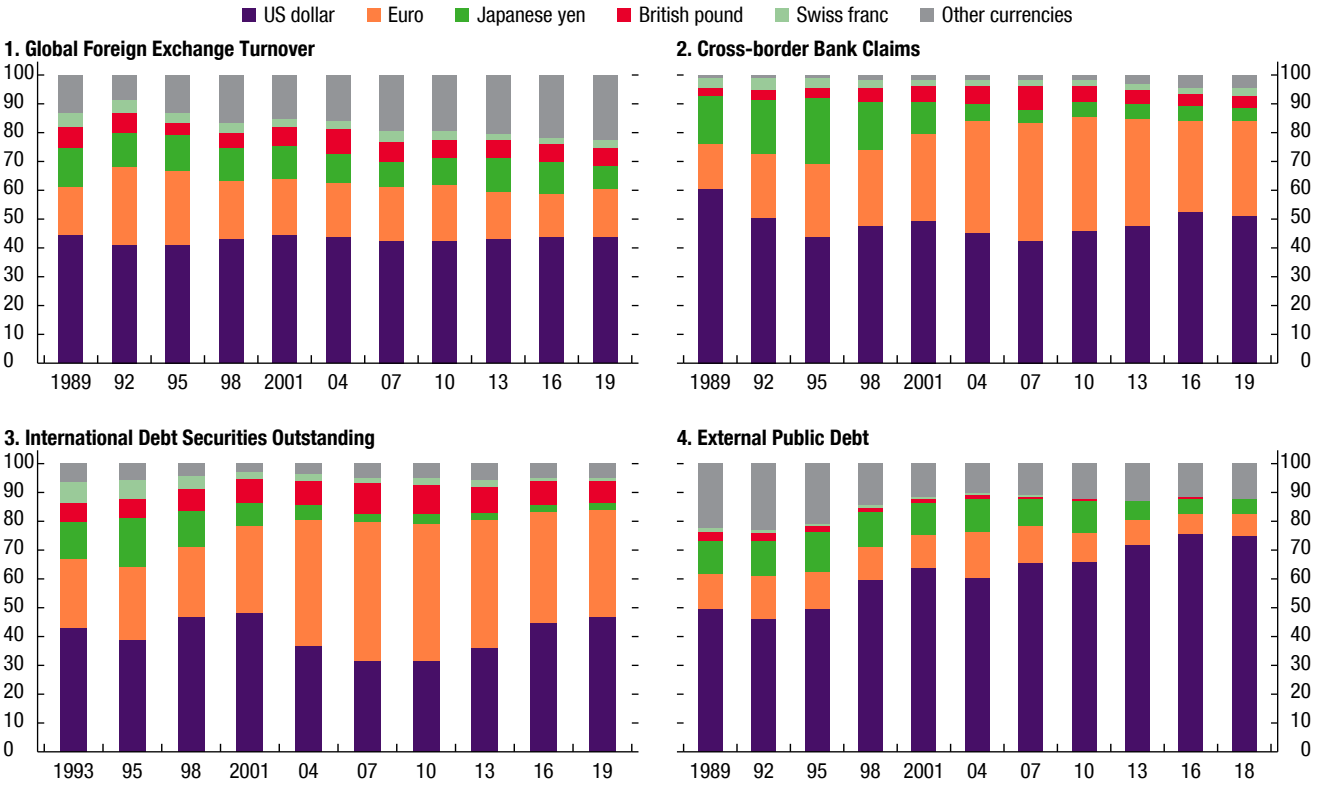
its wide international use: it stands out as the currency most traded in the foreign exchange market (44 percent of turnover), and most used for trade invoicing (54 percent of global trade) and financial claim denomination (for example, 51 percent of cross-border bank claims) (Figure 1).

The US dollar has held this dominant position for more than 60 years, notwithstanding significant shifts in the international monetary system (IMS) (Figure 2). Some of these shifts have included, in chronological order, the creation of the SDR in the 1960s to help address the so-called Triffin dilemma[3]; the collapse of the Bretton Woods system in the 1970s that diminished the link to the dollar in exchange rate arrangements; the emergence of Japan in the 1980s as a global creditor; the introduction of the euro in 1999; trends toward greater reserve diversification following the GFC[4]; and

[3]The Triffin dilemma refers to the fundamental tension between the heightened global demand for reserve currencies and the domestic policy incentives of reserve issuers, with implications for global financial stability. As such, the outsized role of the US dollar as a reserve currency was seen to impart instability in the system.

[4]A 2012 IMF survey of reserve managers showed that many central banks were contemplating shifts to currencies such as the Australian and Canadian dollars (Morahan and Mulder 2013).

Figure 3. Currency Composition of Foreign Exchange Turnover and Financial Claims, 1989–2019
(Percent)



Sources: Bank for International Settlements; World Bank, International Debt Statistics; and IMF staff calculations.

China's efforts to boost the internationalization of the renminbi and promote its reserve currency status over the last decade. Despite all these changes, the dollar's share in global reserves has remained above 50 percent, while its share in global foreign exchange turnover has been remarkedly stable at close to 45 percent since 1989 (Figure 3). And while other currencies, particularly the renminbi, have been reportedly gaining some ground in trade invoicing,[5] the dollar's use for financial asset denomination, in particular EMDEs debt, has been on the rise.

The IMS has often been dominated by a few currencies that were used widely for significant periods of time. In recent decades, these currencies have been the US dollar and, to some extent, the euro (Figures 2 and 3). The transition from one dominant currency to another has taken anywhere between several years to many decades, but there have also been periods without a dominant currency (Box 1).

[5]For instance, Ito and others (2019) show that the share of renminbi invoicing in Japanese exports to China increased from 1.3 percent in 2009 to 12.3 percent in 2017.

Box 1. International and Reserve Currencies in Retrospect

The use of national currencies as reserves is a relatively new phenomenon linked to the development of nation states and central banks. Even under the gold standard, balance of payments differences were primarily settled in gold, with national fiat currencies accounting for a relatively limited share of total reserves.[1,2] The growing use of national fiat currencies as reserves was supported by the collapse of the gold standard together with the recognition of various benefits of holding fiat currency over commodities.[3]

Historically, transitions from one dominant "international" currency to another took anywhere from several years to many decades.[4] In the 18th century, policy errors and a lack of fiscal backing contributed to the Dutch florin's abrupt (in just over a decade) loss of status as the dominant international currency, while the rise of Britain as an industrial and commercial power supported the concurrent rise of London as a financial center and of pound sterling as an international—and reserve—currency (Quinn and Roberds 2014). In the 20th century, the US dollar replaced the sterling as the dominant international currency only many decades after the United States overtook Britain economically.[5]

There have been periods with no clearly dominant international currency. For example, prior to the classical gold standard, silver, gold, and bimetallic blocs coexisted; in the 19th century, the British pound, French franc, and Deutsche mark all accounted for significant fractions of global foreign exchange reserves (Lindert 1969); and in the interwar period, the British pound and US dollar contributed equally to the stock of global liquidity and were equally important as invoicing and settlement currencies (Eichengreen and Flandreau 2009, 2010; Chițu, Eichengreen, and Mehl 2012). How-

[1]Flandreau and Jobst (2009) document how, prior to the industrial revolution, the "international" monetary system was a European-dominated intercity system based on privately issued bills of exchange.

[2]Lindert (1969) estimates that, despite rapid growth, foreign exchange reserves accounted for less than 20 percent of total reserves by the end of 1913.

[3]For instance, currency holdings offered interest income and lower transportation and transaction costs, and provided increased flexibility in the face of temporary balance of payments deficits amid competition for gold reserves. Meanwhile, growing dependence on credit from international financial centers bolstered the ability of some currencies to serve as collateral for short-term credits.

[4]Ghosh, Ostry, and Tsangarides (2010) assess the literature on the interwar sterling-dollar switch, and discuss the likelihood of a switch in reserve currencies (notably, a tipping point of the dollar). Neither historical experience nor simulation analysis suggest that an abrupt change in the stock of US dollar assets held as reserves was likely, but the possibility of a sudden and disorderly tipping point could not be ruled out definitively.

[5]Although the precise timing of transition has been debated intensely, it was clearly many decades after the United States overtook Britain economically. The United Kingdom lost its position to the United States as the world's largest economy in 1872 and the largest exporter in 1915. The switch in net debtor/creditor positions started in 1914, and as the US dollar emerged as a convertible net creditor currency, its use in trade and finance widened (for instance, according to Eichengreen, 2019, the US share of Argentina's imports rose from 15 percent in 1913 to 25 percent in 1927).

Box 1. International and Reserve Currencies in Retrospect *(continued)*

ever, the 20th century has been characterized by long periods in which one currency has been used in a significant way internationally at a time—first the British pound, and after the inter-war transition, the US dollar.

Currently, not all reserve currencies fulfill all international roles. For example, the Japanese yen, British pound, and Swiss franc are used internationally mainly for investment purposes, while the renminbi has been little used for investment purposes but increasingly so for trade invoicing. The European Currency Unit (ECU—a basket of European currencies) has predominantly played the role of an anchor currency and was neither a vehicle nor an invoicing currency. But the most used reserve currencies (currently the US dollar and, to some extent, the euro) have been widely used internationally for both trade and finance.

CHAPTER

3 Drivers of Reserve Currencies

This chapter uses an empirical model to investigate the main drivers of reserve currencies, how their importance has changed over time, and how they differ across AEs and EMDEs. Understanding these drivers could help tackle the question of how and when (if at all) a transition to a new reserve currency configuration might occur, which is discussed in Chapter 4.

This paper overcomes an important gap in the existing literature by compiling and using a novel database of individual economies' reserve holdings by currency—to the authors' knowledge, the most comprehensive database based on official data published by individual central banks. Compared to earlier papers, it also considers a broader range of specifications to check the robustness of the results.

Conceptual Framework

The existing literature emphasizes four key elements in determining reserve currency status:

- *The economic size/dominance of reserve issuers:* In theory, the larger the economy and its role in international trade and financial networks, the more likely its currency will be used for those international transactions and as a reserve asset.
- *The credibility of reserve issuers:* Reserve assets should, in theory, offer a stable store of value over time, and be widely used and traded, emphasizing the importance of reserve issuers' policy credibility and their financial markets' depth and liquidity.
- *The transactional demand of reserve holders:* Central banks' reserve portfolio decisions are likely to be influenced by the intended uses of reserves,

particularly for trade- and finance-related payments or foreign exchange market intervention.

- *Inertia:* Reserve currency status tends to change very slowly, inducing inertia. There is a strong inertial bias in favor of using whichever currency has been the reserve currency in the past. Network effects exacerbate this inertia and create strong path dependence.

The literature on the drivers of reserve currency shares at the *global level* indeed finds a significant role for the economic characteristics of reserve issuers, such as their global reach and credibility, as well as inertia (Li and Liu 2008; Eichengreen, Mehl, and Chițu 2016; see Annex 1 for a detailed discussion of the existing literature). The literature also concludes that, after the collapse of Bretton Woods system, the inertial effects became stronger, while the network effects, captured by the reserve issuer's economic size, seem to have weakened, possibly reflecting lower switching costs due to advances in financial and transactions technology. A few studies offer evidence of the geopolitical or strategic considerations influencing countries' choice to hold reserves in a given currency.

Studies using aggregate reserves data cannot capture reserve holders' potential transactional demand (the intended uses of the reserves). The literature using *individual country* data fills this gap but is relatively sparse due to the lack of publicly available data. Studies using confidential COFER country-level data find that reserve holders' potential transactional demand for international payments and foreign exchange market intervention drive the currency composition of their reserves (Heller and Knight 1978; Dooley, Lizondo, and Mathieson 1989; Eichengreen and Mathieson 2000), but such data remain inaccessible for public use.[1]

Empirical Investigation

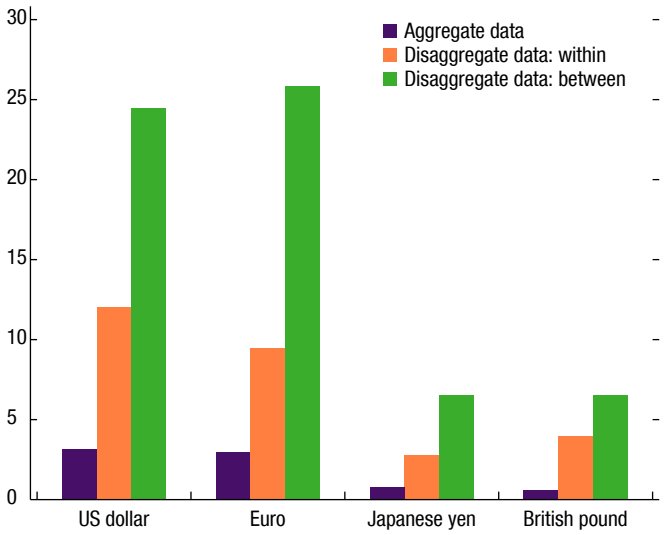
Data and Methodology

The analysis in this paper relies on aggregate data from the IMF COFER database, Eichengreen, Mehl, and Chițu (2016), and individual country data collected from a select group of central banks.

Aggregate reserve currency shares cover the period 1947–2018 and are sourced from Eichengreen, Mehl, and Chițu (2016) before 1995 and

[1]Many national authorities report the currency composition of their reserves to the IMF on a confidential basis reflecting market and/or political sensitivities.

Figure 4. Variation (S.D.) in Reserve Currency Shares, 1999–2018



Source: IMF staff calculations.
Note: "Within" refers to the variation over time, and "between" refers to the variation across countries.

COFER since 1995.[2] The COFER database contains data reported to the IMF on a voluntary and confidential basis. As of the end of 2019, there are 149 reporters accounting for roughly 94 percent of global reserves.[3] Individual responses are confidential, and only the aggregate data are publicly available.[4]

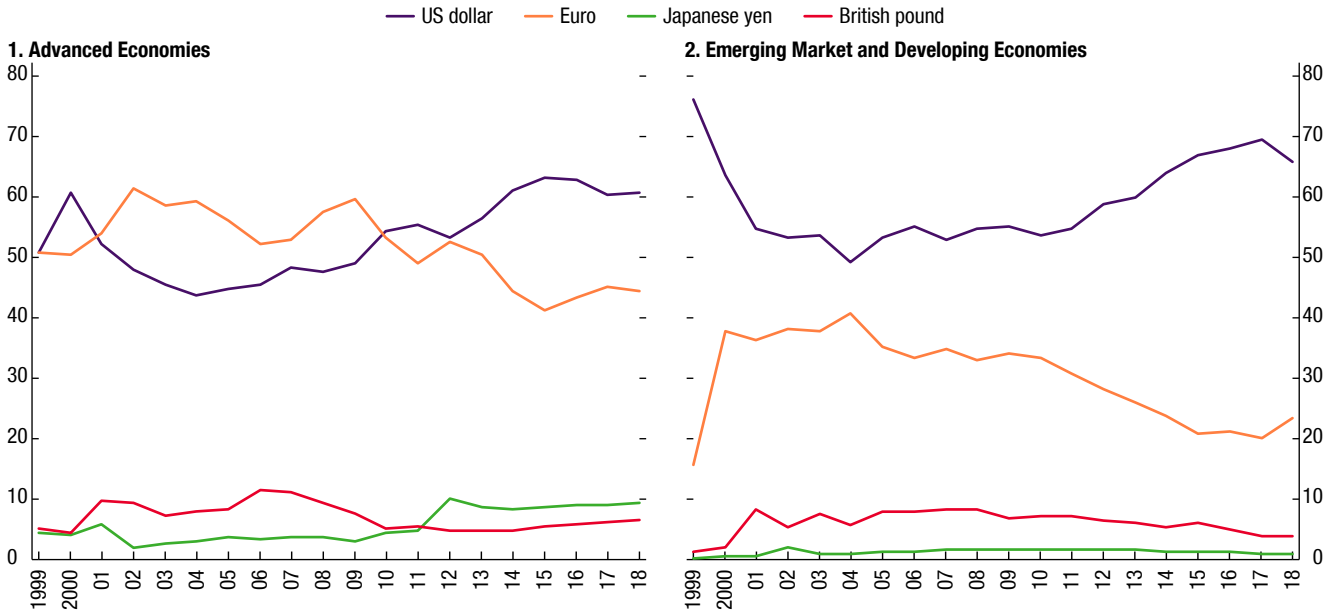
Aggregate data may mask significant shifts within individual countries' portfolios, potentially over-emphasizing inertia. Indeed, the variation in individual countries' reserve currency shares is significantly higher than in the aggregate data (Figure 4). Furthermore, the use of country-level data allows for the examination of more granular drivers—for instance, trade or financial links to the reserve issuer or its currency and the de facto use of the reserve

[2]Data from Eichengreen, Mehl, and Chițu (2016) are originally sourced from IMF Annual Reports and Horsefield (1969).

[3]The remaining 6 percent of global reserves are the unallocated reserves for which the currency breakdown is not available.

[4]The reported shares of the US dollar and British pound cover the entire period of analysis (1947–2018). Other currencies cover shorter periods consistent with their status of "reserve currencies," including the French franc and Deutsche mark since 1970 and Dutch guilder since 1973 (all three were replaced by the euro in 1999), Swiss franc and Japanese yen since 1973, Australian dollar and Canadian dollar since 2012, and Chinese renminbi since 2016.

Figure 5. Disaggregated Data: Average Reserve Shares
(Percent)



Source: IMF staff calculations.
Note: The figure shows the simple average reserve shares in the sample of countries.

currency as an anchor. It can also provide additional insights into how aggregate shares may evolve in the future.

Individual country reserve currency shares are compiled using various central bank publications for 57 economies—19 AEs and 38 EMDEs—over the period 1999–2018. Lack of trade and financial data for some countries further limits the sample to 10 AEs and 32 EMDEs, accounting for 28 percent of global reserves in 2018.[5]

Country-level data confirm the main trend observed in the aggregate data: the average share of US dollar-denominated reserves slipped somewhat following the introduction of euro but recovered after the GFC and the eurozone debt crisis (Figure 5). In addition, the average share of euro-denominated reserves is higher in AEs compared to EMDEs, most likely due to the country composition in each sample, but has trended down for

[5]The list of countries, year coverage, and sources are provided in Annex 3 Table 8. The sample consists of 15 countries in Europe, 8 in the Americas, 8 in Africa, 5 in Asia, and 6 in the Middle East and Central Asia. The panel is unbalanced; for example, only 8 countries report data for the full period and 3 for less than 10 years. In addition, the number of currencies reported varies by country, with some countries reporting separately only a few currencies. Limiting the sample to US dollar and euro shares, the two currencies consistently reported by most countries in the sample, yields qualitatively similar results.

both groups of countries over the sample period.[6] The share of British pound has been relatively small at about 4–6 percent in the last decade, while the Japanese yen experienced a slight surge after the GFC in AEs and remains negligible in EMDEs.

The empirical analysis aims to identify factors that are important in explaining reserve currency shares. In line with the existing literature, the core specification based on aggregate data considers the three factors typically found to be important drivers of aggregate reserve shares:

- lagged reserve currency share to capture inertia
- reserve issuer's share in global GDP to proxy for "network effects" pertaining to its global reach/size
- average appreciation of the reserve issuer's currency against the SDR in the previous five years to capture its credibility.

In addition to inertia, country-level regressions consider factors that could drive individual countries' transactional demand for reserves, including:

- trade links captured by the share of country's trade with the reserve issuer
- foreign exchange alignment proxied by the country's exchange rate comovement with the reserve currency, following Ilzetzki, Reinhart, and Rogoff (2019)
- financial links captured by the share of country's external public debt or cross-border bank claims denominated in reserve currency.

The methodology in this paper improves on previous studies. Results from aggregate data are based on fixed effects model (for currencies and countries), as the unobserved effects appear to be systematic (that is, correlated with predictors).[7] For disaggregated data, the model is estimated separately for AEs and EMDEs as different drivers of reserve holdings could be expected, but also because of different data availability; for example, for financial links this paper uses external public debt data for EMDEs and cross-border bank claims for AEs.[8] The authors undertake a number of robustness tests to check the sensitivity of the results to alternative specifications (see Annexes 2 and 3 for a detailed discussion of the methodology and results).

[6]Six out of 10 AEs in the sample are in Europe, whereas the comparable figure for EMDEs is 9 out of 32.

[7]In contrast, Eichengreen, Mehl, and Chițu (2016) rely on a random effects model.

[8]An alternative measure capturing the financial links is the currency breakdown of external debt liabilities constructed by Bénétrix and others (2019). However, using this measure will further limit the sample (to 23 countries).

Results

The econometric analysis of reserve currency shares reveals that (1) the drivers of reserve currency shares vary across AEs and EMDEs; (2) inertial effects are important throughout the entire period and increasingly important in recent decades; and (3) financial links are becoming more important, while trade links do not appear to be a robust driver of reserve currency shares (Annexes 2 and 3).

Drivers of reserve configurations vary between AEs and EMDEs and over time. Financial links seem to be particularly relevant for EMDEs, while trade links appear more important for AEs, possibly reflecting the large concentration of non-euro area European countries in the AEs sample, with the bulk of their trade with eurozone countries and reserve holdings predominantly in euros.

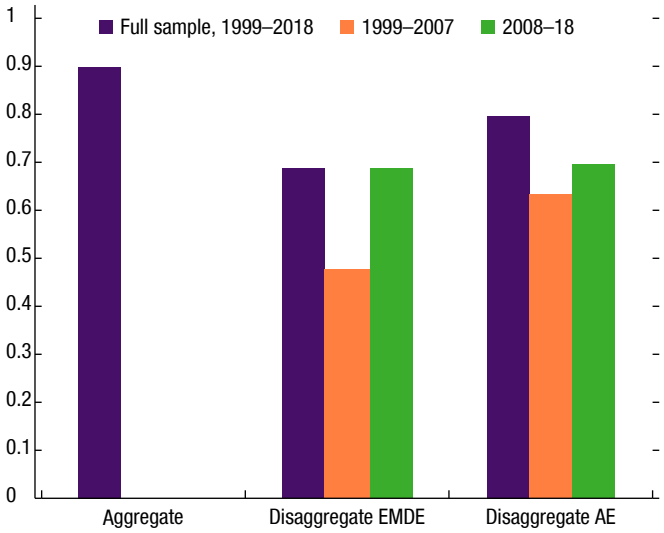
On inertial effects, holding a large share of a given reserve currency in a given year appears to be a good predictor of reserve shares the following year, especially if the currency has been long in use as a reserve currency. Inertial effects are weaker in the disaggregated data, pointing to shifts in some countries' reserve portfolios, but have become more important since the GFC (Figure 6), particularly in EMDEs. Inertial effects appear to dominate economic and geopolitical effects, such as the reserve issuers' economic size and geopolitical influence,[9] and the credibility of its currency. Credibility, in particular, seems to matter only up to a point—once a reserve currency becomes "dominant," short-term episodes of depreciation are less important (Annex 2).

Contrary to previous studies, trade links/networks do not seem to be a robust driver of aggregate reserve shares. Reserve issuers' centrality in global trade networks has some limited explanatory power (Annex 2). When using disaggregated data, the authors also find that trade links with reserve issuers generally fail to explain the observed reserve shares (Figure 7).[10] It could be that a country's trading partners are less relevant for reserve currency considerations in a world where export prices are set in a dominant currency, most likely the US dollar, rather than the producer's currency (Gopinath and others 2020). Unfortunately, the lack of comprehensive data on currencies used for trade invoicing does not allow for a further investigation of this link.

[9]The geopolitical influence is proxied by several measures, including the proportion of countries that have voted in the same direction as the reserve issuer at the UN General Assembly in a given year; spending on official development assistance as a share of GDP; and military spending as a share of total military spending by reserve issuers (see Annexes 2 and 3 for further details).

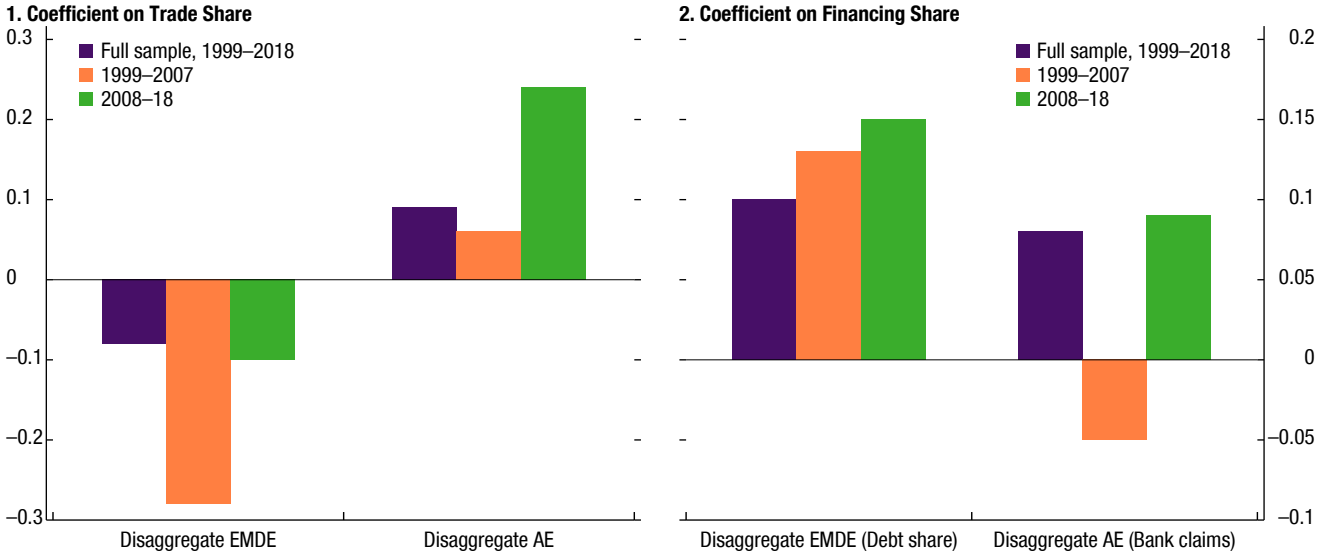
[10]The authors find that trade links have become more important for AEs since the GFC, driven by European countries in their sample. They also find that trade links are important for EMDEs with lower levels of total reserves (Annex 3).

Figure 6. Inertia in Reserve Currency Shares
(Coefficient on lagged currency share)



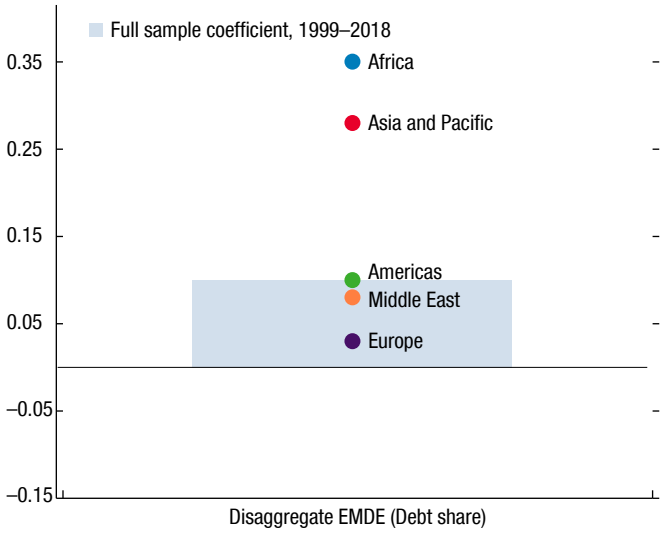
Source: IMF staff calculations.
Note: AE = advanced economy; EMDE = emerging market and developing economy.

Figure 7. Trade and Financial Links



Source: IMF staff calculations.

Figure 8. Denomination of External Debt
(Coefficient on financing share)



Source: IMF staff calculations.

In contrast, financial links appear important and have become more significant over time (Figure 7). The currency denomination of external public debt and cross-border bank claims is an important driver of reserve shares, and increasingly so since the GFC. Moreover, the currency denomination of public debt is an especially important determinant of reserve holdings in EMDEs, particularly those in Africa and Asia (Figure 8). The currency denomination of debt also matters for aggregate reserve shares. But other measures of financial depth/reach of a currency, such as its share in foreign exchange turnover or cross-border bank claims do not matter. This may indicate threshold effects—deep financial markets are likely a precondition for reserve currencies, with incremental changes less relevant.

CHAPTER

4 What Could Alter the Status Quo?

The findings in Chapter 3 and the empirical literature suggest that the currency composition of reserves is influenced by a range of slow-moving factors (historical ties, trade, and finance). But large, sudden changes are not unprecedented historically (Box 1). This chapter offers a discussion of trends and uncertainties, including those related to the COVID-19 crisis, that could affect the status quo and lead to different currency configurations of reserve holdings with significant implications for the IMS.

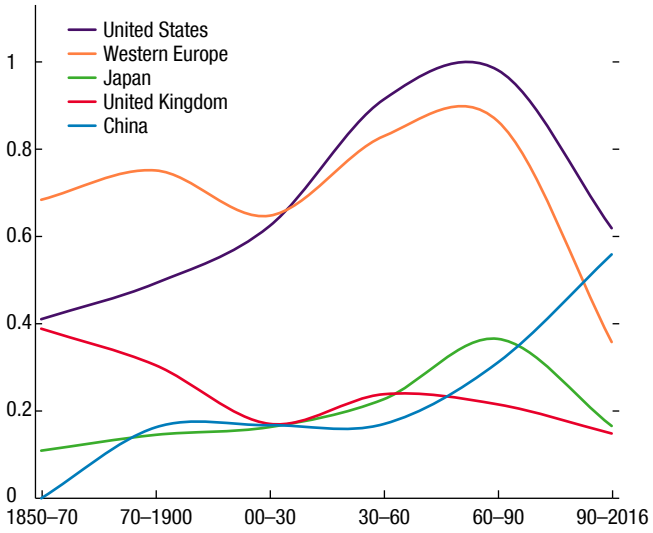
Current Trends

The sustained economic growth and rapid trade integration of EMDEs—particularly China—have led to less-concentrated global output and trade growth and gradually shifted the world's economic center of gravity (Figure 9). Financial integration has also become more pronounced, with global capital flows, measured as the sum of gross capital inflows across all countries relative to the global GDP, three times as large in recent years than in 1970s. These trends have not (yet) affected the role of the US dollar as the dominant reserve and international currency. Further, the COVID-19 crisis has led to a global flight to safe assets, and to the dollar in particular, supported by the US Federal Reserve's actions to provide liquidity.[1]

Going forward, China could overtake the United States as the world's largest economy by 2030, while the share of EMDEs in global GDP is expected to

[1]As with past crises, the pandemic triggered a global market selloff and capital flight to safety. But capital outflows from EMDEs—at more than $100 billion in just two months—were more than three times larger than those seen during the GFC. At the same time, the massive capital outflows were short-lived and have already been partially reversed: exchange rates have stabilized, net issuance of bonds abroad reached $77 billion in April and May, and nonresident portfolio flows to EMDEs were back in positive territory in the second quarter of 2020.

Figure 9. Historical Evolution of Simple Growth Polarity
(Selected economies, 1850–2016)



Source: IMF staff calculations, from Maddison Project Database (2018).
Note: The simple polarity index was calculated from size-weighted (compound) GDP growth rates measured in 2011 US dollars normalized to the maximum and minimum of the full 1850–2016 period.

exceed 50 percent by 2030. Despite this ongoing shift to a more multipolar global economy, the high degree of inertia in the currency composition of global reserves suggests that the US dollar will remain the dominant reserve currency for the foreseeable future.[2]

Uncertainties Going Forward

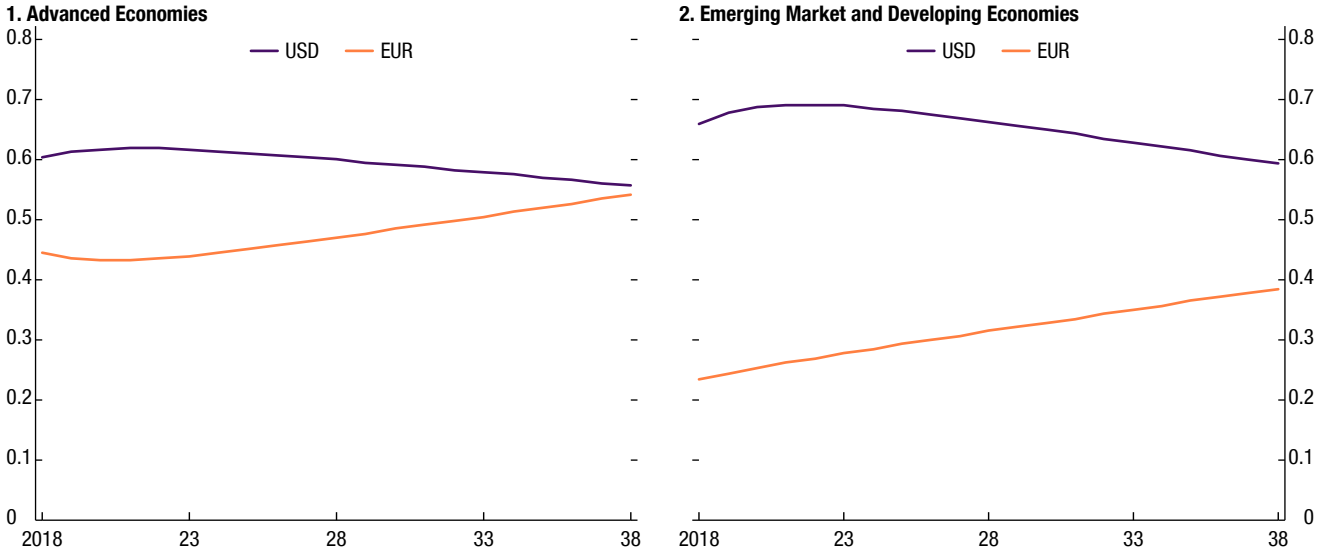
There are many uncertainties regarding current trends, particularly related to the COVID-19 crisis, that could have a lasting impact on trade and financial relationships, with implications for the currency composition of reserve holdings and the IMS.

Financial Considerations

The empirical analysis in Chapter 3 highlights the growing importance of financial links and suggests that reserve issuers may be able to increase the

[2]In theory, data on individual countries' reserves composition allow for a deeper investigation of triggers that make central banks drastically alter their holdings of one currency versus the other as reserves. However, such exploration is not feasible in this paper due to the short time span of the data and a limited number of such episodes.

Figure 10. Scenarios on the Impact of Financial Links on Reserve Currency Shares



Source: IMF staff calculations.
Note: The scenarios are based on the econometric analysis in Chapter 3, using individual country data. For advanced economies, the share of cross-border bank claims in euros is assumed to increase by 30 percentage points over the next 20 years at the expense of the share of claims in US dollars. For emerging market and developing economies, the scenario considers how euro and US dollar reserve shares would evolve if the share of debt denominated in euros increased by 30 percentage points in the next 20 years, whereas the share of debt denominated in US dollars declined by 30 percentage points. The scenarios take into consideration the high degree of inertia in reserve shares and the role of trade links. Trade shares are assumed to be constant at their 2018 level.

prominence of their currencies as a reserve asset if they are able to materially expand their use in cross-border banking and debt markets.

Consider the following thought experiments. If the share of cross-border bank claims in euros were to increase by 30 percentage points over the next 20 years, the share of euro-denominated reserves of an average country in the sample would go up by about 5 percentage points, according to estimates from the country-level regression.[3] Similar extrapolation suggests a greater impact of increased financial links for the reserve portfolios of EMDEs: if the share of euro-denominated public debt were to increase by 30 percentage points over the next 20 years at the expense of debt denominated in US dollars, the average share of the euro in EMDEs' reserve portfolios could increase almost two-fold, from 23 percent to 40 percent (Figure 10).

The debt landscape, in which new creditors—including China—have become increasingly important (Horn, Reinhart, and Trebesch 2020), was evolving

[3]The choice of euro for these thought experiments is dictated by data availability, which relates to its broad use as an international currency over the past 20 years. For opposite reasons, a similar exercise on the renminbi is not feasible at this stage. The magnitude of any increase is influenced by past trends: euro saw its share in cross-border bank claims increase by 15 percentage points within a 10-year period after its launch in 1999.

rapidly before the pandemic. Such shifts could accelerate in a post-pandemic world. Given the large scale of EMDEs' financing needs, it is plausible that EMDEs' renminbi-denominated debt could rise in future—consistent with a larger share of reserves held in renminbi.

Trade Links

The empirical analysis in Chapter 3 suggests that trade links have become less relevant as a driver of reserve currency configurations. Whether this trend persists depends on how trade patterns evolve in future.

The pandemic has highlighted the fragility of global supply chains and countries' interest in ensuring the future security of critical supplies. Such factors could lead to more diversified supply chains and/or localized production to avoid overreliance on a single dominant supplier country in the future, with implications for the demand for reserves.[4] This paper's findings suggest that, post crisis, lower trade shares with reserve issuers could lead to lower reserve shares. However, this potential development in trade links could be countered by any reserve issuer's ability to elevate the status of its currency as an invoicing currency.

Credibility

The existing literature and the authors' empirical analysis find that credibility matters. The US dollar's dominance has been related, in part, to a lack of credible alternatives. For instance, stalling use of the euro as a reserve currency has been linked to institutional gaps in the European monetary union—including a lack of risk sharing—exposed during the eurozone debt crisis (Maggiori, Neiman, and Schreger 2019) (Box 2). If the euro or other currencies were to overcome such impediments, they could provide more credible alternatives to the US dollar, and the currency composition of reserves could shift.[5]

Despite significant inertia observed in the past, the dominance of a single reserve currency might not be a sustainable equilibrium going forward. In the short term, swift actions by the US Federal Reserve during the COVID-19

[4]For instance, more localized production could reduce international trade and subsequently the demand for international reserves. Alternatively, more diversified international supply chains might encourage demand for a more diversified portfolio of reserves.

[5]The COVID-19 crisis may prompt actions toward overcoming such impediments. For instance, the European Commission's "next generation EU" proposal moots significant EU debt issuance over 2021–23.

crisis may have reinforced the credibility of the US dollar.[6] But if the US economy continues to decline in size relative to the global economy, the demand for reserves might eventually outstrip the supply of US dollars, prompting the official sector to look for alternatives. Rising demand for reserve assets, particularly in the context of a global shortage of safe assets (Caballero, Farhi, and Gourinchas 2017), may create incentives for other potential suppliers to take proactive steps to develop new reserve currencies.

In light of the COVID-19 pandemic, the credibility of any reserve currency may depend on how the issuing country performs in bringing the pandemic under control and restarting its economy while managing the rising levels of debt. Failure to contain the spread of the virus and enact sound policies to avert a longer-lasting downturn and maintain the country's economic health could lead to a depreciation of the issuer's currency. This paper's findings suggest that this would lead to a lower share in global reserves.

Exchange Rate Anchor

The number of countries with exchange rate pegs has declined in recent years, lowering the need to hold the reserve currency for foreign exchange intervention purposes. Reluctance to change fixed exchange rate arrangements, owing to fears of inducing instability, may have contributed to previously observed persistence, but such ties have loosened over time with an increasing use of alternative monetary frameworks (Figure 11).[7] This could partly explain why the empirical analysis does not find a positive relationship between anchoring and reserve currency shares. It is also possible that the effect of exchange rate regimes and anchoring is poorly identified given the small sample size.

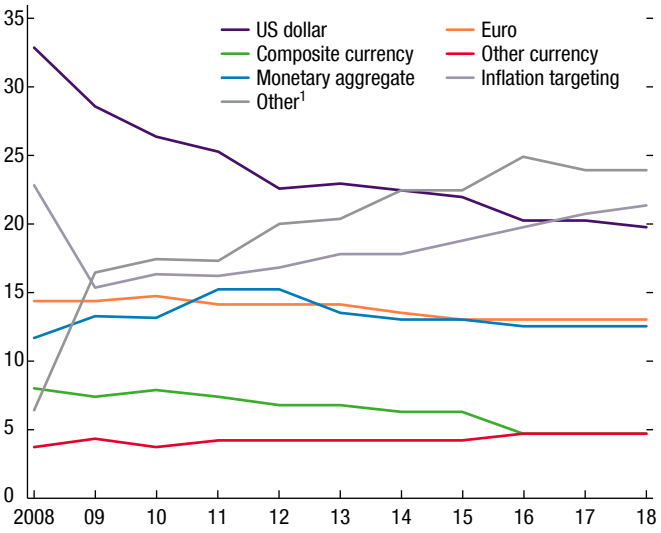
Geopolitics as a Trigger of Currency Switches

Geopolitical or strategic considerations may trigger changes in reserve holdings beyond those driven by economic factors. For example, decisions to hold reserves in any currency may also be motivated by foreign policy considerations and security ties or military alliances.

[6]The US Federal Reserve acted quickly to help support the smooth functioning of financial markets by activating bilateral swap lines with several major central banks, including in emerging markets, and creating an international repo facility for foreign monetary authorities.

[7]For instance, the CFA franc was established in French African colonies after World War II; it was initially pegged against the French franc and subsequently against the euro. Countries using the CFA franc have been obliged to keep half of their reserves at the French treasury and to have a French representative on the currency union board in exchange for French guarantees on their balance of payments needs. Recent moves have been taken, however, to loosen such historical obligations—which may have implications for not only the location of reserves, but also their composition.

Figure 11. Monetary Policy Frameworks and Exchange Rate Anchors
(Percent of IMF members)



Source: IMF staff calculations.
[1]Includes countries that have no explicitly stated nominal anchor but instead monitor various indicators in conducting monetary policy.

Although it is difficult to pin down the geopolitical effects in the empirical analysis (Annexes 2 and 3), the authors cannot rule them out, given the historical evidence. In fact, a recent example of a significant and sustained shift from one reserve currency to another point to a possible correlation with the introduction of sanctions (Box 3). More specifically, in the Spring of 2018, the Bank of Russia implemented a significant reallocation of its reserve portfolio away from the US dollar, mostly into renminbi, following the imposition of US sanctions.

Going forward, spillovers from trade tensions and the COVID-19 pandemic, including as reflected in recent oil price movements, export bans on medical supplies and equipment, and less cooperation between countries, could result in strategic changes in reserve holdings of individual countries.

A deliberate push to internationalize currencies could also drive change. National policies have played a role in supporting the internationalization of currencies for economic as well as political benefits, including international prestige and the enhanced ability to project military power abroad. More recently, China has been actively promoting a wider use of the renminbi for trade and investment, which was supported by the addition of the renminbi

to the SDR basket in 2016.[8] Between 2010 and 2014, 37 central banks have reportedly added the renminbi to their reserve portfolios (Liao and McDowell 2016), with the share of renminbi in global reserves reaching 2 percent in 2019. The next stage in the internationalization of the renminbi could depend, to some extent, on the landscape of China's economic and political ties that emerge after the COVID-19 crisis.

Technology as a Disruptor

The current configuration of reserve currencies could be altered by the rapid pace of financial innovation, underpinned by technology. Advances in financial and payments technologies can reduce switching costs and informational asymmetries, and thus further reduce the strength of existing network effects and inertia. Technology might also facilitate the circumvention of capital controls and sanctions, potentially facilitating the use of alternative currencies.[9] In the short term, the two most potent channels are (1) the emergence of digital currencies and (2) changes in existing networks, including payment ecosystems.

Digital Currencies

Digital currencies can take on various forms and can be issued by both the public and private sectors. The implications of digital currencies for reserve holdings would depend on which kind of digital currency prevails.

Many central banks are seriously considering issuing a central bank digital currency (CBDC). A recent BIS survey of central banks indicates that about 80 percent are engaging in work related to CBDCs, and 40 percent have progressed to experiments or proof of concept (Boar, Holden, and Wadsworth 2020).[10] In 2020, China became the first large country to put a CBDC into limited use; testing of a digital renminbi by banks, government, businesses,

[8]The internationalization of the renminbi has proceeded along two main lines. First, domestic and foreign companies have been encouraged to use renminbi in trade settlements, with the expectation that use in financial transactions will follow. This was followed, in 2018, by the launch of renminbi-denominated oil futures contracts, widening the scope for renminbi-denominated commodity trading. At the same time, there were efforts to boost the development of offshore renminbi markets and financial clientele and promote currency swap lines.

[9]For instance, disagreements between the United States and European countries regarding the sanctions imposed on Iran prompted Germany, France, and the United Kingdom to create a parallel payment system (INSTEX) in 2019, which circumvents the dollar-dominated SWIFT messaging system and allows European companies to trade with Iran without risking to be sanctioned by the United States. INSTEX has concluded its first transaction in March 2020 by facilitating the export of medical goods from Europe to the pandemic-hit Iran.

[10]Including 21 advanced and 45 emerging market economies.

and individuals is currently under way in 28 provinces. Reserve implications of a CBDC issuance would depend on country and global circumstances. A CBDC issued by current issuers could increase the demand for reserves denominated in these currencies, whereas a CBDC issued by smaller countries with highly credible policy frameworks could make their currencies easier to use as reserves.[11]

Recently, the idea of a *universal CBDC* has also gained prominence. A synthetic hegemonic currency, backed by a basket of CBDCs, could provide more efficient domestic and cross-border payment services, benefiting from the credibility of multiple central banks that support it (Carney 2019). Such an architecture could change the demand for reserves denominated in currencies in the basket based on their relative weight.

Private digital currencies (PDCs) could also emerge as important international currencies.[12] In 2019, Facebook announced plans to launch Libra, a single-currency private stablecoin with potentially global reach, which could become the first example of a global stablecoin (GSC).[13] The launch of a GSC could increase the demand for fiat reserve currencies it is backed by. But GSCs do not need to be backed by existing fiat reserve currencies and could themselves attain reserve currency status. It is also conceivable that more than one global stablecoin could become a reserve asset.

Digital currency competition may differ from traditional currency competition by differentiating along associated networks and users rather than being based on macroeconomic performance (Brunnermeier, James, and Landau 2019), hence possibly altering the traditional drivers of reserve currency configurations. But, while these "digital currency areas" may cut across borders in ways that existing currencies do not, variations in regulatory frameworks could lead to increased fragmentation of currency use.

Payment Systems

Most existing cross-border transfer and payment systems face challenges (Box 4). Alternative systems, using technologies such as distributed ledgers, could overcome existing constraints and inefficiencies. New payment systems

[11]For instance, Eastern Caribbean Central Bank has accelerated its plan to issue a CBDC by 2021.

[12]PDCs can take various forms with differences in design and stability of value. For instance, while first generation crypto-assets (for example, Bitcoin and Ripple) are denominated in their own unit of account and exhibit large price volatility, stablecoins seek to minimize price fluctuations, enhancing their potential as a store of value.

[13]The Financial Stability Board has developed a set of high-level principles for the regulation of GSCs, responding to a call by the G20 to examine regulatory issues and advise on multilateral responses, as appropriate (FSB 2020a).

(and some existing ones) may offer the opportunity to settle in multiple currencies, reducing the need for vehicle and invoicing currencies going forward and moving the IMS toward decentralization.[14] Other new systems may be centered around one established international currency and boost its position among regional or global reserve currencies.

Digital platforms could offer alternative networks for emerging (fiat or digital) currencies to tap into. For instance, as discussed above, some digital assets might gain rapid traction if they are able to tap into large pre-existing networks or attract users with bundled services. Both features could be accomplished by Big Tech companies with operations transcending national borders.

Longer-Term Considerations

With accelerating digitalization and technological innovations, the impact of technology on international reserves and global configurations could become more prominent over time. In addition to creating new classes of assets, reshaping the financial industry, and transforming reserve management—trends that are already underway—technology can affect reserve holdings by transforming the traditional drivers of reserve configurations (such as network effects, trade and financial linkages, geopolitics, and institutions and the legal system) and their impact on reserves.

Future reserve currency configurations will be shaped by many factors which are explored in Box 5 using a well-established scenario planning approach.[15] Scenarios are narratives that illustrate how an unpredictable future might play out; they are not forecasts or predictions but help generate perspectives sufficiently different from those currently held. The scenarios outlined in Box 5 illustrate how technology can either strengthen the role of a dominant currency or facilitate a shift toward a multipolar world. They also highlight the importance of other factors, such as the credibility, scale, and stability of traditional and nontraditional reserve assets, as well as emerging considerations, such as climate change risks. The scenarios particularly underscore the importance of credibility and trust, which generally benefit currencies of countries offering geopolitical neutrality and/or strong institutions. However, it may no longer be unthinkable to see currencies issued by a more socially responsible and accountable private sector to replace those from the public

[14]Having multiple currencies could raise transaction costs to some extent. In the free banking period in mid-19th century, note reporters (periodicals) and brokers quoted secondary market prices for banknotes to help individuals identify and value various notes. Today, such information can be collated and shared almost instantaneously, aiding price discovery.

[15]Large corporations and other strategic planners, as well as the IMF (Behar, Kostial, and Ramírez 2018), have increasingly used scenario planning to conceive plausible future states of the world.

domain, or to simply see a trend toward greater decentralization of economic power as well as reserve currencies.

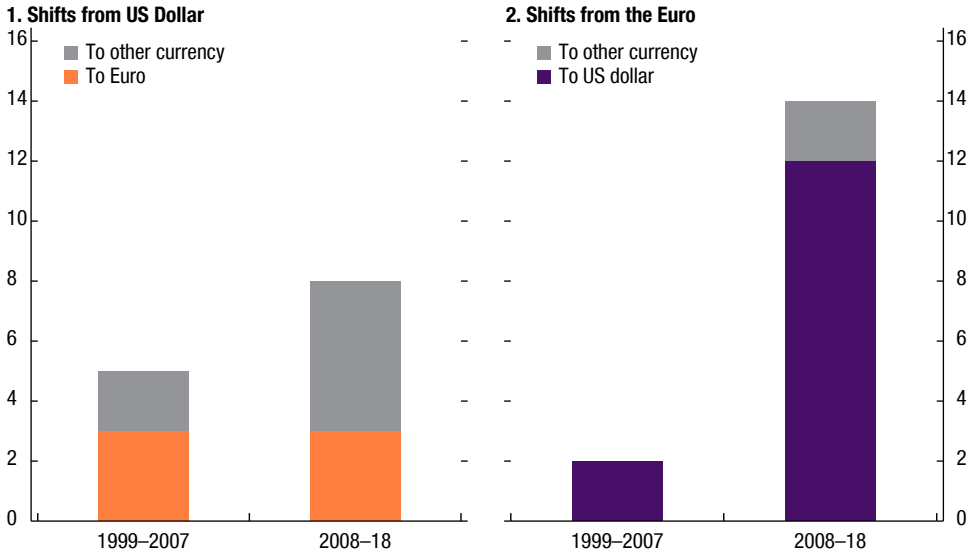
Reserve configurations may also be less stable in the future, particularly due to the prominence of cyber risks. The scenarios highlight risks ranging from cyberattacks to network and technology vulnerabilities to "shortage" of personal data (the asset underlying a new form of money in Scenario 3, Box 5). And, while risk insurance and regulation may take a different shape in the future, they would still be needed in an interconnected world.

Box 2. Evidence on Eurozone Credibility

Following the GFC and Eurozone debt crisis, there was an observable decline in the share of euro in reserve currency portfolios (Figure 2.1), consistent with a broad reappraisal of risks. This trend is in line with the evidence from individual countries' reserve portfolios on *significant* and *sustained* shifts from one reserve currency to another.[1] Prior to the GFC, the authors observe a roughly similar number of shifts away from the US dollar toward the euro (3) as from the euro toward the US dollar (2). Since 2008, the number of shifts has generally increased, but with significantly larger number of shifts away from the euro. Indeed, 5 out of 8 significant and sustained shifts away from the dollar have been toward currencies other than the euro, including the Australian dollar, Japanese yen, and Chinese renminbi (Figure 2.1).

Despite such shifts, it is noteworthy that the euro shares have held up in countries with strong economic and political ties with the eurozone, for example, the European Union countries outside of the eurozone, which are in the European Exchange Rate Mechanism (ERM) II and maintain a peg against the euro, or are obliged under European Union membership to eventually adopt the euro.

Figure 2.1. Currency Shifts
(Number of shifts)



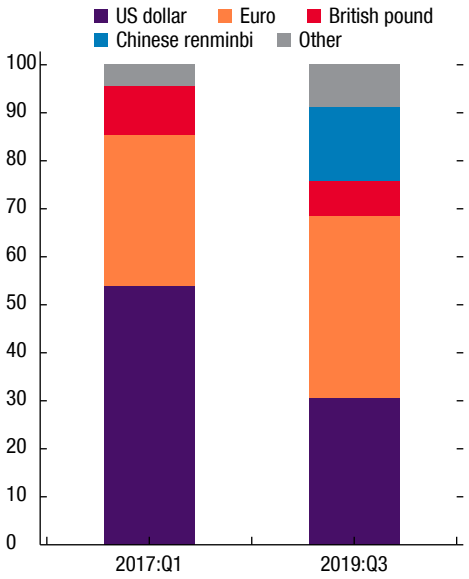
Source: IMF staff calculations.
Note: Shift into other currencies is determined by which currency's share increased the most over the period in which the corresponding euro or US dollar decline occurred. "To other currency" also includes the shifts into unidentified currencies.

[1]Defined as the decline in three-year average over previous (non-overlapping) three-year average share, which is both greater than a 5 percentage point decline and greater than 2 standard deviations for a three-year moving average time series of the currency share.

Box 3. Russia's Reserve Holdings and US Sanctions

In recent years, Russia's reserves have seen a large shift away from the US dollar. Publicly available data highlight a gradual decline in the US dollar's share of reserves over 2006–14, from 49 to 44 percent, with significant fluctuations starting in 2017, possibly mirroring developments in US-Russian relations. There was a particularly sharp decline in the US dollar share in Russian foreign exchange reserves in 2018 following the issuance of US sanctions against Russia (Figure 3.1).[1] A simple event study analysis, using quarterly data from 2006 through 2018, supports the hypothesis that sanctions may have been correlated with shifts in reserve shares. The comparison of dollar shares before and after the 2018 episode, after applying year fixed effects to partially control for economic and other factors, suggests that tensions in 2018 were associated with a statistically significant 26 percentage points decline in the dollar share.[2]

Figure 3.1. Composition of Russia's International Reserves



Source: Bank of Russia.

[1]In April 2018, the United States issued new sanctions against Russian individuals and business entities, in response to events in Syria and Ukraine.

[2]Data scarcity and identification issues (including from the presence of multiple episodes at short intervals, some leading to increased, some to an easing of, tensions) suggest that the results should be interpreted as a correlation rather than a causal relationship.

Box 4. Payment Systems: Challenges and Promises

Existing cross-border transfer and payment systems face multiple legacy issues. They rely on correspondent banking relationships, which can be complex, slow, expensive, and nontransparent.[1] Part of the issue relates to reliance on legacy technology. For instance, correspondent banking transfers typically rely on legacy real-time gross settlement systems (RTGSs) run by central banks that require downtime for end-of-period batch processing and that each bank in a correspondent relationship be "open" to process a transaction.

Change is coming. For example, the SWIFT global payments initiative aims to improve payment speed and transparency,[2] while many RTGSs are moving to new messaging standards offering increased interoperability and transparency.[3] The European Central Bank has launched a new TARGET instant payment service (TIPS), which helps reduce credit risk by providing instant settlement. Canada's payment system CLUE already allows trading in seven international currencies, which will be expanded to 18. However, these initiatives offer partial solutions by integrating recent technologies into existing infrastructure.[4] And, while alternative payments and money transfer services are disrupting incumbents in the retail space, those services use traditional wholesale payments infrastructure to settle their transactions and hence may not significantly alter international currency usage.[5]

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[1]These problems have resulted in the withdrawal of several correspondent banking relationships (Erbenová and others 2016). For US banks, the cost of cross-border transfers is estimated to be 10 times the cost of domestic payments, with 34 percent of the cost attributable to trapped liquidity in correspondent bank accounts (McKinsey & Co 2016).

[2]SWIFT established a new standard for participating institutions—SWIFT gpi (global payments innovation)—to improve speed, security, and transparency in cross-border payments across the correspondent banking network.

[3]For an overview, see BoC, BoE, and MAS (2018).

[4]The G20 has tasked the Financial Stability Board with coordinating a three-stage process to develop a roadmap to enhance cross-border payments by October 2020. The reports for the first two stages have been published, which include exploring the potential role of new payment infrastructures and arrangements as one of the focus areas (FSB 2020b, 2020c; CPMI 2020).

[5]For instance, while PayPal, Apple Pay, or Alipay offer cross-border retail payment capabilities, such services rely on the funding and debiting of user accounts through standard bank account debiting and crediting or credit card payments. In effect, such services offer improved end-user experience, but do not alter the existing international currency usage.

Box 5. Technology and Reserve Currency Configurations: Long-Term Scenarios

This box explores the implications of technology on reserve currencies over the long term, using a scenario-planning approach, which is particularly well suited for the highly uncertain and increasingly digitalized environment emerging as a result of the COVID-19 pandemic. In the three scenarios that follow, technological developments, combined with economic and geopolitical factors, bring about changes in the configurations of reserve currencies by 2045.

Scenario 1. The rise and fall of a global Central bank digital currency (CBDC). The scenario is cast in the context of growing geopolitical divisions, which put a premium on transactions via a neutral currency. A bloc of countries gains advantage by moving first in developing comprehensive digital platforms, supported by strong governance and institutions. The continued trend of growing importance of data services provides an additional comparative advantage to the first-mover countries, which have the technology and infrastructure to offer and export such services. Favorable climate conditions further provide a more cost-effective environment for the provision of digital services (for example, sufficiently cold and relatively stable climates for data centers against the backdrop of accelerating climate change). This bloc of countries issues a CBDC and invests heavily in data infrastructure and cyber defense, generating a growing supply of the CBDC-denominated financial instruments. The CBDC—seen as a trustworthy and credible reserve currency because it provides safety and access and is backed by high-tech secure platforms with low transaction costs—emerges as a major reserve currency. With central banks around the world holding more of the new CBDC, its share in global reserves rises well above the levels consistent with the size and fiscal backing of the economic bloc. Speculations about the extent of overvaluation of the CBDC expose the system to large capital outflows and an unraveling of the CBDC's position as a major currency.

Scenario 2. A world of multiple private digital currencies. This scenario starts off in a global setting wherein increased anxiety about governments' capacity to deliver on their socioeconomic objectives erodes credibility of public institutions, including fiat currencies. In parallel, big technology companies continue to grow, offering more services and platform payment instruments. Their efforts to enhance privacy and corporate governance pay off, and people increasingly prefer private payment platforms to fiat currencies. Over time, as more people use the private payment instruments, these become digital currencies—full-fledged private currencies that fulfill all the roles of

Based on an IMF scenario planning workshop held in January 2020. The authors thank Alberto Behar and Sandile Hlatshwayo for their outstanding facilitation of the workshop, and Itai Agur, Sakai Ando, Tamim Bayoumi, Karla Chaman, Ana Corbacho, Sonja Davidovic, Christopher Erceg, Aquiles Farias, Vikram Haksar, Dong He, Kristina Kostial, Istvan Mak, Maria Soledad Martinez Peria, Johan Mathisen, John McCoy, Marcello Miccoli, Raunak Mittal, Martin Mühleisen, Gomiluk Otokwala, Herve Tourpe, Camilo Tovar Mora, and Jeromin Zettelmeyer for their excellent contributions to the workshop.

Box 5. Technology and Reserve Currency Configurations: Long-Term Scenarios *(continued)*

money. A few large digital currency areas emerge, on the basis of digital interconnectedness. Governments retreat from most of their roles as technology corporations expand the scope of their services. National central banks lose relevance. AI is used to establish exchange parities between digital currencies by facilitating price finding. To maintain credibility of the system, a technology consortium is set up to supervise the digital networks and provide emergency liquidity financing by pooling digital currencies across currency areas. Traditional reserve assets thus cease to exist and are replaced by holdings of private digital currencies.

Scenario 3. A new form of money based on personal data that becomes a global currency. In response to growing concerns about the misuse of personal data, privacy laws are tightened, giving individuals full control over their personal data. To access and use such data, companies begin to purchase data off individuals using "data tokens"—a payment instrument issued as a claim on their goods and services. Technological advances allow for enhanced methods of data collection and increase the supply of data, leading to AI-based processes and products, which in turn create a greater demand for data. Technology also makes it possible to privately value and monetize data and transfer it securely to willing buyers on a decentralized marketplace in exchange for data tokens. These tokens thus become a global digital currency widely used by both individuals, to supplement their traditional income, and product providers. The use of fiat monies is very limited, and the effectiveness of the monetary policy is significantly reduced. Instead, fiscal policy becomes the main tool for domestic macroeconomic stabilization, using data token-based fiscal instruments. Countries hold reserves in data tokens, along with real assets, particularly gold, to mitigate against the risks of cyberattacks or loss of credibility of the system.

CHAPTER

5 Conclusion

This paper investigates the drivers of the currency composition of international reserves using both COFER data of aggregate reserve shares and a newly compiled panel data set of individual countries' reserve holdings by currency. Findings suggest that inertia in reserve currency shares remains important and in fact has grown in significance since the GFC. With continued financial globalization and maturing global value chains, financial links have also become a more significant driver over time, while the significance of trade links has waned. The authors also find that drivers of reserve currency shares vary between AEs and EMDEs, with financial links appearing to be particularly relevant for EMDEs.

This paper's empirical evidence suggests that, extrapolating recent trends, the US dollar's dominance as a reserve currency is expected to endure. However, the COVID-19 pandemic raises significant uncertainties concerning key trends in economic drivers of reserve configurations going forward. At the same time, rising geopolitical tensions could trigger sudden strategic adjustments in reserve holdings. Furthermore, technological advances, particularly the emergence of digital currencies and advances in payment systems, could alter the importance of traditional drivers of reserve currencies, speed up the transition to alternative reserve configurations, result in the emergence of new reserve currencies, and even lessen the stability of future reserve currency configurations.

Annex 1. Existing Literature on Drivers of Reserve Currency Shares

The literature examining the drivers of reserve currency shares *at the global level* finds a significant role for the economic characteristics of reserve issuers, such as their global reach (generally captured by their economic size and/or role in international trade and finance, also aiming to capture "network effects")[1] and credibility (Li and Liu 2008; Eichengreen, Mehl, and Chițu 2016; Aizenman, Cheung, and Qiand 2019). Some studies also point to the role of national policies in either supporting or preventing the internationalization of currencies (Eichengreen, Mehl, and Chițu 2016).[2] Furthermore, some studies capture the reserve currencies' perceived safety and effective medium of exchange by relating it to the depth and liquidity of onshore and offshore financial markets (Chinn and Frankel 2008).[3]

In addition to global reach, network effects, and credibility, the literature finds that inertia plays an important role; that is, holding a larger share of a given reserve currency in the past tends to be a good predictor of reserve shares in the future, as discussed by Triffin (1960). This suggests that reserve currency take-up may be nonlinear, with a high degree of inertial bias in favor of the incumbent reserve currency (Frankel 2012). As such, reserve currency choices may be informed less by short-term economic fundamen-

[1]Network effects could promote the use of a new reserve currency (by reducing the switching costs) once it reaches a critical mass or create a lock-in effect for an incumbent currency used widely because of high switching costs.

[2]For example, the Federal Reserve system acted as a market maker for the US dollar. On the other hand, capital controls were used to limit access to the Deutsche mark in the 1960s and 1970s to better control inflation and allay exporters' fears of loss of international competitiveness, while the internationalization of the Japanese yen also occurred despite initial domestic political resistance—the Foreign Exchange Law of 1980 allowed capital controls.

[3]Chițu, Eichengreen, and Mehl (2012) and Eichengreen and Flandreau (2010) also provide evidence that the development of US financial markets supported the increased role of the US dollar in trade finance and international debt markets.

tals and more by historical ties.[4] The literature also concludes that, after the collapse of the Bretton Woods system, inertial effects became stronger, which may reflect the higher stability in the US dollar's share after the shift from the pound to the dollar. By contrast, the network effects seem to be weaker post-Bretton Woods, which may reflect lower switching costs due to advances in financial and transactions technology (Eichengreen, Mehl, and Chițu 2016).

A few studies argue that geopolitical considerations can also play a role, as countries may choose to hold reserves in a given currency because of geopolitical or strategic considerations, or as a result of military alliances, and so reserve currencies' perceived safety can be linked to reserve issuers' geopolitical or military power (Cohen 2015; Kindleberger 1970; Posen 2008; Liao and McDowell 2016). Eichengreen, Mehl, and Chițu (2017) show that military alliances boosted the shares of the currencies of alliance partners in foreign reserve portfolios by close to 30 percent in the run up to World War I.

Studies using aggregate data, however, fail to account for shifts within individual countries' portfolios and cannot capture reserve holders' potential transactional demand (the intended uses of the reserves). Central banks' reserve portfolio decisions are often influenced by the pattern of a country's transactional demands, including the structure of its trade and financial payments, and foreign exchange arrangements.[5] More specifically, the trade links can be captured by the share of trade with the reserve currency issuer in the absence of granular data on trade invoicing, financial links by the currency composition of public debt or cross-border bank claims, and the foreign exchange market intervention by *de facto* anchoring to a reserve currency.

The literature using *individual country* data is relatively sparse due to lack of publicly available data. Studies using confidential COFER country-level data find evidence that the reserve holders' potential transactional demand for trade and finance-related payments and foreign exchange market intervention

[4]Historical (political and economic) ties continued to support the sterling area and the international role of the British pound despite the declining role of the United Kingdom in the global economy. More specifically, after the United Kingdom left the gold standard in 1931, it encouraged key trading partners and colonies to peg their currencies against the pound to facilitate trade. Following World War II, the sterling area was formalized into a legally defined group with pegged exchange rates to sterling, common exchange controls against the rest of the world, and the maintenance of national reserves in sterling. Despite episodes of sterling devaluation, in 1970 the sterling area still comprised the United Kingdom and 35 other countries together with all British dominions, protectorates, protected states, and trust territories except Canada and Zimbabwe. The sterling area effectively dissolved with the demise of the Bretton Woods system in 1972.

[5]Survey data also confirm that for EMDEs, the currency composition of reserves is driven by the currency composition of external liabilities, the composition of trade, and currency pegs (Morahan and Mulder 2013). For AEs, depth and liquidity of markets are the dominant considerations.

drives the currency composition of their reserves (Heller and Knight 1978; Dooley, Lizondo, and Mathieson 1989; Eichengreen and Mathieson 2000).[6]

More specifically, Heller and Knight (1978), using data for 55 countries during 1970–76, find that the exchange rate regime (choice of peg) and trade linkages with reserve issuers matter. In turn, Dooley, Lizondo, and Mathieson (1989) show that the currency denomination of debt service payments is also a significant driver. Eichengreen and Mathieson (2000) highlight the stability of the currency composition of reserves over time and in relation to its main determinants (exchange rate links and trade and financial flows) during 1971–95, and find evidence that capital account liberalization in emerging market economies raises the share of currencies from reserve issuers with particularly active financial markets (United States and United Kingdom).

More recent work has focused on the links between reserve currencies and the currencies used for trade invoicing and financial claim denomination. Gopinath (2015), Gopinath and Stein (2018), and Gopinath and others (2020) emphasize the dominance of the US dollar and euro in trade invoicing, beyond direct trade links with the United States and the euro area.[7,8] Ito, McCauley, and Chan (2015) and Ito and McCauley (2019) also highlight the role of the trade invoicing and financial liabilities denomination, as well as exchange rate comovements with reserve currencies, using publicly available country-level data.

[6]More recently, Laser and Weidner (2020) confirm the earlier findings, using the same methodology as Eichengreen and Mathieson (2000) but employing country-specific data on currency composition of reserves disclosed by various central banks. The methodology used in these papers is not robust to various specifications and does not account for the inertial effects.

[7]Gopinath (2015) highlights that, in a sample of 43 economies, the dollar's share for imported goods invoicing is about 4.7 times the share of US goods in imports.

[8]The choice of the invoicing currency itself is influenced by the size and centrality of countries in global trade networks reflecting natural advantages, and the coalescence of exporters to limit competitive disadvantages (Bacchetta and van Wincoop 2005; Goldberg and Tille 2013).

Annex 2. Drivers of Reserve Currencies using Aggregate Data

This annex analyzes the drivers of reserve currencies' shares in global reserve holdings using aggregate data since 1947. In line with the existing literature, the authors find that inertia and the credibility of reserve currency issuers are significant drivers of reserve configurations. In contrast to previous studies, the authors find evidence of a limited role for reserve issuers' trade and financial reach, and, after controlling for these factors, no role of their geopolitical reach.

Empirical Specification

Building upon previous literature, the authors investigate global reserve currency shares using data sourced from Eichengreen, Mehl, and Chițu (2016) before 1995 and COFER since 1995, and covering the period 1947–2018. The core specification, in line with the existing literature, considers the three factors typically found to be important drivers of aggregate reserve shares: inertia, global reach/size, and credibility.[1] Specifically, the aggregate reserve share of currency i in year t is modeled as:

$$\textit{Reserve Share}_{i,t} = \alpha_i + \delta_t + \textit{Reserve Share}_{i,t-1} + \textit{GDP Share}_{i,t-1} + \textit{Credibility}_{i,t-1} + \varepsilon_{i,t}$$

in which:

α_i is a currency random/fixed effect

δ_t is a time fixed effect

[1]The analysis presented here uses reserve shares unadjusted for valuation effects; however, the results are robust to using the valuation adjusted shares of Eichengreen, Mehl, and Chițu (2017).

GDP Share is the share of the reserve issuer's economy in global GDP

Credibility is the average appreciation of the reserve issuer's currency against the SDR in the previous five years.

The authors use different econometric specifications and sample periods. The baseline specification uses currency fixed effects, since the Hausman test rejects random effects and the Arellano-Bond (1991) estimator has limitations due to the small cross section relative to the time horizon (Arellano 2003).

The authors also split the sample into 1947–98 and 1999–2018 to assess whether the importance of different drivers has changed since the introduction of the euro. The Deutsche mark, the French franc, and the Dutch guilder are used prior to 1999, and the euro is used starting in 1999.[2]

Results

Results under the baseline specification highlight the importance of inertia and credibility (Annex Table 1)[3]:

- *Inertia:* Consistent with previous literature, inertia effects are large and significant across econometric specifications. The coefficients on lagged reserve shares are about 0.9, indicating a high degree of persistence.
- *Credibility:* Coefficients are significant over the full sample period, but the economic effect is more limited, with a 10 percent appreciation of a currency associated with a 0.4 percentage point increase in its share of global reserves.
- *Size*: In contrast to previous literature, the relative size of the economy of the reserve currency issuer, measured by its share of global GDP, is not robustly significant across specifications. Although the coefficient on size is positive and significant in the random effects specification, consistent with Eichengreen, Mehl, and Chițu (2016), the sign is negative in other specifications and insignificant when using fixed effects.
- *Time variation:* Results (Annex Table 1, columns 4 and 5) indicate that inertia and credibility effects may have been more important in the earlier period (1947–98).

[2]The main findings are robust to using, as a dependent variable, the share of synthetic euro reserves, which aggregates the shares of pre-1999 legacy currencies (Deutsche mark, French franc, Dutch guilder).

[3]The high *R*-squared in all tables using aggregate reserve shares is due to the latter being a very slow-moving variable, which provides yet another reason to examine the reserve shares at country level.

Annex Table 1. Baseline Specification

	Fixed Effects	Random Effects	Arellano-Bond	Fixed Effects		
	1947–2018	1947–2018	1947–2018	1947–1998	1999–2018	1947–2018
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged Reserve Share	0.888***	0.946***	0.908***	0.864***	0.758***	0.885***
	(0.004)	(0.015)	(0.014)	(0.013)	(0.059)	(0.003)
Credibility	0.046**	0.040*	0.044**	0.055***	0.014	0.069***
	(0.016)	(0.022)	(0.018)	(0.014)	(0.036)	(0.013)
GDP	−0.027	0.178***	−0.122**	−0.523**	0.209**	−0.072*
	(0.03)	(0.057)	(0.051)	(0.197)	(0.067)	(0.038)
Credibility * USD						−0.103***
						(0.013)
GDP * USD						0.052***
						(0.015)
Observations	315	315	300	207	108	315
No. of groups	11	11	11	7	8	11
R-squared	0.994	0.995		0.971	0.998	0.994
Hausman Test (p-value)		0.004				

Source: Authors' calculations.

Note: Robust standard errors in parentheses. ***, **, * indicates significance at the 1%, 5%, and 10% levels, respectively. All specifications include time fixed effects. Reserve shares are sourced from Eichengreen, Mehl, and Chițu (2017) for 1947–2013 and the Currency Composition of Official Foreign Exchange Reserves database for 2014–18. GDP data is sourced from the Maddison Project database for 1947–2016, with data for 2017 calculated using IMF data on GDP based on PPP. "Credibility" is the average appreciation of the reserve currency against the SDR in the previous five years. "GDP" is the share of world GDP, which the reserve currency issuer accounts for. "USD" is a dummy variable equal to one if the reserve currency is the US dollar and zero otherwise. "No of groups" refers to the number of reserve currencies included. PPP = purchasing power parity; SDR = special drawing rights.

Robustness Checks

The authors test for heterogeneity in coefficients for specific currencies and whether longer lags matter. In particular, the authors consider whether the effects of credibility and size vary for the US dollar (Annex Table 1, column 6), which is the currency with the largest share of reserves throughout the sample period. Results suggest that credibility is not an important factor for the US dollar share of aggregate reserves. This may indicate that once a reserve currency is widely used, short-term episodes of depreciation are less important. Alternatively, periods when the US dollar is appreciating may reflect flight to safety effects, rather than the underlying credibility of the United States as a reserve issuer. The authors also include longer lags of reserve shares and credibility and size measures, but these generally are not statistically significant and do not materially change the results.

The coefficient for the reserve currency issuer's share of global GDP is only positive and significant in the random effects specification, suggesting that GDP shares could be a poor proxy for the global reach of reserve issuers and their importance in global trade and financial networks. Instead, direct measures of trade and financial reach are considered as alternative measures of global reach:

To measure the importance of a reserve currency issuer in global trade networks,the country's share of world exports and a measure of its centrality

Annex Table 2. Alternative Measures of Global Reach: Trade and Financial Reach

	1947–2018 (1)	1950–2017 (2)	1948–2018 (3)	1980–2018 (4)	1976–2018 (5)	1977–2018 (6)
Lagged Reserve Share	0.888***	0.875***	0.885***	0.872***	0.840***	0.887***
	(0.004)	(0.005)	(0.005)	(0.029)	(0.017)	(0.016)
Credibility	0.046**	0.008	0.038	0.035	0.03	0.060*
	(0.016)	(0.038)	(0.031)	(0.023)	(0.025)	(0.024)
GDP	−0.027	−0.208*	−0.082	−0.011	−0.041	0.054
	(0.03)	(0.1)	(0.109)	(0.068)	(0.055)	(0.077)
Export Share		3.806				
		(3.461)				
Export Centrality			0.126			
			(0.255)			
FX Turnover				−0.027		
				(0.035)		
Debt Securities					0.037***	
					(0.009)	
Bank Claims						−0.054**
						(0.013)
Observations	315	301	315	226	264	178
No. of groups	11	10	11	11	10	5
R-squared	0.994	0.993	0.994	0.997	0.995	0.997

Source: Authors' calculations.

Note: Robust standard errors in parentheses. ***, **, * indicates significance at the 1%, 5%, and 10% levels, respectively. All specifications include currency and time fixed effects. For comparison, column 1 shows the baseline specification presented in Annex Table 1. "Export share" is the share of the reserve currency issuer's exports in world exports, using the Direction of Trade Statistics. "Export Centrality" is a measure of eigenvector centrality of the reserve currency issuer in the world trade network, calculated using the Direction of Trade Statistics. "FX Turnover" is the currency share of turnover in over-the-counter foreign exchange markets (BIS Triennial Central Bank Survey). "Debt Securities" is the share of long-term external debt of low- and middle-income countries in a given currency share of the outstanding stock of long-term external debt for low and middle-income countries (World Bank. International Debt Statistics). "Bank claims" is the currency share of total cross-border bank claims excluding unallocated currencies (Bank for International Statistics, Locational Banking Statistics). "No of groups" refers to the number of reserve currencies included.

in the global trade network are used (see Papamichalis and others, forthcoming).[4] While the estimated coefficients are positive, they are not significant at the 5 percent level (Annex Table 2,column 3). Thus, the authors find weak evidence that prominence in global trade networks matters for reserve currency shares.

The currency denomination of external debt in low- and middle-income countries matters for global reserves shares (Annex Table 2, column 5). Other measures of financial development—the share of foreign exchange turnover in a given currency and the share of cross-border bank claims in a given currency—are not found to be significant drivers of reserve shares.[5] A possible explanation: reserve currency issuers typically tend to be highly financially developed and their currencies have usually achieved international status, so incremental gains in this context may not be important for reserve currency shares.

[4]The authors use a measure of the "eigenvector centrality" of the reserve issuer in the global trade network.

[5]In using measures of financial development, the time horizon of the sample is substantially reduced due to their limited availability. Findings are robust to controlling for the GDP share alongside measures of financial development.

Annex Table 3. Alternative Measures of Global Reach: Geopolitics

	1947–2018 (1)	1947–2017 (2)	1947–2015 (3)	1960–2018 (4)	1949–2018 (5)
Lagged Reserve Share	0.888***	0.888***	0.880***	0.851***	0.865***
	(0.004)	(0.004)	(0.008)	(0.012)	(0.004)
Credibility	0.046**	0.053**	0.064***	0.065**	0.047***
	(0.016)	(0.019)	(0.015)	(0.019)	(0.014)
GDP	−0.027	0.175	−0.166**	−0.040	−0.066**
	(0.030)	(0.163)	(0.070)	(0.065)	(0.022)
GDP per capita		−0.040			
		(0.035)			
UN Votes			−0.001		
			(0.011)		
ODA				0.791	
				(0.817)	
Military Spending					−0.085**
					(0.029)
Observations	315	307	248	233	291
No. of groups	11	11	9	8	9
R-squared	0.994	0.993	0.992	0.994	0.99

Source: Authors' calculations.

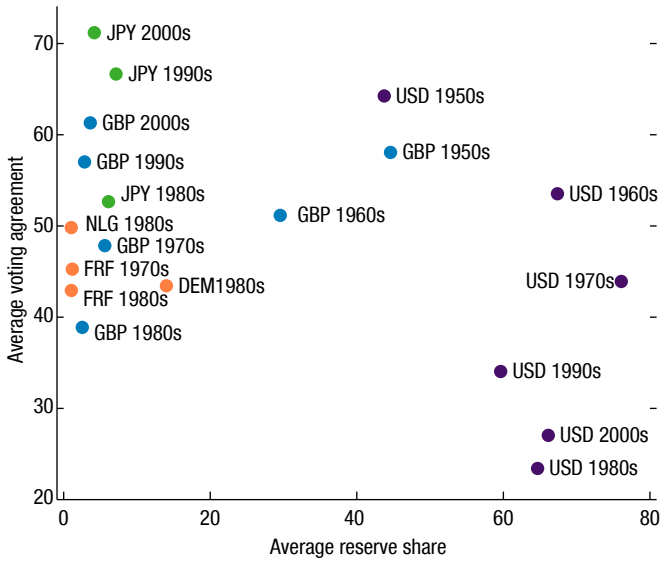
Note: Robust standard errors in parentheses. ***, **, * indicates significance at the 1%, 5%, and 10% levels, respectively. All specifications include currency and time fixed effects. For comparison, column 1 shows the baseline specification presented in Annex Table 1. GDP per capita data is sourced from the Maddison Project dataset. "UN Votes" is the share of votes by all countries at the UN General Assembly which have been in agreement with the votes of the reserve currency issuing countries, where abstentions are counted as "no" votes (Voeten 2013). "ODA" is the amount of official development assistance provided by the reserve currency issuer country as a share of the currency issuer's GDP (Organisation for Economic Co-operation and Development). "Military Spending" is the military expenditure of the reserve currency issuer country as a share of total military spending by all reserve currency issuers (Stockholm International Peace Research Institute). "No of groups" refers to the number of reserve currencies included.

Eichengreen, Mehl, and Chițu (2017) suggest that reserve currency choices may be influenced by geopolitical interests, with countries choosing to hold reserves of issuers which have diplomatic or military power. Since military alliances display little variation during the sample period, four alternative measures of geopolitical influence are considered: GDP per capita relative to the average GDP per capita of reserve issuers; the proportion of countries that have voted in the same direction as the reserve issuer country at the UN General Assembly in a given year using the data set detailed in Voeten, Strezhnev, and Bailey (2009)[6]; spending on official development assistance (ODA) as a share of GDP using OECD data; and military spending as a share of total military spending by reserve issuers using Stockholm International Peace Research Institute (SIPRI) data. The authors find no evidence that geopolitical factors have driven aggregate reserve shares during the sample period, once other factors are controlled for (Annex Table 3)—the sign on the geopolitical variables is negative for three of the measures and is insignificant for all measures. For instance, the proportion of countries voting in line with the United States has fallen sharply while the dollar's share of reserves has been resilient (Annex Figure 1).[7] Whether the measures used are poor proxies for geopolitical considerations, or

[6]For more information on the UN voting data set, see "Data and Analyses of Voting in the UN General Assembly," Voeten (2013).

[7]A similar pattern emerges when average reserve shares are plotted against official development assistance; the US ODA as a share of GDP has fallen since the 1960s.

Annex Figure 1. UN Voting Agreement and Reserve Currency Shares



Sources: Voeten, Strezhnev, and Bailey (2009); and IMF staff calculations.

whether political considerations are less relevant than they have been historically remain open questions.

Annex 3. Drivers of Reserve Currencies using Disaggregated Data

Disaggregated data for 42 economies covering the period of 1999–2018 are used to further investigate the drivers of reserve currency shares by using more granular trade, financial, and geopolitical measures linking reserve holders to reserve currencies and their issuers. The authors find that inertia effects remain a key driver of reserve currency shares, although of smaller magnitude than in the aggregate data, while financial considerations are important but vary over time and across regions.

Empirical Specification

In line with previous literature, the baseline specification focuses on reserve holders' potential transactional demands (the intended uses of the reserves) and bilateral links to reserve issuers as drivers of reserve currency shares. More specifically, the trade share with the reserve currency issuer proxies for trade links, the currency denomination of public debt or cross-border bank claims captures financial considerations, while the *de facto* anchoring to a reserve currency captures exchange rate stability considerations for intervening in the foreign exchange market.[1] The authors use a panel of 42 economies with data available for some or all years from 1999 to 2018 for reserve holdings in the main four reserve currencies (US dollar, euro, Japanese yen, and British pound),[2] and model the reserve share of currency i in country c's reserve portfolio in year t as:

$$\begin{aligned} \textit{Reserve Share}_{c,i,t} = \alpha_{c,i} + \delta_t + \textit{Reserve Share}_{c,i,t-1} + \textit{Trade Share}_{c,i,t} + \\ \textit{FX Alignment}_{c,i,t} + \textit{Financial Links}_{c,i,t} + \varepsilon_{i,t} \end{aligned}$$

[1]Time-series data for trade by invoicing currency are not available for many countries.

[2]Other reserve currency shares, including renminbi shares, are not included due to the lack of data on cross-border bank claims and external public debt denominated in those currencies.

where:

$\alpha_{c,i}$ is a country-currency random/fixed effect

δ_t is a time fixed effect

$Trade\ Share_{c,i}$ is the share of country c's trade with reserve issuer i

$FX\ Alignment_{c,i}$ is the estimated country c's exchange rate comovement with the reserve currency i, following Ilzetzki, Reinhart, and Rogoff (2019)

$Financial\ Links_{c,i}$ is either the share of country c's public debt or cross-border bank claims denominated in reserve currency i.[3]

The baseline specification uses a model with country-currency and year fixed effects, as the Hausman test rejects the random effects model and the Arellano-Bond estimator has limitations due to the small sample size. A Tobit model addressing the fractional nature of the dependent variable provides qualitatively similar results.[4]

The authors estimate their model separately for AEs and EMDEs due to different drivers of reserve holdings and also different data availability across the two sets of countries. For example, debt considerations are much more relevant for EMDEs than for AEs, while the currency denomination of cross-border bank claims is available for AEs but not for EMDEs. The authors use the 2019 *World Economic Outlook* (WEO) classification to split the sample into EMDEs (32) and AEs (10, of which 6 are European). The findings do not change if instead the 2001 WEO or the contemporaneous WEO country classifications is used.

[3]The currency denomination of public debt and cross-border bank claims are obtained from the World Bank International Debt Statistics dataset and the BIS international banking data by location, respectively.

[4]In contrast from previous studies that use disaggregated data, the authors include the lagged reserve share as a regressor, which makes the panel dynamic and introduces dynamic panel bias, that is, strict exogeneity of the regressors no longer holds. The fixed effects model is no longer consistent when the number of country-currency pairs tends to infinity and T is fixed, while the interpretation of the random effects model depends on the assumption of initial values of a dynamic process. The Arellano-Bond estimator overcomes these issues but is designed for "small T large N" panels, which might not be applicable in this case given relatively small N. Also, all these models ignore the fractional nature of the dependent variable, that is, predicted values should always lie in the unit interval. A Tobit model addresses this issue but might suffer from the incidental parameters problem in the presence of fixed effects.

Annex Table 4. Econometric Specifications

	Fixed Effects		Random Effects		Arellano-Bond		Tobit	
	EMDE (1)	AE (2)	EMDE (3)	AE (4)	EMDE (5)	AE (6)	EMDE (7)	AE (8)
Lagged Reserve Share	0.68*** (0.02)	0.79*** (0.06)	0.88*** (0.02)	0.97*** (0.01)	0.57*** (0.05)	0.70*** (0.11)	0.68*** (0.03)	0.80*** (0.04)
Trade Share	−0.08 (0.10)	0.09 (0.13)	0.05*** (0.02)	−0.02 (0.03)	−0.23 (0.16)	0.02 (0.19)	−0.08 (0.10)	0.08 (0.07)
FX Alignment	−0.06*** (0.01)		0.06*** (0.01)	0.01 (0.01)	−0.08 (0.06)	0.00 (0.00)	−0.06** (0.03)	−0.03 (0.03)
Debt Share	0.10*** (0.04)		0.03** (0.02)		0.16*** (0.06)		0.10*** (0.03)	
Bank Claims Share		0.08*** (0.03)		0.03** (0.01)		0.05* (0.03)		0.08 (0.05)
Observations	1,585	417	1,585	417	1,450	385	1,585	417
Hausman Test (p-value)			0.00	0.00				

Source: Authors' calculations.

Note: Robust standard errors in parentheses. ***, **, * indicates significance at the 1%, 5%, and 10% levels, respectively. All specifications include time and country-currency fixed (random) effects. Reserve shares for four reserve currencies (US dollar, British pound, Japanese yen, and euro) are obtained from the central banks' websites. "Trade Share" is the share of trade with the reserve issuer, obtained from the Direction of Trade Statistics. "FX Alignment" is a dummy variable equal to one if the exchange rate co-moves with the reserve currency, as estimated by Ilzetzki, Reinhart, and Rogoff (2019). "Debt Share" is the share of public debt denominated in a given reserve currency, obtained from the World Bank International Debt Statistics dataset. "Bank Claims Share" is the share of cross-border bank claims denominated in a given reserve currency obtained from the BIS international banking data by location. AE = advanced economies; EMDE = emerging market and developing economies.

Results

Results under baseline specification highlight the importance of inertia and financial considerations (Annex Table 4):

- *Inertia:* The findings suggest relatively large and significant inertia effects although of smaller magnitude than in aggregate data, with coefficients on the lagged reserve currency share in a range of 0.6–0.7 for EMDEs and 0.7–0.8 for AEs.
- *Financial considerations:* The currency denomination of public debt (EMDEs) and cross-border bank claims (AEs) are also statistically significant, although economically less significant than inertia. A 10 percent increase in the share of a given currency denomination in public debt or bank claims is associated with about 1 percentage points increase in that currency's reserve share.
- *Trade links and FX alignment:* The measures of trade links and exchange rate comovement are not statistically significant determinants of reserve currency shares.

The importance of financial considerations has increased since the GFC (Annex Table 5). Also, the currency denomination of public debt is a significant determinant of reserve holdings in EMDEs in all regions except Mid-

Annex Table 5. Alternative Region and Time Periods

	EMDE							AE			
	1999–2007 (1)	2008–2018 (2)	Africa (3)	Middle East (4)	Asia and Pacific (5)	Europe (6)	Americas (7)	1999–2007 (8)	2008–2018 (9)	Europe (10)	Americas (11)
Lagged Reserve Share	0.47***	0.68***	0.60***	0.70***	0.69***	0.65***	0.64***	0.63***	0.69***	0.78***	0.83***
	(0.06)	(0.03)	(0.06)	(0.05)	(0.09)	(0.04)	(0.06)	(0.03)	(0.04)	(0.08)	(0.08)
Trade Share	−0.28	−0.10	0.48**	−0.50***	0.03	0.03	0.16	0.06	0.24***	0.21***	−0.57**
	(0.20)	(0.13)	(0.19)	(0.13)	(0.33)	(0.23)	(0.10)	(0.29)	(0.07)	(0.05)	(0.19)
FX Alignment		−0.03***				−0.08***					
		(0.01)				(0.01)					
Debt Share	0.13	0.15***	0.35***	0.08	0.28*	0.03*	0.10*				
	(0.10)	(0.06)	(0.12)	(0.06)	(0.15)	(0.01)	(0.05)				
Bank Claims Share								−0.05	0.09***	0.07***	−0.05
								(0.15)	(0.03)	(0.02)	(0.12)
Observations	369	1,216	379	334	152	436	284	124	293	316	85
R-squared	0.28	0.50	0.57	0.52	0.53	0.55	0.55	0.54	0.57	0.69	0.78

Source: Authors' calculations.

Notes Robust standard errors in parentheses. ***, **, * indicates significance at the 1%, 5%, and 10% levels, respectively. All specifications include time and country-currency fixed effects. Reserve shares for four reserve currencies (US dollar, British pound, Japanese yen, and euro) are obtained from the central banks' websites. "Trade Share" is the share of trade with the reserve issuer, obtained from the Direction of Trade Statistics. "FX Alignment" is a dummy variable equal to one if the exchange rate co-moves with the reserve currency, as estimated by Ilzetzki, Reinhart, and Rogoff (2019). "Debt Share" is the share of public debt denominated in a given reserve currency, obtained from the World Bank International Debt Statistics dataset. "Bank Claims Share" is the share of cross-border bank claims denominated in a given reserve currency obtained from the BIS international banking data by location. AE = advanced economies; EMDE = emerging market and developing economies.

dle East and Central Asia, and economically very significant in Africa and Asia-Pacific, while the currency denomination of cross-border bank claims is only statistically significant in AEs in Europe.

After the GFC, inertia effects appear to have become stronger for both EMDEs and AEs (Annex Table 5, columns 1–2 and 8–9), with inertia effects for EMDEs converging with those for AEs in terms of magnitude. Inertia effects are largest among AEs in the Americas, and generally larger in AEs compared to EMDEs across all regions.

Trade links have become more important for AEs since the GFC (Annex Table 5, column 9). This is particularly striking for European countries, although not surprising given their trade links with Euro area economies.

Robustness Checks

Alternative measures of trade links and exchange rate comovement do not change the main results (Annex Table 6). The coefficient on trade links becomes positive but continues to be statistically insignificant when the share of trade is replaced by the share of imports, to account for the fact that for some countries the reserves are held mainly to cover purchases of foreign goods and services. Similarly, when the trade shares are replaced

Annex Table 6. Alternative Measures: Imports and Invoicing Share, De Jure Peg, Total Level of Reserves

	Imports Share		Invoicing Share		EMDE	
	EMDE (1)	AE (2)	EMDE (3)	AE (4)	Total reserves (5)	De jure Peg (6)
Lagged Reserve Share	0.68***	0.79***	0.68***	0.51***	0.68***	0.69***
	(0.02)	(0.06)	(0.03)	(0.08)	(0.02)	(0.02)
Trade Share	0.04	0.09	−0.07	−0.05	1.29**	−0.08
	(0.07)	(0.09)	(0.08)	(0.32)	(0.58)	(0.10)
FX Alignment	−0.06***		−0.07***		−0.06***	0.00
	(0.01)		(0.01)		(0.01)	(0.01)
Debt Share	0.10***		0.05*		0.12***	0.11***
	(0.03)		(0.03)		(0.04)	(0.04)
Bank Claims Share		0.08***		0.08		
		(0.03)		(0.05)		
Trade Share*Log Reserves					−0.06**	
					(0.02)	
Observations	1,585	417	380	104	1,585	1,585
R-squared	0.52	0.69	0.57	0.53	0.53	0.52

Source: Authors' calculations.

Note: Robust standard errors in parentheses. ***, **, * indicates significance at the 1%, 5%, and 10% levels, respectively. All specifications include time and country-currency fixed effects. Reserve shares for four reserve currencies (US dollar, British pound, Japanese yen, and euro) are obtained from the central banks' websites. "Trade Share" is the share of imports with the reserve issuer, obtained from the Direction of Trade Statistics., or share in imports invoicing, obtained from Boz and others (2020). "FX Alignment" is a dummy variable equal to one if the exchange rate co-moves with the reserve currency, as estimated by Ilzetzki, Reinhart, and Rogoff (2019). In column (4), "FX Alignment" dummy is replaced with the de jure peg to a reserve currency from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions database. "Debt Share" is the share of public debt denominated in a given reserve currency, obtained from the World Bank's International Debt Statistics dataset. "Bank Claims Share" is the share of cross-border bank claims denominated in a given reserve currency obtained from the Bank for International Settlements international banking data by location. Data on the levels of total reserves come from IMF's International Financial Statistics database. AE = advanced economies; EMDE = emerging market and developing economies.

with currency shares in imports invoicing, obtained from Boz and others (2020), the coefficients continue to be imprecisely measured, possibly due to little variability in invoicing shares over time and hence collinearity with the fixed effects.

The authors also find that trade links are a significant determinant of reserve shares in EMDEs with lower level of total reserves (measured by the log of total reserves from IMF IFS database), becoming less important as the level of reserves rises (Annex Table 6, column 5).[5] Finally, the coefficient on anchoring turns positive, as expected, but remains statistically insignificant when using the measure of the de jure peg to a reserve currency from the IMF AREAER database.[6]

Geopolitical measures deliver mixed results (Annex Table 7). Three measures of geopolitical influence are considered: the proportion of votes cast the same

[5]The authors do not find similar effect for financial links.

[6]Using the de jure naturally restricts the sample to EMDEs. The de facto anchoring measure by Ilzetzki, Reinhart, and Rogoff (2019) based on exchange rate comovements has the drawback that it classifies some floating exchange rates as anchored to other currencies, for example, the Canadian dollar as anchored to the US dollar and the Swiss franc to the Euro.

Annex Table 7. Alternative Geopolitical Measures

	UN Voting		ODA	Arms Imports	
	EMDE (1)	AE (2)	EMDE (3)	EMDE (4)	AE (5)
Lagged Reserve Share	0.54***	0.74***	0.68***	0.67***	0.78***
	(0.05)	(0.09)	(0.02)	(0.02)	(0.06)
Trade Share	−0.02	0.13	−0.06	−0.08	0.11
	(0.11)	(0.09)	(0.10)	(0.09)	(0.13)
FX Alignment	−0.10***		−0.06***	−0.05***	
	(0.01)		(0.01)	(0.01)	
Debt Share	0.12***		0.11***	0.10***	
	(0.04)		(0.03)	(0.03)	
Bank Claims Share		0.06			0.08***
		(0.05)			(0.03)
UN Votes	0.06	0.17***			
	(0.04)	(0.06)			
ODA Share			−0.03**		
			(0.01)		
Share in Arms Imports				0.04***	0.02
				(0.02)	(0.02)
Observations	1,102	288	1,585	1,585	417
R-squared	0.35	0.62	0.53	0.53	0.69

Source: Authors' calculations.

Note: Robust standard errors in parentheses. ***, **, * indicates significance at the 1%, 5%, and 10% levels, respectively. All specifications include time and country-currency fixed effects. Reserve shares for four reserve currencies (US dollar, British pound, Japanese yen, and euro) are obtained from the central banks' websites. "Trade Share" is the share of trade with the reserve issuer, obtained from the Direction of Trade Statistics. "FX Alignment" is a dummy variable equal to one if the exchange rate co-moves with the reserve currency, as estimated by Ilzetzki, Reinhart, and Rogoff (2019). "Debt Share" is the share of public debt denominated in a given reserve currency, obtained from the World Bank's International Debt Statistics dataset. "Bank Claims Share" is the share of cross-border bank claims denominated in a given reserve currency obtained from the Bank for International Settlement's international banking data by location. "UN Votes" is the share of votes cast the same way as the reserve issuer at the UN General Assembly, with abstentions counted as "no" votes (Voeten 2013). "ODA Share" is the share of official development assistance received from the reserve issuer, sourced from the Organisation for Economic Co-operation and Development. "Share in Arms Imports" is the share of imports of arms and ammunition (classified under Harmonized System Chapter 93) from the reserve issuer, obtained from UN Comtrade. AE = advanced economies; EMDE = emerging market and developing economies; ODA = official development assistance.

way as the reserve issuer at the UN General Assembly in a given year; the share of official development assistance (ODA) received from a given reserve issuer (for EMDEs only); and the share of imports of arms and ammunition (classified under Harmonized System Chapter 93) from a given reserve issuer. The results are mixed, and only the UN votes in AEs and the share of arms imports from reserve issuers in EMDEs are positively associated with the reserve currency share.

Annex Table 8. List of Economies

Country	Years	Country Group	Source
Azerbaijan	1999–2018	EMDE	Central Bank of Azerbaijan
Bangladesh	2005–18	EMDE	Bangladesh Bank
Bolivia	2008–18	EMDE	Central Bank of Bolivia
Bosnia and Herzegovina	2001–18	EMDE	Central Bank of Bosnia and Herzegovina
Brazil	2002–18	EMDE	Central Bank of Brazil
Bulgaria	2000–18	EMDE	Bulgarian National Bank
Canada	1999–2018	AE	Bank of Canada and Department of Finance Canada
Colombia	2007–18	EMDE	Bank of the Republic
Costa Rica	2011–18	EMDE	Central Bank of Costa Rica
Denmark	1999–2018	AE	Danmarks Nationalbank
Finland	2001–18	AE	Bank of Finland
Georgia	1999–2018	EMDE	National Bank of Georgia
Germany	2000–18	AE	Deutsche Bundesbank
Ghana	2003–18	EMDE	Bank of Ghana
Hong Kong SAR	1999–2018	AE	Hong Kong Monetary Authority
Kazakhstan	1999–2018	EMDE	National Bank of Kazakhstan
Kenya	2001–18	EMDE	Central Bank of Kenya
Korea	2007–18	AE	Bank of Korea
Kyrgyz Republic	2003–18	EMDE	National Bank of the Kyrgyz Republic
Malawi	2008–18	EMDE	Reserve Bank of Malawi
Moldova	2011–18	EMDE	National Bank of Moldova
Nigeria	2011–15	EMDE	Central Bank of Nigeria
North Macedonia	2001–18	EMDE	National Bank of the Republic of North Macedonia
Norway	1999–2018	AE	Norges Bank
Papua New Guinea	2005–18	EMDE	Bank of Papua New Guinea
Paraguay	2002–18	EMDE	Central Bank of Paraguay
Peru	2000–18	EMDE	Central Reserve Bank of Peru
Philippines	2005–18	EMDE	Bangko Sentral ng Pilipinas
Romania	2001–18	EMDE	National Bank of Romania
Russia	2007–18	EMDE	Bank of Russia
Serbia	2005–18	EMDE	National Bank of Serbia
South Africa	2005–18	EMDE	South African Reserve Bank
Sweden	2006–18	AE	Sveriges Riksbank
Switzerland	1999–2018	AE	Swiss National Bank
Tajikistan	2008–18	EMDE	National Bank of Tajikistan
Tanzania	2003–18	EMDE	Bank of Tanzania
Tunisia	2009–18	EMDE	Central Bank of Tunisia
Turkey	2004–18	EMDE	Central Bank of the Republic of Turkey
Uganda	2006–18	EMDE	Bank of Uganda
Ukraine	2001–18	EMDE	National Bank of Ukraine
United States	1999–2018	AE	Federal Reserve
Zambia	2004–18	EMDE	Bank of Zambia

Source: Authors' compilations.

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