Sectoral dynamics of safe assets in advanced economies *

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April 15, 2025

Abstract

What is the sectoral composition of the market for safety, and does it matter for economic stability? To address these questions, we construct a novel dataset of sectoral safe asset positions in 21 advanced economies since 1980. In almost every country, safe assets have grown considerably relative to GDP, while maintaining a stable "safe-asset share" relative to total financial assets. We find that safe-asset fluctuations are almost exclusively driven by the foreign and financial sectors—who are, respectively, the key marginal buyers and issuers of safe assets—with the real and public sectors playing a muted role. Moreover, increases in safe asset demand by foreigners (raw, and instrumented using emerging-market FX holdings)—or its counterpart, the supply by financials—are associated with expansions in domestic risky credit and lower medium-term output growth. Our results suggest that advanced economies have been increasingly intermediating safety within and across borders, with potentially adverse effects on their economic stability.

Keywords: safe assets, capital flows, financial accounts, business cycles, financial stability
JEL classification codes: E42, E44, E51, F33, F34, G15

*This work was kindly supported by the European Commission (ERC Starting Grant 101116832-SAFECRISES), the Severo Ochoa Program of Centers of Excellence (CEX2019-000915-S), and the Spanish Ministry of Science and Innovation and the State Research Agency (Ministry grant PID2020-118541GB-I00 and Ramon y Cajal fellowships RYC2021-033982-I and RYC2022-038033-I). We would like to thank Veronica De Falco (discussant), William Diamond, Karen Lewis, Alberto Martin, Lira Mota, Guillermo Ordoñez, Enrico Perotti, Andrea Sy (discussant), conference participants at the ABS-Wharton Workshop on Safety vs Liquidity Demand, BSE Summer Forum Workshop on Safety, Liquidity, and the Macroeconomy, CEPR Gersenzee European Summer Symposium on Financial Markets, Madrid & Barcelona Workshop on Banking and Corporate Finance, and seminar participants at the Bank of England and University of Pennsylvania for helpful comments. Haowei Luo and Yuhan Luo provided excellent research assistance. The views expressed are solely the responsibility of the authors and should not be interpreted as reflecting the views of the European Central Bank.

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1 Introduction

Safe assets, broadly defined as those with a highly certain stream of payments, are a key building block of modern financial markets due to their unique ability to be reliable stores of value, act as collateral in transactions, fulfill prudential requirements, and serve as price benchmarks (Gourinchas and Jeanne, 2012). Yet safe assets are not all alike: for example, some are produced by the financial sector—e.g., through deposits and securitized bonds—while others are produced by the public sector—e.g., through reserves and treasury securities. Equally, safe assets can be held by different sectors of the domestic economy (households, firms, banks and non-bank financials), and increasingly in the modern globalized financial system, domestically produced safe assets may end up being held abroad.

Who supplies, and who demands safety can, in principle, be crucial for macro-financial stability. Recent theoretical and policy debates have discussed the potential dangers of privately created safety (Gorton, 2010; Gennaioli, Shleifer, and Vishny, 2013; Gorton and Ordoñez, 2022; Castells-Jauregui, 2023; Altinoglu, 2023), the impact of increasing foreign sector safe-asset demand on economic stability (Bernanke, 2005; Maggiori, 2017; Caballero and Simsek, 2020; Ahnert and Perotti, 2021), the overall role of the public sector in supplying safe assets (Krishnamurthy and Vissing-Jorgensen, 2015; Kacperczyk, Perignon, and Vuillemey, 2021), and whether it is possible to meet an increasing demand for safety without endangering financial stability (Stein, 2012; Benigno and Nisticò, 2017; Moreira and Savov, 2017; Diamond, 2020).

In all these debates, the supply and demand of safety by different economic *sectors* plays a key role. Yet to date, there is no systematic empirical analysis of which sectors issue and hold safe assets, nor of how the sectoral composition of this market is related to macroeconomic and financial stability. In this paper, we fill this gap by studying the following two questions. First, which sectors are the key players in the market for safety, both for long-run trends (i.e. average issuers and holders) and for fluctuations (i.e. marginal issuers and holders)? Second, how does the sectoral activity in the market for safety relate to future real outcomes?

To do this, we construct a new cross-country dataset of safe assets and liabilities of different economic sectors—public, household, non-financial corporate, financial, and foreign—using financial accounts data extended backwards based on Diebold and Richter (2021). The data cover 21 advanced economies going back to 1960 for the US, and to the 1980s or 1990s for most other countries. We calculate gross and net (asset minus liability) safe-asset positions, and we say that a sector demands (supplies) safety if its net safe-asset holdings are positive (negative).

Our main findings are: first, the financial and foreign sectors are key players in the market for safety, and, second, how much safety they supply and demand has macroeconomic effects. We start by showing that there has been a trend of increasing foreign sector holdings of safe assets (produced by the domestic economy), and of increasing safe-asset intermediation by the financial sector. We then use variance decompositions rooted in national accounting identities to show that the foreign and the financial sectors are responsible for most of the variation in acquisitions and issuances of safe assets. Moreover, the dynamics of these two sectors are closely interlinked: when the foreign sector acquires domestic safe assets, the domestic financial sector issues safe assets. Finally, in terms of real effects, safe asset purchases by the foreign sector are associated with (contemporaneous) increases in domestic risky lending, and (future) lower medium-term real GDP growth. These results hold both in OLS, and in an IV setting using quasi-exogenous variation in rest-of-the-world demand for safety proxied by changes in official FX reserve holdings of Asian economies and country-specific response elasticities (following the methodology of Nakamura and Steinsson, 2014).

We begin our analysis by studying the evolution of safe assets in our sample. We follow Gorton et al. (2012) and categorize as safe the debt-like securities issued by governments, central banks, and financial intermediaries.[1] We find that the safe-asset share (safe assets over total financial assets) has remained stable in the US, the EU, the UK, and for an aggregate of our advanced economies, despite a significant secular increase in both safe and risky assets relative to GDP, consistent with Gorton et al. (2012) and Barro et al. (2022). The safe-asset share has remained relatively constant in large economies, but at different levels, suggesting that these economies may be heterogenous in their ability to produce and/or hold safe assets. Moreover, we observe some heterogeneities in the evolution of the safe-asset share across small EU countries, which, given the stability of the aggregate, points towards some substitutability between safe assets within the EU, consistent with Nenova (2023).

We identify two patterns in the evolution of the sectoral composition of the market for safety that may be relevant for financial stability. First, when looking at net positions, the increase in safe asset holdings has been mainly driven by the foreign sector within each country, with its counterpart being an increase in the issuance of safe assets by the domestic financial sector (pre-GFC) and the public sector (post-GFC), suggesting a substitution from private to publicly created safety after the 2008-09 crisis.[2] Second, when looking at the gross positions, we observe a large increase in safe-asset holdings

[1] In particular, we define as safe the following financial instruments: government bonds (central and local), currency, reserves, gold, special drawing rights, deposits, money market fund shares, and bonds issued by financial intermediaries.

[2] It is worth highlighting that as these patters are observed in most countries in our sample, it is likely that

and issuance for both the financial and the foreign sectors, suggesting an increase in intermediation through privately produced safe assets both within and across borders. Surprisingly, the safe asset holdings of the real economy (households and firms) have been rather stable during this period.

Next, we study the nature of fluctuations in the market for safety by analyzing which sectors are the marginal holders and issuers of safe assets. This analysis is based on variance decompositions rooted in the accounting identity that economy-wide safe assets must equal economy-wide safe liabilities, and follows Fang, Hardy, and Lewis (2022), who analyze the marginal holders of government debt. Using cross-country panel data on financial flows across sectors and instruments, we find that both gross safe asset acquisitions, and gross safe asset issuance are driven by the financial and foreign sectors, while the real and even the public sector are much less important. On the asset side, households and firms hold around 36% of safe assets on average, but only account for 4% of fluctuations, while the foreign sector holds only 23% of safe assets on average, but accounts for 39% of fluctuations. On the liability side, the public sector issues 24% of safe instruments on average, but only accounts for 11% of fluctuations, while the financial and foreign sectors jointly account for 89% of fluctuations.

Moreover, the dynamics of the financial and the foreign sectors are closely interlinked: the foreign sector is the key marginal buyer of safe assets issued by the financial sector, and the domestic financial sector is the key marginal issuer for safe assets acquired by the rest of the world. We find that for every $1 of net safe assets acquired by the foreign sector, financial sector net issuance of safe assets increases by 81 cents, with most of this issuance driven by bank deposits (51 cents) and non-bank bonds (19 cents).

To improve the interpretation of our variance decomposition, we replicate the exercise by instrumenting changes in foreign safe-asset acquisitions with changes in foreign exchange reserves of a group of East Asian countries (China, Taiwan, Hong Kong, Singapore, and Korea). Our instrument follows the methodology in Nakamura and Steinsson (2014) and Guren, McKay, Nakamura, and Steinsson (2020) by estimating country-specific exposures to changes in the demand for safety from East Asia, and combining these country-specific sensitivities with aggregate variation in East Asian countries' reserve holdings to instrument the changes in the foreign sector net safe asset position.[3] We find that the response of the financial sector to the foreign sector safe-asset acquisitions is, if anything, stronger

the documented increase in the net demand for safety from the rest of the world is mainly driven by growing developing economies not included in our sample, such as China.

[3]Our identifying assumption is that changes in reserve holdings for these Asian countries are driven by local economic conditions, mainly a need to defend their domestic currencies, and not by changes in the demand or supply for safety of the domestic sectors in the advanced economies in our sample.

than that implied by the OLS. For each $1 of instrumented foreign sector safe asset demand, the domestic financial sector issues close to $1, with around 70 cents coming from domestic banks and the rest from non-banks.

We conclude by exploiting our cross-country dataset to study the relevance of the sectoral composition of the market for safety for financial stability and economic growth. Recent theoretical work has shown that private safe asset creation may generate financial instability, for example by backing these safe assets with risky loans of poor quality (Gennaioli et al., 2013; Gorton and Ordoñez, 2022; Castells-Jauregui, 2023). We find support for this view in the data. We first show that foreign demand for safety is strongly associated with domestic risky credit expansions: for every $1 of net safe assets acquired by the foreign sector, domestic financials increase their risky credit by 61 cents. We then show that higher net safe asset demand by the foreign sector, and higher safe-asset supply by the domestic financial sector are associated with lower medium-term real GDP growth—both on their own, and after controlling for overall growth in risky credit and net foreign asset position. Differently, higher supply of public safe assets is not associated with lower GDP in the future. Again, these results hold both in OLS, and when instrumenting foreign sector demand or financial supply with changes in foreign reserve demand from Asian countries as described above.

Our findings indicate that over the past four decades, advanced economies—particularly their financial sectors—have increasingly exported safety to the rest of the world, aligning with the perspectives of Bernanke (2005), Bernanke et al. (2011), and Maggiori (2017). However, the proliferation of privately created safe assets also introduces significant vulnerabilities, as it shifts residual risk onto the domestic real economy (households and firms) and the financial sector (banks and non-banks). This dynamic is consistent with theoretical work that underscores the fragility associated with privately produced safety (Stein, 2012; Moreira and Savov, 2017; Caballero and Farhi, 2018), particularly when held abroad, as argued by Caballero and Simsek (2020) and Ahnert and Perotti (2021).

Our work contributes to a growing literature on safe assets by extending Gorton et al. (2012) to many advanced economies and by providing a new perspective on the market for safety through the study of the role played by different economic sectors. Our results complement those in Barro et al. (2022), who document a stable safe-asset share on average in OECD countries in recent years, and in Gourinchas and Jeanne (2012), who document the importance of the rest-of-the-world sector in the market for safety in a small sample of advanced economies.

In recent years, academics have emphasized that safe asset shortages, i.e. the fact that the global demand for safe assets may increase faster than its supply, have contributed to the decline in real

interest rates and to important global imbalances (Gourinchas and Jeanne, 2012; Caballero et al., 2016, 2017; Caballero and Farhi, 2018; Del Negro et al., 2019; Brunnermeier et al., 2021). In the same line, a large literature has studied mechanisms through which safe-asset production by financials can pose a threat to financial stability (Stein, 2012; Gennaioli et al., 2013; Hanson et al., 2015; Dang et al., 2017; Moreira and Savov, 2017; Diamond, 2020; Kacperczyk et al., 2021; Acharya et al., 2021; Gorton and Ordoñez, 2022) and to economic stability and growth (Caballero and Farhi, 2018; Segura and Villacorta, 2023; Castells-Jauregui, 2023; Altinoglu, 2023). We contribute to these views by providing evidence that which sectors demand (domestic vs. foreign) and supply (private vs. public) safety matters for financial stability, by differentially affecting domestic credit and output growth.

The paper is organized as follows. Section 2 describes the data sources and methodology used to construct the new dataset of safe assets and liabilities. Section 3 presents the trends in safe asset positions of different economic sectors. Section 4 studies which sectors are the marginal buyers and issuers of safe assets through several variance decomposition exercises. Section 5 analyzes the links between sectoral safe asset positions, risky credit, and GDP growth. Section 6 concludes with a discussion of the implications of our findings for policymakers and future research.

2 A new database of safe assets in advanced economies

Coverage. This project uses annual financial balance sheets data to construct a new cross-country dataset of safe assets and liabilities of different economic sectors. The dataset builds on Diebold and Richter (2021), who extended the OECD financial accounts' time series available online by digitizing data from the printed historical OECD publications. We further extend the data in Diebold and Richter (2021) which cover amounts outstanding (balance sheet positions) with additional data on flows (quantities acquired or issued) of financial assets and liabilities of different economic sectors.

The data cover an unbalanced panel of 33 countries. For our analysis, we focus on a subsample of 21 advanced economies. When analyzing the trends, we further restrict this group to a consistent sample of 16 countries whose data go back to at least 1980 or 1990. This subset includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, UK, and the US. The remaining countries in our 21-economy sample are Iceland, Ireland, Israel, Portugal, and Switzerland.

Safe asset definition. We follow the definition of Gorton et al. (2012), and define safe assets as the following financial instruments: special drawing rights, monetary gold, currency, reserves, deposits, money market fund shares, and bonds issued by the government or by financial institutions. In contrast, we classify bonds issued by non-financial corporates, loans, equity, and investment fund shares (excluding money market fund shares), as well as insurance and pension claims or entitlements, derivatives, stock options, and other accounts receivable/payable, as risky assets.[4] With our data, this breakdown into safe and risky assets can easily be implemented on the liability side of sectoral balance sheets. The breakdown is more challenging on the asset side, because for bonds the safety classification depends on the sector issuing them. To deal with this, for the US, we obtain the breakdown directly from the flow of funds data (where the issuing counterparty sector can be observed). For the other countries, we proxy the breakdown of bonds on the asset side with the shares of safe and risky bonds in total domestic bonds in the given year.[5]

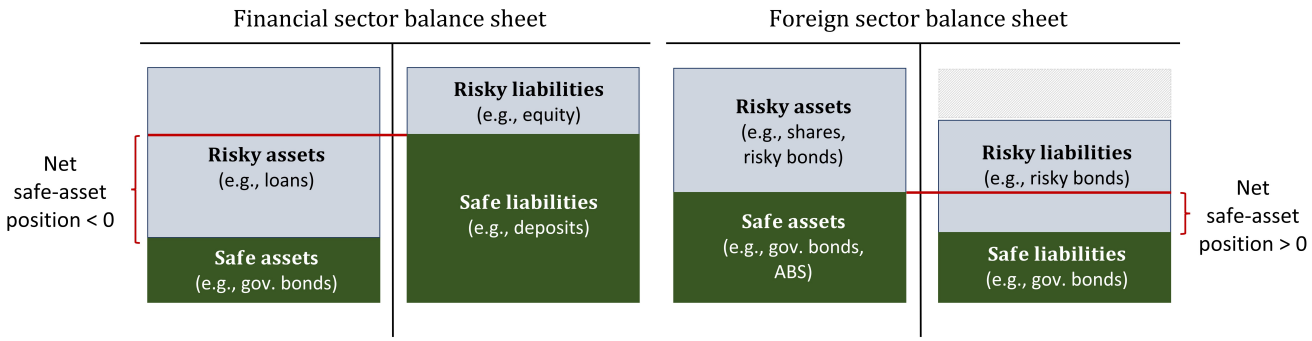
Sectoral safe-asset positions. We measure the amount of safe assets and liabilities for the following economic sectors within each country, as reported in the non-consolidated financial accounts data: the public sector (government and central bank), the financial sector (banks and non-bank financial companies), the real sector (households and non-financial firms), and the foreign sector (rest of the world). The foreign sector in each country includes both other advanced economies in our sample, and the economies outside our sample (for example, emerging markets). Gross positions represent the total safe assets and total safe liabilities of each sector. We define the net safe asset position of a given sector as its safe assets minus its safe liabilities, and we say that a sector demands (supplies) safety if its net safe asset position is positive (negative).

Figure 1 shows an example of sectoral balance sheets to illustrate how we compute both gross and net safe-asset positions in our data. On the left, we depict a typical financial sector balance sheet with a negative net safe-asset position. That is, its safe liabilities are larger than its safe assets. This example reflects how the financial sector tends to supply safety as it finances risky loans with safe deposits. On the right, we depict a typical foreign sector balance sheet with a positive net safe-asset

[4]Alternatively, one could characterize an asset as safe by measuring its convenience or safety premium, as in Krishnamurthy and Vissing-Jorgensen (2012); Nagel (2016); Kacperczyk et al. (2021); Mota (2023); Nenova (2023). This, however, requires granular data on prices of financial securities which we do not have for our entire sample.

[5]In our sample, outside of the US, bond markets are dominated by governments and financials, which account for roughly 90% of total bond issuances (consistent with other evidence on the small size of non-financial corporate bond markets outside of the US, e.g., Darmouni and Papoutsi, 2022). Therefore, any measurement imprecisions from splitting the bond holdings based on ratio of sectoral bond liabilities are likely to be small.

Figure 1: Example financial balance sheets of different sectors



position. That is, the domestic safe assets held by foreigners are larger than the foreign safe assets held by the domestic sectors. This example reflects how the foreign sector in advanced economies tends to demand safety by holding relatively large amounts of safe bonds issued by the domestic sectors. Lastly, the difference between total assets and liabilities of the foreign sector captures the country's net foreign asset position.[6]

One sector's financial asset is necessarily another sector's liability. For example, a bank deposit is an asset for a household and a liability for the bank issuing it. As a result, for the economy as a whole (domestic and foreign sectors) the sum of sectoral safe assets must equal the sum of sectoral safe liabilities and the sum of sectoral net safe assets must equal zero. These identities will be essential for the variance decompositions in our analysis of safe-asset fluctuations in Section 4.

3 Trends in the market for safety

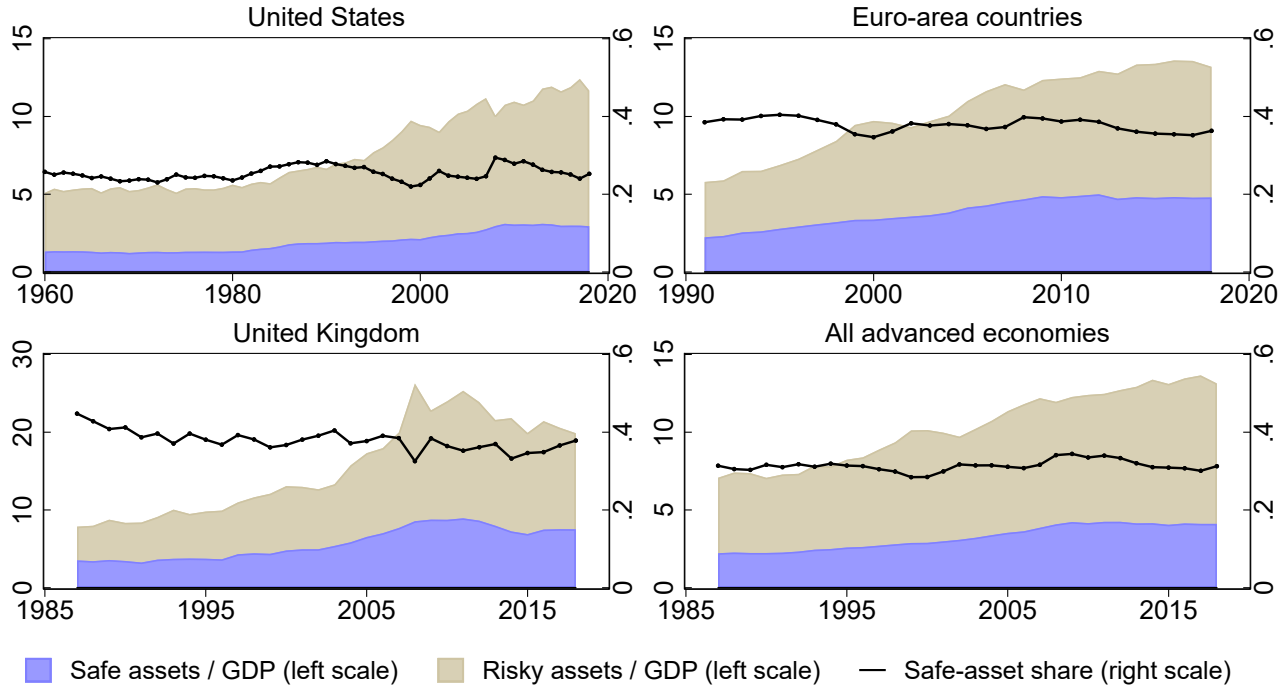
3.1 Total safe and risky assets

We begin by analyzing the evolution of safe asset positions in our sample. Figure 2 plots economy-wide safe and risky asset positions relative to GDP, as well as the ratio of safe to total financial assets, referred to as the safe-asset share. We present results for the US, the UK, a euro-area composite (Austria, Belgium, Finland, France, Germany, Italy, Netherlands, and Spain), and an aggregate of 16 advanced economies with long-run data in our sample.[7]

[6]Generally, assets are not equal to liabilities in financial accounts data as the positions only reflect financial assets. An exception tends to be the financial intermediary balance sheet which shows only small deviations between financial assets and liabilities, as this sector's business model relies on activities in financial markets.

[7]In Appendix Figure A.1, we show that the overall patterns remain consistent when we focus solely on liabilities issued by the domestic sectors (i.e., excluding the rest-of-the-world sector), as in Gorton et al. (2012).

Figure 2: Safe and risky asset holdings, and the safe-asset share



Notes: Safe assets include currency, reserves, deposits, gold, special drawing rights, money market mutual fund shares, and bonds issued by governments and financial intermediaries. Risky assets are all other financial assets (equities, non-financial corporate bonds, loans, insurance & pension assets, derivatives, and other accounts). The safe-asset share is the ratio of safe to total (safe + risky) financial assets. The series for euro-area countries is the sum of (nominal euro) positions in Austria, Belgium, Finland, France, Germany, Italy, Netherlands, and Spain divided by the sum of the respective countries (nominal euro) GDP. The advanced-economy total is the sum of US dollar positions in 16 countries (12 European countries, Australia, Canada, US, and Japan) divided by the sum of their US dollar GDP. The series include financial assets issued by domestic sectors and those issued abroad but held by domestic sectors.

We find that the ratio of safe to total financial assets—the safe-asset share—has remained relatively stable over time, despite the large increase in safe and risky assets relative to GDP since the 1980s (see Figure 2). These patterns hold in the US, as documented by Gorton et al. (2012), as well as the UK, euro area, and the total of advanced economies in our data. In Appendix Figure A.2 we depict these trends for all 16 countries in our long-run sample. The safe-asset share is either stable or slightly declining over time in every country with the exception of Japan, which has witnessed a large increase in domestic government debt during our sample period.

There are two additional patterns in the data that are worth highlighting. First, even though the safe-asset share has remained relatively stable through time, we observe some differences in levels of the safe-asset share in different large advanced economies (e.g., around 40% in the UK and euro-area, and 30% in the US). This suggests that economies may be heterogenous (and potentially constrained)

in their ability to either produce or to hold safe assets (as in Maggiori, 2017). Second, there is substantial variation in the evolution of the safe-asset share within individual euro countries (see Appendix Figure A.2), which, given the stability of the euro-area aggregate, is consistent with safe assets of these countries being highly substitutable (as shown in Nenova, 2023).

3.2 The sectoral allocation of safety

To better understand which sectors play an important role in the market for safety, we begin by studying the trends in sectoral safe asset positions. Figure 3 depicts the gross and the net safe asset positions for each sector for the US, UK, euro-area composite, and the total of 16 advanced economies.[8] Appendix Tables A.1 and A.2 show the average sectoral safe-asset positions across 16 advanced economies in 1980, 2005 and 2015, as well as the changes for each sector as share of GDP and proportion of total economy-wide growth.[9]

The sectoral composition of the market for safety has changed substantially during our sample period, as documented in Figure 3a and Table A.1. We see that most of the growth in gross safe-asset holdings and liabilities during the last decades (80% and 75% respectively) has been driven by the financial and foreign sectors (see Table A.1). Within financials, banks are responsable for a large fraction of this growth for most countries in our sample. In the US, however, non-banks (insurance, pension funds, mutual funds, and other non-banks) play a central role, reflecting the importance of GSEs and money market mutual funds in the US financial system (Appendix Figure A.3a). Finally, the position of the real sector has remained relatevely stable during this period, despite its substantial safe-asset holdings.

Given the large positions of the financial and the foreign sector on both the asset and liability sides, we next study the evolution of the net positions, i.e., safe assets minus safe liabilities, which we depict in Figure 3b. We find that the foreign sector is important in explaining the increase in net safe asset holdings, and the financial sector—in net safe liabilities (see also Appendix Table A.2 and Figure A.5). That is, the foreign sector has been increasingly demanding safe assets, and the financial sector increasingly supplying them.[10] In the Appendix Figure A.3b, we split the financial sector into

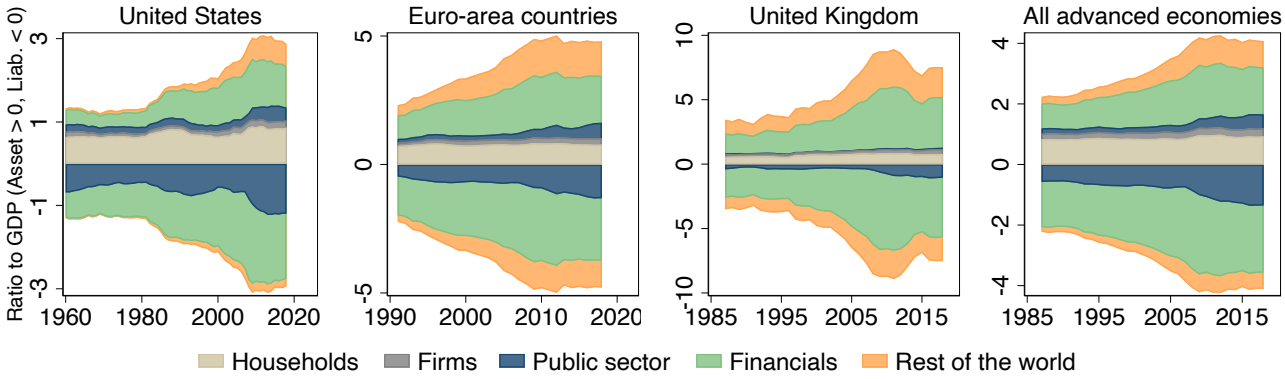
[8] Appendix Figures A.4 and A.5 show these trends for the 16 countries in our long-run sample.

[9] We chose the periods to capture the start of our sample for most countries (1980), the pre global financial crisis level (2005), and the end of our sample (2015). Note that the numbers in the table are unweighted averages of cross-country data, whereas the right panels of Figure 3 show the sum of country-level positions divided by the sum of their GDP (both converted to US dollars).

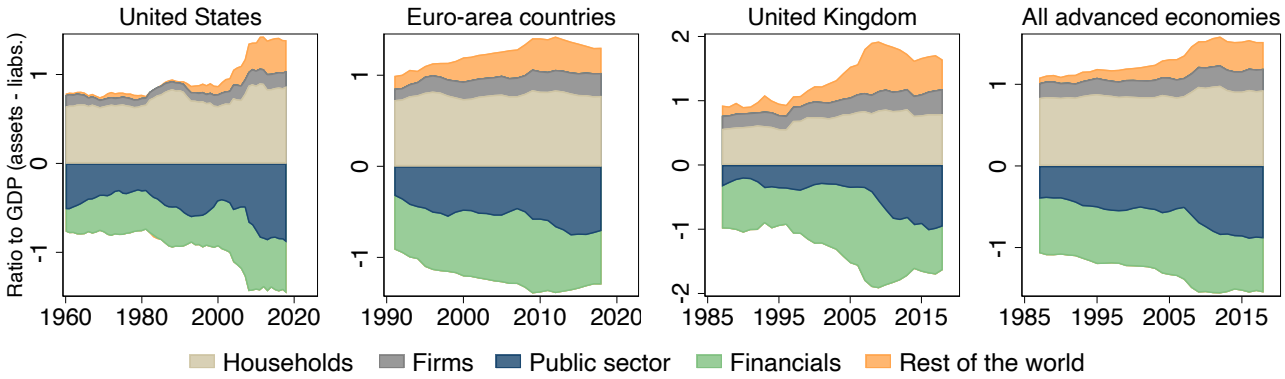
[10] Recall that we say a sector demands (supplies) safe assets if it has a positive (negative) net position.

Figure 3: Trends in sectoral safe-asset positions

(a) Gross sectoral safe-asset positions (assets > 0, liabilities < 0):



(b) Net sectoral safe-asset positions (assets minus liabilities):



Notes: The net safe-asset position is the difference between safe assets and safe liabilities of the specific sector. The public sector includes central government, local government, and the central bank. Financials include both banks (deposit taking institutions) and non-banks, shown separately in Figure A.3. The series for euro-area countries are the sum of Austria, Belgium, Finland, France, Germany, Italy, Netherlands, and Spain. The advanced-economy total is the sum of 16 advanced economies for which we have long-run data.

banks and non-banks. We find that banks supply safety, while non-banks typically demand it, with the exception of the US, where non-banks became important suppliers of safe assets post-1990s. The public sector is also an important supplier of safe assets, particularly so after the global financial crisis of 2008-09. Finally, the net position of the real sector has remained stable throughout our sample.

Our findings suggest that, over the last few decades, the financial sectors in advanced economies have been increasingly intermediating safety both within and across borders. This is reflected in the increase in gross safe asset holdings and liabilities of both the financial and the foreign sector. Moreover, we find that our advanced economies have been increasingly supplying safety to countries outside of our sample. This is reflected in the increasing and positive net safe asset position of most

countries in our sample (Figure A.5) and of the aggregate of our advanced economies (Figure 3b).

4 Fluctuations in the market for safety

Next, we study which sectors are active in the market for safety; that is, which sectors are important drivers of fluctuations of both gross and net safe asset positions. To do this, we use a variance decomposition approach that exploits national accounting identities using data on flows (gross and net issuances and acquisitions) of safe assets from the financial accounts.

4.1 Safe-asset fluctuations

We now study which sectors drive the fluctuations in safe assets. In particular, we want to understand which sectors are the marginal buyers of safe assets and which sectors are the marginal issuers.

We follow a similar methodology to Fang et al. (2022) and conduct a variance decomposition exercise that exploits two accounting identities. First, that the economy-wide safe asset acquisitions, ΔSA^{Total}, must equal the economy-wide safe asset issuances, ΔSL^{Total}. And second, that the economy-wide acquisitions (issuances) must equal the sum of the sectoral acquisitions, ΔSA^{j} (issuances, ΔSL^{j}), where sectors are indexed by j. We combine these to obtain the following two identities:

$$\Delta SL_{it}^{Total} = \Delta SA_{it}^{Finan.} + \Delta SA_{it}^{Public} + \Delta SA_{it}^{RoTW} + \Delta SA_{it}^{Real} \tag{1}$$

$$\Delta SA_{it}^{Total} = \Delta SL_{it}^{Finan.} + \Delta SL_{it}^{Public} + \Delta SL_{it}^{RoTW}. \tag{2}$$

Above, ΔSL_{it}^{j} and ΔSA_{it}^{j} denote the 1-year flow in safe liabilities and in safe assets, respectively, of sector j in country i in year t relative to country i's GDP, and where we made use of the fact that the real sector does not issue safe assets, i.e., $\Delta SL_{it}^{Real} = 0$.

We take equation (1), multiply both sides by ΔSL_{it}^{Total}, take expectations, and after some algebra obtain the following decomposition of the variation in the issuance of safe liabilities:

$$\begin{aligned} Var\left(\Delta SL_{it}^{Total}\right) &= Cov\left(\Delta SL_{it}^{Total}, \Delta SA_{it}^{Real}\right) + Cov\left(\Delta SL_{it}^{Total}, \Delta SA_{it}^{Public}\right) \\ &+ Cov\left(\Delta SL_{it}^{Total}, \Delta SA_{it}^{Finan.}\right) + Cov\left(\Delta SL_{it}^{Total}, \Delta SA_{it}^{RoTW}\right) \end{aligned} \tag{3}$$

Then, dividing both sides by $Var\left(\Delta SL_{it}^{Total}\right)$ we obtain:

$$1 = \beta^{Real} + \beta^{Finan.} + \beta^{Real} + \beta^{Public} + \beta^{RoTW} \tag{4}$$

where $\beta^j \equiv \frac{Cov\left(\Delta SA_{it}^j, \Delta SL_{it}^{Total}\right)}{Var\left(\Delta SL_{it}^{Total}\right)}$ for sector $j \in \{Real, Finan., Public, RoTW\}$.

We estimate each β^j by regressing the safe-asset flows of the corresponding sector j, ΔSA^j, on the economy-wide issuance of safe liabilities, ΔSL^{Total}:

$$\Delta SA_{it}^j \;=\; \alpha_i \;+\; \alpha_t \;+\; \beta^j \Delta SL_{it}^{Total} \;+\; \varepsilon_{it}^j, \tag{5}$$

where we include country (α_i) and year (α_t) fixed effects. Thus, β^j reflects the marginal acquisition of safe assets by sector j for a one unit economy-wide issuance of safe liabilities. We measure the contribution of each sector to fluctuations in safe-assets holdings with these βs, with high-β sectors as more important drivers. We repeat this exercise for identity (2) to estimate the marginal issuance of safe liabilities by sector j for a one unit economy-wide acquisition of safe assets.

Table 1 shows the resulting regression coefficients for safe asset acquisitions (panel A, first row) and issuances (panel B, first row). For comparison, the bottom rows of each panel show, correspondingly, the average share of safe asset holdings and liabilities of each sector. The results are based on an unbalanced panel of 17 advanced economies for which we have safe-asset flows data.[11] This reduced-form analysis does not imply any causal relationship, but findings are consistent with evidence using instrumented changes in rest-of-the-world demand for safety in Section 4.2.2.

We find that the financial and the foreign sectors are the main drivers of fluctuations in both safe asset holdings and liabilities. For each dollar of safe liabilities issued in the economy, the financial sector acquires 45 cents and the foreign sector acquires 39 cents (top row of Panel A). Even though the real sector holds a substantial amount of safe assets (households and firms together hold 36% of all safe assets, see bottom row of Panel A), they are not important drivers of fluctuations in safe asset holdings. The financial and foreign sectors, on the other hand, account for 84% of the fluctuations in safe asset holdings, but hold only 60% of safe assets.

In Panel B we see that for every dollar of safe assets acquired in the economy, the financial sector issues 57 cents and the foreign sector issues 32 cents, with only 11 cents issued by the public sector.

[11] For the variance decompositions, we exclude Iceland and Ireland from the pooled-sample analysis because these countries have very large safe-asset, and in particular financial and foreign sector positions relative to GDP, so the variance decomposition analysis ends up being driven disproportionately by these two countries. Our results, however, also hold when including these two countries, in fact they become starker in terms of the financial and foreign sectors driving an even larger share of safe-asset fluctuations. We also exclude Australia and Israel because of the lack of financial flows data for these countries.

Table 1: Marginal holders and issuers of safe assets

	(1) Households	(2) Firms	(3) Financials	(4) Public sector	(5) RoTW
	Panel A: Holdings				
Marginal share	0.02**	0.02***	0.45***	0.11***	0.39***
	(0.01)	(0.01)	(0.03)	(0.03)	(0.02)
Average share	0.29	0.07	0.36	0.09	0.23
	Panel B: Issuance				
Marginal share	0.00	0.00	0.57***	0.11***	0.32***
	(.)	(.)	(0.03)	(0.03)	(0.04)
Average share	0.00	0.00	0.58	0.24	0.17
Observations	512	512	512	512	512

Notes: In panel A, we show the marginal sectoral shares for fluctuations in gross safe-asset acquisitions—obtained through the regressions in (5)—and the average shares in total safe asset holdings—calculated as the ratio of each sector's holdings to the economy-wide total in the full sample. In panel B, we show the marginal sectoral shares for fluctuations in gross safe-asset issuances, and the average sector-shares in safe-asset liabilities. The shares in each row add up to 1, subject to a small residual. Standard errors clustered by country and year are in parentheses. *,**, and *** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

This is surprising, as the public sector is important for long-run trends in safe assets (Figure 3) and issues 24% of safe assets on average. Appendix Figure A.6 plots these decompositions for 18 advanced economies separately. The financial and foreign sectors are important marginal holders and issuers of safe assets across the board, while public sector issuance and household acquisitions are important in some larger and less-open economies (Japan, the US, and Canada).

We conclude by conducting a more detailed analysis for more granular economic sectors (e.g., banks vs non-bank financials, government vs the central bank) and financial instruments (e.g., bonds, money market fund shares, deposits). Results are presented in Appendix Tables A.3 and A.4. For both acquisitions and issuance of safe assets, the bulk of the gross fluctuations is driven by domestic bank deposits, with a somewhat smaller part attributable to foreign deposits and bonds issued by domestic governments and financial institutions. Finally, in Appendix Table A.5 we show that our findings are robust to controlling for macro-financial observables (GDP growth, inflation and short-term interest rates), and to using 3-year as opposed to 1-year flows.

4.2 Net safe-asset fluctuations

We have shown that the financial and the foreign sectors are the key drivers of both safe assets acquisitions and issuances. Motivated by this, next, we study who is their marginal counterpart sector.

Since the financial and the foreign sectors both acquire and issue safety, we focus on fluctuations in their *net* safe-asset positions.[12]

To do this, we perform a new set of variance decompositions for the financial and the foreign net safe asset flows. The decompositions are, again, based on financial accounting identities—in this case that the sum of total net safe asset flows of all sectors should equal zero. Given this, we can express fluctuations in the net issuance by financials or the net acquisitions by foreigners as follows:

$$\textbf{Financial issuance:} \quad -\Delta NSA_{it}^{Finan.} = \Delta NSA_{it}^{Real} + \Delta NSA_{it}^{Public} + \Delta NSA_{it}^{RoTW} \tag{6}$$

$$\textbf{Foreign acquisitions:} \quad \Delta NSA_{it}^{RoTW} = -\Delta NSA_{it}^{Real} - \Delta NSA_{it}^{Finan.} - \Delta NSA_{it}^{Public} \tag{7}$$

As in equation (5), we estimate the variance share of each sector j by regressing the net acquisitions of this sector on the financial-sector net safe asset issuance, and on the foreign-sector safe asset acquisitions, respectively:

$$\Delta NSA_{it}^{j} = \alpha_i + \alpha_t - \beta_{Finan.}^{j} \Delta NSA_{it}^{Finan.} + \varepsilon_{it}^{j} \tag{8}$$

$$\Delta NSA_{it}^{j} = \alpha_i + \alpha_t - \beta_{RoTW}^{j} \Delta NSA_{it}^{RoTW} + \varepsilon_{it}^{j}, \tag{9}$$

where we include country (α_i) and year (α_t) fixed effects. As before, we use 1-year safe-asset flows as a measure of changes in net safe-asset holdings, and run the regression in the unbalanced panel of 17 advanced economies. Now, $\beta_{Finan.}^{j}$ reflects the marginal acquisition by sector j for a one unit net issuance of safe liabilities by the financial sector, while β_{RoTW}^{j} reflects the marginal issuance of safe assets by sector j for a one unit net acquisition of safe assets by the foreign sector. As before, we say that a sector contributes to fluctuations if it is a high β sector.

4.2.1 Who acquires the safe assets issued by the financial sector?

Table 2 shows the marginal sectoral acquisition of net safe assets issued by the financial sector, computed from (8). All estimated coefficients are positive and statistically significant: an increase in the net issuance of the financial sector is associated with an increase in net acquisitions by households, firms, the public sector, but mainly, the rest of the world. One way to interpret these coefficients is as follows. For each \$1 of net safe assets issued by the financial sector the rest of the world sector acquires 61 cents, the real sector (households and firms) acquires 21 cents and the public sector issues

[12]Because the foreign sector usually has a positive net position, we say it usually demands safety, while the financial sector has a negative net position, and thus it usually supplies safety.

Table 2: Counterparts of financial sector net safe-asset issuance

	(1) Households	(2) Firms	(3) Public sector	(4) RoTW
$-\Delta \text{NSA}^{\text{Financials}}$	0.15***	0.06***	0.17***	0.61***
	(0.03)	(0.02)	(0.05)	(0.07)
Observations	512	512	512	512

Notes: The shares are obtained by regressing the net safe-asset flows of the corresponding sector on the negative of the net safe-asset flows of the financial sector following equation (8). The shares add up to 1, subject to a small residual. Standard errors clustered by country and year are in parentheses. *,**, and *** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

17 cents less. Our findings highlight the importance of the financial sector in advanced economies in supplying safety to the rest of the world, and they are consistent with the view that private safe assets are a substitute for public safe assets as in Krishnamurthy and Vissing-Jorgensen (2015).

Appendix Table A.6 provides a decomposition of these results into more granular sectors and financial instruments. The findings highlight the importance of deposits as safe assets for the real economy and of deposits and bonds as safe assets for the rest of the world.

4.2.2 Who issues the safe assets acquired by the rest of the world?

Table 3 shows the marginal sectoral issuance of net safe assets acquired by the foreign sector, computed from (7). We find that net acquisitions by the rest of the world are almost exclusively met by net issuance of the financial sector. In Panel A, we see that for each $1 of safe assets acquired by the foreign sector, the financial sector issues 81 cents (most of it by domestic banks) and the public sector issues 17 cents (most of it by the government). The financial sector is a key counterpart of foreign acquisitions for most countries in our sample, as shown in Figure 4, with the notable exception of the US, where the public sector plays an important role.[13]

Table 4 provides a more detailed breakdown of these issuances across different economic subsectors and financial instruments. The sectoral shares (rows) sum to 1, while the instrument-specific shares (columns 2–4) sum to the total share of each sector (column 1). The findings highlight the significant role of domestic bank deposits and safe bonds of domestic financial institutions—particularly non-banks—as key counterparts to foreign safe-asset acquisitions. Specifically, for every $1 of net safe assets acquired by the foreign sector, domestic bank deposits increase by 51 cents and financial-sector

[13]The finding for the US is consistent with the central role of the US dollar in the international financial system, and large foreign sector demand for US government debt (Bernanke, 2005; Bernanke et al., 2011).

Table 3: Counterparts of foreign sector net safe asset acquisitions

	Panel A: OLS					
	Domestic Real Sector		Financial Sector		Public Sector	
	Households	Firms	Banks	Non-banks	Government	CB
$\Delta \text{NSA}^{\text{RoTW}}$	-0.02	0.04	0.66***	0.15	0.15*	0.02*
	(0.03)	(0.03)	(0.09)	(0.09)	(0.08)	(0.01)
Observations	500	500	500	500	500	500
	Panel B: Instrumental variable					
$\Delta \text{NSA}^{\text{RoTW}}$	-0.07	0.03	0.73***	0.33***	-0.00	0.02
	(0.11)	(0.07)	(0.22)	(0.11)	(.)	(0.01)
Observations	500	500	500	500	500	500

Notes: The shares are obtained by regressing the negative of the net safe-asset flows of each domestic sector on the net safe-asset flows of the foreign sector following equation (9). The shares add up to 1, subject to a small residual. In panel B, we instrument foreign sector flows with changes in FX reserve holdings of Asian economies following equation (10). The Kleibergen-Paap weak ID statistic for the first-stage regression is 69.22. Standard errors clustered by country and year are in parentheses. *,**, and *** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

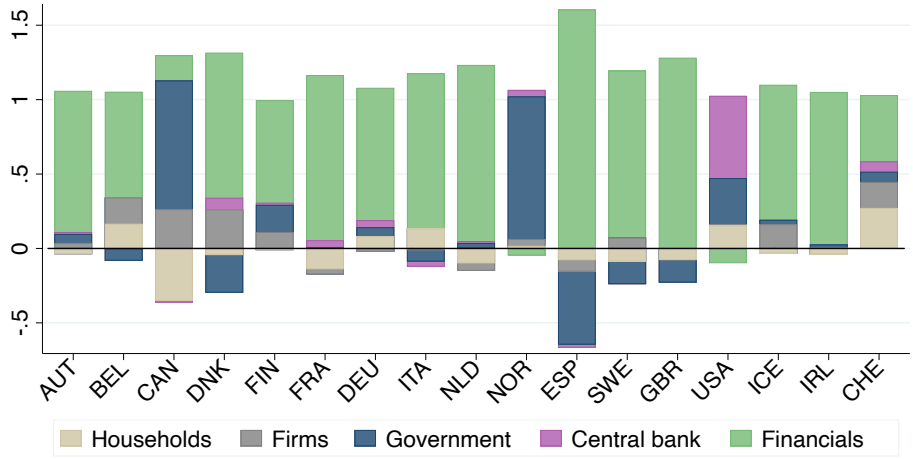
bonds by 34 cents (19 cents of these coming from non-banks and 15 cents from banks). Note that since we are analyzing *net* safe asset flows, these higher bond flows could signify both lower bond holdings on the asset side (e.g., via the financials selling their government bond holdings to the foreign sector), and higher bond issuances on the liability side.

Next, to provide a causal interpretation of our results, we instrument rest-of-the-world safe asset acquisitions with a proxy for safe asset demand from emerging markets not in our sample. To construct the instrument, we use data from Lane and Milesi-Ferretti (2018) on the foreign exchange reserve holdings of the following Asian countries: China, Hong Kong, Taiwan, Korea, and Singapore. We argue that these reserves are held for domestic reasons, mainly to defend the domestic currency, and thus do not respond to the safe asset demand nor supply of the real, public, and financial sectors in our advanced economies.[14] This reasoning allows us to exploit changes in the foreign exchange reserve holdings of these Asian countries as exogenous variation in net safe asset demand from the rest of the world to our sample of countries, i.e., a shock to ΔNSA^{RoTW}.

We follow Nakamura and Steinsson (2014) and Guren et al. (2020) who use the interaction between local elasticities and aggregate changes as an instrument. In our context, this approach leverages the

[14]Minoiu et al. (2023) use a similar identification strategy for the US and Tabova and Warnock (2021) provide evidence that foreign official holdings are price insensitive in the market for US Treasuries.

Figure 4: Counterparts of foreign sector net safe asset acquisitions, individual countries



Notes: Each shaded bar corresponds to the share of the specific sector in the decomposition of net foreign-sector safe asset flows, within a specific country, obtained through regressions in (9) at country and sector level. For each country, the shares add up to 1, subject to a small residual.

Table 4: Counterparts of foreign sector net safe asset acquisitions, granular sectors and instruments

	(1)	(2)	(3)	(4)
	Total	Depo. and Cur.	MMF shares	Bonds
Domestic Economy	1.00***	0.51***	0.01	0.49***
	(0.01)	(0.07)	(0.01)	(0.08)
1) Real Sector	0.02	-0.02	0.01**	0.03
	(0.06)	(0.04)	(0.00)	(0.03)
→ Households	-0.02	-0.04**	0.01	0.01
	(0.03)	(0.02)	(0.00)	(0.02)
→ Firms	0.04	0.02	0.00***	0.02**
	(0.03)	(0.02)	(0.00)	(0.01)
2) Financial Sector	0.81***	0.47***	-0.00	0.34***
	(0.10)	(0.06)	(0.01)	(0.11)
→ Banks	0.66***	0.51***	0.00	0.15***
	(0.09)	(0.07)	(0.00)	(0.05)
→ Non banks	0.15	-0.04	-0.00	0.19**
	(0.09)	(0.03)	(0.01)	(0.09)
3) Public Sector	0.17*	0.06*	-0.00	0.11
	(0.09)	(0.03)	(0.00)	(0.09)
→ Government	0.15*	0.02	-0.00	0.13*
	(0.09)	(0.02)	(0.00)	(0.08)
→ Central bank	0.02*	0.04	-0.00	-0.02
	(0.01)	(0.03)	(0.00)	(0.03)

Notes: The shares are obtained by regressing the negative of the net safe-asset flows for each domestic sector and financial instrument on the (total) net safe asset flows of the foreign sector. The shares add up to 1 across sectors and instruments, subject to a small residual (which, for instruments, includes gold flows). Depo. and Cur. stands for deposits and currency. Standard errors clustered by country are in parentheses. *, **, and *** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

fact that some of our advanced economies are more likely to supply safety to the emerging Asian economies. To compute these elasticities, we estimate the sensitivity of the foreign sector net safe asset flows, ΔNSA_{it}^{RoTW}, to changes in Asian foreign reserves, ΔAD_t, using the following regression:

$$\Delta NSA_{it}^{RoTW} = \alpha_i + \alpha_t + \sum_{i \in I} \gamma_i \Delta AD_t I_i + v_{it}. \tag{10}$$

Importantly, γ_i is a country-specific coefficient, and I_i is a dummy which equals 1 for country i and 0 for all other countries. We then use the predicted values $z_{it} = \hat{\gamma}_i \Delta AD_t$ as an instrument for ΔNSA_{it}^{RoTW} in equation (5). We estimate $\hat{\gamma}_i$ using all years except the year in question, following a similar approach as in Guren et al. (2020) to avoid a mechanical relationship in the first-stage. The left panel in the Appendix Figure A.7 shows a strong relationship between the net safe asset flows of the foreign sector in our set of advanced economies and z, suggesting a strong first stage. The Kleibergen-Paap weak ID statistic for the first stage is 69.22, well above conventional thresholds for the relevance condition.

Next, we run regression (9) and instrument ΔNSA^{RoTW} with changes in Asian economies' FX reserves as described above. The results are shown in Panel B of Table 4, and support those from OLS shown in panel A. For each \$1 increase in (instrumented) foreign demand for safety, the domestic banking sector issues 73 cents of safe assets, and the domestic non-bank financial sector issues 33 cents, while public-sector response is not significant. In Appendix Figure A.7, we show that these findings also hold in reduced form: our instrument z is strongly correlated with safe-asset flows of the financial sector (middle panel), but not those of the public sector (right panel).[15]

Overall, we have shown that the key sectors driving the marginal issuances and purchases of safe assets are the financial sector (as net issuers of safety), and the foreign sector (as net holders of safety). Moreover, these sectors are closely interlinked, with almost all the fluctuations in foreign sector safe asset acquisitions met by financial sector issuance. In the next section, we study whether these sectoral safe-asset fluctuations are important for macro-financial outcomes.

5 The market for safety and macro-financial stability

We have shown that the key drivers of fluctuations in the market for safety are the financial sector (main net issuer), and the foreign sector (main net acquirer). Moreover, these sectors are closely interlinked, with almost all foreign sector acquisitions being met by financial sector issuance. These

[15]Since higher instrumented foreign sector safe asset demand (i.e., higher net *acquisitions*) is associated with higher financial sector net *issuances*, the correlation in the middle panel of Figure A.7 is negative.

dynamics may have important implications for the economy. In particular, since the 2008-09 Global Financial Crisis there has been substantial theoretical work underpinning the potential downsides of privately created safety (Stein, 2012; Gennaioli et al., 2013; Hanson et al., 2015; Caballero and Farhi, 2018; Segura and Villacorta, 2023; Castells-Jauregui, 2023; Altinoglu, 2023), and of safety-seeking capital inflows from abroad (Caballero and Simsek, 2020; Ahnert and Perotti, 2021). A mechanism highlighted in this literature relates to safe asset creation associated with increases in risky credit and the proliferation of low-quality loans, which back insured deposits and asset-backed securities. Motivated by these theories, we now study how foreign demand for safety (met by a private supply of safety) impacts domestic risky credit and GDP growth.

To do so, we first study how different components of the financial sector balance sheet—in particular, domestic risky credit—respond to changes in (instrumented) foreign safe asset demand. Second, we build on the methodology used to study the real outcomes of domestic risky credit expansions (Mian and Sufi, 2009; Mian et al., 2017; Müller and Verner, 2023) and relate changes in foreign demand for safety to medium-term real GDP growth.

5.1 Safe assets and risky lending

We now study how the different components of the financial sector balance sheet change with foreign safe-asset acquisitions using a variance decomposition approach as in Section 4. Due to the nature of their business, financial intermediaries typically maintain a close balance between their financial assets and liabilities. As a result, any increase in net safe liabilities is typically matched by an increase in net risky assets. Given this, we can express the change in net safe-asset holdings by the foreign sector as follows:

$$\begin{aligned}
\Delta NSA_{it}^{RoTW} &= -\Delta NSA_{it}^{Public} - \Delta NSA_{it}^{Real} - \Delta NSA_{it}^{FI} \\
&\approx -\Delta NSA_{it}^{Public} - \Delta NSA_{it}^{Real} + \Delta NRA_{it}^{FI} \\
&\approx -\Delta NSA_{it}^{Public} - \Delta NSA_{it}^{Real} + \Delta N_{it}^{FI,Loans} + \Delta N_{it}^{FI,Shares} \\
&+\Delta N_{it}^{FI,Ins.} + \Delta N_{it}^{FI,Risky\ bonds} + \Delta N_{it}^{FI,Deriv.} + \Delta N_{it}^{FI,Oth.},
\end{aligned} \tag{11}$$

where we first replace $-NSA_{it}^{FI}$ (net safe asset issuance of the financial sector) with NRA_{it}^{FI} (net risky asset acquisitions of the financial sector), and then decompose the changes in net risky asset flows by risky financial instrument (loans, shares, insurance and pension claims, risky bonds, derivatives, and other accounts) which add up to the total ΔNRA^{FI} flows. As in (4) and (5), the share for each risky

Table 5: Foreign sector safe asset acquisitions and domestic risky assets

	Panel A: OLS							
	Financials Total		Decomposition of risky financial instruments					
	Net Safe	Net Risky	Loans	Equity	Insur.	R. Bonds	Deriv.	Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta \text{NSA}_{it}^{\text{RoTW}}$	-0.81***	0.74***	0.61***	0.11*	-0.03	-0.00	0.01	0.04**
	(0.10)	(0.11)	(0.11)	(0.07)	(0.02)	(0.01)	(0.01)	(0.02)
Observations	500	500	500	500	500	500	500	500
	Panel B: Instrumental variable							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta \text{NSA}_{it}^{\text{RoTW}}$	-1.06***	0.95***	0.47*	0.43**	-0.03	0.01	-0.03*	0.10**
	(0.27)	(0.27)	(0.27)	(0.21)	(0.05)	(0.02)	(0.02)	(0.04)
Observations	500	500	500	500	500	500	500	500

Notes: The number in column (1) corresponds to the financial-sector net safe asset flows for each $1 of foreign-sector net safe asset acquisitions (sum of banks and non-banks in Table 3, with a negative sign indicating higher financial sector net issuances). The shares in columns (2)–(8) are obtained by regressing the net risky asset acquisitions (in total and by instrument) of the financial sector on the total net safe asset acquisitions of the foreign sector. The shares of individual instruments in columns (3)–(8) add up to the total net risky asset share in column (2) subject to a small residual. In panel B, we instrument the foreign sector safe asset flows with changes in FX reserve holdings of Asian economies following equation (10). The Kleibergen-Paap weak ID statistic for the first-stage regression is 69.22. Standard errors clustered by country and year are in parentheses. *,**, and *** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

instrument is estimated by (pairwise) OLS regressions of the financial sector's net acquisition of each risky financial instrument on the (total) net safe-asset acquisitions of the foreign sector.

The results are presented in Table 5 and can be interpreted as the marginal acquisition of each risky asset by the financial sector in response to a $1 increase in foreign safe asset acquisitions. Panel A shows the OLS coefficients, and panel B—the IV coefficients, using changes in Asian economies' FX reserves and heterogeneous elasticities, following equation (10). For comparison, column (1) displays the coefficient for $NSA^{Finan.}$ from equation (6) (the sum of banks' and non-banks' coefficients in Table 3). In column (2) we replace $NSA_{it}^{Finan.}$ with $NRA_{it}^{Finan.}$, the net risky asset supply of the intermediary sector. The coefficient estimate is very similar, but with a reversed sign: changes in safe asset acquisitions by the foreign sector are not only reflected in net safe-asset issuance, but also in net risky-asset acquisitions of the financial sector.

The results of the decomposition by risky instrument are shown in Table 5 columns (3) to (8). We find that an increase in the demand for safety by the rest of the world is highly correlated with an increase in the supply of risky loans by the financial sector. If the rest of the world acquires $1

of safe assets, net risky assets of the domestic financial sector go up by 74 cents, with additional exposure to risky loans accounting for most of this increase (61 cents). Panel B shows that for each \$1 of instrumented safe-asset demand from the foreign sector, domestic risky lending increases by 47 cents. In the IV specification, we also find a sizable increase in the position in equity, indicating either increased purchases of risky equity (on the asset side) or lower equity and hence higher leverage on the liability side. Overall, these results directly link the export of safe assets to domestic risky credit expansions and other forms of financial sector risk-taking.

5.2 Safe assets and medium-term real activity

To analyze the link between sectoral safe asset flows and real activity, we follow the literature on credit booms (Mian et al., 2017), and study the medium-term relationship between sectoral safe asset flows and subsequent output dynamics by estimating

$$\Delta_3 y_{it+3} = \alpha_i + \beta^j \Delta_3 NSA^j_{it-1} + \Gamma X_{it-1} + u_{it+3}, \tag{12}$$

where $\Delta_3 y_{it+3}$ are three-year changes in real GDP between t and $t+3$, α_i are country fixed effects. X_{it-1} is a control vector that includes three lags of GDP growth, inflation, policy rate changes, and a financial crisis indicator in the baseline specification and, in more saturated specifications, it additionally includes three-year changes in net foreign assets, household and business credit relative to GDP. The coefficient of interest will be β^j for each sector $j \in \{RoTW,\ Finan.,\ Public\}$ which links subsequent output dynamics to changes in net safe asset positions of the foreign, financial, and the public sector, respectively.

The results are shown in Table 6. From column (1) we see that an increase in the net safe asset position of the foreign sector is associated with significantly lower subsequent GDP growth, even after controlling for business-cycle, inflation, and interest rate dynamics. In column (2) we additionally control for changes in net foreign assets, household credit, and firm credit relative to GDP between $t-1$ and $t-4$. The relationship between $\Delta_3 NSA^{RoTW}$ and GDP remains unchanged, indicating that our findings go beyond the dynamics associated with capital flows (and the corresponding trade balance) and domestic credit.

Table 6 columns (3) and (4) repeat these specifications replacing changes in net safe asset positions of the foreign sector with the changes in the net safe asset position of the financial sector. The results show that an increase in safe asset issuance (a decreasing net safe-asset position) by the financial sector

Table 6: Sectoral safe-asset positions and subsequent output dynamics

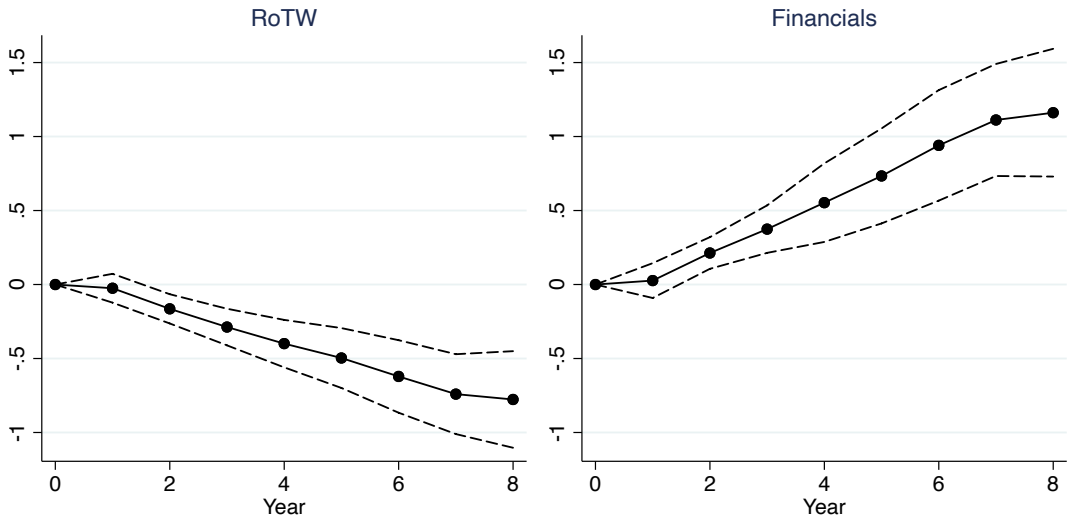
	Dependent variable: real GDP growth$_{t \text{ to } t+3}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Δ_3NSA RoTW$_{i,t-1}$	-0.09***	-0.06**				
	(0.02)	(0.03)				
Δ_3NSA Financials$_{i,t-1}$			0.10***	0.08***		
			(0.01)	(0.01)		
Δ_3NSA Public$_{i,t-1}$					-0.06	-0.06
					(0.04)	(0.04)
R^2	0.204	0.232	0.238	0.256	0.188	0.228
Country FE	✓	✓	✓	✓	✓	✓
Base controls	✓	✓	✓	✓	✓	✓
Additional controls		✓		✓		✓
Observations	528	528	528	528	528	528

Notes: The dependent variable is the change in log real GDP between t and $t+3$. Explanatory variables (in rows) are changes in the ratio of the respective variable and GDP between $t-4$ and $t-1$. Base controls include three lags of GDP growth, inflation, short-term interest rates, and the financial crisis dummy. Additional controls include the three-year changes in net foreign assets to GDP, household credit to GDP, and business credit to GDP. Country fixed effects included. Driscoll-Kraay standard errors (5 lags) in parentheses. *, **, and *** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

is associated with lower subsequent GDP growth. Differently, higher issuance of safe assets by the public sector does not predict lower medium-term GDP growth (columns 5 and 6, with statistically insignificant and negative rather than positive coefficients). This relationship between changes in sector-level net safe asset positions and subsequent output dynamics is a robust pattern of the data. Appendix Table A.7 shows that results hold using 3-year cumulative net safe asset flows as opposed to changes in levels. Appendix Figure A.8 shows results from local projection (Jordà, 2005) exercises, using 1-year flows at the sector level and both country and year fixed effects as well as a rich set of controls, that confirm the dynamics described above at horizons of up to eight years.

One concern in these regressions is that the results may be driven by reverse causality or omitted variables. That is, foreigners may increase their demand for safe assets when financials have increased risky credit for other domestic reasons we are omitting in the specification. To get around these issues, as before, we instrument the net safe-asset flows of the foreign sector (and here, additionally the financial sector) in our sample of advanced economies with the changes in foreign exchange reserves of Asian economies, allowing for heterogeneous elasticities in responses across countries following equation (10). We estimate the dynamic response using local projections with a rich set of controls, and leave

Figure 5: Net safe asset positions and future GDP growth: LP-IV



Notes: The dependent variable is the change in log real GDP between year t and $t+h$. Local projection estimates for 1-year changes in the net safe-asset rest of the world (left panel) and financial (right panel) sector position. Changes in (rest of the world, or financial sector) safe-asset positions are instrumented using changes in FX reserve holdings of Asian economies following equation (10), excluding the year for which the regression is run when estimating the country-specific elasticity. Controls include contemporaneous values and four lags of GDP growth, inflation, short-term interest rates, financial crisis dummy, changes in net foreign assets to GDP, household credit to GDP, and business credit to GDP. Country and year fixed effects included. Dashed lines are 95% confidence intervals using Driscoll-Kraay standard errors with $1.5 \times h$ lags.

out the observation used in the local projection (year t) when estimating the country-specific elasticity:

$$\Delta_h y_{i,t+h} = \alpha_{i,h} + \alpha_{t,h} + \sum_{s=0}^{4} \beta_{h,s}^{j} \Delta NSA_{i,t-s}^{j} + \sum_{s=0}^{4} \beta_{h,s}^{y} \Delta y_{i,t-s} + \iota_h X_{i,t} + \epsilon_{i,t}, \quad h \in \{1,..,8\}. \tag{13}$$

Above, $\Delta_h y$ is the h-year cumulative change in real GDP between t and $t+h$, α_i are country fixed effects, α_t are year fixed effects, X_{it} is the control vector including contemporaneous values and 4 lags of baseline and additional (credit and net foreign asset position) controls. $\beta_{h,0}^{j}$ are the coefficients of interest, that we estimate for the foreign (j=RoTW) and financial-sector (j=Finan.) safe-asset flows, both instrumented using the predicted values z_{it} from (10).

Figure 5 shows the estimated instrumented regression coefficients for the foreign and the financial sector. Consistent with the OLS results in Table 6, high instrumented net safe-asset purchases by the foreign sector ($\Delta NSA^{RoTW} > 0$), and high net safe-asset issuance by the domestic financial sector ($\Delta NSA^{Finan.} < 0$) reduce medium-term real GDP growth. The effects are large and persistent, with an instrumented 1% of GDP rest of the world purchases, or financial sector issuance, associated with cumulatively 0.5–1 percentage point lower real GDP growth over the following 5–8 years.

Appendix Figure A.9 shows that these relationships continue to hold under alternative specifications. Figure A.9a shows that they hold when using the baseline set of controls (i.e., without controlling for credit growth and the net foreign asset position). Figure A.9b shows that the effects are not driven by differential exposures to macroeconomic dynamics in Asian countries (as opposed to exposures to safe asset demand): the estimates remain virtually unchanged when we control for country-specific elasticities interacted with GDP growth of the Asian economies (constructed analogously to the safe-asset demand elasticities that we use in our instrument).

Together with the results in the previous sections, our findings suggest that higher demand for safety from the rest of the world is largely met by privately produced domestic safe assets, increases domestic risky lending, and lowers future medium-term real GDP growth. To our knowledge, these results provide the first systematic empirical evidence of the adverse macro-financial consequences of increased rest-of-the-world demand—and private sector supply—for safety.

6 Conclusions

This paper provides key insights into the role of safe assets in modern economies by studying the sectoral composition of the market for safety in an extensive cross-country sample. Analyzing harmonized financial accounts data across countries and over time points to a pivotal role of the foreign sector in driving safe asset demand, and of the financial sector in supplying privately produced safe assets. We relate our findings to macro outcomes and show that expansions in safety demand from the rest of the world, or equivalently in supply by financials, are associated with lower subsequent GDP growth and expansions in risky credit to households and firms.

Our results point to some important issues. After 2008, there has been some substitution from private to public safety through expansions in central bank balance sheets and government debt and a retrenchment in private debt issuance, which has created concerns among policymakers and academics. Our findings suggest that these public balance sheet expansions may have a positive side-effect through reducing the need for the private provision of safety, and thus ameliorate the associated negative effects on macro-financial stability. Our findings highlight important trade-offs to be considered in the design of macro-prudential regulation in advanced economies.

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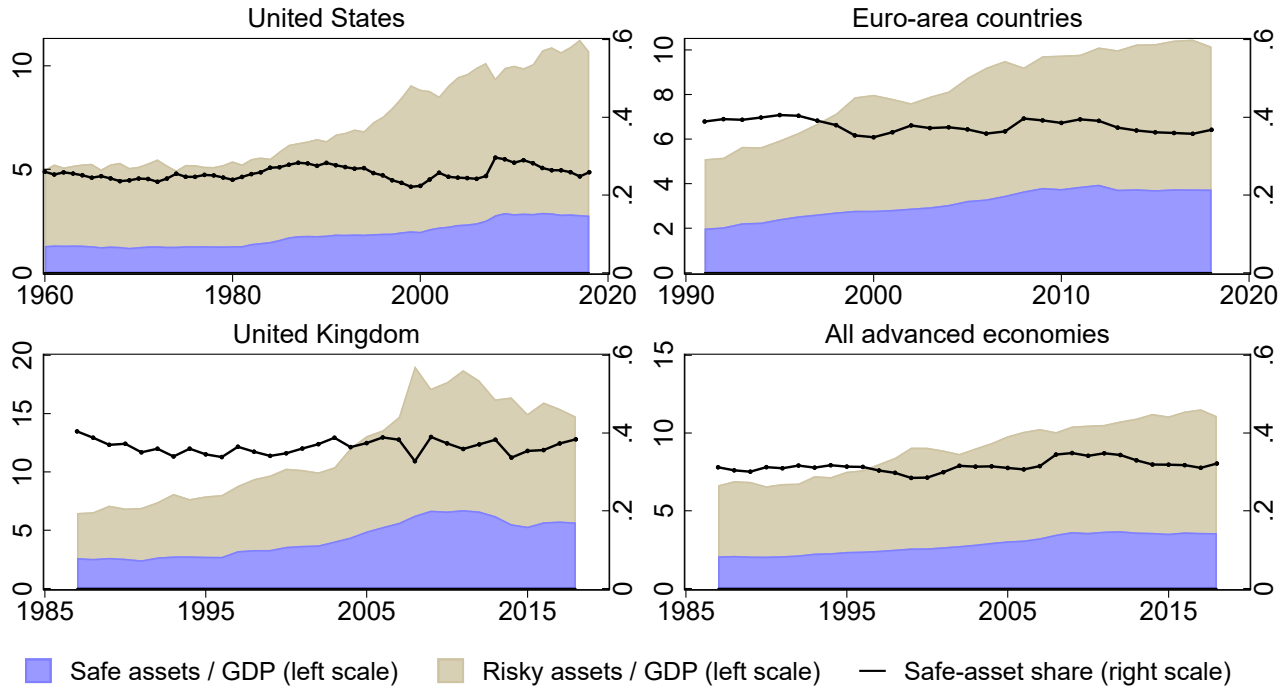
Appendix

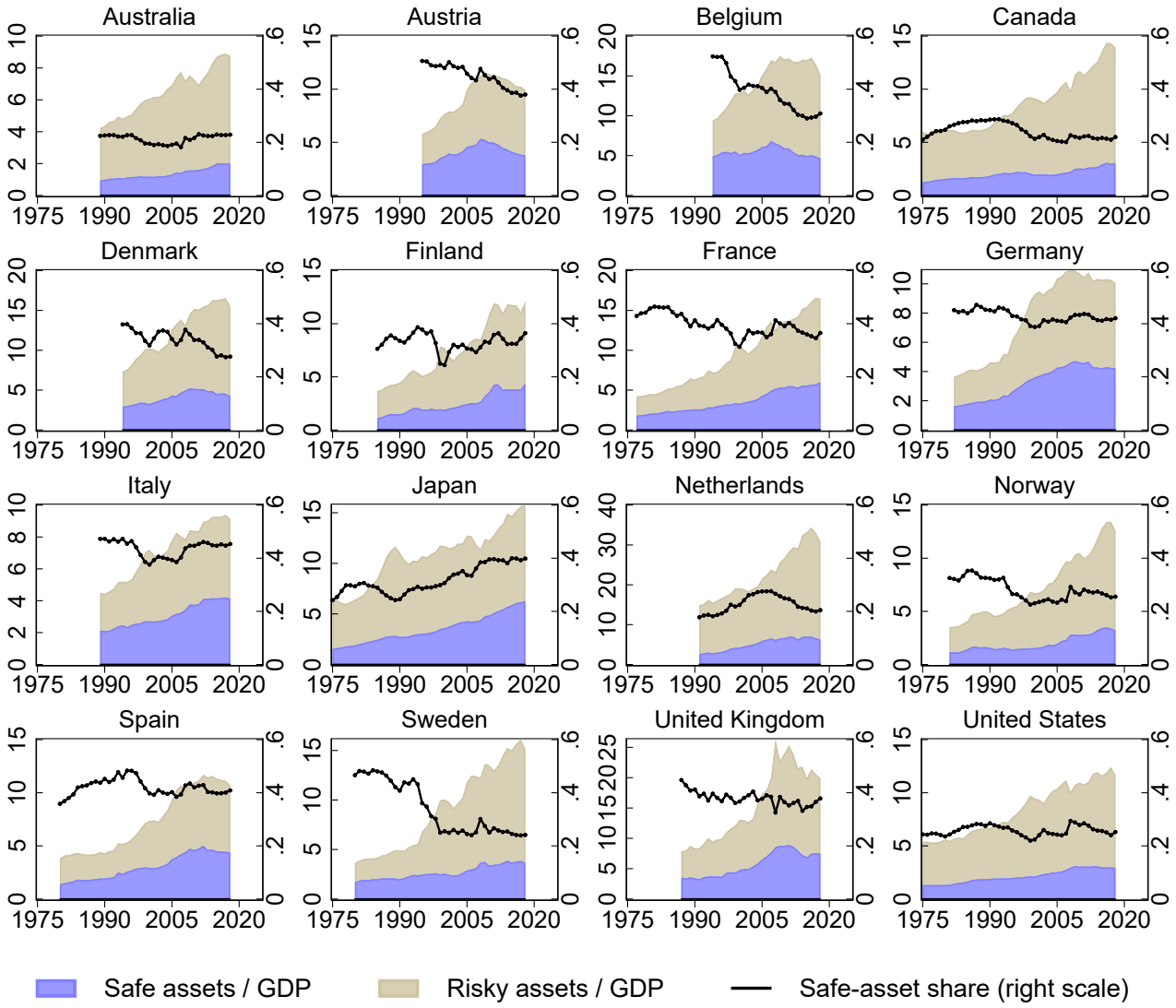
A Trends in sectoral safe-asset positions: additional results

Figure A.1: Safe assets, risky assets, and the safe-asset share: domestic-produced safe assets only



Notes: Safe assets include currency, reserves, deposits, gold, special drawing rights, money market mutual fund shares, and bonds issued by governments and financial intermediaries. Risky assets are all other financial assets (equities, non-financial corporate bonds, loans, insurance & pension assets, derivatives, and other accounts). The safe-asset share is the ratio of safe to total (safe + risky) financial assets. The series for euro-area countries is the sum of (nominal euro) positions in Austria, Belgium, Finland, France, Germany, Italy, Netherlands, and Spain divided by the sum of the respective countries (nominal euro) GDP. The advanced-economy total is the sum of US dollar (safe or risky asset) positions in 16 countries divided by the sum of their US dollar GDP. The series include financial assets issued by domestic sectors only, and exclude those issued by rest-of-the-world counterparties and held domestically.

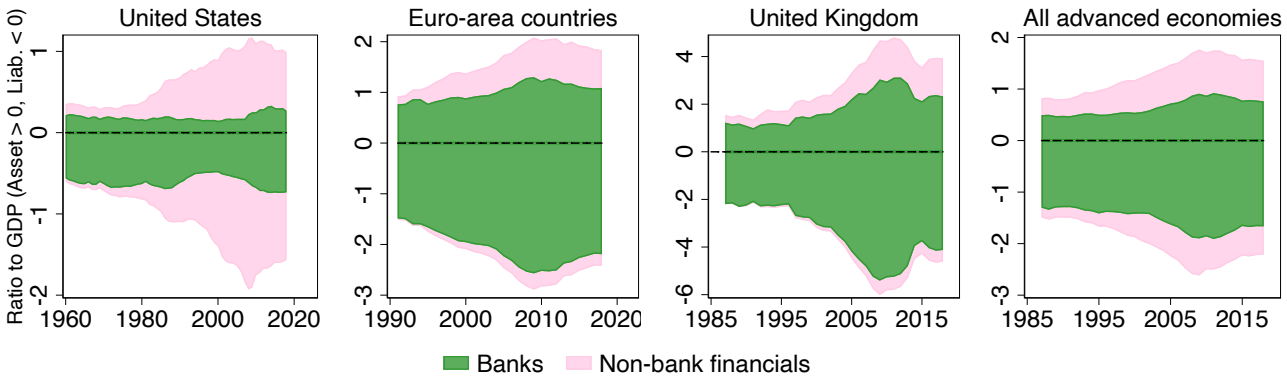
Figure A.2: Safe and risky asset holdings in individual countries



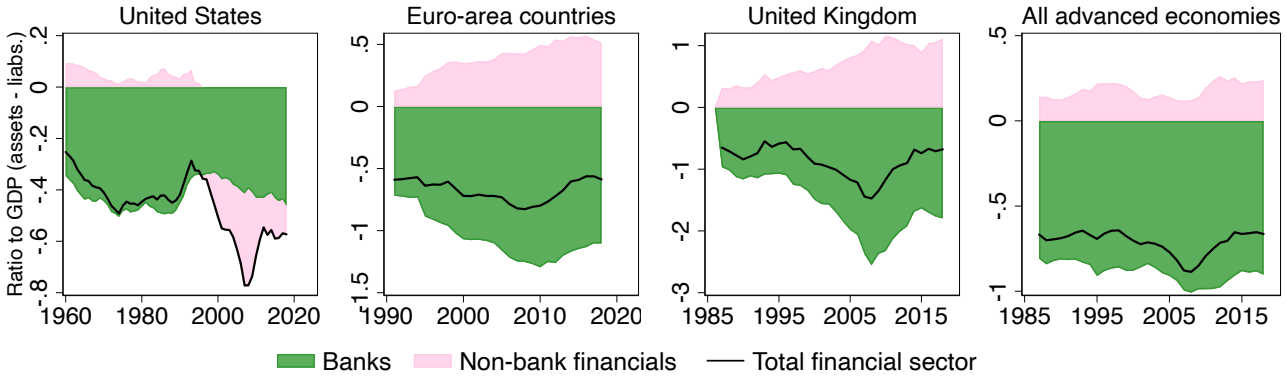
Notes: Safe assets include currency, reserves, deposits, gold, special drawing rights, money market mutual fund shares, and bonds issued by governments and financial intermediaries. Risky assets are all other financial assets (equities, non-financial corporate bonds, loans, insurance & pension assets, derivatives, and other accounts). The safe-asset share is the ratio of safe to total financial assets.

Figure A.3: Sectoral safe-asset positions of banks and non-bank financials

(a) Gross safe-asset positions (assets > 0, liabilities < 0):

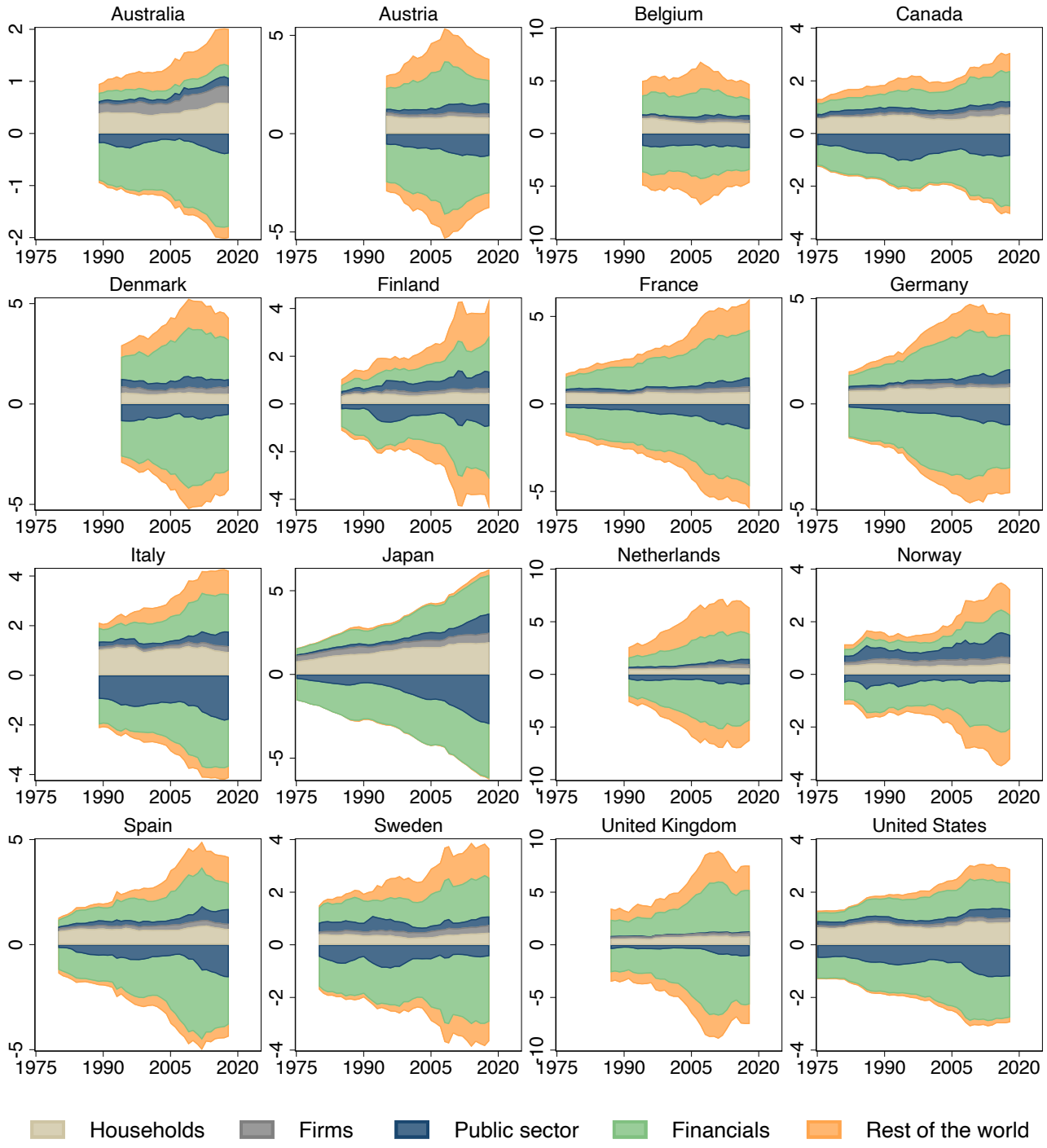


(b) Net safe-asset positions (assets minus liabilities):



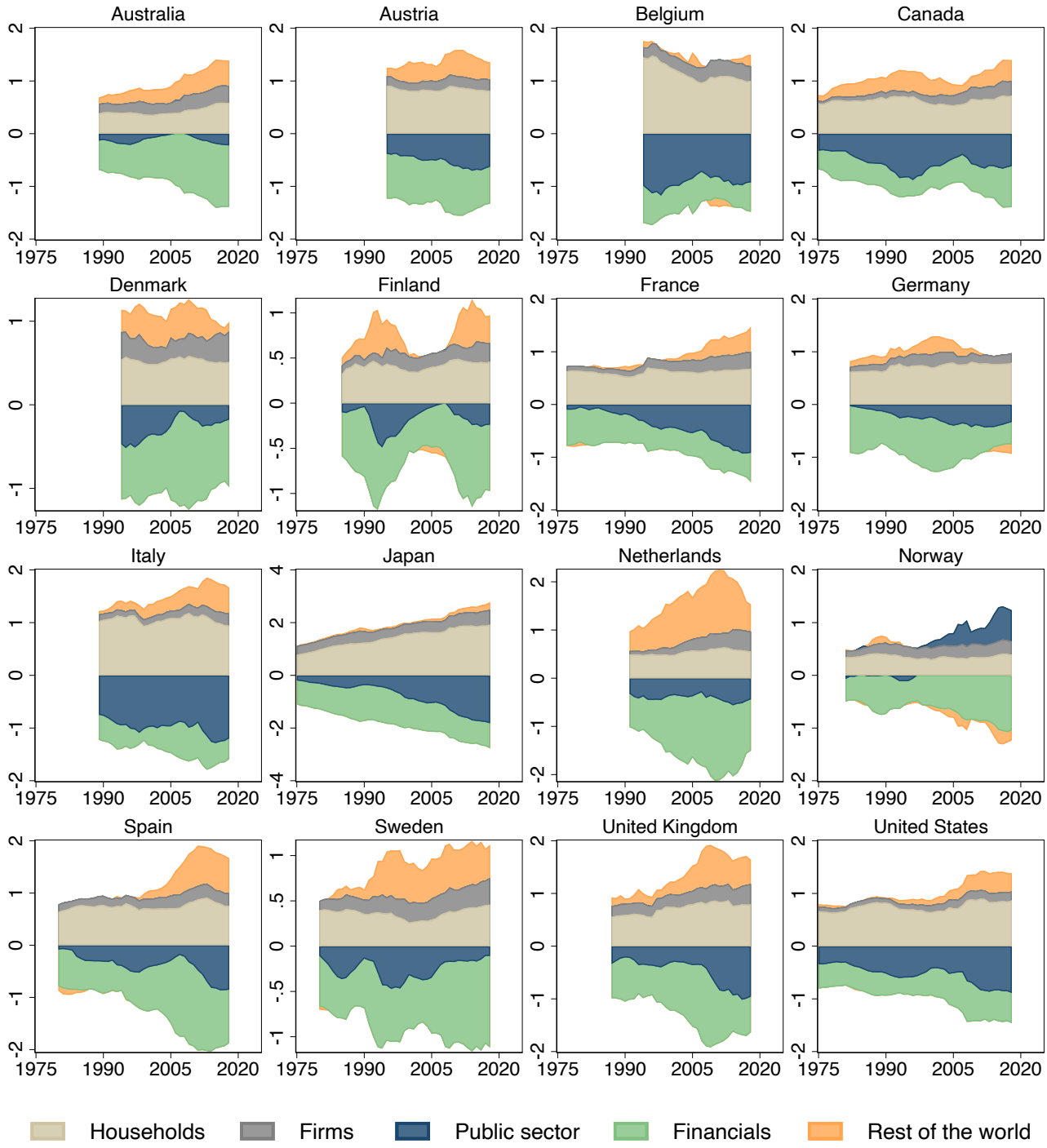
Notes: Gross positions are the sum of total safe asset holdings, or safe liabilities of the specific sector. Banks are deposit taking institutions, and non-bank financials are all other financial institutions (insurance & pension funds, money market funds, broker-dealers etc). Euro-area countries are the sum of Austria, Belgium, Finland, France, Germany, Italy, Netherlands, and Spain; all advanced economies are sum of 16 advanced economies.

Figure A.4: Gross sectoral safe-asset positions in individual countries



Notes: Gross positions are the sum of total safe asset holdings, or safe liabilities of the specific sector. Public sector includes central government, local government, and the central bank. Financials include both banks (deposit taking institutions) and non-bank financials.

Figure A.5: Net sectoral safe-asset positions in individual countries



Notes: Net position is the difference between safe assets and safe liabilities of the specific sector. Public sector includes central government, local government, and the central bank. Financials include both banks (deposit taking institutions) and non-bank financials.

Table A.1: Gross sectoral safe-asset positions in selected years, average of 16 advanced economies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Level / GDP			Change 1980–2005		Change 1980–2015	
	1980	2005	2015	Absolute	% Total	Absolute	% Total
Safe asset holdings:							
Households	0.66	0.71	0.77	0.05	2%	0.11	4%
Firms	0.14	0.22	0.28	0.08	4%	0.14	5%
Public sector	0.17	0.25	0.43	0.08	4%	0.26	9%
Financials	0.51	1.50	1.68	1.00	47%	1.17	42%
Rest of the World	0.13	1.06	1.25	0.93	43%	1.12	40%
Total	1.61	3.76	4.41	2.14	100%	2.80	100%
Safe liabilities:							
Public sector	0.38	0.68	1.05	0.30	14%	0.67	24%
Financials	1.16	2.29	2.47	1.13	53%	1.32	48%
Rest of the World	0.11	0.80	0.89	0.68	32%	0.78	28%
Total	1.65	3.77	4.41	2.12	100%	2.77	100%

Notes: Unweighted averages of gross safe-asset positions relative to GDP in 16 advanced economies (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, UK, and the US). Safe assets include currency, reserves, deposits, gold, special drawing rights, money market mutual fund shares, and bonds issued by governments and financial intermediaries.

Table A.2: Net sectoral safe-asset positions in selected years, average of 16 advanced economies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Level / GDP			Change 1980–2005		Change 1980–2015	
	1980	2005	2015	Absolute	% Total	Absolute	% Total
Positive net safe-asset position (demand):							
Households	0.66	0.71	0.77	0.05	13%	0.11	18%
Firms	0.14	0.22	0.28	0.08	22%	0.14	24%
Rest of the World	0.02	0.26	0.36	0.25	65%	0.35	58%
Total	0.82	1.20	1.41	0.38	100%	0.59	100%
Negative net safe-asset position (supply):							
Public sector	0.20	0.42	0.62	0.22	62%	0.42	75%
Financials	0.65	0.78	0.79	0.13	38%	0.14	25%
Total	0.85	1.21	1.41	0.36	100%	0.56	100%

Notes: Unweighted averages of net safe-asset positions relative to GDP in 16 advanced economies (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, UK, and the US). Positive positions are shown as safe assets minus liabilities, and negative positions as safe liabilities minus assets. Safe assets include currency, reserves, deposits, gold, special drawing rights, money market mutual fund shares, and bonds issued by governments and financial intermediaries.

B Fluctuations in the market for safety: additional results

B.1 Gross safe-asset fluctuations: additional results

Figure A.6: Marginal holders and issuers of safe assets, individual countries

Notes: In the left panel, the shaded bars correspond to the marginal sectoral shares for fluctuations in gross safe-asset acquisitions, obtained through the regressions in (5) for each specific country and sector. In the right panel, the shaded bars correspond to the marginal sectoral shares for fluctuations in gross safe-asset issuances. The shares in each country add up to 1, subject to a small residual.

Table A.3: Marginal holders of safe assets, granular sectors and instruments

	Total	Depo.and Cur.	MMF shares	Bonds
Total Economy	1.00***	0.82***	-0.00	0.18***
	(0.00)	(0.03)	(0.00)	(0.03)
1) Real Sector	0.04***	0.05***	-0.00	-0.00
	(0.01)	(0.01)	(0.00)	(0.00)
→ Households	0.02**	0.02***	-0.00	-0.00
	(0.01)	(0.01)	(0.00)	(0.00)
→ Firms	0.02***	0.02***	-0.00*	0.00
	(0.01)	(0.00)	(0.00)	(0.00)
2) Financial Sector	0.45***	0.37***	-0.00	0.08***
	(0.03)	(0.03)	(0.00)	(0.02)
→ Banks	0.39***	0.33***	-0.00**	0.06***
	(0.02)	(0.03)	(0.00)	(0.02)
→ Non banks	0.07***	0.04***	-0.00	0.03***
	(0.02)	(0.02)	(0.00)	(0.01)
3) Public Sector	0.11***	0.09***	0.00	0.03**
	(0.03)	(0.02)	(0.00)	(0.01)
→ Government	0.02**	0.02**	0.00	0.00
	(0.01)	(0.01)	(0.00)	(0.01)
→ Central bank	0.09***	0.07***	0.00	0.02**
	(0.02)	(0.02)	(0.00)	(0.01)
4) RoTW Sector	0.39***	0.32***	0.00	0.07***
	(0.02)	(0.03)	(0.00)	(0.02)

Notes: The numbers correspond to the marginal sector and instrument shares for fluctuations in gross safe-asset acquisitions, obtained through the regressions in (5) by both sector and instrument. The shares add up to 1 across sectors and instruments, subject to a small residual (which, for instruments, includes the shares accounted for by gold flows). Standard errors clustered by country are in parentheses. *, **, and *** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

Table A.4: Marginal issuers of safe assets, granular sectors and instruments

	Total	Depo.and Cur.	MMF shares	Bonds
Total Economy	1.00***	0.83***	-0.00	0.17***
	(0.00)	(0.03)	(0.00)	(0.03)
1) Real Sector	0.00	0.00	0.00	0.00
	(.)	(.)	(.)	(.)
→ Households	0.00	0.00	0.00	0.00
	(.)	(.)	(.)	(.)
→ Firms	0.00	0.00	0.00	0.00
	(.)	(.)	(.)	(.)
2) Financial Sector	0.57***	0.48***	-0.00	0.09***
	(0.03)	(0.02)	(0.00)	(0.03)
→ Banks	0.54***	0.47***	-0.00	0.07***
	(0.03)	(0.02)	(0.00)	(0.02)
→ Non banks	0.03	0.01	-0.00	0.02
	(0.02)	(0.01)	(0.00)	(0.02)
3) Public Sector	0.11***	0.10***	0.00	0.00
	(0.02)	(0.02)	(.)	(0.01)
→ Government	0.01	-0.00	0.00	0.01
	(0.01)	(0.00)	(.)	(0.01)
→ Central bank	0.10***	0.10***	0.00	-0.00
	(0.02)	(0.02)	(.)	(0.00)
4) RoTW Sector	0.32***	0.25***	0.00	0.08***
	(0.04)	(0.04)	(0.00)	(0.01)

Notes: The numbers correspond to the marginal sectoral and instrument shares for fluctuations in gross safe-asset issuances, obtained by regressing the issuances of the corresponding sector and instrument on economy-wide safe-asset acquisitions. The shares add up to 1 across sectors and instruments, subject to a small residual (which, for instruments, includes the shares accounted for by gold flows). Standard errors clustered by country are in parentheses. *, **, and *** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

Table A.5: Marginal holders and issuers of safe assets, alternative specifications

	(1) Households	(2) Firms	(3) Financials	(4) Public sector	(5) RoTW
Marginal buyers:					
Baseline	0.02**	0.02***	0.45***	0.11***	0.39***
	(0.01)	(0.01)	(0.03)	(0.03)	(0.02)
Controls	0.02	0.02**	0.44***	0.13***	0.39***
	(0.01)	(0.01)	(0.03)	(0.04)	(0.03)
3-year flows	0.04**	0.02**	0.43***	0.10***	0.41***
	(0.02)	(0.01)	(0.02)	(0.03)	(0.04)
Marginal issuers:					
Baseline	0.00	0.00	0.57***	0.11***	0.32***
	(.)	(.)	(0.03)	(0.03)	(0.04)
Controls	0.00	0.00	0.57***	0.13***	0.31***
	(.)	(.)	(0.04)	(0.03)	(0.03)
3-year flows	0.00	0.00	0.65***	0.09***	0.26***
	(.)	(.)	(0.05)	(0.03)	(0.04)

Notes: The numbers correspond to the marginal sectoral shares for fluctuations in gross safe-asset acquisitions (marginal holders)—obtained through the regressions in (5)—and the marginal sectoral shares for fluctuations in gross safe-asset issuances (marginal issuers) The shares in each row add up to 1, subject to a small residual. "Controls" specification controls for contemporaneous values and two lags of real GDP growth, inflation, and the short-term interest rate. 3-year flow specification uses 3-year instead of 1-year safe-asset flows. Standard errors clustered by country and year are in parentheses. *, **, and *** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

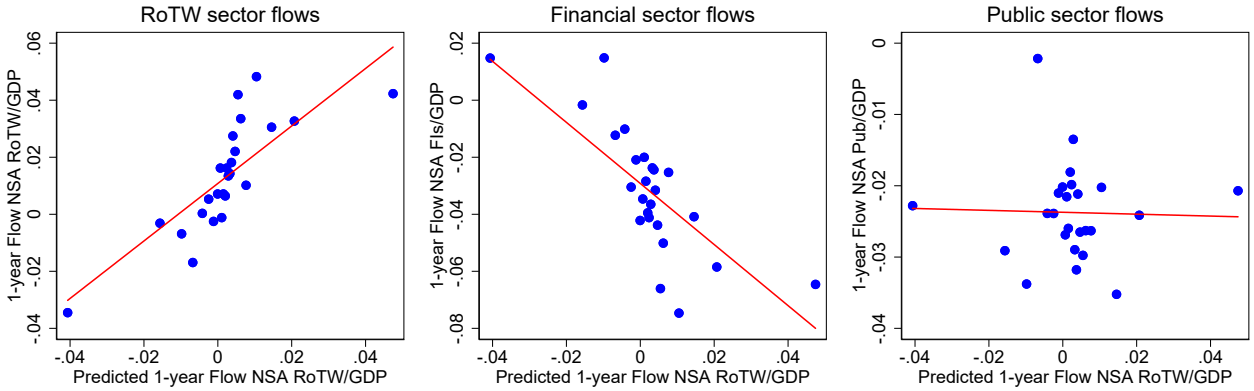
B.2 Net safe-asset fluctuations: additional results

Table A.6: Counterparts of financial sector net safe-asset issuance, granular sectors and instruments

	(1)	(2)	(3)	(4)
	Total	Depo. and Cur.	MMF shares	Bonds
Total other sectors	0.99***	0.49***	-0.00	0.50***
	(0.01)	(0.06)	(0.00)	(0.06)
1) Real Sector	0.21***	0.17***	-0.00	0.04
	(0.05)	(0.03)	(0.00)	(0.03)
→ Households	0.15***	0.13***	-0.00	0.02
	(0.03)	(0.02)	(0.00)	(0.02)
→ Firms	0.06***	0.04***	-0.00	0.02
	(0.02)	(0.01)	(0.00)	(0.01)
2) Public Sector	0.17***	0.01	0.00	0.16***
	(0.05)	(0.03)	(0.00)	(0.04)
→ Government	0.17***	0.03	0.00	0.14***
	(0.04)	(0.02)	(0.00)	(0.03)
→ Central bank	0.00	-0.01	0.00	0.02
	(0.01)	(0.03)	(0.00)	(0.02)
3) RoTW Sector	0.61***	0.30***	0.00	0.30***
	(0.07)	(0.07)	(0.00)	(0.05)

Notes: The shares are obtained by regressing the net safe-asset flows of the corresponding sector and instrument on the negative of the (total) net safe asset flows of the financial sector. The shares add up to 1, subject to a small residual. Depo. and Cur. stands for deposits and currency, RoTW for rest of the world. The shares add up to 1 across sectors and instruments, subject to a small residual (which, for instruments, includes the shares accounted for by gold flows). Standard errors clustered by country are in parentheses. *, **, and *** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

Figure A.7: Predicted RoTW safe asset demand and sectoral safe asset flows



Notes: Binned scatter plots, 25 bins. The figures show the relationship between the predicted foreign-sector safe asset flows, calculated as changes in foreign exchange reserves of China, Taiwan, Hong Kong, Singapore and Korea relative to world GDP multiplied with the country-specific elasticity following (10) (x axis), and the net safe asset flows of different sectors (y axis). All graphs show the residual relationship controlling for country and time fixed effects.

C The market for safety and macro-financial stability: additional results

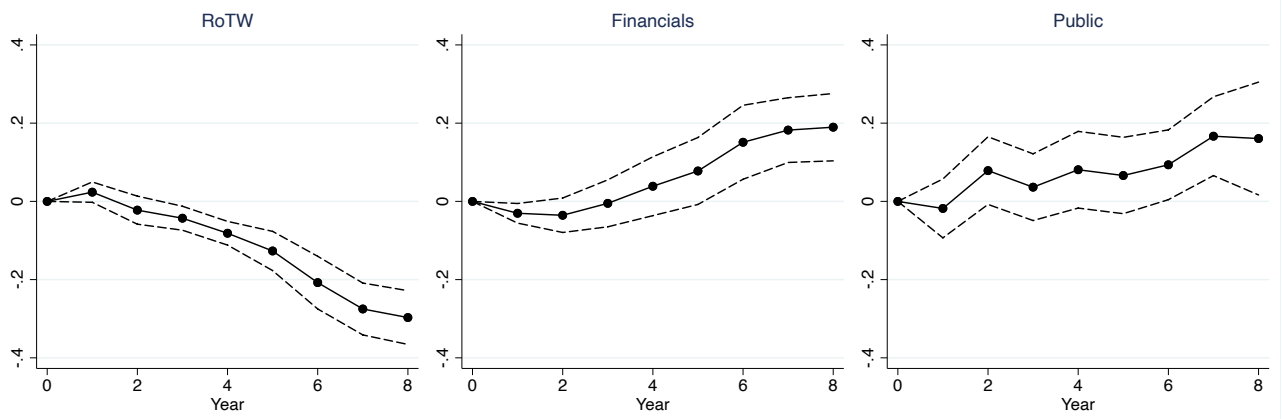
Table A.7: Net safe asset flows at sector-level and subsequent output dynamics

	Dependent variable: real GDP growth$_{t \text{ to } t+3}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$\sum_3$ NSA RoTW$_{i,t-1}$	-0.13***	-0.10***				
	(0.03)	(0.03)				
$\sum_3$ NSA Financials$_{i,t-1}$			0.13***	0.10***		
			(0.03)	(0.03)		
$\sum_3$ NSA Public$_{i,t-1}$					0.03	0.05
					(0.05)	(0.04)
R^2	0.328	0.357	0.354	0.364	0.254	0.326
Country FE	✓	✓	✓	✓	✓	✓
Base controls	✓	✓	✓	✓	✓	✓
Additional controls		✓		✓		✓
Observations	388	388	388	388	388	388

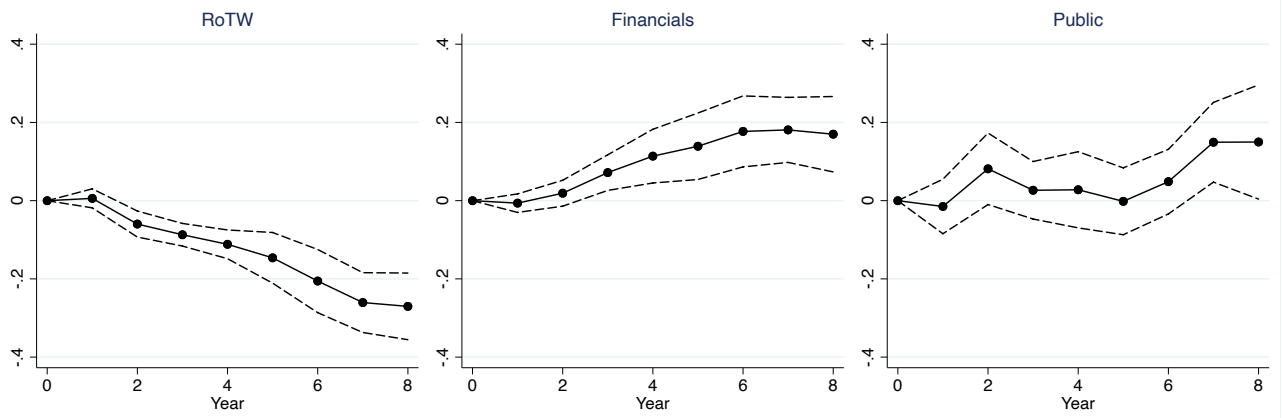
Notes: The dependent variable is the change in log real GDP between t and $t+3$. Explanatory variables are the three-year sum of sectoral net safe asset flows between $t-4$ and $t-1$ relative to GDP. Base controls include three lags of GDP growth, inflation, short-term interest rates as well as three lags of the financial crisis dummy. Additional controls include the three-year change in net foreign assets to GDP, household credit to GDP and business credit to GDP. Country fixed effects included. Driscoll-Kraay standard errors (5 lags) in parentheses. *,**,*** indicates significance at the 0.1, 0.05, 0.01 level, respectively.

Figure A.8: Net sectoral safe-asset flows and future GDP growth: local projections

(a) Baseline controls:



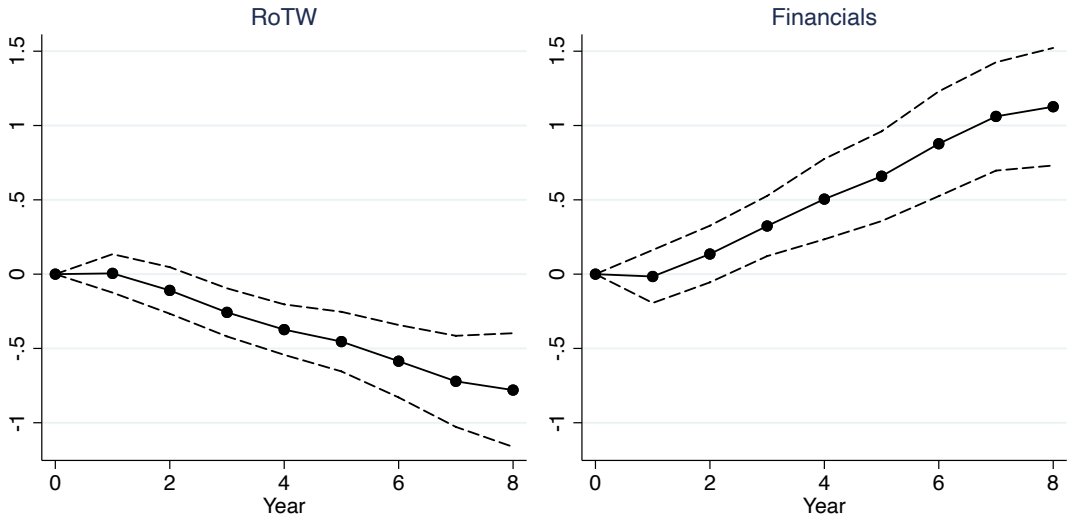
(b) Additional controls:



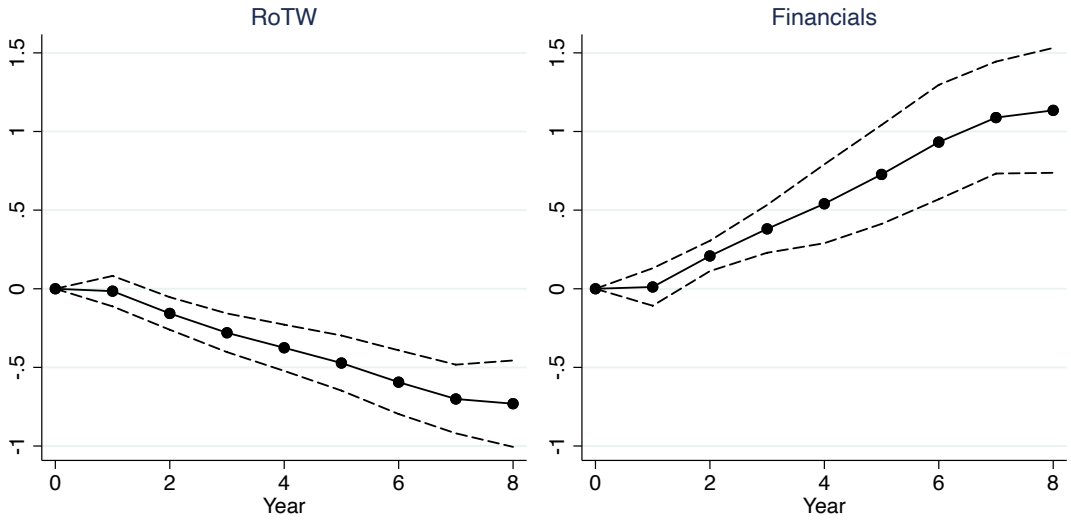
Notes: Local projections for real GDP growth (in percentage points) at horizons $h = 1, ..., 8$ years ahead, following a 1% GDP change in net safe asset flows of a given sector. Top panel controls for current levels and four lags of GDP growth, inflation, policy rate changes and the financial crisis dummy, as well as country and year fixed effects. Bottom panel additionally includes contemporaneous values and four lags of changes in net foreign assets, household credit, and firm credit relative to GDP. 95% confidence intervals are computed based on Dricoll-Kraay standard errors (ceiling (1.5×h) lags).

Figure A.9: Net safe asset positions and future GDP growth, LP-IV: alternative specifications

(a) Baseline controls:



(b) Heterogeneous Asian GDP growth elasticities:



Notes: The dependent variable is the change in log real GDP between year t and $t+h$. Local projection estimates for 1-year changes in the net safe-asset rest of the world (left panel) and financial (right panel) sector position. Changes in (rest of the world, or financial sector) safe-asset positions are instrumented using changes in FX reserve holdings of Asian economies following equation (10), excluding the year for which the regression is run when estimating the country-specific elasticity. The controls in panel (a) include contemporaneous values and four lags of GDP growth, inflation, short-term interest rates, and the financial crisis dummy. The controls in panel (b) additionally include contemporaneous values and four lags of changes in net foreign assets to GDP, household credit to GDP, and business credit to GDP, as well as the interaction of the country dummies with the GDP growth rate of the Asian economies. Country and year fixed effects included. Dashed lines are 95% confidence intervals using Driscoll-Kraay standard errors with $1.5 \times h$ lags.