Do Investor Differences Impact Monetary Policy Spillovers to Emerging Markets?*

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Abstract

An increasingly diverse investor base intermediates capital flows into Emerging Market Economies (EME). Using sectoral-level securities holdings data for Euro Area and U.S. investors, we reevaluate monetary policy spillovers to investors' EME portfolios. Local projections with identified high-frequency monetary shocks across different types of investors detect no significant evidence of shifts in portfolio allocation, except in the case of investment funds. Banks, insurers and pension funds have stickier EME portfolios against surprise monetary tightening, consistent with their institutional characteristics. Long rate shocks, pure monetary shocks and central bank information shocks have distinct implications for investment funds' portfolio allocation. Synchronized monetary tightening between the Fed and the ECB triggers clearer capital reallocation out of emerging markets.

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The recent rise in interest rates worldwide has reignited the debate over its implications to Emerging Market Economies (EME). Motivated by this debate, we revisit the old question of the monetary policy spillovers from the center to the periphery – the possibility that interest rate hikes in AE (Advanced Economies) may trigger capital flows reversals in EME debt. We focus in particular on assessing whether the interest rate hike may induce different types of institutional investors to reduce their exposure to EME. This outcome may occur due to costlier liabilities, a loss in long-term portfolio holdings, or a tightening-induced rise in uncertainty, among other reasons.

To answer this question, we analyze publicly available securities holdings data from Euro Area investors. The securities holdings data provide information on the investor and issuer sectors at quarterly or higher frequency over the past decade. Compared to traditional international capital flow data, the high frequency of the data is particularly well suited to study the impact of monetary policy. Moreover, the disaggregated nature of the data allows us to examine potential heterogeneity in investors' response to interest rate hikes. This disaggregated approach is useful in two ways. First, by analyzing investor portfolio responses, we can directly ascertain how monetary spillovers interact with financial channels. Second, as capital flows into emerging market economies originate from an increasingly diverse investor base, the potential heterogeneity in investors' responses to monetary policy shocks provides a way to understand how these monetary policy spillovers may have shifted over time.

We start by using a broad range of data to document some stylized facts on EME investor base that also motivate our empirical design. EME governments have both lengthened the duration and increased the share of local currency-denomination of external bond issuance in recent decades, a feature highlighted in Du and Schreger (2016). These two patterns suggest that the risk that foreign investors take in holding EME sovereign debt securities increasingly comes from exchange rate movements and interest rate fluctuations from the EME issuers. The shifting profile of EME debt overall also makes it a natural asset class for an expanding set of investors and is closely associated with the diversification of EME investor base.

Against this backdrop, we study the monetary spillovers from AE to EME bond portfolio shares using the Euro Area (EA) investor behavior as a benchmark. For this purpose, we estimate local projections (see Jordà (2005) or more recently Montiel Olea and Plagborg-Møller (2021) among others) linking Euro Area investor portfolio shares of EME bonds to monetary policy shocks. These shocks are identified using high-frequency responses of asset prices around monetary policy events. As investors in the Euro Area securities holdings data are mostly domiciled in the Euro Area, we focus on policy shocks by the European Central Bank in our baseline specification (see Altavilla et al. (2019)). In other versions of these shocks, we interact Euro Area and U.S. (see Bauer and Swanson (2023*b*)) monetary policy tightening events to assess the impact of synchronized interest rate hikes on EME capital flows. in order to understand the implications of monetary shocks with different characteristics, we also gauge whether investors respond differently to central bank information shocks versus long rate shocks (reflecting the effect of forward guidance and/or central bank asset purchases).

We first illustrate our empirical procedure using data on German investors' external debt holding shares, including both AE and EME issuers. Local projection on monthly data shows that following a surprise tightening of ECB monetary policy, investors reduce their portfolio shares of foreign securities, particularly for corporate bonds. By contrast, portfolio shares of sovereign issuers held by insurers and pension funds (ICPF) increase. Substantial differences in the responses by investor sector suggest a significant role for heterogeneous investor demand in affecting aggregate capital flows.

We next turn to the response of quarterly Euro Area portfolio shares of EME debt to a surprise tightening by the ECB. For EME debt holdings aggregated across all issuer sectors, we find no significant change in the portfolio weights, for any investor group. To study this effect further, we decompose the portfolio holdings by each investor group into whether the EME issuer sectors are sovereign or corporate, finding that the responses are more nuanced. However, even with these breakdowns, we find a significant decline in the portfolio weights only for the specific case of corporate bonds held by investment funds. As in the aggregated results, investors such as insurers and pension funds and banks maintain relatively stable portfolio weights.

The stickier EME portfolios responses for EA investors appear to contrast with the pattern in the German investor responses that demonstrate a decline in foreign debt portfolio shares. However, the German portfolio shares are based upon total foreign holdings data that are dominated by AE debt issues. These combined findings are consistent with two possibilities. First, since the share of EME debt held by ICPFs has increased over time, the stability of their holdings may explain the lack of response of the aggregate holdings. Second, since the holdings in our data are measured at market value, the moderate response of the EME portfolio shares may reflect changes in bond prices and local currency fluctuations.

We next study the impact of other types of monetary policy shocks. Here we find clearer evidence of portfolio reallocation away from EMEs when we examine episodes synchronized monetary tightening between the ECB and the Fed. In this way, we add to recent research underscoring the contractionary impact of concerted tightening by major central banks (Caldara et al., 2023) by showing that the adverse impact on financing conditions is partly driven by the cross-border capital flow channel.

We further show that the responses of investors' EME allocations strongly depend on the nature of monetary shocks. A surprise yield curve steepening, represented by a high-frequency relative widening of the 10-year-to-3-month German Bund spread, leads to increases in ICPFs' and investment funds' allocation towards EMEs. As we discuss below, this finding may be consistent with ICPFs capital structure and investment funds' reach for yield motive. Similarly, when we decompose short rate shocks into a pure monetary shock component and a central bank information shock component as in Jarociński and Karadi (2020), we find that investment funds' EME government portfolio weights respond positively to an increase in the information component. This pattern is potentially linked to a rise in Euro Area investors' risk-bearing capacity after positive news about the broad economy is revealed through ECB policy actions.

Our results have two main implications. The first is that the extent of monetary policy spillovers to EME may have declined relative to the 1980s and the 1990s. That is, while studies such as Kalemli-Özcan (2019) using data from these earlier decades find a strong spillover, our analysis shows little to no effects. We speculate that sounder monetary and fiscal regimes, adopted by those countries in recent decades, may help explain the results.

Second, our evidence demonstrates the close relationship between a stable investor base and smaller exposure to foreign monetary shock influences, as well as the need to take into account the complicated nature of identified monetary shocks in analyzing monetary policy spillovers empirically.

Relation to Literature. The issue of the monetary spillovers from AE to EME has occupied economists since the Mundellian theory of the trilemma. Most of the theories used macro models and studied the impact on macro variables. See for example, the classic examples of Calvo, Leiderman and Reinhart (1996), Eichengreen and Saka (2022), Reinhart and Reinhart (2009) and Reinhart and Rogoff (2009). For this reason most early and recent empirical studies (see Rey (2015), Obstfeld and Taylor (2017), Burger and Warnock (2007) or Kalemli-Özcan (2019) and Obstfeld and Zhou (2023) to name a few recent ones) have examined the impact of monetary shocks on EME macro variables. However, that approach does not provide direct evidence of a capital flow retrenchment, nor of specific micro channels that drive the potential reversal. Our study therefore moves the literature a step forward by leveraging new securities data, disaggregated across issuers and investors, and available at business cycle frequencies.

Recent empirical studies have focused on the financial channel and on the role of global investors for capital flows. Rey (2015), Miranda-Agrippino and Rey (2020) and Obstfeld (2021) cast doubts on the insulating properties of floating exchange rates. Rather, they argue that in times of increased uncertainty or when a monetary tightening at the center weakens global intermediaries' balance sheets, institutional investors are forced to deleverage and reduce their exposure, particularly to assets in the periphery. For those arguments the balance sheet and asset structure of the institutional investors play an important role for the transmission of shocks. By focusing precisely on the holdings of institutional investors, our evidence can address part of those arguments directly.

Other recent studies have examined the financial channel using disaggregated data (see Chari, Dilts Stedman and Lundblad (2020) and Ciminelli, Rogers and Wu (2022) and Bertaut, Bruno and Shin (2023)). The closest work to ours is Avdjiev et al. (2022), who construct a disaggregated dataset of global balance of payment flows at the sector level. They focus on the response of capital flows to global financial conditions and find that public sector and corporate sector flows exhibit divergent response, a result that aligns with some of our findings. Bertaut, Bruno and Shin (2023) use high frequency holdings from the Treasury International Capital Statistics and shows that capital flows to EME respond to the US broad dollar index, which they take as a proxy for global financial conditions. Like us, they also find that the response of the investment funds tends to be larger than that of long term investors, such as pensions and insurance funds, whose holdings are stickier. In contrast to those papers, we study the impact of exogenous monetary policy shocks, as well as the various nuances of the monetary transmission mechanism.

Some recent papers have examined and found evidence for the role of investor heterogeneity for capital flows and currency pricing. Fang, Hardy and Lewis (2023) show that fickle investors pose a threat to fiscal sustainability for EME. Faia, Salomao and Veghazy (2022) find evidence for the role of investor demand and market segmentation in affecting arbitrage deviations and the transmission of large asset purchases to international bond pricing. Zhou (2024) shows, using highly disaggregated data from the Bundesbank, that the pass-through of the global shock transmission to EME yields is stronger when the security is held by investment funds, while banks, insurers and pension funds tend to act as shock absorbers.[1] Boermans and Burger (2023) use confidential ECB securities holdings data to establish the relationship between investor flows by currency and global risk factors. Finally, Nenova (2023) uses disaggregated proprietary fund-level data for Euro area and US mutual funds holdings and exploits investor heterogeneity in monetary policy shocks to identify portfolio share elasticities. Contrary to those studies, we combine identification from monetary shocks with heterogeneous investor groups.

1. Securities holding data at the sector level

Our study is based on the publicly available securities holdings statistics (SHS-ECB hence forth), a harmonized collection of security-by-security portfolio holdings by all Euro Area investors and for all asset classes. These data are collected at the country level by the

1 Also see Doornik et al. (2024).

corresponding national central bank. They are then merged by the ECB into consolidated Euro Area series. We complement the analysis using time series of German investors' monthly security holding data, also available at investor sector and issuer sector level.[2]

Compared to other datasets often used in international finance research, SHS is the ideal dataset for this study. Importantly, this dataset has a wide coverage of securities, investors, and issuers. Holdings of securities issued worldwide, including emerging market sovereign and corporate bonds, are reported. The data set covers all investors types in the European system of accounts 1995 and 2020 sector classification, including but not limited to domestic and foreign banks, insurance companies and pension funds, governments, households, and investment funds. By contrast, popular datasets studying international capital allocation at a high frequency, such as Emerging Portfolio Fund Research (EPFR), limit their scope to mutual funds and exchange traded funds.[3] As we show later, a large share of EME debt is held by non-investment funds.

For SHS-ECB, we construct portfolio shares of debt holdings at issuer country–issuer-sector–investor sector–quarter level. For the issuer sector classification, we consider debt categorized in three groups: debt issued by sovereigns, by private financial entities, and lastly by non-financial corporations. In terms of investor sectors, the breakdown provides portfolio shares for over 22 categories of institutional and retail investors. However, we focus on the three largest investor categories, namely, banks and money market funds (MFI), insurance companies and pensions funds (ICPF), and other financial institutions (OFI). This last investor group includes mutual funds, exchange-traded funds and other non-bank financial intermediaries that are not ICPFs. These three investor groups tend to have very different characteristics and rebalancing behaviour, mostly due to their mandates. One objective of our analysis is to exploit the differences in investor demand and rebalancing behaviour.

2 Section 6 also uses TIC data published by the U.S. Treasury Department to study the response of foreign debt portfolio of U.S. investors in response to identified U.S. monetary shocks.

3 Such datasets are typically compiled using investor flows to open-ended mutual funds and ETFs (rather than actual fund portfolio) and estimate country-level allocations based on the flows, potentially introducing measurement errors. Avdjiev et al. (2022) construct sectoral level capital flow data from Balance of Payment statistics, separating the sources of outflow into banks, corporates and sovereigns. Our data provides a more granular breakdown for financial corporations, entities that are the major foreign investors in EME.

2. Motivating facts

To provide context for our discussion of EME investment flows from foreign monetary policy spillovers, we draw from different sources of data to illustrate a number of broad points. First, with an increasing size of local currency and long-term bond issuance, EME debt issuers appear to have alleviated concerns on default risk induced by unhedged currency depreciation (the "original sin") and short-term interest rate fluctuations. Consequently, these risks have shifted to the balance sheet of the investors. Second, the transformation of the debt risk profile is accompanied by an increasingly diverse foreign investor base with a considerable share of long-term investors such as ICPFs. Still, cross-country variation in foreign investor composition reflects differing levels of issuer country fundamentals, with countries in better credit standing attracting a higher share of stable, long-term investors.

Figure 1 demonstrates the shifting risk profile of EME debt, focusing on government bond issuance. Panel (a), taken from the data compiled by Onen, Shin and von Peter (2023), shows that local currency bonds have started to dominate foreign investors' EME bond portfolio since the Global Financial Crisis. The substantial reduction of foreign participation in local currency market in recent years amidst a stable issuance profile suggests that EME has been able to concurrently enhance the depth of the domestic investors.[4] Panel (b) tracks the average size-weighted years to maturity of external bonds issued by EME governments.[5] Over the past decades, EME sovereign issuers lengthened the average time to maturity of external debt issuance from 8 years (2013) to nearly 16 years (2021), reducing the rollover risk brought by short-term foreign interest rate hikes.[6]

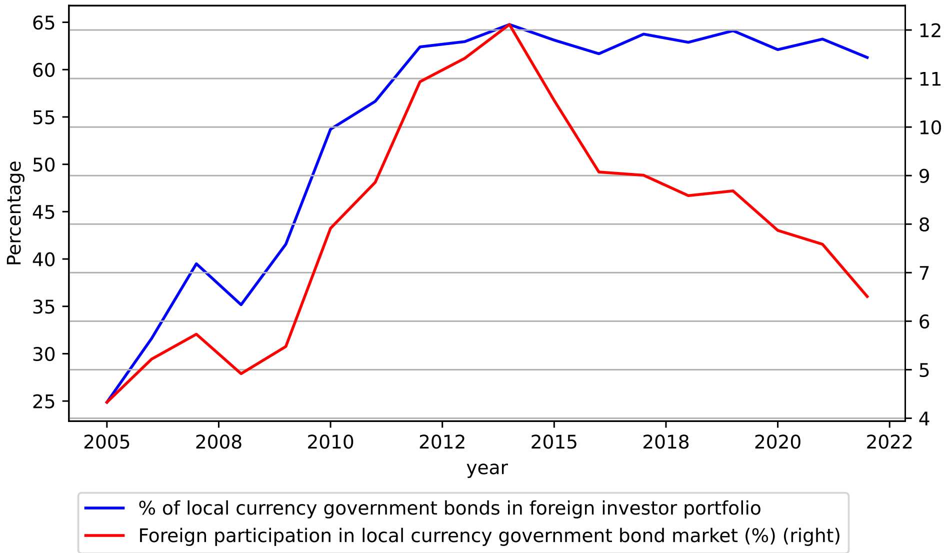
These major developments shed light on the transformation of EME risk: issuers' outright default risk induced by currency or interest rate movement is giving way to currency and duration risk relevant for investors' mark-to-market return. Such transformation of risk is closely associated with an increasingly diverse investor base. Long-term, default risk-averse investors such as banks (possibly excluding their trading desks), insurers and

4 Boermans and Burger (2023) show that Euro Area investors' EME bond holding are evenly split among local currency, USD and Euro denominations. Moreover, Fang, Hardy and Lewis (2023) show that the share of EME sovereign debt held by domestic investors has increased over time.

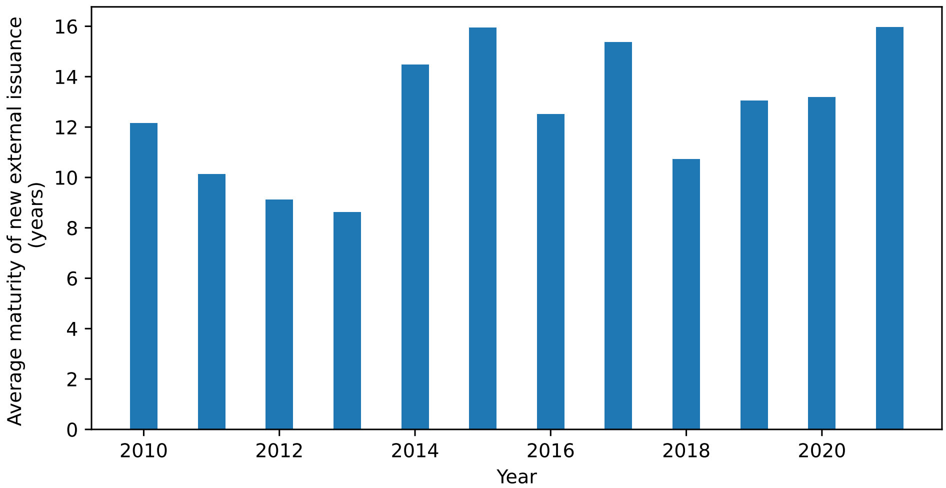
5 We construct the time series by aggregating bond-level issuance from Bloomberg covering 1592 government bonds issued by 52 countries.

6 Micic (2017) makes similar observations.

Figure 1
Shifting risk profile of emerging market sovereign debt



(a) Foreign investors and local currency bonds (Onen, Shin and von Peter (2023))



(b) Evolution of years to maturity for external issuance

Note: Figure 1 illustrates the evolution of EME government debt risk profile over the past decade. The data on foreign investor holding of local currency government bonds comes from Onen, Shin and von Peter (2023). The figure covers 23 major EMEs (Argentina, Bulgaria, Brazil, Chile, China, Colombia, Czech Republic, Croatia, Hungary, Indonesia, Israel, India, Korea, Mexico, Malaysia, Peru, Philippines, Poland, Romania, Russia, Thailand, Turkey, South Africa). Panel (b) calculates, for each year from 2010 to 2021, average years to maturity for new bonds issued by 1592 government bonds issued by 52 EMEs. The source is Bloomberg. See Zhou (2024) for the list of countries.

pensions funds enter into the picture.[7] Accordingly, the nature of investor demand that EME issuers are exposed to has also become more heterogeneous.

To highlight these patrens, Figure 2 and Panel (a) of Figure 3 present the composition

7 Capital regulation on these investors limits these institutions' credit risk exposure. On the other hand, the long-term, sticky nature of their liabilities as well as accounting treatment make them natural buy-and-hold investors. See Zhou (2024) for discussion.

of foreign investors for EME long-term debt securities using the SHS-ECB data and the IMF Coordinated Portfolio Investment Survey (CPIS). CPIS covers more investor and issuer countries, while SHS-ECB focuses on Euro Area investors but with a more detailed issuer sector breakdown. Both cases, however, point to the similar picture – while investment funds hold the largest amount of EME debt for all issuer sectors, the size of holding by long-term, stable investors such as ICPF and banks is also on the rise. Panel (b) of Figure 2 indicates that this set of investors account for 40% of all of Euro Area's holding of EME government debt.

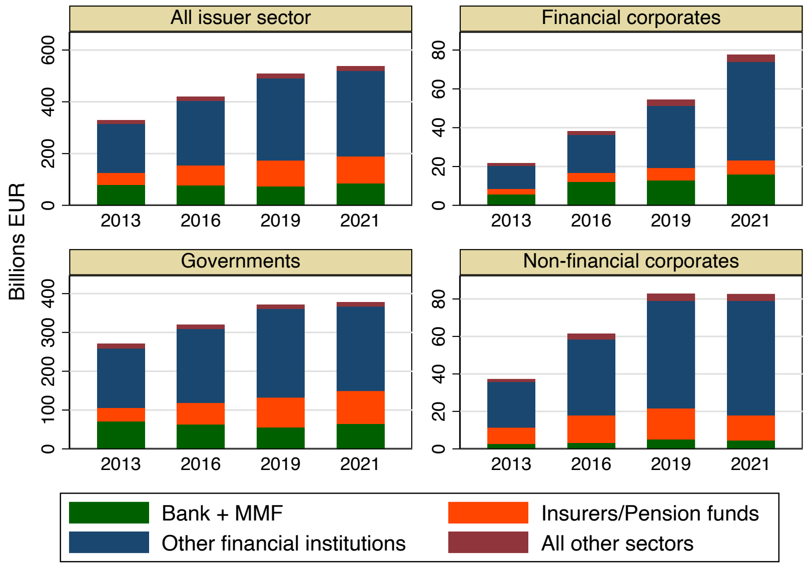
The shifts in foreign investor profile are nevertheless not uniform across EME issuers. Panel (b) of Figure 3 compares the foreign investor base of long-term debt issued by Argentina and Chile. For Chile, the share of long-term foreign investors exceeds the exposure of investment funds, but the opposite is true for Argentina. Country fundamentals play a role in determining capital inflows from default-averse stable investors (also see Fang, Hardy and Lewis (2023) and Zhou (2024)).

3. Empirical strategy

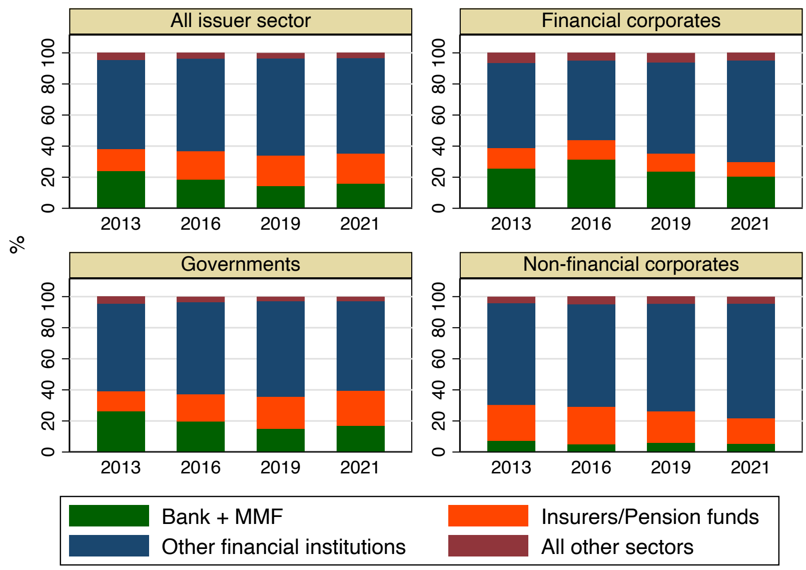
The heterogeneity in investor demand and the changing nature of EME risk may shape the foreign monetary policy spillovers through portfolio holding adjustments. We therefore investigate this possibility by estimating the responses of investor portfolio shares of EME bonds issued by different sectors to identified high frequency monetary policy shocks using panel local projection (see Jordà (2005) or more recently Montiel Olea and Plagborg-Møller (2021)). By focusing on these shares, we follow a tradition in international finance that relates capital flows to investor portfolio adjustment including Hau and Rey (2005), Curcuru et al. (2011), Raddatz, Schmukler and Williams (2017) and Camanho, Hau and Rey (2022). Nevertheless, aggregate capital flows clearly include other factors such as the level of investor wealth as well as the potential offsetting impact of domestic investor holdings. We leave the possible impact of these factors for future research.

Given the focus on investor adjustment, we begin by defining our primary variable of interest as the investor portfolio share: $\omega^{j}_{i,s,t}$ where j indexes the investor group, i signifies

Figure 2
Euro area investor composition of emerging market debt securities, by issuer sector



(a) Levels (Billions EUR)

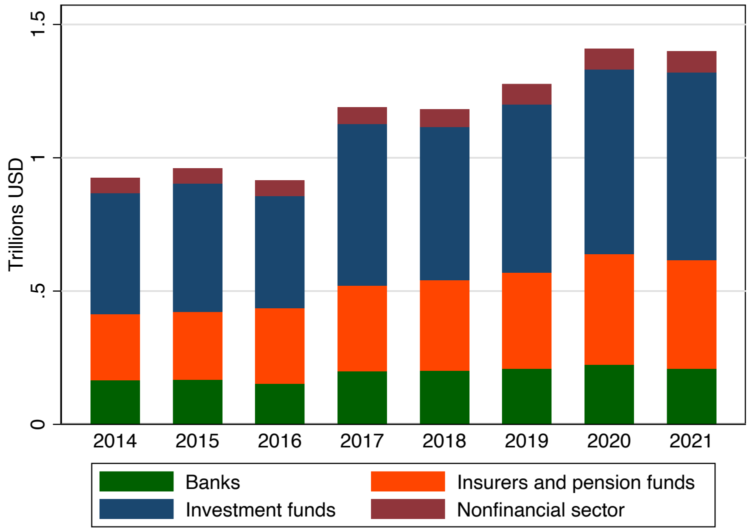


(b) Investor sector share (% of total market value held by Euro area investors)

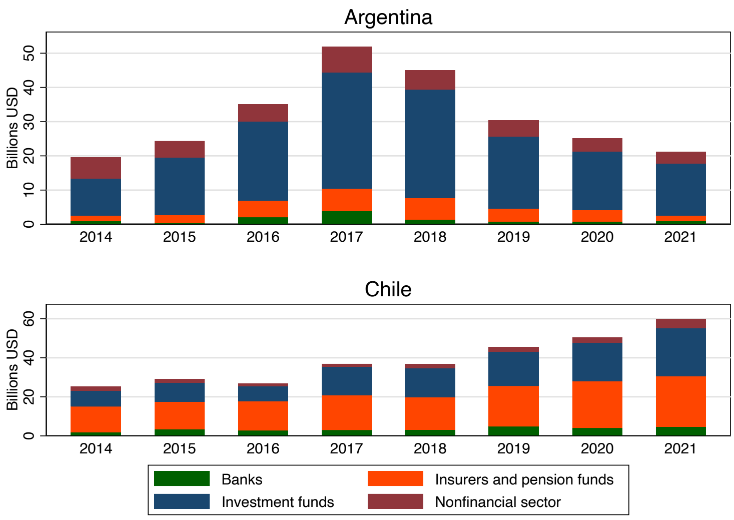
Note: Figure 2 plots the aggregate market value of debt securities issued by emerging market economies and held by Euro area investors recorded in ECB's securities holdings data. All observations are end-of-year values, and the units are in billions EUR. For holders, "all other sectors" include non-financial companies, households and non-profit institutions serving households (NPISHs), and governments. The emerging market economies covered in the public SHS-ECB dataset include Argentina, Bulgaria, Brazil, Chile, China, Czech Republic, Croatia, Hungary, Indonesia, India, Latvia, Lithuania, Mexico, Poland, Romania, Russia, Slovenia, Slovakia, Turkey, South Africa.

the issuer country, s denotes the issuing sector, and t is the time period. Each of these indices are described in detail below.

Figure 3
EME exposure to heterogeneous foreign investors



(a) All emerging markets



(b) Country heterogeneity: an illustration

Note: Figure 3 illustrate the foreign investor base of EME debt using IMF Coordinated Portfolio Investment Survey, a country-by-country bilateral dataset covering cross-border portfolio holding on a sector-by-sector basis since 2013. Both panel (a) and (b) include issuers from all sectors. Panel (a) reports total cross-border holding with investor sector breakdown for all emerging markets (we adopt a modified version of country classification from IMF WEO). Panel (b) focus on the differences in investor base for countries with varying country fundamentals, using Chile and Argentina as case studies.

Our baseline specification then takes the following form:

$$\omega^j_{i,s,t+h} - \omega^j_{i,s,t-1} = \alpha^j_{i,h} + \Gamma^{j,h}_s \Delta m_t + \sum_{k=0}^{p} \Theta^{j,h}_{s,k} X_{i,t-k} + \epsilon^j_{i,s,t+h}. \quad (1)$$

where the variables are described below.

Indices i denotes issuer country (such as Croatia). s denotes issuer sector (all, financial corporations, non-financial corporations and governments). j denotes holder sector (MFI, OFI, ICPF), and $h \in \{0, \ldots, H\}$ denotes the horizon of the impulse response function. $k \in \{0, \ldots, p\}$ defines the lags in the control variables $X_{i,t-k}$. We set the maximum number of lags p to 4 quarters and the maximum horizon of the impulse responses H to 8 quarters, given earlier discussion.

Variables The dependent variable, $\omega^j_{i,s,t+h}$, denotes investor sector j's *portfolio weight* of debt securities issued by country i's sector s. The weight is computed by dividing the market value of holding over the total market value of securities portfolio of sector j.[8] $\alpha^j_{i,h}$ denotes issuer country fixed effect.

Δm_t is the monetary policy shock, obtained by aggregating high-frequency movements in 3-month Euro OIS rate around monetary policy event windows to the quarterly level. More details on this variable are given below.

$X_{i,t-k}$ is a set of control variables at the country issuer level, including lagged monetary shocks (Δm_{t-k}). The controls are year-over-year CPI inflation, quarterly changes in unemployment and quarterly changes in the industrial production index.

Note that k starts from 0, so that the controls include contemporary values. This approach provides a conservative timing assumption. Current country fundamentals are allowed to independently affect the holdings other than through the impact of the monetary policy shocks.

For German investors, we modify this baseline specification since the available monthly holdings data series do not provide a breakdown of debt securities by issuer countries. In this case we simplify the specification as follows:

$$\omega^j_{F,s,t+h} - \omega^j_{F,s,t-1} = \alpha^{j,h}_{F,s} + \Gamma^{j,h}_{F,s} \Delta m_t^{\text{Short (Long)}} + \epsilon^j_{F,s,t+h}. \tag{2}$$

8 As such, we include all asset classes such as equities and investment fund shares for a particular investor sector.

where the dependent variable is investor i's holding of sector s's issuance, as a share of total debt holding of the investor. $\omega_{i,t}^{s,F}$ for each issuer sector s, formally defined as:

$$\omega_{F,s,t}^{j} = \frac{B_{F,s,t}^{j}}{\sum_{s'} B_{F,s',t}^{j} + \sum_{s'} B_{D,s',t}^{j}}$$

where $B_{F,s,t}^{j}$ and $B_{D,s,t}^{j}$ denote investor j's aggregate face value of holding of foreign and domestic sector-s's debt, respectively.[9] The monetary shock $\Delta m_t^{\text{Short (Long)}}$ is given by either the short-rate shock or the long-rate shock. The control variables $X_{i,t}$ include lagged (up to 3 months) monetary shocks, and lagged changes in ω.

High-frequency identified monetary policy shocks and their components Exogenous monetary policy shocks are obtained through high-frequency identification of monetary policy surprises: see Romer and Romer (2000), Gürkaynak, Sack and Swanson (2005), Bernanke and Kuttner (2005), Hanson and Stein (2015) among early contributors. Monetary policy surprises are constructed from high frequency movements in interest rates of near risk-free market instruments, such as Overnight Indexed Swaps (OIS), in a narrow window around interest rate announcements by the ECB. As such, they plausibly rule out reverse causality and other endogeneity concern. The identification assumption is as follows. As interest rate decisions are completed an hour or two before the decision is announced, the ECB could not have been reacting to changes in financial markets in a sufficiently narrow window of time around the announcement. Therefore any asset price change is caused by the announcements themselves, rather than vice versa. More formally, the monetary policy shock is given, in each month t, by the variable $\Delta m_t = \tau(t)\Delta_w m$, where $\Delta_w m$ is the change in the interest rate within a small time window around the announcement. The variable $\tau(t)$ controls for the time of the announcement during the month. Those shocks have been constructed for the the euro area by Altavilla et al. (2019).

To assess the various components of the monetary transmission mechanism we distinguish between two types of monetary policy shocks by selecting the horizon of the underlying

9 We use face value of holdings in this exercise as the German dataset is the only one that provides information on changes in holding free from valuation effects.

interest rate i used to construct the shocks. While the literature focuses on short-term rates, long-term rates may affect the rebalancing behavior as well. This behavior seems especially likely for long term investors such as ICPFs. To measure the shocks, we use the high-frequency movements of the 3-month OIS rate as the proxy for short-rate shocks and use the difference between 10-year and 3-month German Bund yield as the proxy for long-rate shocks. In some specifications we also break down high-frequency interest rate movements into those driven by pure monetary shocks and those driven by a potential information effect as described in Jarociński and Karadi (2020). More specifically, we decompose high-frequency responses of 3-month OIS rate into two parts: $\Delta_w m = \Delta_w^{\text{Pure}} m + \Delta_w^{\text{Info}} m$, where the pure monetary shocks, $\Delta_w^{\text{Pure}} m$ and the central bank information shocks $\Delta_w^{\text{Info}} m$ are identified based on the direction of high-frequency responses of Euro STOXX50 around monetary policy event windows (sign restrictions).[10] All the shock decompositions that we employ allow us to discuss in depth the various channels of the transmission of monetary shocks from the center to the periphery.

The Impact of Synchronized Spillovers. In recent times the worldwide surge in inflation has induced several central banks around the world to raise the interest rates in a concerted way. Previous evidence by Caldara et al. (2023) has shown that coordinated interest rate movements by the Fed and other central banks has a stronger impact on macroeconomic variables in the periphery. We test whether this feature holds for bond flows to EME by including and interacting both the Fed and the ECB monetary policy shocks using the following specification:

$$\omega_{i,s,t+h}^{j} - \omega_{i,s,t-1}^{j} = \alpha_{i,h}^{j} + \Gamma_{s}^{j,h} \mathbb{1}\{\Delta m_t, \Delta m_t^* > 0\} + \sum_{k=0}^{p} \Theta_{s,k}^{j,h} X_{i,t-k} + \epsilon_{i,s,t+h}^{j}. \tag{3}$$

where Δm_t^* corresponds to the identified monetary policy shocks around the Fed announcements. The indicator function $\mathbb{1}\{\Delta m_t, \Delta m_t^* > 0\}$ takes the value one if and only if both ECB and Fed surprisingly tighten monetary policy in the same month t.

10 The sign restriction is based on the idea that pure monetary shocks depress equity prices through the discount rate and the cash flow channel, while tightening shocks inferred by market participants as revealing positive private information about the state of the economy going forward will be correlated with higher equity prices. The interpretation of $\Delta_w^{\text{Info}} m$ is still highly debated. We provide some alternative interpretations following the literature below.

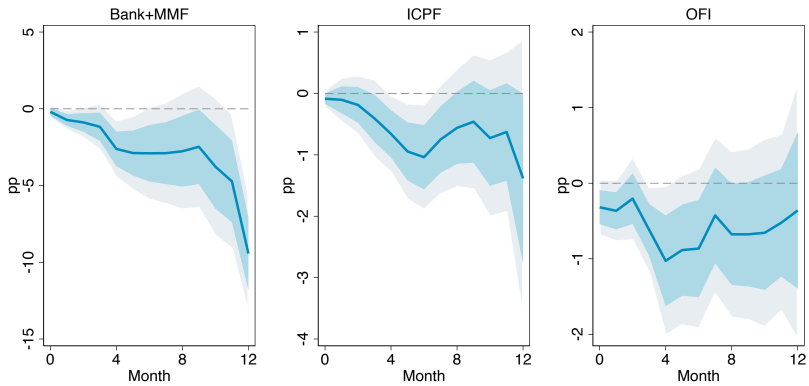
For the U.S. we employ the monetary policy shocks constructed by Bauer and Swanson (2023*b*). The identified time series has two advantages over earlier work. First, Bauer and Swanson (2023*b*) cover a larger set of announcement events: the purpose is to contain the possibility of an attenuation bias, a concern recently raised by Ramey (2016). Note that the communication strategy of the Fed also entails more announcements than that of the ECB. Second, they are orthogonalized with respect to a series of macroeconomic and financial variables observed before each FOMC announcements. This approach helps alleviate endogeneity concerns, primarily when considering the U.S. monetary policy stance, as the Fed provides additional information also through the publication of the Greenbook forecasts.

4. Baseline Results: Foreign Debt across Investors

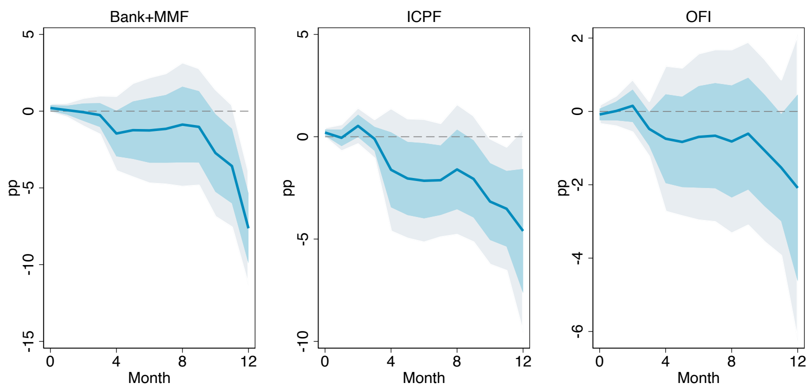
We start by presenting the impact of a monetary shock on foreign holdings of German investors. This evidence provides a broad overview of the spillovers from monetary policy in an advanced economy onto the flows toward the rest of the world, including both AE and EME.

Figure 4 reports the impulse responses of Germany-based investors' portfolio weights of foreign debt holding in response to a 25 bps tightening of ECB monetary policy ("short-rate shocks") based on Equation (2). The shaded areas are the 68% and 90% confidence bands. The figure shows two main patterns. First, we observe large heteroegeneity in the investor responses, both qualitatively and quantitatively. Most investors reduce their holdings of foreign securities, but the responses are significant mostly at medium or longer horizons. Second, there is some substitution across asset classes, with a decline in the shares of corporate bonds and an increase in sovereign debt holdings, a result suggesting flight to safety. This finding may reflect a perceived increase in the risk of default in the private sector. If so, investors that are subject to prudential and value-at-risk constraints are then forced to reduce their asset and currency risk. This perception could then help explain the decline in the holdings of foreign securities and the shift from corporate to sovereign. Since some investors have tighter constraints than others, such a response would lead to heterogenous rebalancing.

Figure 4
Impulse response of holding of foreign debt (as share of total debt holding) to 25 bps short-rate tightening



(a) Debt issued by all sectors



(b) Debt issued by financial corporations

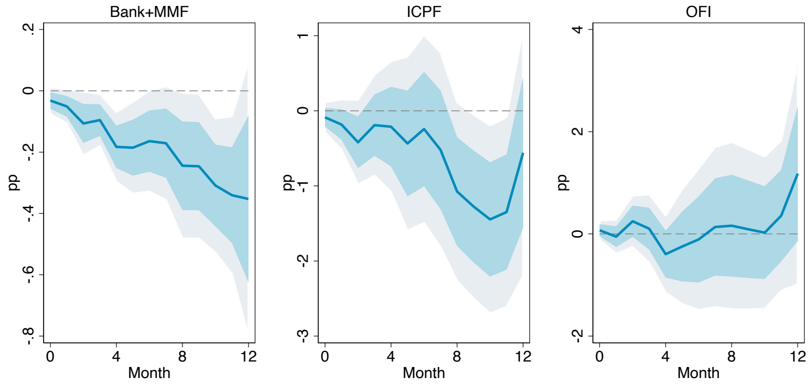
Note: Figure 4 plots impulse responses of Germany-based investors' foreign debt holding (face value, including both AE and EME debt) as share of total debt holding to 25 bps monetary policy surprise reflected in the short-term interest rate. The monetary policy surprise is identified via high-frequency movements in the asset prices around ECB monetary policy event windows (Altavilla et al., 2019). Impulse responses are estimated using the local projection (2) by investor sector (bank+MMF, ICPF, and other financial institutions), and by issuer sector (all sectors, financial corporations, non-financial corporations and government). The control variables include 3 lags of monetary policy shock and lagged changes (for 3 months) of the dependent variables. Foreign debt holding refers to aggregate holding of all debt securities issued by non-German entities. The unit of the y-axis is percentage point. 68% and 90% confidence interval with robust standard error are reported.

4.1. EME versus AE and the Role of Investors

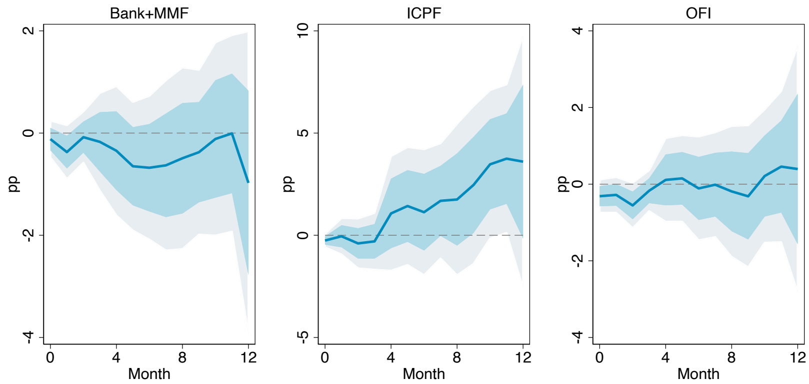
In response to monetary shocks, our previous results have shown that investors reduce their shares of foreign securities and riskier securities, such as corporate bonds. But

Figure 4
Impulse response of holding of foreign debt (as share of total debt holding) to 25 bps short-rate tightening (continued)

See the first part of the figure for detailed notes.



(c) Debt issued by non-financial corporations

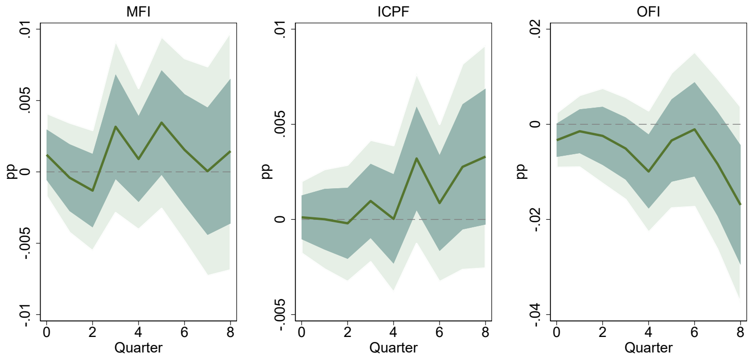


(d) Debt issued by governments

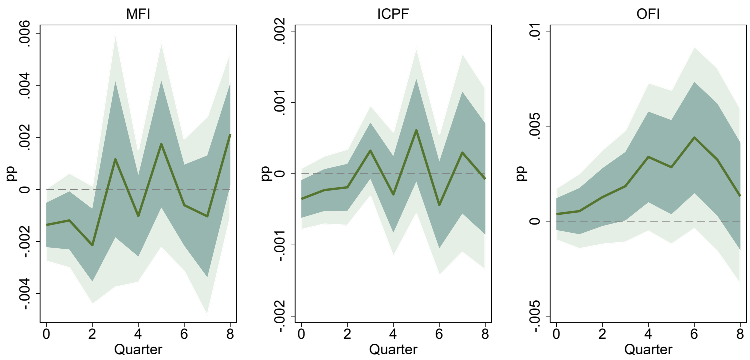
investors may also substitute securities across countries, in particular between EME and AE issuers. We examine this possibility with the data on all Euro Area holdings, the SHS-ECB, which includes information on the country of issuance. We break down the securities in two groups, those issued by EME and those issued by AE.[11]

11 A simple summary statistics table is available at Table A1 in the Appendix. The emerging market economies covered in the public SHS-ECB dataset include Argentina, Bulgaria, Brazil, Chile, China, Czech Republic, Croatia, Hungary, Indonesia, India, Latvia, Lithuania, Mexico, Poland, Romania, Russia, Slovenia, Slovakia, Turkey, South Africa.

Figure 5
Impulse response of holding of emerging market debt (as share of total size of securities portfolio) to 25 bps short-rate tightening



(a) Debt issued by all sectors

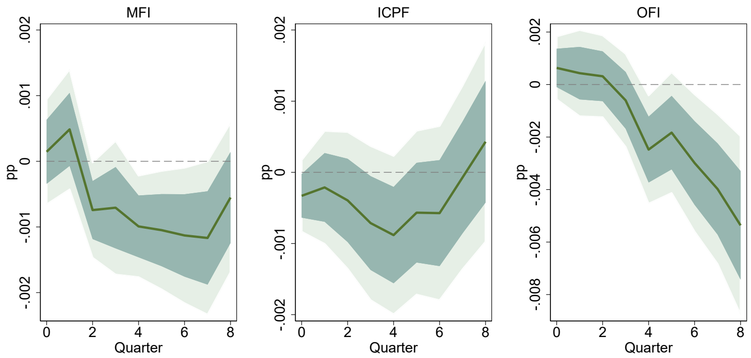


(b) Debt issued by financial corporations

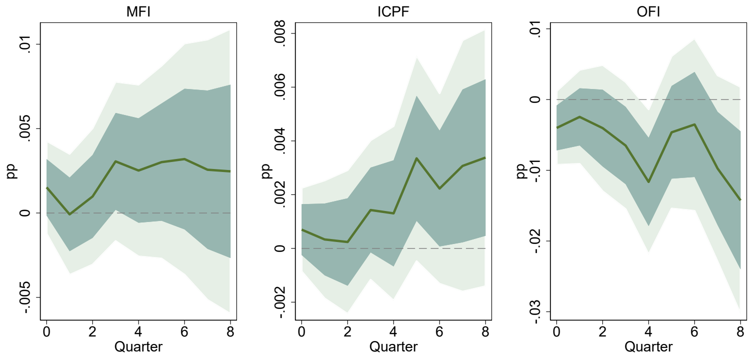
Figure 5 plots quarterly impulse responses of Euro area investors' emerging market debt holding (market value) as share of total market value of securities portfolio to 25 bps monetary policy surprise reflected in the short-term interest rate (3-month OIS). The monetary policy surprise is identified via high-frequency movements in the asset prices around ECB monetary policy event windows (Altavilla et al., 2019). Impulse responses are estimated using the local projection (1) by investor sector (bank+MMF, ICPF, and other financial institutions), and by issuer sector (all sectors, financial corporations, non-financial corporations and government). The control variables include 4 lags of monetary policy shock and lagged changes (for 4 quarters) of the dependent variables. The unit of the y-axis is percentage point. 68% and 90% confidence interval with robust standard error are reported.

Figure 5
Impulse response of holding of emerging market debt (as share of total size of securities portfolio) to 25 bps short-rate tightening (continued)

See the first part of the figure for detailed notes.

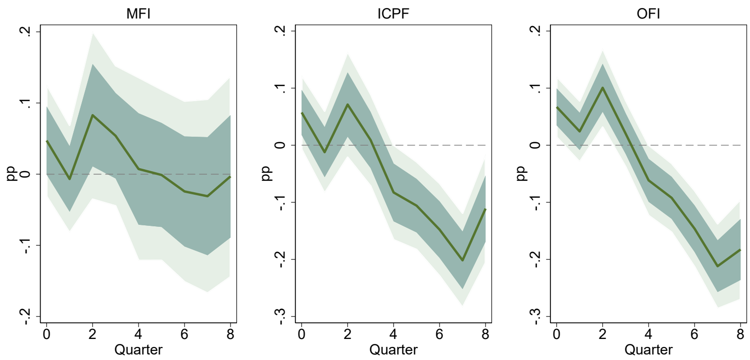


(c) Debt issued by non-financial corporations

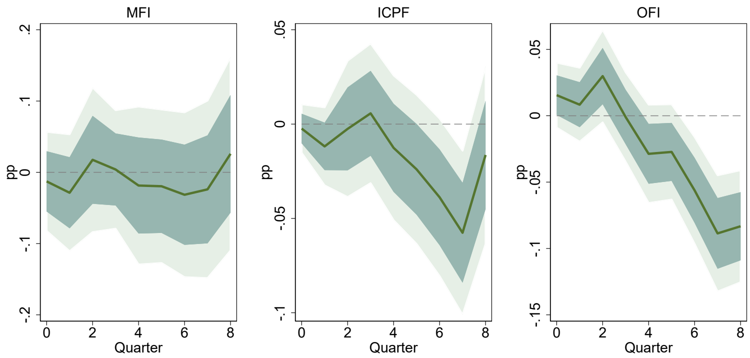


(d) Debt issued by governments

Figure 6
Impulse response of holding of debt issued by advanced economies in the Euro Area (as share of total size of securities portfolio) to 25 bps short-rate tightening



(a) Debt issued by all sectors

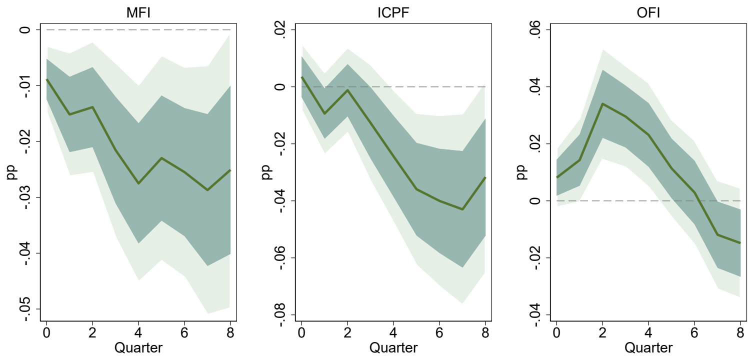


(b) Debt issued by financial corporations

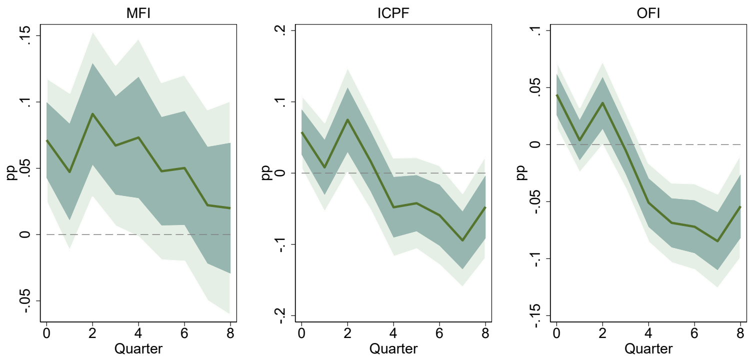
Figure 6 plots quarterly impulse responses of Euro area investors' holding of debt securities (market value) issued by issuer in Euro Area classified as Advanced Economies (AE) as share of total market value of securities portfolio to 25 bps monetary policy surprise reflected in the short-term interest rate (3-month OIS). The monetary policy surprise is identified via high-frequency movements in the asset prices around ECB monetary policy event windows (Altavilla et al., 2019). Impulse responses are estimated using the local projection (1) by investor sector (bank+MMF, ICPF, and other financial institutions), and by issuer sector (all sectors, financial corporations, non-financial corporations and government). The control variables include 4 lags of monetary policy shock, lagged changes (for 4 quarters) of the dependent variables, and country-level variables (inflation, quarterly changes in unemployment rate and industrial production). The unit of the y-axis is percentage point. 68% and 90% confidence interval with robust standard error are reported.

Figure 6
Impulse response of holding of debt issued by advanced economies in the Euro Area (as share of total size of securities portfolio) to 25 bps short-rate tightening (continued)

See the first part of the figure for detailed notes.

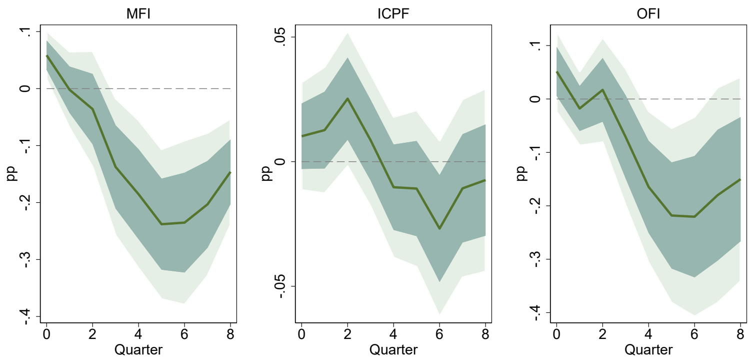


(c) Debt issued by non-financial corporations

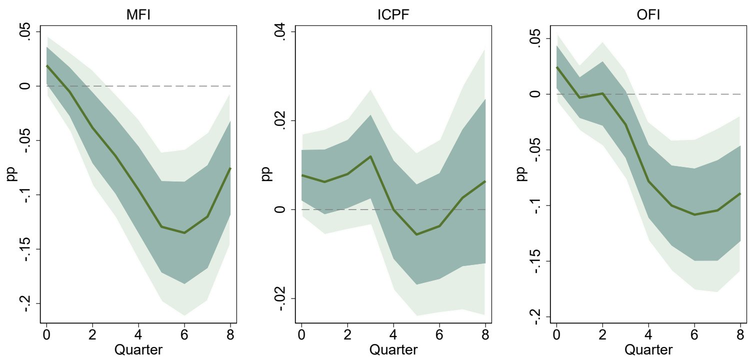


(d) Debt issued by governments

Figure 7
Impulse response of holding of debt issued by advanced economies outside the Euro Area (as share of total size of securities portfolio) to 25 bps short-rate tightening



(a) Debt issued by all sectors

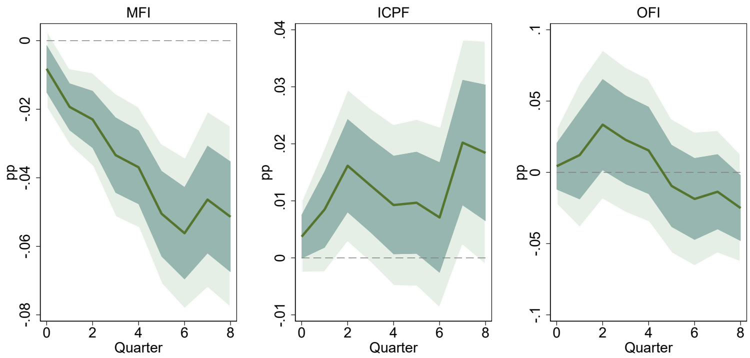


(b) Debt issued by financial corporations

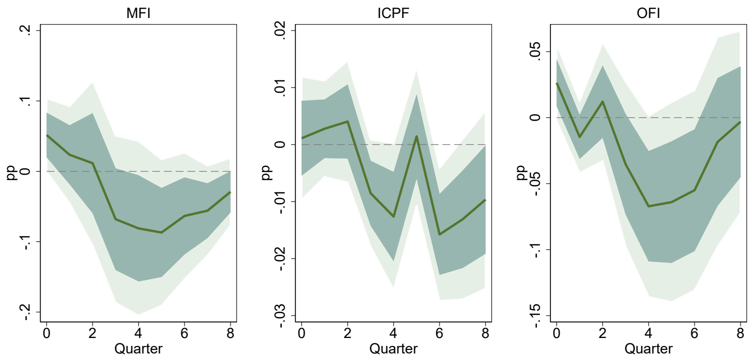
Figure 7 plots quarterly impulse responses of Euro area investors' holding of debt securities (market value) issued by issuer outside Euro Area classified as Advanced Economies (AE) as share of total market value of securities portfolio to 25 bps monetary policy surprise reflected in the short-term interest rate (3-month OIS). The monetary policy surprise is identified via high-frequency movements in the asset prices around ECB monetary policy event windows (Altavilla et al., 2019). Impulse responses are estimated using the local projection (1) by investor sector (bank+MMF, ICPF, and other financial institutions), and by issuer sector (all sectors, financial corporations, non-financial corporations and government). The control variables include 4 lags of monetary policy shock, lagged changes (for 4 quarters) of the dependent variables, and country-level variables (inflation, quarterly changes in unemployment rate and industrial production). The unit of the y-axis is percentage point. 68% and 90% confidence interval with robust standard error are reported.

Figure 7
Impulse response of holding of debt issued by advanced economies outside the Euro Area (as share of total size of securities portfolio) to 25 bps short-rate tightening (continued)

See the first part of the figure for detailed notes.



(c) Debt issued by non-financial corporations



(d) Debt issued by governments

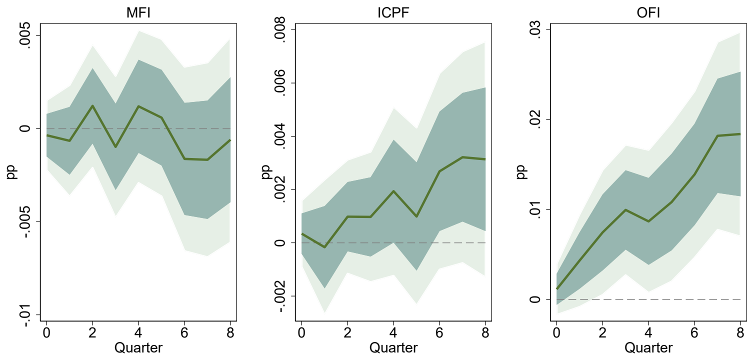
Figures 5 present the impulse responses of the baseline local projection specification in Equation (1) for EME only. They show no significant decline of the debt shares toward EME, except for the shares of sovereign and corporate bonds held by OFI.[12] Those institutional investors indeed tend to show more active responses.[13] By contrast, the shares held by ICPF and MFI (banks and money market funds) show no significant decline. As shown in Figures 5, these two investor groups together also account for a substantially share of EME bonds. Their passive behaviour may contributes to the moderation in the response of the aggregate bond flows. In addition, as long-term investors could self-select into countries with various degrees of sensitivity to center-country monetary shocks, the response could also reflect fundamental trajectories differences between issuer countries in and out of stable investors' portfolio.

To better gauge the potential for asset substitution across countries we re-estimate our local projection specification in Equation (1) using, alternatively, the portfolio shares for holdings of debt from Euro Area countries and, next, for debt of AE countries outside the Euro Area. Results for the first set are shown in Figure 6 and results for the second are shown in Figure 7. For shares of debt securities issued in the Euro Area, Figure 6 shows an increase in the short run, followed by a decline in the longer run. Although our market value data series do not provide identification of price versus quantity, one explanation could be a short run search for yield and a longer term decline in valuation. As before, rebalancing is more pronounced for investment funds (OFI). For debt securities issued by AE outside the Euro Areas, Figure 7 shows a significant decline, more so for shares held by banks and investment funds. In sum, international spillovers by Euro Area investors appear stronger in the form of a substitution between securities issued across AE in the major currency areas.

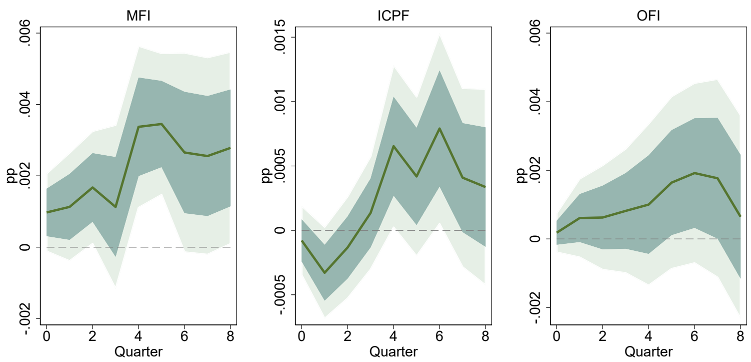
12 We show 68% and 90% confidence interval constructed using heteroskedasticity-robust standard errors, so that we are not conservative on the standard error estimation. The results hold up when we two-way cluster the standard errors by time and issuer country.

13 Even when we witness a significant reduction in the portfolio shares, the magnitude is small. EME debt accounts for 2.6% of the total portfolio size of the investment funds. As an illustration, on average in our data, EME government accounts for 1% of the total size of investment funds' securities portfolio.

Figure 8
Impulse response of holding of emerging market debt (as share of total size of securities portfolio) to 25 bps long-term rate tightening relative to short rate



(a) Debt issued by all sectors



(b) Debt issued by financial corporations

Figure 8 plots quarterly impulse responses of Euro area investors' emerging market debt holding (market value) as share of total market value of securities portfolio to 25 bps monetary policy surprise reflected in the change of long-term interest rate (10-year Bund yield) relative to short-term interest rate (3-month Bund yield). The monetary policy surprise is identified via high-frequency movements in the asset prices around ECB monetary policy event windows (Altavilla et al., 2019). Impulse responses are estimated using the local projection (1) by investor sector (bank+MMF, ICPF, and other financial institutions), and by issuer sector (all sectors, financial corporations, non-financial corporations and government). The control variables include 4 lags of monetary policy shock, country-level variables (inflation, quarterly changes in unemployment rate and industrial production), and lagged changes (for 4 quarters) of the dependent variables. The unit of the y-axis is percentage point. 68% and 90% confidence interval with robust standard error are reported.

5. Portfolio responses to alternative monetary shocks

In judging the monetary spillovers from the Euro Area to the rest of the world and in particular to EME capital flows, it is useful to consider separately alternative monetary policy stances. These stances may affect also the extent and the direction of the spillovers. We focus in particular on two aspects.

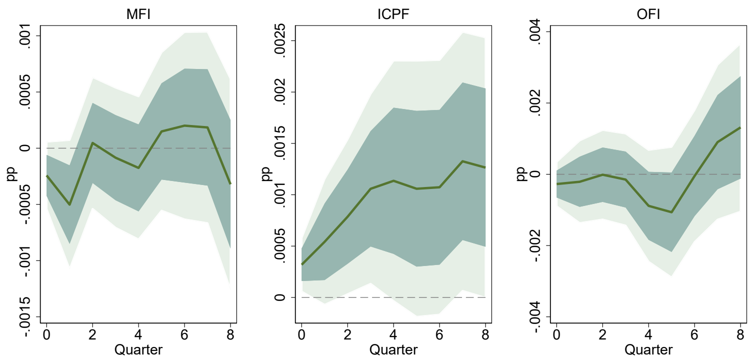
First, our sample period was characterized by widespread use of unconventional policy,

Figure 8

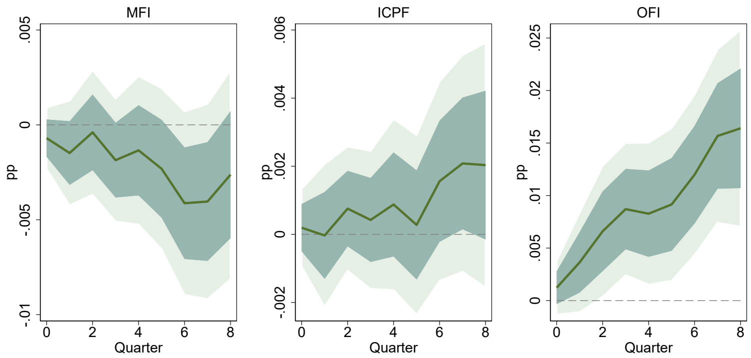
Impulse response of holding of emerging market debt (as share of total size of securities portfolio) to 25 bps long-term rate tightening relative to short rate

(continued)

See the first part of the figure for detailed notes.



(c) Debt issued by non-financial corporations



(d) Debt issued by governments

whose spillovers to EME may be larger than those induced by conventional policy. Several authors have assessed the impact of unconventional policies, particularly on financial markets, in a closed economy. See for example D'Amico and King (2013). Recent evidence also examines the impact of quantitative easing policies on international securities prices, for instance Fratzscher, Lo Duca and Straub (2016) and Faia, Salomao and Veghazy (2022). However, there is little evidence of its effects on international portfolio adjustments.

Second, monetary policy decisions in AE are often made in response to their business cycle movements. Since tightening often occurs contemporaneously, as was the case during the recent inflation surge, and since EME also issue in dollars and euros, the spillovers to EME could be magnified (see for instance Obstfeld (2022) and Caldara et al. (2023)).

Spillovers from long-term rate shocks Unconventional or quantitative easing policies operate through central bank purchases of long term assets with the goal of reducing long term rates and flattening the term structure. To assess the role of these policies relative to that of conventional policies, we re-estimate our baseline specification by employing a decomposition of the rates that focuses on the long term component. This measure is obtained as the response of the spreads for long horizon. Thus, the measure also captures the changes in the slope of the term structure. Altavilla et al. (2019) provide such as a decomposition for Euro Area shocks. Figure 8 in Appendix A shows the results for the estimates with the short and the long run component of the shocks and for EME debt securities. Figure A1 shows results for AE debt securities. As before, the responses are estimated across different investor types.

Compared to Figure 5, we find strong spillovers from surprise yield curve steepening to investment funds' portfolio allocation to EME, driven by an *increase* in the relative allocation to EME government bonds (Figure 8). We also find some evidence that ICPFs increase their allocation to EME corporate bonds. Figures A4 and A5 in Appendix A show that the ICPF reallocation is driven by both Euro Area EME issuers and issuers outside the Euro Area, while investment funds primarily reallocate to non-Euro Area government bonds following the shock.

Although we cannot identify investor behavior directly, the results can be understood in a number of ways. As ICPFs exhibit limited sensitivity to short rate shocks (Figure 5), surprise increases in the long rate drive the response. Upon the shock, insurers suffer mark-to-market losses on their safe government bond holdings while the erosion in the real value of liabilities compensate for the loss. Given that European insurers have negative duration gaps on average, the long rate could expand their risk-bearing capacity through a wealth channel. For investment funds, on the other hand, mark-to-market losses on Euro Area government bonds could encourage fund managers to compensate by seeking higher yields abroad, thus allocating a higher weight on non-Euro Area EMEs.

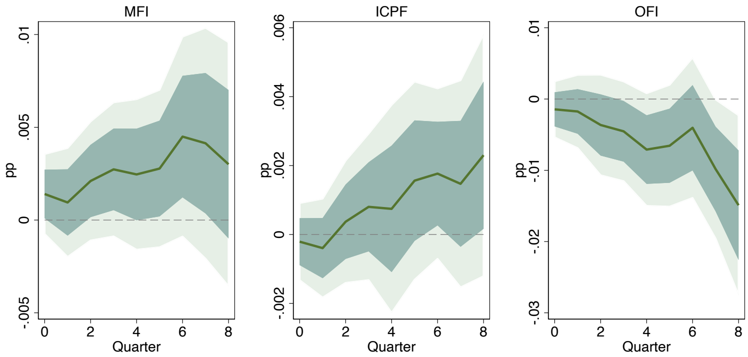
Central bank information shocks and pure monetary shocks So far, we have treated monetary shocks as unexpected changes in the interest rate that impacts the borrowing and lending price between issuers and investors; that is, as a "pure" monetary shock. However, the fact that the central bank deems the economy sufficiently robust to be able to increase rates may be interpreted as a positive ”information” shock to investors overall. To explore this possibility, Figure 9 plots the impulse responses of Euro Area investors' portfolio weight on EME government bonds in response to a positive “pure” monetary shock in Panel (a), and a positive central bank information shock in Panel (b), both levelled at 25bps. As these panels show, investment funds exhibit stark difference in their reallocation pattern. They allocate less to EME government bonds upon a pure monetary tightening while a monetary tightening that comoves positively with the stock market increases the portfolio weight.

There are alternative interpretations of central bank information shocks. In Uribe (2022), the positive shock component captures permanent monetary shocks that are expansionary from a Neo-Fisherian perspective. Bauer and Swanson (2023*a*) suggest that such shocks may correspond to positive economic news. Notwithstanding this discussion, our results suggest that when analyzing monetary spillovers through the balance sheet of financial institutions, it is important to account for the nature of shocks. Investment funds positively surprised by the information content of ECB tightening could expand, rather than reduce their risk-bearing capacity.

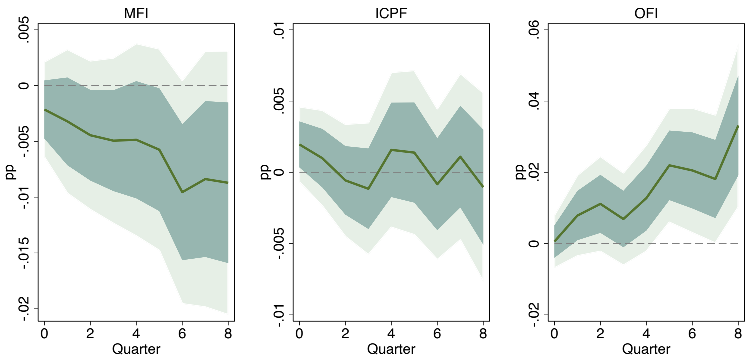
Synchronized policy shocks and spillovers. A new perspective that is gaining ground is that spillovers to EME may be stronger when central banks take coordinated actions. The worldwide increase in inflation, by triggering synchronized rise in interest rate across central banks around the world, may heighten the adverse spillovers (see Obstfeld (2022)). Caldara et al. (2023) provide evidence of this hypothesis by examining the impact of synchronized policies on EME macro variables. We provide evidence of the impact of synchronized monetary tightening on EME bond flows, by estimating the specification described in Equation (3).

Figure 10 shows results for EME holdings. We focus on short term rate surprises as those are available for both central banks. Like before investment funds significantly reduce their holdings, in particular those of sovereign. However the decline is now significant at shorter horizon. This pattern suggests that part of the rebalance may be due to an increase in the cost of dollar liabilities.

Figure 9
EME government debt portfolio weights of different Euro Area investors and central bank information shocks



(a) Pure monetary shocks

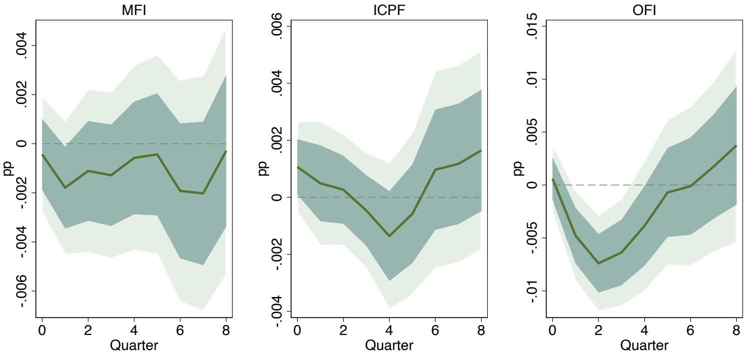


(b) Central bank information shocks

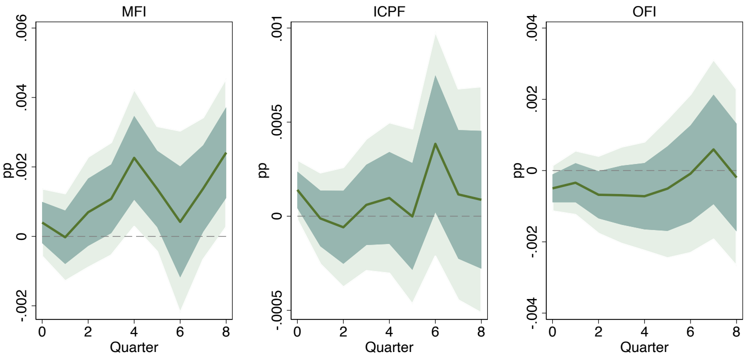
Figure 9 plots impulse responses of Euro Area investors' EME government debt holding (market value) as share of total market value of securities portfolio to a 25bps increase in pure monetary policy shocks (Panel (a)) and central bank information shocks (Panel (b)). We decompose 3-month OIS rate surprises into these two components following the identification procedure of Jarociński and Karadi (2020). Impulse responses are estimated using the local projection (1) by investor sector (bank+MMF, ICPF, and other financial institutions), and by issuer sector (all sectors, financial corporations, non-financial corporations and government), replacing the monetary shock Δi_t with pure monetary shock (panel (a)) or central bank information shock (panel (b)). The control variables include 3 lags of monetary policy shock and lagged changes (for 3 months) of the dependent variables, as well as issuer country-level controls. The unit of the y-axis is percentage point. 68% and 90% confidence interval with robust standard error are reported.

Figure 10 shows results for EME holdings. We focus on short term rate surprises as those are available for both central banks. Like before investment funds significantly reduce their holdings, in particular those of sovereign. However the decline is now significant at shorter horizon. This suggests that part of the rebalance may be due to an increase in the cost of dollar liabilities.

Figure 10
Impulse response of holding of EME debt (as share of total size of securities portfolio) to episodes of synchronized monetary tightening of ECB and Fed



(a) Debt issued by all sectors



(b) Debt issued by financial corporations

Figure 10 plots impulse responses of Euro Area investors' EME debt holding (market value) as share of total market value of securities portfolio, when both the Fed and the ECB surprisingly tighten monetary policy. The monetary policy surprise is identified via high-frequency movements in the asset prices around ECB and Fed's monetary policy event windows (Altavilla et al., 2019; Bauer and Swanson, 2023*b*). Impulse responses are estimated using the local projection (2) by investor sector (bank+MMF, ICPF, and other financial institutions), and by issuer sector (all sectors, financial corporations, non-financial corporations and government), replacing the monetary shock Δi_t with an indicator function $\mathbb{1}\{\Delta i_t^{\text{ECB}} > 0, \Delta i_t^{\text{Fed}} > 0\}$, where i refers to high-frequency short-term rate (3-month OIS for the ECB, and Fed Funds future shocks for the U.S.). The control variables include 3 lags of monetary policy shock and lagged changes (for 3 months) of the dependent variables, as well as issuer country-level controls. The unit of the y-axis is percentage point. 68% and 90% confidence interval with robust standard error are reported.

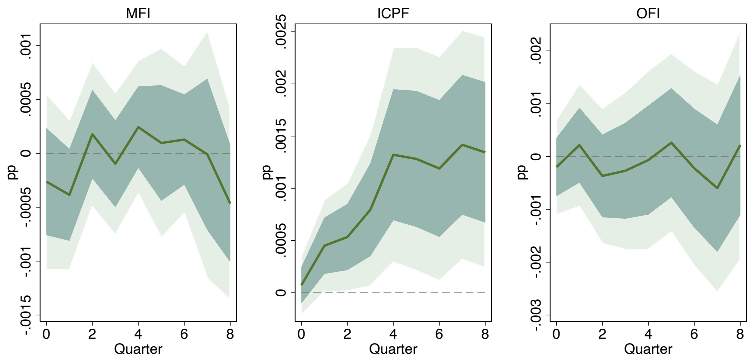
6. U.S. investors, foreign debt holding and U.S. monetary shocks

Our analysis has so far focused on holdings of Euro Area investors. We followed this baseline approach for two important reasons. First, this investor group is large and well representative of AE holdings. Second, and as discussed earlier, their positions are

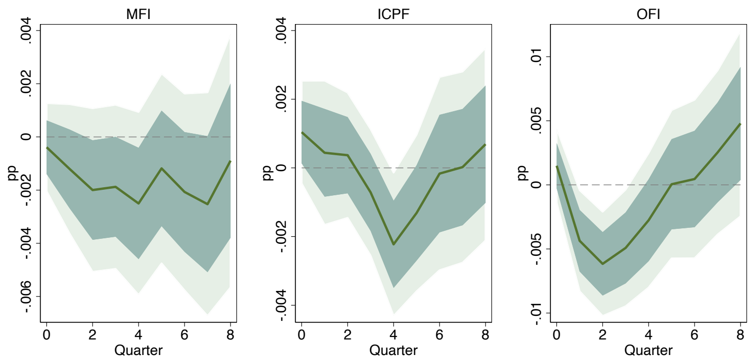
Figure 10

Response of foreign debt holding (as share of total size of securities portfolio) in episodes of synchronized monetary tightening of ECB and Fed (continued)

See the first part of the figure for detailed notes.



(c) Debt issued by non-financial corporations



(d) Debt issued by governments

available with observations of high frequency securities data, provided with a break down across issuers and investors. This data set therefore is one of the few sources of such detailed, disaggregated investor information.

Our final exercise turns attention to U.S. monetary policy shocks and U.S. investors. We use Treasury International Capital System data, more specifically the SLT2F form recording the stock of foreign liabilities held by U.S. resident, to understand if foreign debt holding of different types of U.S. investors responds to U.S. monetary shocks. These data provide a break down across investors and are available at the monthly frequency for about 10 years, since 2013 to 2023, although no issuer country can be identified from the data, so that we cannot distingtuish between AE and EME issuers. For the monetary policy shocks we use alternatively the ones provided by Bauer and Swanson (2023*b*) and the ones provided by Nakamura and Steinsson (2018) for robustness. (The latter results are provided in Figure A6 in the Appendix).

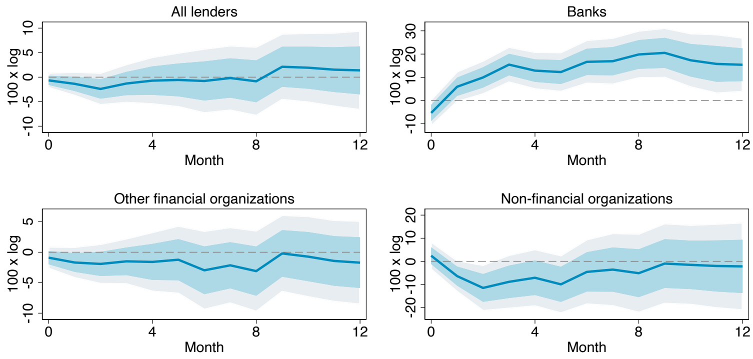
In Figure 11, we show the results for corporate and sovereign debt in the market value of holdings (Panel (a) and (b)), as well as the relative weight of foreign sovereign debt in Panel (c). We do not find significant evidence that either U.S. banks or non-banks reduce their portfolio allocation to foreign debt upon monetary tightening. For banks, we observe an increase in the market value of their debt holding.

7. Concluding Remarks

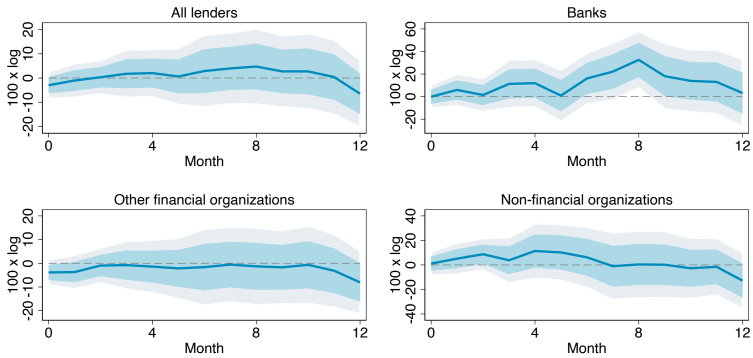
We study the monetary spillovers onto foreign securities, with a focus on EME debt, using securities holdings held by different investors type in the Euro Area. Specifically, we proxy for capital flow changes by studying the response of the portfolio shares held by those investors to surprise monetary policy shocks. Contrary to past literature, that studied the spillovers by examining the response of the EME macro variables, our results can identify the nature of the investor financial channel and which investor and asset classes were involved.

We find no significant evidence of spillovers to capital flows through EME bond holdings, except for those linked to the changes in the shares held by investment funds. As a growing literature is showing, these investment funds appear to be the most active investors. Some substitution patterns are identified such as shifts from corporate to sovereign bonds. We also examine whether the strength and nature of the spillovers changes with the stance of monetary policy. Specifically, we distinguish the effects of conventional versus unconventional policies and the impact of synchronized tightening between U.S. and Euro Area. Moroever, we find that information shocks induce very different response of investment fund behavior than traditional monetary shocks. Overall, our results provide new evidence for the connection between monetary shocks and investment funds. They also suggest a rich array of future research issues.

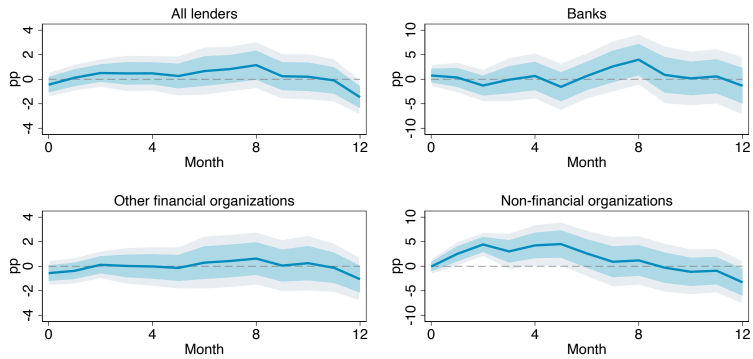
Figure 11
Impulse responses of U.S. holding of foreign debt to 25 bps short-rate tightening by the Fed



(a) Corporate debt, market value of holdings as the dependent variable



(b) Sovereign bond, market value of holdings as the dependent variable



(c) Sovereign bond, portfolio weight relative to total foreign debt holding as the dependent variable

Note: Figure 11 plots monthly impulse responses of U.S. investors' foreign debt holding (market value) to 25 bps monetary policy surprise reflected in the short-term U.S. policy interest rate. Panel (a) and (b) reports the impulse responses of the levels of holding and Panel (c) reports foreign sovereign debt holding as a share of total foreign debt holding. The monetary policy surprise is identified via high-frequency price movements of Fed Funds futures around Fed monetary policy event windows, orthogonalized by ex-ante economic news as in (Bauer and Swanson, 2023*b*). Impulse responses are estimated using the local projection (1) by investor sector (bank+MMF, ICPF, and other financial institutions), and by issuer sector (all sectors, financial corporations, non-financial corporations and government). The control variables include 3 lags of monetary policy shock and lagged changes (for 3 months) of the dependent variables. The unit of the y-axis is percentage point (Panel (c)) and log points (Panel (a) and (b)). 68% and 90% confidence interval with robust standard error are reported.

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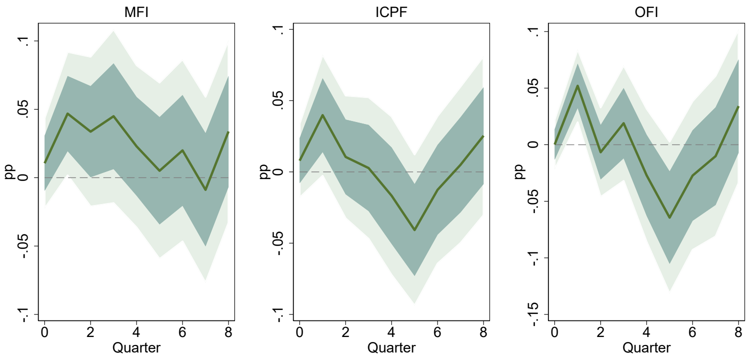
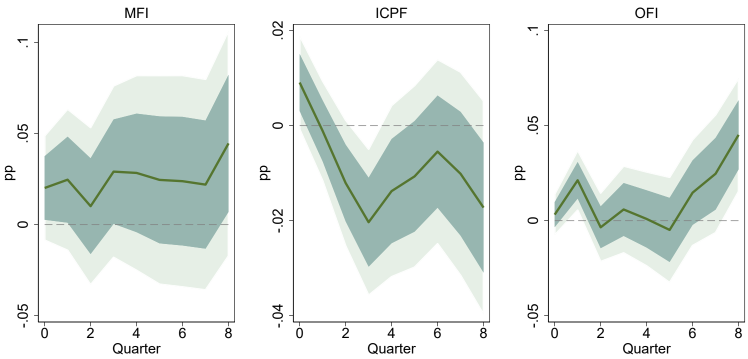
A. Additional Empirical Results

Figure A1
Impulse response of holding of advanced economies debt (as share of total debt holding) to 25 bps long-term rate tightening relative to short rate



(a) Debt issued by all sectors



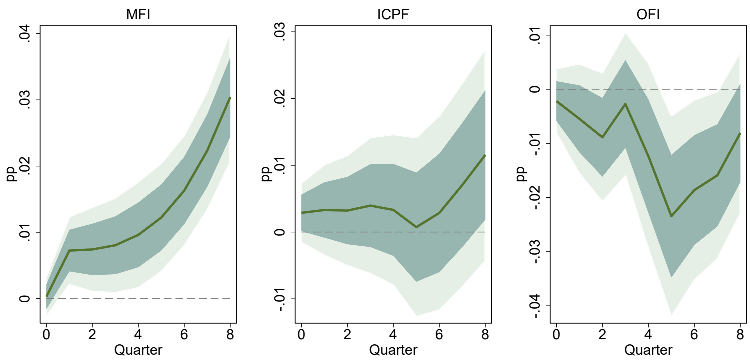
(b) Debt issued by financial corporations

Figure A1 plots quarterly impulse responses of Euro area investors' advanced economies debt holding (market value) as share of total market value of securities portfolio to 25 bps monetary policy surprise reflected in the change of long-term interest rate (10-year Bund yield) relative to short-term interest rate (3-month Bund yield). The monetary policy surprise is identified via high-frequency movements in the asset prices around ECB monetary policy event windows (Altavilla et al., 2019). Impulse responses are estimated using the local projection (1) by investor sector (bank+MMF, ICPF, and other financial institutions), and by issuer sector (all sectors, financial corporations, non-financial corporations and government). The control variables include 4 lags of monetary policy shock, country-level variables (inflation, quarterly changes in unemployment rate and industrial production), and lagged changes (for 4 quarters) of the dependent variables. The unit of the y-axis is percentage point. 68% and 90% confidence interval with robust standard error are reported.

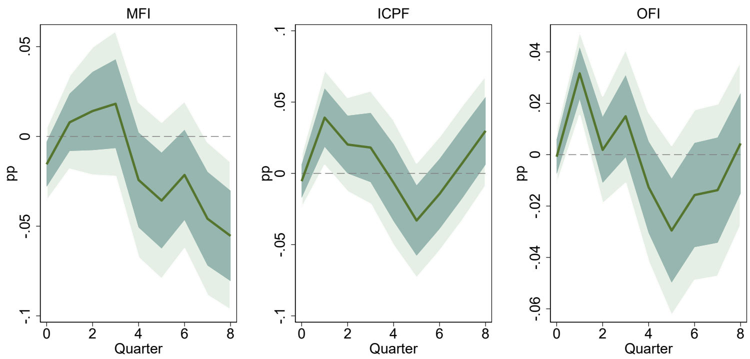
Figure A1

Impulse response of holding of advanced economics debt (portfolio weight) to 25 bps long-term rate tightening relative to short rate (continued)

See the first part of the figure for detailed notes.

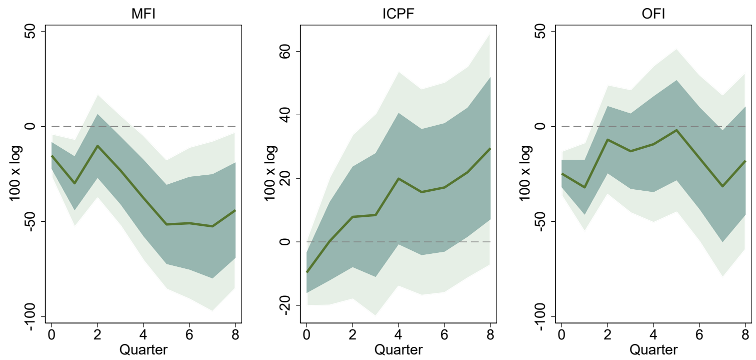


(c) Debt issued by non-financial corporations

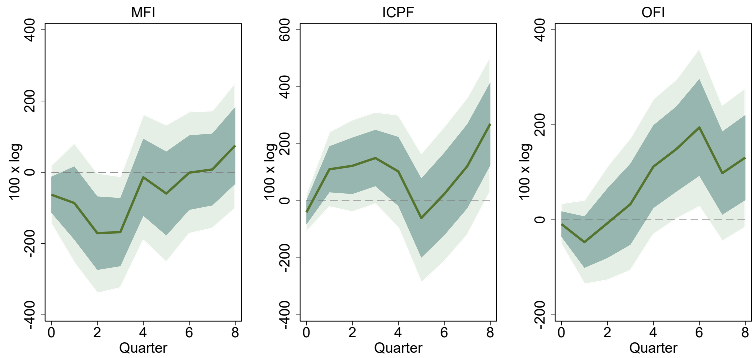


(d) Debt issued by governments

Figure A2
Impulse response of holding of emerging market debt holdings (level) to 25 bps long-term rate tightening relative to short rate



(a) Debt issued by all sectors



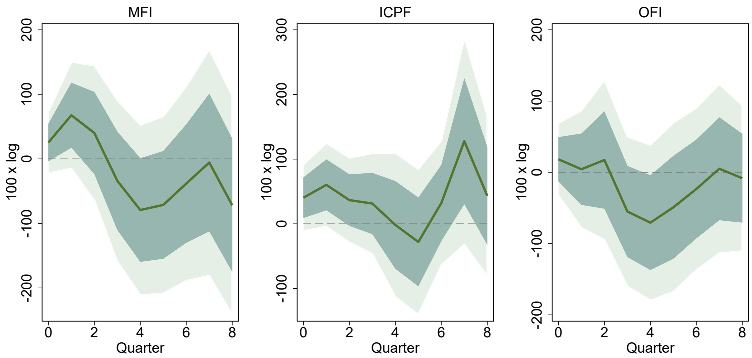
(b) Debt issued by financial corporations

Figure A2 plots quarterly impulse responses of Euro area investors' EME debt holding (market value, issuer outside the Euro Area) to 25 bps monetary policy surprise reflected in the change of long-term interest rate (10-year Bund yield) relative to short-term interest rate (3-month Bund yield). The monetary policy surprise is identified via high-frequency movements in the asset prices around ECB monetary policy event windows (Altavilla et al., 2019). Impulse responses are estimated using the local projection (1) by investor sector (bank+MMF, ICPF, and other financial institutions), and by issuer sector (all sectors, financial corporations, non-financial corporations and government). The control variables include 4 lags of monetary policy shock, country-level variables (inflation, quarterly changes in unemployment rate and industrial production), and lagged changes (for 4 quarters) of the dependent variables. The unit of the y-axis is percentage point. 68% and 90% confidence interval with robust standard error are reported.

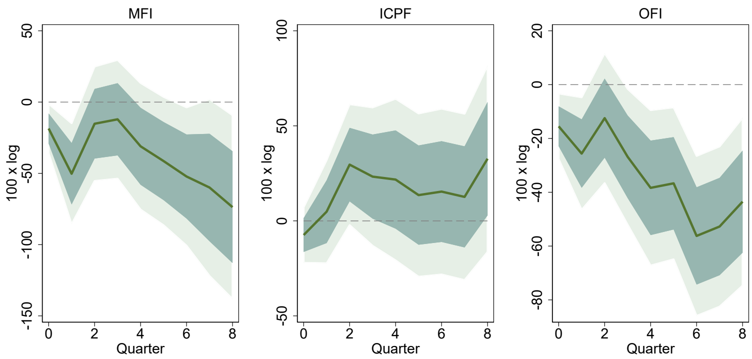
Figure A2

Impulse response of holding of emerging market debt holdings (level) to 25 bps long-term rate tightening relative to short rate (continued)

See the first part of the figure for detailed notes.

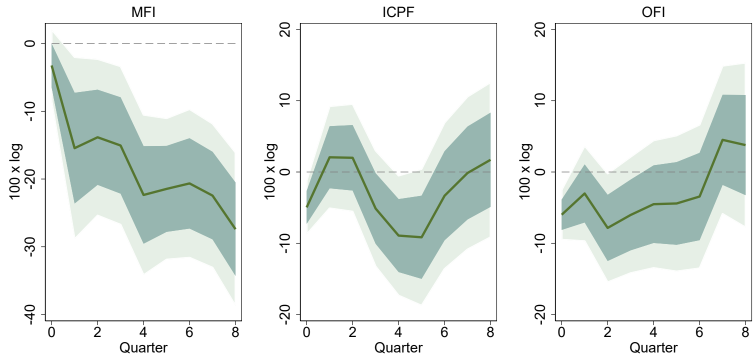


(c) Debt issued by non-financial corporations

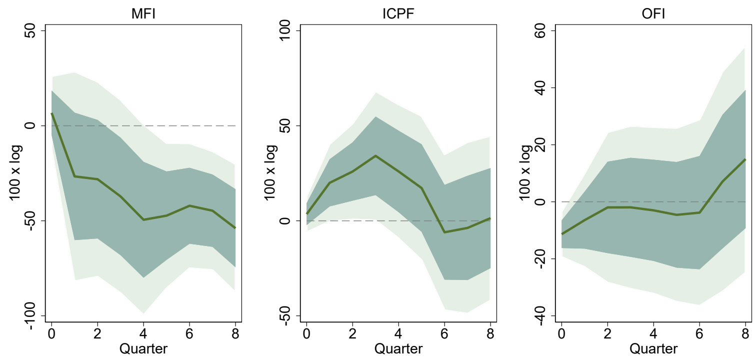


(d) Debt issued by governments

Figure A3
Impulse response of holding of advanced economies debt (level) to 25 bps long-term rate tightening relative to short rate



(a) Debt issued by all sectors

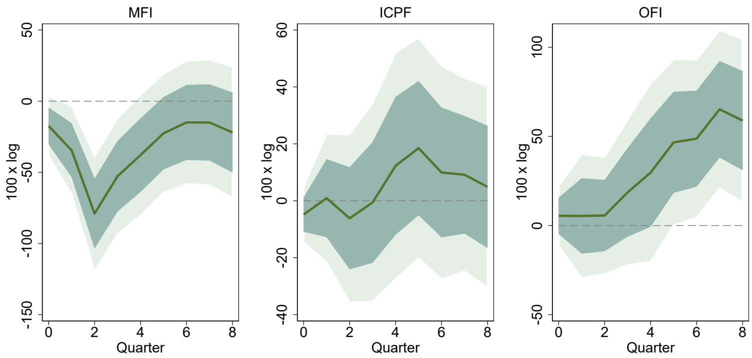


(b) Debt issued by financial corporations

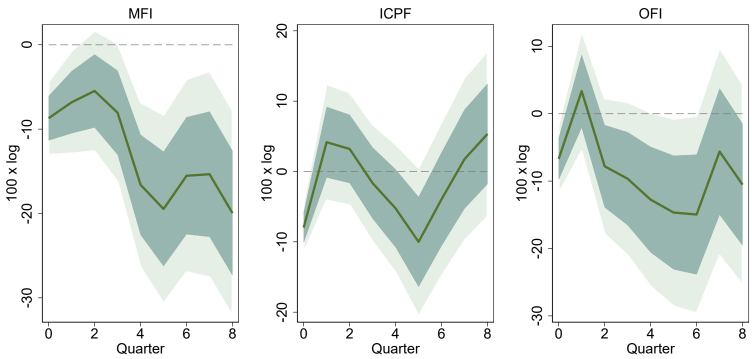
Figure A3 plots quarterly impulse responses of Euro area investors' advanced economies debt holding (market value, issuer outside the Euro Area) to 25 bps monetary policy surprise reflected in the change of long-term interest rate (10-year Bund yield) relative to short-term interest rate (3-month Bund yield). The monetary policy surprise is identified via high-frequency movements in the asset prices around ECB monetary policy event windows (Altavilla et al., 2019). Impulse responses are estimated using the local projection (1) by investor sector (bank+MMF, ICPF, and other financial institutions), and by issuer sector (all sectors, financial corporations, non-financial corporations and government). The control variables include 4 lags of monetary policy shock, country-level variables (inflation, quarterly changes in unemployment rate and industrial production), and lagged changes (for 4 quarters) of the dependent variables. The unit of the y-axis is percentage point. 68% and 90% confidence interval with robust standard error are reported.

Figure A3
Impulse response of holding of advanced economies debt (level) to 25 bps long-term rate tightening relative to short rate (continued)

See the first part of the figure for detailed notes.

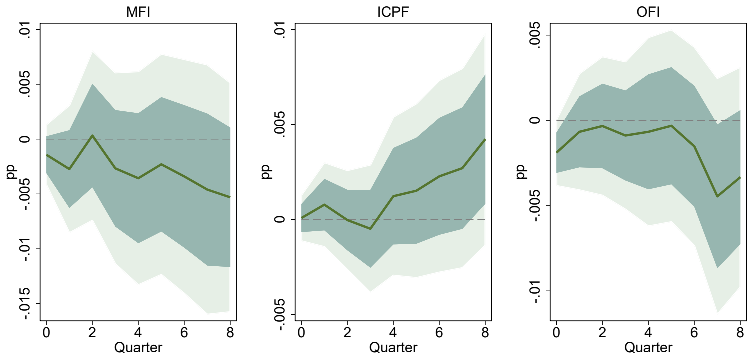


(c) Debt issued by non-financial corporations

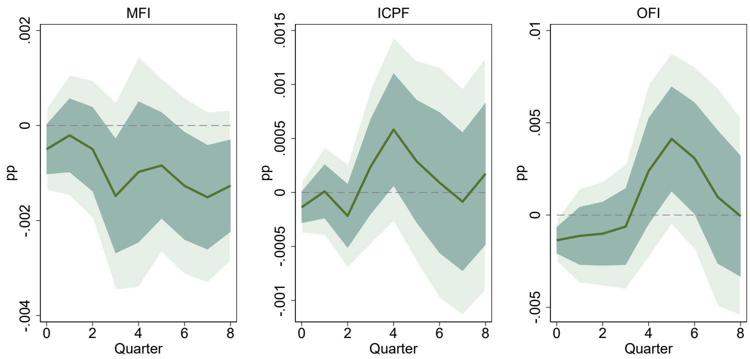


(d) Debt issued by governments

Figure A4
Impulse response of holding of emerging market (inside the euro area, portfolio weight) debt securities to 25 bps long-term rate tightening relative to short rate



(a) Debt issued by all sectors

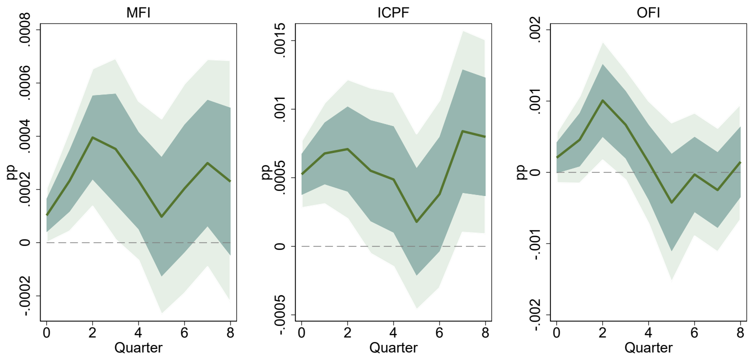


(b) Debt issued by financial corporations

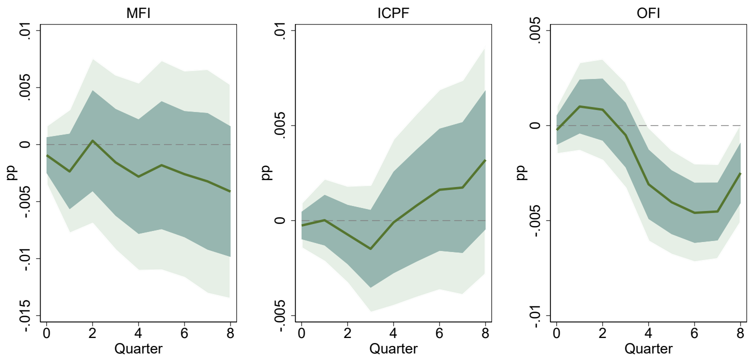
Figure A4 plots quarterly impulse responses of Euro area investors' emerging market debt holding (market value, issuer outside the Euro Area) as share of total market value of securities portfolio to 25 bps monetary policy surprise reflected in the change of long-term interest rate (10-year Bund yield) relative to short-term interest rate (3-month Bund yield). The monetary policy surprise is identified via high-frequency movements in the asset prices around ECB monetary policy event windows (Altavilla et al., 2019). Impulse responses are estimated using the local projection (1) by investor sector (bank+MMF, ICPF, and other financial institutions), and by issuer sector (all sectors, financial corporations, non-financial corporations and government). The control variables include 4 lags of monetary policy shock, country-level variables (inflation, quarterly changes in unemployment rate and industrial production), and lagged changes (for 4 quarters) of the dependent variables. The unit of the y-axis is percentage point. 68% and 90% confidence interval with robust standard error are reported.

Figure A4
Impulse response of holding of emerging markets (inside the euro area, portfolio weight) debt as share of total debt holding to 25 bps long-term rate tightening relative to short rate (continued)

See the first part of the figure for detailed notes.

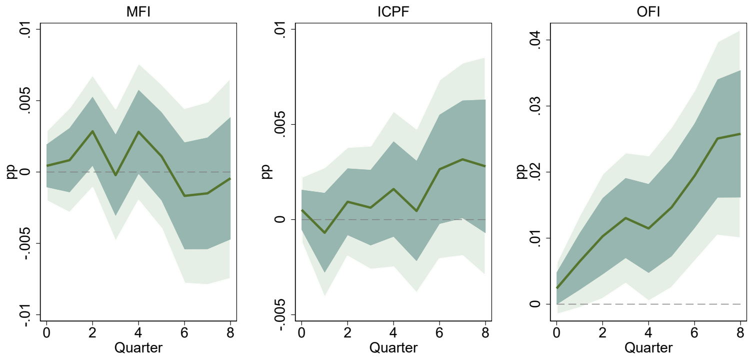


(c) Debt issued by non-financial corporations

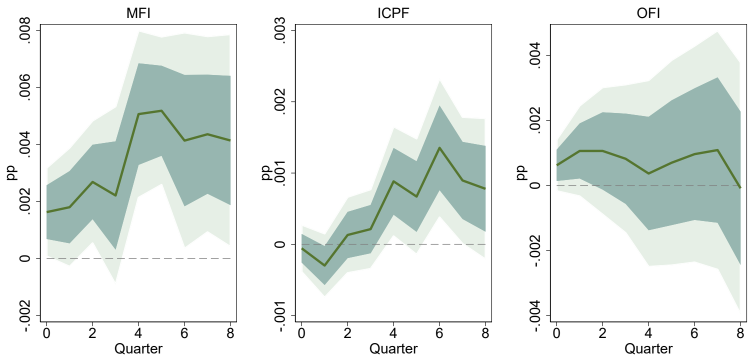


(d) Debt issued by governments

Figure A5
Impulse response of holding of emerging markets (outside the euro area, portfolio weight) debt securities as share of total debt holding to 25 bps long-term rate tightening relative to short rate



(a) Debt issued by all sectors



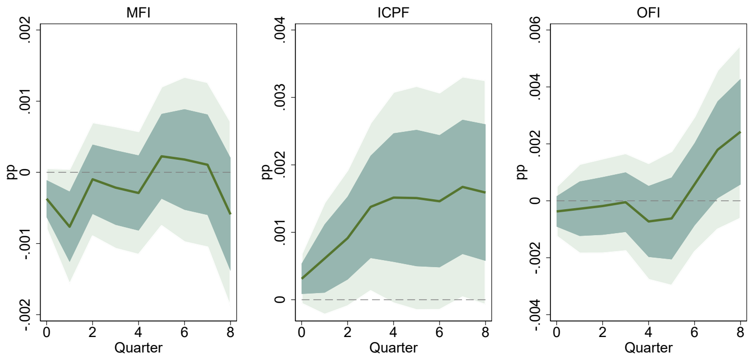
(b) Debt issued by financial corporations

Figure A5 plots quarterly impulse responses of Euro area investors' emerging market debt holding (market value, issuer outside the Euro Area) as share of total market value of securities portfolio to 25 bps monetary policy surprise reflected in the change of long-term interest rate (10-year Bund yield) relative to short-term interest rate (3-month Bund yield). The monetary policy surprise is identified via high-frequency movements in the asset prices around ECB monetary policy event windows (Altavilla et al., 2019). Impulse responses are estimated using the local projection (1) by investor sector (bank+MMF, ICPF, and other financial institutions), and by issuer sector (all sectors, financial corporations, non-financial corporations and government). The control variables include 4 lags of monetary policy shock, country-level variables (inflation, quarterly changes in unemployment rate and industrial production), and lagged changes (for 4 quarters) of the dependent variables. The unit of the y-axis is percentage point. 68% and 90% confidence interval with robust standard error are reported.

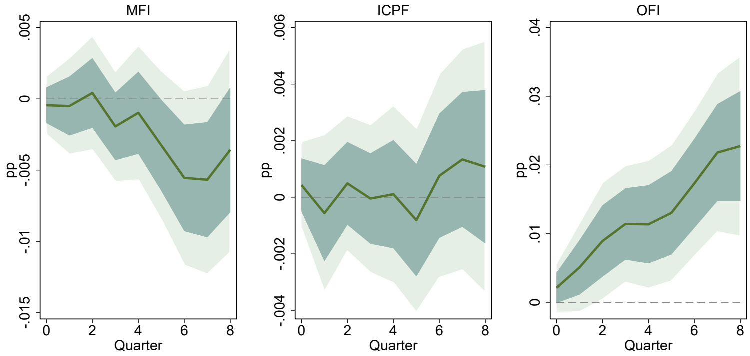
Figure A5

Impulse response of holding of advanced economics debt (portfolio weight) to 25 bps long-term rate tightening relative to short rate (continued)

See the first part of the figure for detailed notes.

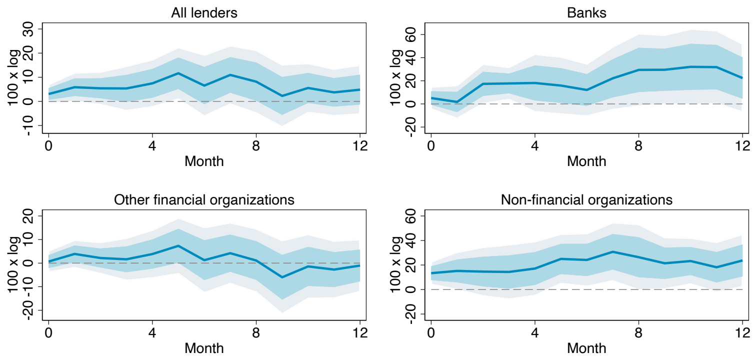


(c) Debt issued by non-financial corporations

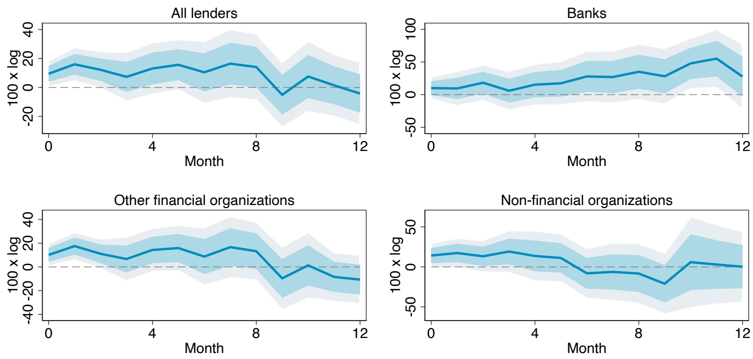


(d) Debt issued by governments

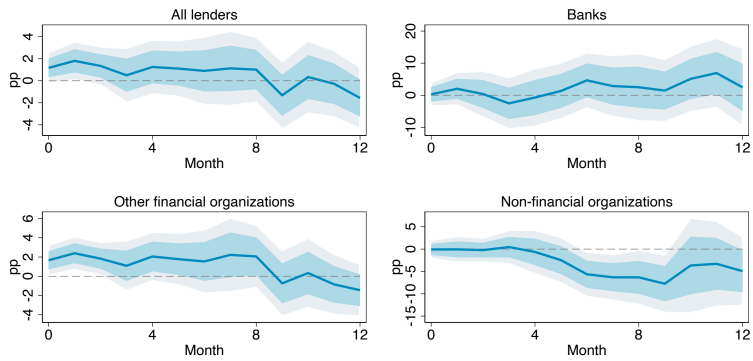
Figure A6
Impulse response of U.S. holding of foreign debt to 25 bps short-rate tightening by the Fed, Nakamura and Steinsson (2018) U.S. monetary policy shocks



(a) Corporate debt, level



(b) Sovereign debt, level



(c) Sovereign debt, portfolio weights

Figure A6 plots monthly impulse responses of U.S. investors' foreign debt holding as share of total debt holding (market value) to 25 bps monetary policy surprise reflected in the short-term U.S. policy interest rate. Panel (a) and (b) reports the impulse responses of the levels of holding and Panel (c) reports foreign sovereign debt holding as a share of total foreign debt holding. The monetary policy surprise is identified via high-frequency price movements of Fed Funds futures around Fed monetary policy event windows as in (Nakamura and Steinsson, 2018). Impulse responses are estimated using the local projection (1) by investor sector (bank+MMF, ICPF, and other financial institutions), and by issuer sector (all sectors, financial corporations, non-financial corporations and government). The control variables include 3 lags of monetary policy shock and lagged changes (for 3 months) of the dependent variables. The unit of the y-axis is percentage point (Panel (c)) and log points (Panel (a) and (b)). 68% and 90% confidence interval with robust standard error are reported.

Table A1

Summary statistics: Euro Area investor holding of EME securities

	MFI		**OFI**		**ICPF**	
	mean	sd	mean	sd	mean	sd
holdings (mkt val, issuer country-sector, millions EUR)	2090.48	(3743.25)	7026.91	(10020.42)	2159.80	(3304.75)
portfolio weight (issuer country-sector, %)	0.02	(0.03)	0.03	(0.05)	0.01	(0.02)
Observations	2565		2579		2571	

(a) Emerging market economies sample

	MFI		**OFI**		**ICPF**	
	mean	sd	mean	sd	mean	sd
holdings (mkt val, issuer country-sector, millions EUR)	75471.49	(155063.95)	66522.76	(128194.56)	60627.16	(136737.70)
portfolio weight (issuer country-sector, %)	0.64	(1.32)	0.32	(0.60)	0.43	(0.97)
Observations	3798		3799		3800	

(b) Advanced economies sample

Note: Table A1 reports portfolio holding of EME securities by Euro Area investor, broken down into investor categories in each set of columns. "MFI" denotes monetary-financial institutions (banks, money market funds). "OFI" denotes investment funds. "ICPF" denotes insurers and pension funds.