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

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Abstract

We re-examine monetary policy spillovers to Emerging Market Economies (EME) in the form of capital flow reversals, using sectoral-level securities holdings data for Euro Area investors. In response to a surprise monetary tightening, active investors such as investment funds re-balance their portfolios away from EME, while more passive, long term investors such as insurance funds and banks exhibit no significant reaction on average. For active investors, the reallocation out of EME appears stronger under synchronized monetary tightening between the Fed and the ECB. However, these investors may even inject more capital to EME securities when the monetary tightening surprises contain positive news about the Euro Area economy. Issuers' monetary-fiscal stability may explain the heterogeneous impact of these spillovers.

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The recent rise in interest rates worldwide has reignited the debate over its implications for Emerging Market Economies (EME). Motivated by this debate, we revisit the old question of whether monetary policy spills over from the center to the periphery. That is, do interest rate hikes in Advanced Economies (AE) trigger capital outflows from EME debt? Based upon novel investor holdings data from Germany, U.S. and the whole Euro Area, we focus on assessing how surprise AE interest rate increases impact the EME holdings of different types of institutional investors.

Our analysis provides three striking sets of results. First, in contrast to conventional wisdom, we find that there is little evidence of a significant overall capital flow reversal, measured by changes in Euro Area investor portfolio weights, out of EME in response to surprise AE interest rate increases. Rather, we find a significant contraction in portfolio allocation to AE non-Euro Area debt securities by these investors. Thus, capital flow reversals appear stronger for AE than EME debt holdings.

Second, when we look within the composition of aggregate portfolio allocations, we find important differences in responses across investor groups. That is, unlike the aggregate portfolio responses, active investors such as investment funds do demonstrate some reversals out of EME securities. However, these responses appear to be offset in the aggregate holdings data by more passive investors such as insurance and pension funds. Therefore, we speculate that the growing importance of these passive investors help explaining the dampened impact on capital flows.

Third, the investor portfolio reallocation out of EME is more pronounced under synchronized monetary tightening from the Fed and the ECB. However, when the monetary surprise conveys positive information about the future of the economy, these investors may even increase their weight on EME debt. Overall, our results have important policy implications: as the exposure of passive, long term investors to EME grows, their sticky responses to AE monetary policy shocks may help moderate EME capital flow cycles.

These findings mostly rely on analyzing public and confidential securities holdings data from Euro Area investors. The securities holdings data provide information on the investor and issuer sectors at quarterly or, in some cases, monthly 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 the heterogenous response of investors to the same interest rate hike. We consider three main investor categories that provide a good spectrum of the heterogeneous variation in asset holding highlighted above. First, insurance companies and pension funds (ICPF) tend to be passive and invest at a longer term maturity. As for the second group, banks and other short term deposit entities such as money market funds, collectively called "Monetary Financial Institutions" (MFI) may also exhibit distinct responses to interest rate hikes compared to other types of sinvestors. As we document below, these institutions tend to rebalance more actively than insurance and pension funds, but are constrained within the borders of their regulation. The third investor group sector is termed "Other Financial Institutions (OFI)" by the ECB. This broad but important group includes investment and mutual funds. This investor group is the least constrained and includes the most active participants in the EME debt market.

We start by using a broad range of data to document some general facts that are relevant to our research question about the EME portfolio composition across investors. These facts help to motivate and interpret the results of the empirical analysis. First, the data show an increase over time in the holdings of EME bonds by longer term, more passive investors, such as banks and ICPFs. Second, EME governments have issued debt with longer maturity. This feature may make the EME bonds more attractive for institutions with a longer investment horizon. Finally, comparing the foreign investor base of Argentina and Chile, we illustrate a natural investor sorting. Specifically, passive investors hold bonds issued by EME with more stable monetary regimes (e.g., Chile) and active investors such as investment funds are willing to be exposed to countries issuing bonds with higher return-risk profiles (e.g., Argentina.) Jointly those patterns suggest that different investor preferences, as dictated by their mandates, may also drive the rebalancing of investor portfolios in response to aggregate monetary policy shocks.

To examine this hypothesis, we next 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 high frequency identified monetary policy shocks.

We first illustrate our empirical procedure using data on German and U.S. investors' total external debt holding shares. As these estimates rely on data at monthly frequencies, they are particularly well suited to study the impact of fast-moving monetary shocks, and therefore provide an initial benchmark. Following a monetary contraction, the point estimates indicate that German investors shift their portfolio away from riskier external securities, such as corporate bonds, and into sovereign bonds, though these estimates are generally insignificant. More importantly, these estimates reflect responses of the aggregate foreign debt holdings and therefore mask substitution effects across different issuer countries.

To zoom in on EME, we use data on Euro Area investors' securities holdings published by the European Central Bank that provides a more granular disaggregation. Specifically, we study the response of quarterly Euro Area investors' portfolio shares of EME debt to a surprise monetary tightening by the ECB. Broadly speaking, we find little evidence indicating a significant decline for investor allocation to either the total EME country debt or its sector components, namely corporate and sovereign issuers. The only exception is a significant decline in the portfolio shares of corporate bonds held by OFI, or investment funds. To determine whether this lack of response reflects a lack of power in our short sample, we re-estimate the responses for the Euro Area investor holdings of Advanced Economies (AE) Non-Euro Area holdings. In contrast to the EME investment response, the bond share holdings for AE debt exhibit more significant declines. Importantly, this evidence shows that Euro Area investor portfolios did respond significantly to monetary policy shocks during the period, albeit away from AE investments, not EME investments.[1]

Some may wonder whether the fact that AE interest rates were at zero for part of our sample contributes to the mild response of the flows. However, the significant response of some of the investors, of the AE portfolio shares and the fact that variation in policy rates has increased significantly in recent years, should make this explanation unlikely. Moreover, during this period, some of the monetary policy changes were through various signals or announcements (e.g., forward guidance) indicating views about the future of

1 This evidence may also suggest that investors substitute across assets issued by countries with higher proximity. For evidence on mutual fund response to monetary policy shocks across country groups see also Nenova (2023).

the economy. Therefore, to study how various aspects of the monetary transmission mechanism may affect spillovers, we test our results under alternative decompositions and combinations of the monetary surprises. In particular, we consider two cases. In the first case, we estimate the effect from a separate shock component that signals central bank information about the future prospects of the economy.[2] In the second case, we analyze the portfolio responses to synchronized tightening between the U.S. Federal Reserve and the European Central Bank. In the case of positive future information shocks, we find again no significant reallocation away from EME debt holdings for passive investors. However, in contrast to our earlier results, we find an increased allocation for investment funds (OFI). Thus, as investors interpret an interest rate hike as signalling positive future prospects, they perceive an improvement of their risk-bearing capacity, leading to an increase in EME exposure. In the case of synchronized policies, by contrast, we find a negative reallocation away from EME debt.

The extent of the spillover could depend on country fundamentals, as investors with different risk tolerance and institutional mandates sort into different issuers. To consider this possibility, we use state-dependent local projection (Ramey and Zubairy, 2018) to uncover heterogeneity in the response of Euro Area investors' EME portfolio allocations to monetary tightening across different issuers. We focus on two dimensions of heterogeneity: monetary effects in the form of currency denomination; and fiscal risk. First, monetary regimes could play a role. Issuers in the same currency union (EME in the Euro Area or pegged to the Euro) tend to face a more stable portfolio weight by their investors compared to their non-Euro Area counterparts. Similarly, countries with a lower local currency share of government debt – associated with weaker monetary discipline by theory (Du, Pflueger and Schreger, 2020; Engel and Park, 2022) – suffer a larger drop in investment funds' portfolio weight. Second, the strength of fiscal position helps fend off adverse monetary spillovers through capital flow reversal. Consistent with this prediction, we find that reduction in the portfolio weights is most significant when an issuer country has a high public debt to GDP ratio.

Finally, we conduct a validation exercise to establish our findings' robustness using

2 See Jarociński and Karadi (2020).

confidential securities data of German investors. These data provide a more disaggregated decomposition of the investors' types for a large investor country in the Euro Area. Thus, it allows us to further examine the response of different types of funds based upon the incentives placed upon their managers by their underlying customer base, incentives that we collectively term "mandates." Based upon this disaggregated investor analysis, we find that the significant response at the aggregate level for OFI appears to be driven by the most active, flexible investors such as retail funds and bond-equity mixed funds.

Overall, our results suggest that a combination of three main trends impacts the observed capital flow responses. First, monetary-fiscal stability has increased for a larger group of EME, enabling them to expand their issuance of long term securities. Second, these longer term securities have been increasingly held by long term investors such as insurance and pension funds (ICPF). Third, these investors tend to follow more passive "stickier" portfolio adjustment processes. As such, they help moderate EME capital flow cycles.

The structure of the paper is as follows. Section 1 details the data sources. Section 2 provides some stylized facts that we use to guide our analysis. Section 3 describes our estimation approach while Section 4 reports the baseline results. Section 5 considers alternative types of monetary shocks. Section 6 investigates state-dependent spillovers and Section 7 provides validation of our findings from security-level datasets. Concluding remarks are in Section 8.

Relation to Literature. The issue of monetary spillovers from AE to EME has occupied economists since the Mundellian theory of the trilemma (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)). Most early and recent empirical studies have examined the impact of monetary shocks on EME macro variables. See Rey (2015), Obstfeld and Taylor (2017), Burger and Warnock (2007) or Kalemli-Özcan (2019) and Obstfeld and Zhou (2023) to name a few examples. In contrast to much of this literature, we examine the impact of monetary shocks directly on the investors' portfolios,

disentangling the responses across investor types with different mandates. This approach provides direct evidence on the investor composition of capital flow reversals, if any.[3]

Recent empirical studies have focused on the financial channel and on the role of global investors in 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 delever and reduce their exposure, particularly to assets in the periphery. Clearly, for these arguments to hold, the balance sheet and asset structure of the institutional investors play an important role for the transmission of shocks. Thus, by focusing precisely on the holdings of institutional investors, our evidence can shed light on these arguments.[4]

Other recent studies have examined the financial channel using disaggregated data (see Chari, Dilts Stedman and Lundblad (2020), 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 responses, 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 show that capital flows to EME respond to the US broad dollar index, which they take as a proxy for global financial conditions. As in our analysis, 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. In contrast to these papers, we study the heterogeneous behavior across Euro area investors to various exogenous monetary policy shocks.

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 governments. Faia,

3 A recent contribution by Kearns, Schrimpf and Xia (2023) focuses on bond yields and show that spillovers from U.S. monetary shocks are stronger for advanced economies compared to emerging markets, Our results complete theirs by providing evidence on the quantity side.

4 In a recent contribution, Cerutti and Claessens (2024) show that global synchronization is stronger in prices and returns compared to quantities.

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. For EME Morais et al. (2019*b*) also find that monetary policy changes may not matter much, except for bank loans and other firm level real variables. 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.[5] Finally, Nenova (2023) studies how Euro area and US mutual funds holdings respond to monetary policy shocks. Contrary to those studies, we consider responses across a wide range of debt issuers, both private and public, as well as for a highly disaggregated group of investors.

1. Data

We source data on security holdings statistics across a range of global investors while focusing on the Euro Area with the best data availability. We explore both aggregated time series and granular, security-level data, all with information on investor and issuer sectors, to examine international monetary shock transmission through securities portfolios.

Main dataset: Euro Area security holding at sector level For our main results, we rely on the public version of the Securities Holdings Statistics published by the European Central Bank (henceforth ECB SHS). This data set provides quarterly time series of the market value of security holdings at the issuer country–issuer sector–investor sector level.

We focus on the market value of long-term debt holdings of securities issued by all emerging market and advanced economies reported in the publicly available version. We therefore construct portfolio shares of debt holdings at the issuer country–issuer-sector–investor sector–quarter level.[6] For the issuer sector classification, we consider debt categorized in three groups of issuers: sovereigns, private financial entities, and lastly non-financial corporations. Although the SHS data set reports data on portfolio holdings for over 22 categories of investors, we focus on the three largest categories described earlier,

5 Also see Doornik et al. (2024).

6 For the security-level dataset (the German subset), we perform our analysis at the monthly frequency.

namely, (1) banks and money market funds, so-called "Monetary Financial Institutions" (MFI);[7] (2) insurance companies and pensions funds (ICPF); and (3) other financial institutions (OFI). In the text below, we call the MFI group collectively "banks and MMFs.", or simply "banks" as MMFs do not hold long-term securities. The last investor group, Other Financial Instituions (OFI), includes mutual funds, exchange-traded funds, hedge funds domiciled in the Euro Area and other non-bank financial intermediaries that are neither Banks nor ICPFs.

Supplement: Aggregate data We start our analysis using monthly time series of German and U.S. investors' outward portfolio debt holdings with information on issuer and holder sector. The German data are publicly available in the time-series database maintained by Deutsche Bundesbank. The time series provide total foreign debt exposure without identifying the countries of issuers. The U.S. data come from the Treasury International Capital (TIC) system, Form SLT2F. The monthly frequency of the time series allows us to track monetary policy spillovers at higher frequencies. These data, however, do not distinguish between EME and AE issuers.

Supplement: Security-level data To complement our analysis, we use two confidential monthly micro-level datasets from Deutsche Bundesbank. The first, Securities Holdings Statistics Base plus (SHS-Base plus) (Blaschke et al., 2023)[8] is a security-level, full census of all financial institutions domiciled in Germany. Domestic banks report all assets held on their own balance sheets. Institutions also report securities held in safe custody on behalf of their customers, regardless of the ultimate investors' countries of origin. For expositional convenience, we refer to investors recorded in the SHS-Base plus data as "Germany-based" investors. For each security identified by the International Securities Identification Number (ISIN), information is available for the face value (nominal amount) held, market value as of the reporting date, and the sector classification of the investors.

The second dataset, Investment Funds Statistics Base (IFS Base) (Eiff et al., 2024)[9], records monthly portfolio holdings of all investment companies and public limited investment companies domiciled in Germany. Compared to SHS-Base, which only identifies the

7 We use the sector code `S12T` to exclude central bank holding from our analysis.
8 DOI: 10.12757/SHSBaseplus.05122212.
9 DOI: 10.12757/Bbk.IFSBase.09092312.

sector of a security holder, the granular fund-level dataset provides additional information to allow us to distinguish between different types of investment funds.

Importantly, all of the securities datasets we use have 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 investor 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.[10] As we show later, a large share of EME debt is held by non-investment funds.

Supplement: Issuer country characteristics We source data on issuer countries' characteristics to tighten inference and explore the role of issuer heterogeneity in amplifying or dampening spillovers through foreign debt holding. From national sources and the IMF, we obtain information on CPI inflation, unemployment rate, and industrial production. World Bank's QPSD provides information on the public debt-to-GDP ratio. We combine BIS debt securities statistics and those of Onen, Shin and von Peter (2023) to construct the share of local currency-denominated government debt for each emerging market economy in the ECB SHS dataset.

In the Appendix, we report summary statistics on the ECB SHS data and country-level control variables in Tables A1 and A2.

2. Motivating facts

We start by discussing some recent trends in the portfolio composition of investors that provide insights about their exposure to EME debt and about how their mandates may

10 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.

guide their investment behaviour. These patterns in turn guide our interpretations about the investor rebalancing behaviour in response to the monetary shocks in later sections.

These trends can be seen by examining the portfolio shares of EME securities held by the main investor categories we consider. Figure 1 and Figure 2 present information about the composition of foreign investors for EME long-term debt securities using two different data sets. These sources provide insights based upon different vantage points of investor-issuer behavior. Specifically, Figure 1 reports the EME holdings by Euro Area investors using the SHS-ECB data, while Figure 2 graphs the holdings of EME country securities by all foreign investors using the IMF Coordinated Portfolio Investment Survey (CPIS). In Figure 2, the CPIS covers more investor and issuer countries, while the SHS-ECB data in Figure 1 focuses only on Euro Area investors.

Both cases point to a similar picture – while investment funds hold the largest amount of EME debt for all issuer sectors, the size of holdings by long-term, stable investors such as ICPF and Banks + MMF is also on the rise. Figure 1 indicates that these two sets of investors account for about 40% of all of Euro Area's holding of EME government debt in 2021. Similarly, Figure 2 shows that for all foreign investments into EME debt, insurers and pension funds have been taking on a substantial proportion.

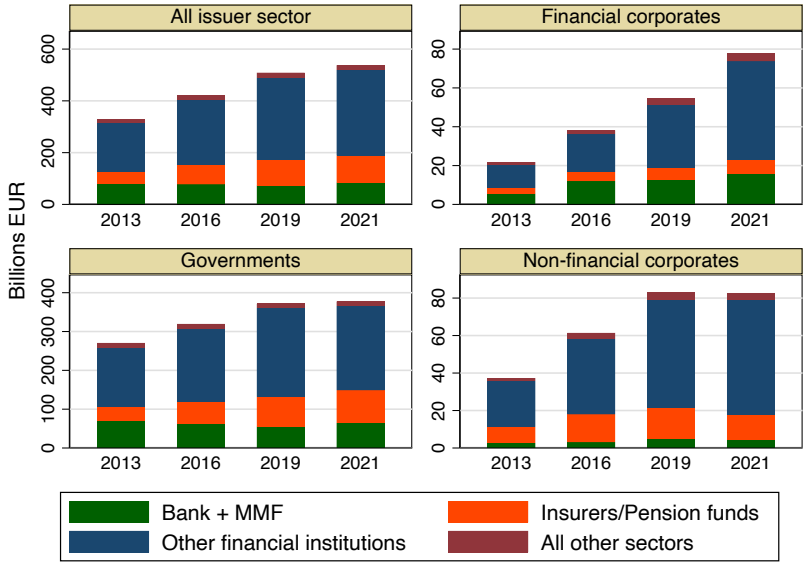
Second, we examine the trends in maturity profile of the foreign investors' holdings in EME debt. Figure 3 depicts the average size-weighted years to maturity of external bonds issued by EME governments.[11] Over the past decades, EME sovereign issuers lengthened the average original maturity of external debt issuance from 8 years (2013) to nearly 16 years (2021). This longer duration of debt reduces the rollover risk to issuers brought by short-term foreign interest rate hikes.[12] Although we do not have global data on maturity breakdown by investor holdings, we conjecture that these securities are also likely to be attractive to long term investors, such as banks and insurance and pensions funds.[13] One approach would be to analyze the effects on asset prices from monetary shocks directly.

11 We construct the time series by aggregating bond-level issuance from Bloomberg covering 1592 government bonds issued by 52 emerging market economies.

12 Micic (2017) makes similar observations.

13 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. Zhou (2024) shows that among German investors, insurance companies and pension funds hold a large share of their EME sovereign debt portfolio in long-term securities.

Figure 1
Euro Area Investor Holdings of Emerging Market Debt by Issuer Sector



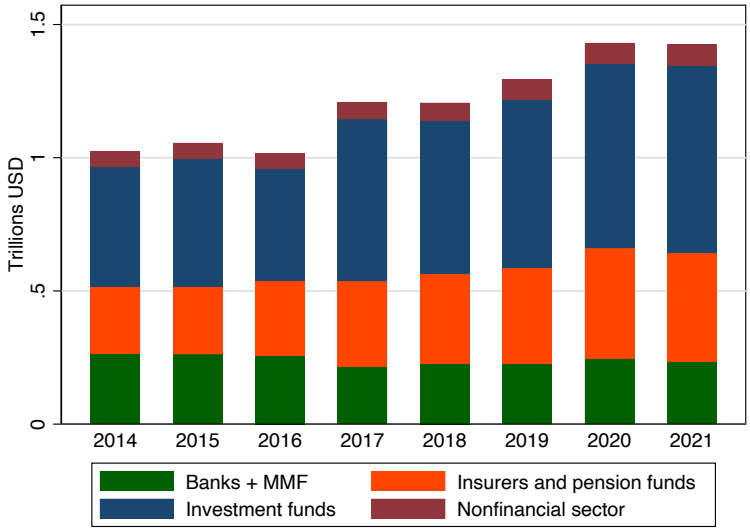
Source: ECB Securities Holding Statistics

Note: Figure 1 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. The"all other sectors" group includes 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.

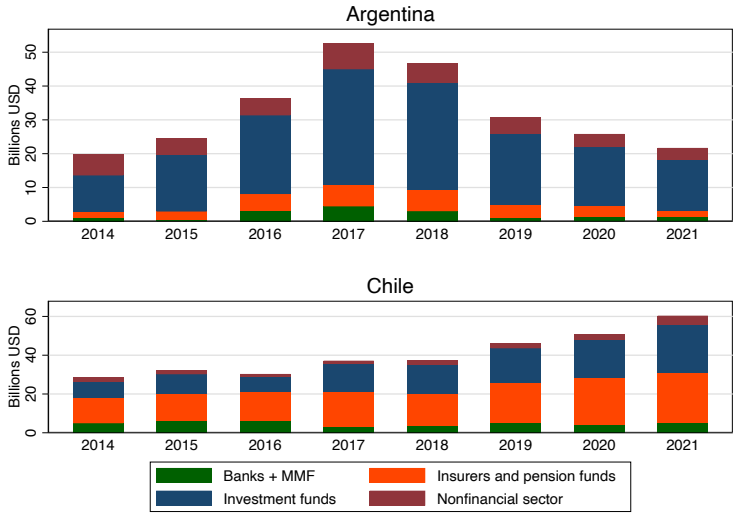
For example, Abbassi et al. (2016) use German securities data based on bank holdings. However, below we base our main analysis on public data on Euro holdings, leaving the interesting effects on asset prices for future research.

The shifts in the foreign investor profile are not uniform across EME issuers, however. Panel (b) of Figure 2 compares the foreign investor base of long-term debt issued by Argentina and Chile. For Chile, the share of holdings by insurance and pension funds exceeds those 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)). These patterns suggest a natural sorting of debt holdings across investor groups based upon these characteristics. That is, slower-to-adjust investor groups, such as banks and insurance/pensions, tend to hold securities from countries with more stable monetary regimes or inflation targeters, while investment funds (OFI) are more willing to be exposed to issuers of riskier bonds with high returns.

Figure 2
EME exposure to heterogeneous foreign investors



(a) All emerging markets

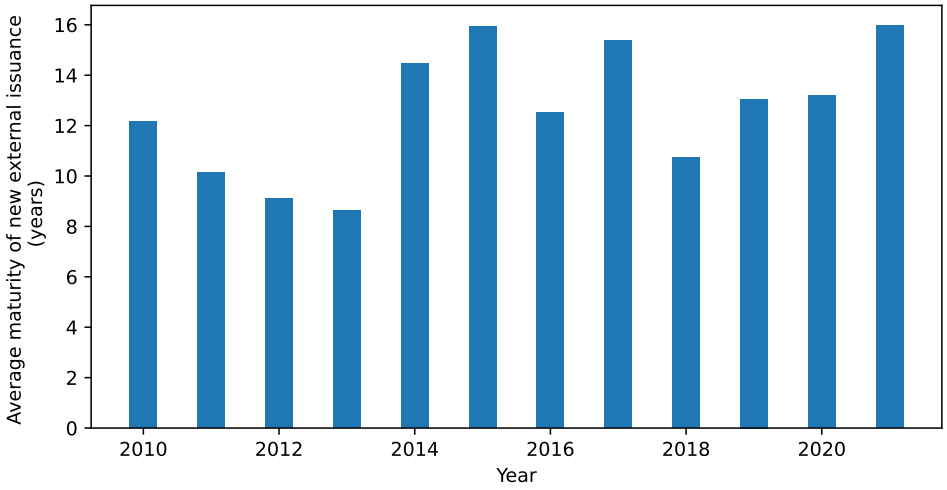


(b) Country heterogeneity: an illustration

Source: IMF Coordinated Portfolio Investment Survey

Note: Figure 2 illustrate the foreign investor base of EME debt using the 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) focuses on the differences in investor base for countries with varying country fundamentals, using Chile and Argentina as case studies.

Figure 3
Shifting maturity profile of emerging market sovereign debt



Source: Bloomberg

Note: Figure 3 illustrates the evolution of EME government debt risk profile over the past decade. For each year from 2010 to 2021, the figure reports the (size-weighted) average years to maturity for 1592 new government bonds issued by 52 EMEs. See Zhou (2024) for the list of countries.

3. Empirical strategy

As suggested by our stylized facts above, the heterogeneity in investor demand and the changing nature of EME risk may impact the foreign monetary policy spillovers through differences in portfolio holding adjustments across these groups. We therefore investigate this possibility by estimating the responses of investor portfolio shares of EME bond holdings. For this purpose, we use panel local projection estimation of these portfolio shares in response to identified high frequency monetary policy shocks (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). Following this literature, we primarily focus on the response of portfolio shares.

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. As shown in Avdjiev, Burger and Hardy (2024), the size and sophistication of domestic financial markets of EME have grown over time. Moreover, bonds issued in foreign markets only capture part of the debt issued by a country's sectors. For example, it leaves out

bank debt and debt held by domestic investors. On the importance of these effects, see for example, Avdjiev et al. (2022), Fang, Hardy and Lewis (2023), and Morais et al. (2019*a*). We leave the question of the relative importance of these factors for future research, focusing here on the role of portfolio allocation.

In this section, we describe and highlight our overall empirical strategy for the ECB SHS data. The results of this estimation are reported in Sections 4 through 6.

Basic estimation approach 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 the issuer country, s denotes the issuing sector, and t is the time period. Our baseline specification then takes the following form:

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

where the indices and variables are described in detail next.

Indices The indices define the differences across the range of issuer countries and sectors, investor groups, and time periods. Specifically, i denotes issuer country (such as Croatia); s denotes issuer sector (all, financial corporations, non-financial corporations and governments); j is the holder sector (MFI, OFI, ICPF); $h \in \{0, \ldots, H\}$ gives 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 be 4 quarters and the maximum horizon of the impulse responses H to be 8 quarters.[14]

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. For the ECB SHS data, the weight is computed by dividing the market value of long-term debt holding over the total market value of (all types of) securities held by sector j.[15]

For other datasets, we construct ω in slightly different ways. As the U.S. TIC data set only contains U.S. holding of long-term foreign securities, we scale holdings of long-term

14 For local projection carried out at monthly frequencies, we set the maximum lag to 3 months and the maximum horizon to 12 months.

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

debt by the sum of foreign debt, equity and investment fund shares. For data provided by the Bundesbank, we fully utilize the availability of debt face (nominal) value, so that we calculate portfolio share with respect to the total face value of the domestic and foreign debt portfolio only.

For the right-hand side variables, 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. $\alpha^j_{i,h}$ denotes the horizon h issuer i country fixed effect for investor j.[16]

$X_{i,t-k}$ is a set of control variables at the country issuer i level. The controls are year-over-year CPI inflation, quarterly changes in unemployment and the industrial production index, and lagged monetary shocks (Δm_{t-k}). Note that k starts from 0, so that the controls include contemporary values, providing a conservative timing assumption. That is, current country fundamentals are allowed to independently affect the holdings rather than through the impact of the monetary policy shocks alone.

High-frequency identified monetary policy shocks and their components We analyze exogenous monetary policy shocks through high-frequency identification of their surprises. For early examples of this approach in the literature, see Romer and Romer (2000), Gürkaynak, Sack and Swanson (2005), Bernanke and Kuttner (2005), Hanson and Stein (2015) among others. Monetary policy surprises are constructed from high frequency movements in interest rates of nearly risk-free market instruments, such as Overnight Indexed Swaps (OIS), in a narrow window around interest rate announcements by the ECB. As such, some have argued that they plausibly rule out reverse causality and other endogeneity concerns in the short run.

The identification assumption following this argument is as follows. As interest rate decisions are completed an hour or two before the decision is announced, the ECB action could not have been in response to changes in financial markets in a sufficiently narrow window of time around the announcement. Therefore any asset price change is caused

16 Altavilla et al. (2019) formally define the shock around a monetary event window as the change in the median price quote from the window 13:25-13:35 before the press release to the median quote in the window 15:40-15:50 after the press conference. When the timing of the press release and the press conference to 14:15 and 14:45 after July 2022, the monetary windows are redefined to 13:55-14:05 and 15:55-16:05, respectively.

by the announcements themselves, rather than vice versa. More formally, the monetary policy shock is denoted, in each month t, by Δm_t, capturing the change in the interest rate within a small time window around the announcement. For our baseline analysis, we use the data series for these shocks constructed for the Euro Area by Altavilla et al. (2019). For analysis conducted at the quarterly frequence, we aggregate the shocks within the quarter and still use the notation Δm_t for simplicity.

To assess the various components of the monetary transmission mechanism we examine a decomposition of the 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 the 3-month OIS rate into two parts: $\Delta m = \Delta^{\text{Pure}} m + \Delta^{\text{Info}} m$, where the pure monetary shocks, $\Delta^{\text{Pure}} m$ and the central bank information shocks $\Delta^{\text{Info}} m$ are identified based on the direction of high-frequency responses of Euro STOXX50 around the monetary policy event windows based on sign restrictions.[17]

In this case, we can rerun the specification in Equation (1) but differentiating between these two types of shocks:

$$\omega^j_{i,s,t+h} - \omega^j_{i,s,t-1} = \alpha^j_{i,h} + \Gamma^{j,h,\text{Pure}}_s \Delta m^{\text{Pure}}_t + \sum_{k=0}^{p} \Theta^{j,h}_{s,k} X_{i,t-k} + \epsilon^j_{i,s,t+h}, \tag{2}$$

$$\omega^j_{i,s,t+h} - \omega^j_{i,s,t-1} = \alpha^j_{i,h} + \Gamma^{j,h,\text{Info}}_s \Delta m^{\text{Info}}_t + \sum_{k=0}^{p} \Theta^{j,h}_{s,k} X_{i,t-k} + \epsilon^j_{i,s,t+h}.$$

Thus, the coefficients, $\Gamma^{j,h,\text{Pure}}_s$ and $\Gamma^{j,h,\text{Info}}_s$ trace out the local projection responses to "pure" and "information" monetary policy shocks, respectively.

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

17 The sign restriction is based on the idea that pure monetary shocks depress equity prices through the discount rate and the cash flow channel. By contrast, 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 $\Delta^{\text{Info}} m$ is still highly debated. We provide some alternative interpretations following the literature below.

macroeconomic variables in periphery countries. 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:

$$\omega^{j}_{i,s,t+h} - \omega^{j}_{i,s,t-1} = \alpha^{j}_{i,h} + \Gamma^{j,h}_{s}\mathbb{1}\{\Delta m^{\text{ECB}}_{t}, \Delta m^{\text{Fed}}_{t} > 0\} + \sum_{k=0}^{p} \Theta^{j,h}_{s,k} X_{i,t-k} + \epsilon^{j}_{i,s,t+h}. \quad (3)$$

where Δm^{*}_{t} for $* = \{\text{ECB}, \text{Fed}\}$, corresponds to the identified monetary policy shocks around the Fed announcements. The indicator function $\mathbb{1}\{\Delta m^{\text{ECB}}_{t}, \Delta m^{\text{Fed}}_{t} > 0\}$ takes the value one if and only if both the ECB and the Fed have tightened monetary policy surprises in the same month t. In this exercise, we also include in $X_{i,t-k}$ two dummy variables $\mathbb{1}\{\Delta m^{\text{ECB}}_{t} > 0\}$ and $\mathbb{1}\{\Delta m^{\text{Fed}}_{t} > 0\}$ to capture the individual impact of past central bank tightening.

For the U.S. we employ the monetary policy shocks constructed by Bauer and Swanson (2023). The identified time series has two advantages over earlier work. First, Bauer and Swanson (2023) cover a larger set of announcement events in order 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 such as through the publication of the Greenbook forecasts.

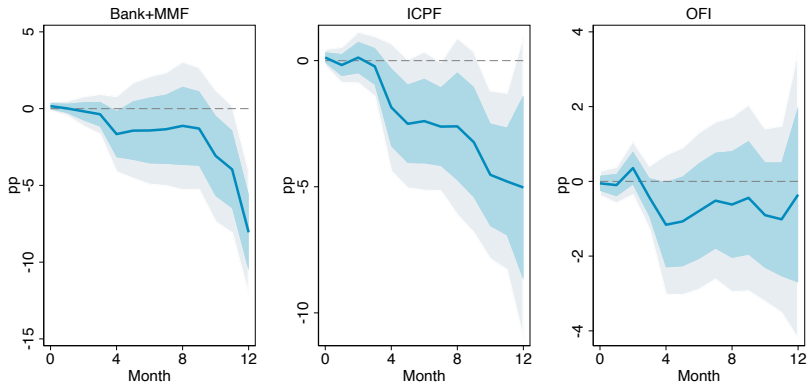
The role of issuer heterogeneity In Section 6, we investigate whether the estimated monetary shock spillover through the investors' security portfolio depends on ex-ante country characteristics. To this end, we follow Ramey and Zubairy (2018) in estimating the following state-dependent local projection:

$$\begin{aligned} \omega^{j}_{i,s,t+h} - \omega^{j}_{i,s,t-1} = (1 - I_{i,t-1}) \cdot [\alpha^{0,j}_{i,h} + \Gamma^{0,j,h}_{s}\Delta m_{t} + \sum_{k=0}^{p} \Theta^{0,j,h}_{s,k} X_{i,t-k}] \\ + (I_{i,t-1}) \cdot [\alpha^{1,j}_{i,h} + \Gamma^{1,j,h}_{s}\Delta m_{t} + \sum_{k=0}^{p} \Theta^{1,j,h}_{s,k} X_{i,t-k}] + \epsilon^{j}_{i,s,t+h}. \end{aligned} \quad (4)$$

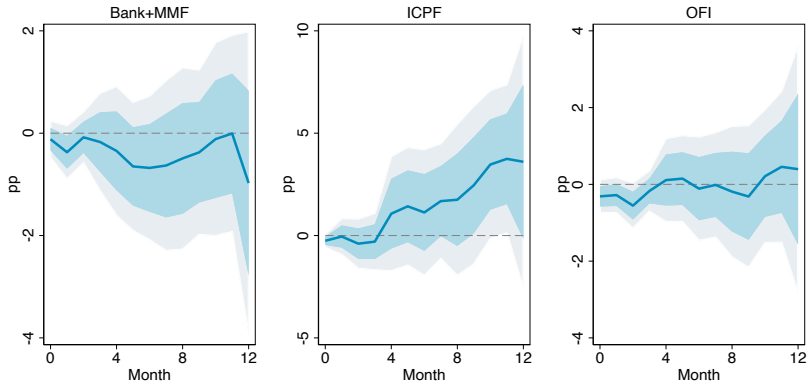
In Equation (4), $I_{i,t}$ is a variable indicating that a country is in a given ex ante state. Below, we consider three versions of this state variable indicating whether the country is: (a) in the Euro Area; (b) has a high share of domestic currency denominated debt; and (c) has a high level of debt-to-GDP. We will report and compare two sets of impulse responses based on this states, given by $\{\Gamma_s^{0,j,h}\}$ and $\{\Gamma_s^{1,j,h}\}$.

A preliminary look: Response of global investors' foreign debt allocation to monetary shocks In the next section, we evaluate the cases described above. Before evaluating these cases, we begin with a preliminary look at global investors' foreign debt portfolio responses to monetary shocks. For this purpose, we adopt a simplified empirical framework, using aggregate time series at the monthly frequency and dropping country-level controls to illustrate our procedure. Figure 4 plots the response of German and U.S. investors' aggregate foreign debt allocation to a 25 basis point surprise monetary tightening by the Fed in the case of the US investors and the ECB in the case of Germany. Despite the high level of data aggregation across countries, we are able to distinguish between investor and issuer sectors. Nevertheless, even with monthly data, we are unable to uncover strong patterns of responses. For example, panels (a) and (b) show that there is weak (statistically insignificant) evidence that following ECB tightening, German investors substitute foreign corporate bonds with foreign government bonds, especially for insurance and pension funds. Panels (c) and (d), however, do not lend further support to this observation once we switch attention to the U.S. data. Overall, therefore, these findings suggest that to understand substitutions by investors across country securities, we require analysis of portfolio holdings at the country-issuer level, a topic we turn to in the next section.

Figure 4
Impulse responses of major global investors' foreign debt allocation to surprise short-rate hikes



(a) German investors, ECB shocks: Debt issued by corporate sector

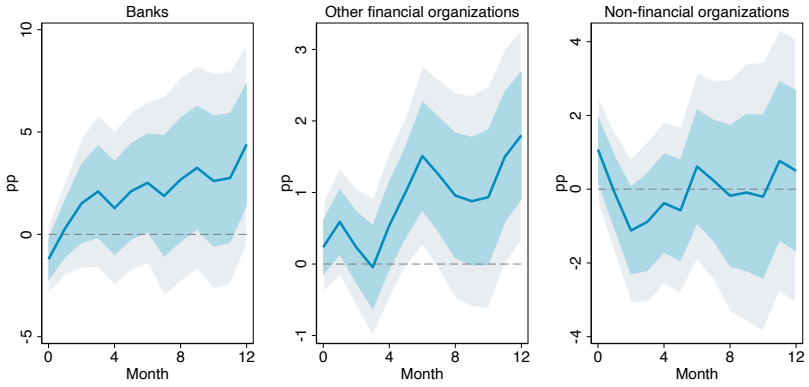


(b) German investors, ECB shocks: Debt issued by government sector

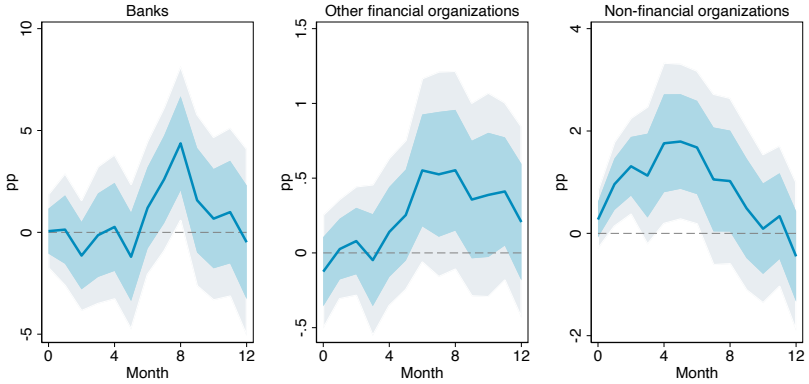
(Panels (c) and (d) are on the next page)

Note: Figure 4 plots impulse responses of Germany-based and U.S.-based investors' foreign debt allocation (including both AE and EME debt) 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) and (Bauer and Swanson, 2023). Impulse responses are estimated using local projection 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. 68% and 90% confidence interval with robust standard error are reported. For Panel (a) and (b), the dependent variable is the total *face value* of external debt issued by an issuer sector held by a German investor sector, scaled by the total size of the debt securities portfolio (also in face value terms). For Panel (c) and (d), the dependent variable is the total market value of sovereign or corporate debt held by a U.S. investor sector, scaled by the total size of the securities portfolio in market values (including debt, investment fund shares and equities).

Figure 4
Impulse responses of major global investors' foreign debt allocation to surprise short-rate hikes (continued)



(c) US investors, Fed shocks: Debt issued by corporate sector



(d) US investors, Fed shocks: Debt issued by government sector

Source: Treasury International Capital system

4. Are Emerging Market Economies Exposed to Monetary Spillovers through Portfolio Reallocation?

Our previous results have shown that, in response to monetary shocks, there is in general unclear evidence that German and U.S. investors reduce the allocation towards foreign debt. However, investors may also substitute securities across countries, in particular between EME and AE issuers. As our focus is on whether EME are particularly exposed to monetary shocks through capital flow reversals, we next examine this possibility with the data set on all Euro Area holdings,i.e., the SHS-ECB, which includes information on

the country of issuance. We break down the securities into two groups, those issued by EME and those issued by AE outside of the euro area.[18] We analyze portfolio responses for AE securities outside the Euro Area in order to focus on foreign advanced economies that may have different monetary policies than the ECB. Later in Section 6, we break down EME issuers into those in or out of the Euro Area.

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, or investment funds.[19] As we described in Section 2, these investors are the most active institutional investors for several reasons.[20] They are subject to prudential constraints less than all other investors and have clientele that often seek for higher yields. By contrast, the shares held by ICPF (insurance and pension funds) and MFI (banks and money market funds) show no significant decline. As previously shown in Figures 3, these two investor groups together also account for a substantial and growing share of EME bonds. Their passive behaviour may therefore contribute to the moderation in the response of the aggregate bond flows.

One concern for the lack of response could be that our data sample is too short so that we do not have sufficient power to find significant responses. Therefore, to better gauge whether the sample size reduces explanatory power for asset substitution estimates across other countries, we re-estimate our local projection specification in Equation (1) focusing on debt holdings from AE countries outside of the euro area. As shown in Figure 6, portfolio shares of AE debt do decline significantly, particularly for shares held by banks and investment funds. Only the insurance and pension fund group appears unresponsive across issuer sectors. Overall, therefore, Euro Area investors appear to

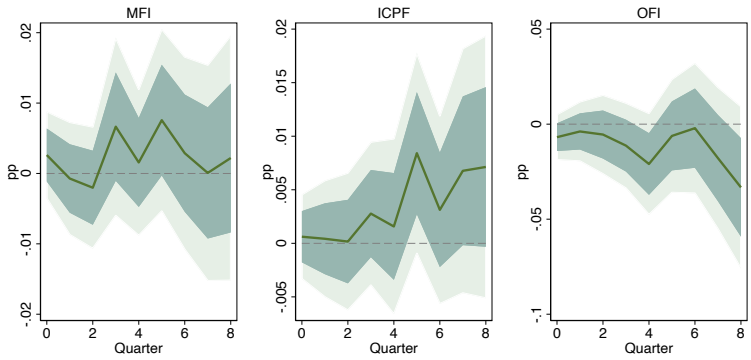
18 The emerging market economies covered in the public SHS-ECB dataset include Argentina, Bulgaria, Brazil, Chile, China, Czech Republic, Croatia, Hungary, Indonesia, India, Latvia, Lithuania, Mexico, Poland, Romania, Russia, Slovenia, Slovakia, Turkey, South Africa. The group of Advanced Economy countries out of the Euro Area included in our sample consists of Australia, Canada, Switzerland, Denmark, United Kingdom, Hong Kong, Japan, South Korea, Norway, Sweden and the U.S..

19 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.

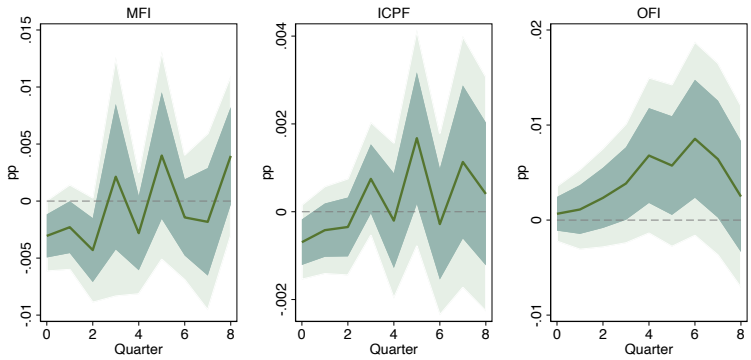
20 Even when we find a significant reduction in the portfolio shares, the magnitude for investor holdings is small. EME debt accounts for 2.6% of the total portfolio size of the investment funds. One reason why these may be small is that we have focused only on securities and not on loans, as noted earlier. Elliott, Meisenzahl and Peydró (2024) show that loans are important even from nonbank lenders.

respond significantly to monetary policy shocks, but the reversal is from AE instead of EME debt securities.

Figure 5
Impulse response of EA emerging market debt allocation to surprise short-rate hikes (portfolio weight)



(a) Debt issued by all sectors

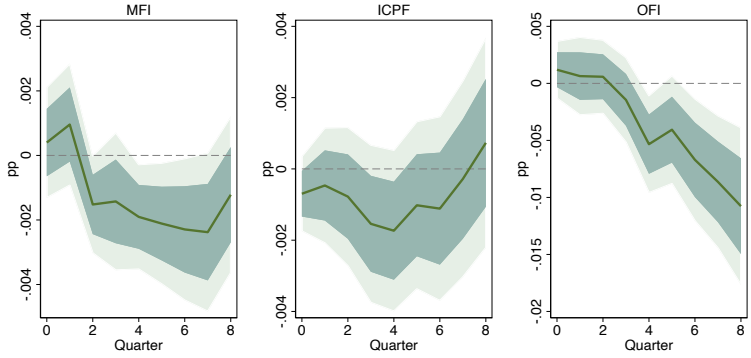


(b) Debt issued by financial corporations

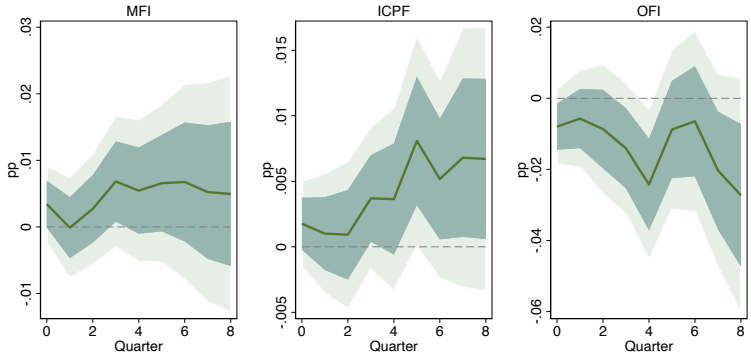
(Panels (c) and (d) are on the next page)

Figure 5 plots quarterly impulse responses of Euro area (EA) 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 EA emerging market debt allocation to surprise short-rate hikes (portfolio weight) (continued)



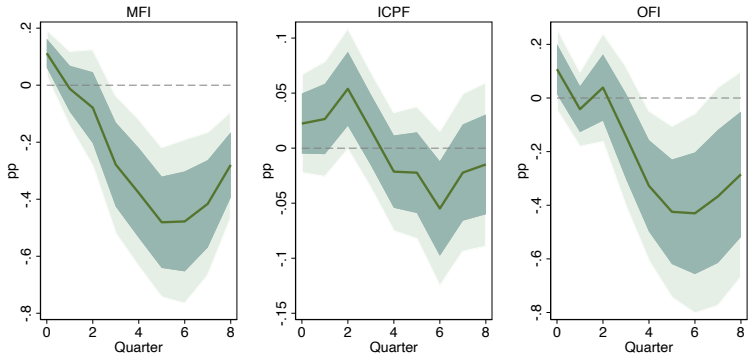
(c) Debt issued by non-financial corporations



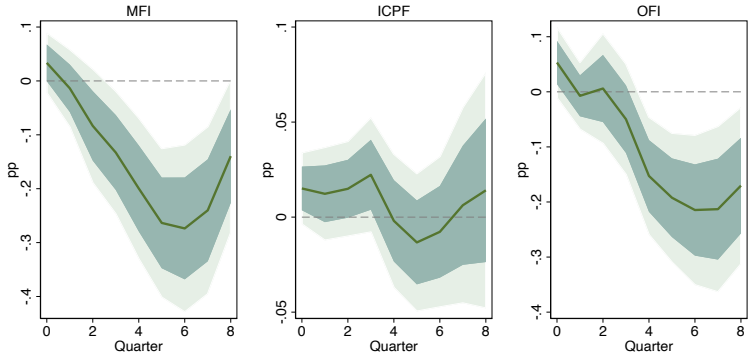
(d) Debt issued by governments

Source: ECB Securities Holdings Statistics

Figure 6
Euro Area investors' non-EA advanced economy debt allocation response to surprise short-rate hikes (portfolio weight)



(a) Debt issued by all sectors

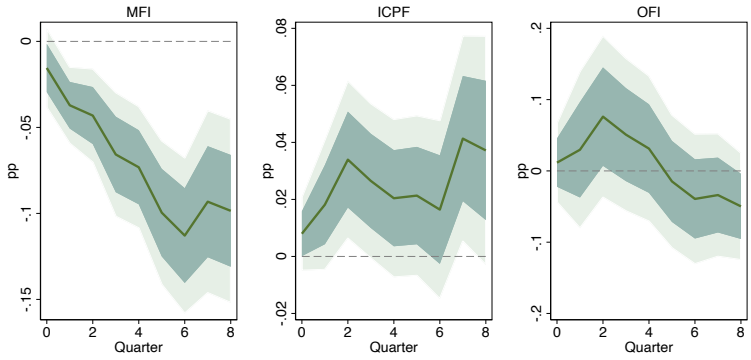


(b) Debt issued by financial corporations

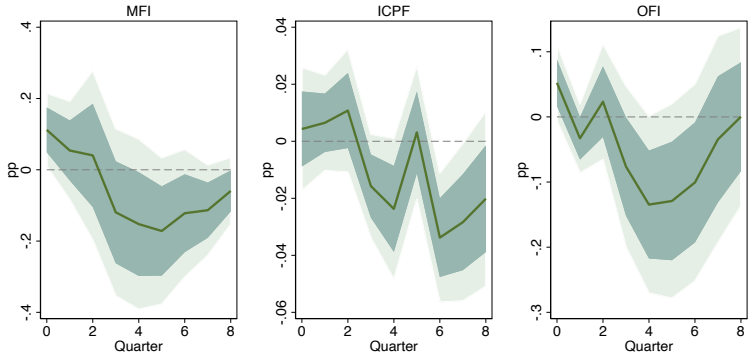
(Panel (c) and (d) are on the next page.)

Figure 6 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 6
Euro Area investors' non-EA advanced economy debt allocation response to surprise short-rate hikes (portfolio weight) (continued)



(c) Debt issued by non-financial corporations



(d) Debt issued by governments

Source: ECB Securities Holdings Statistics

5. Portfolio responses to alternative monetary shocks

The analysis above suggests that monetary policy spillovers from Euro Area investors to EME debt are relatively muted, in contrast to earlier literature. While there are some declines in foreign debt holdings, these declines are most significant for AE issuers, not EME issuers. However, these changes represent responses to short term interest rates over a sample period when interest rates were at zero for part of the time. Therefore, a natural question is whether the lack of response reflects this zero lower bound.

To consider this possibility and to study how various aspects of the monetary transmission mechanism may affect the spillovers, we test our results under alternative decompositions and combinations of the monetary surprises. In particular, we focus on two aspects.

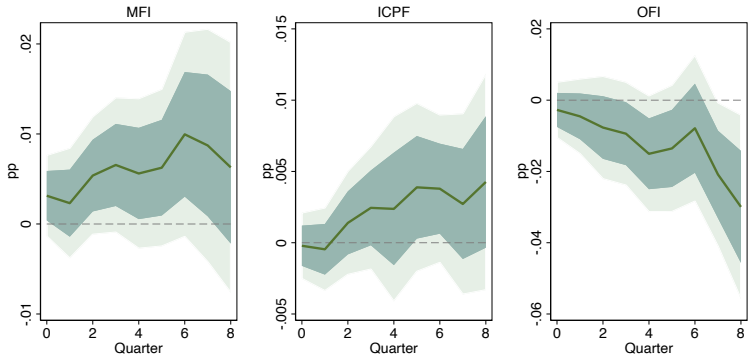
First, we examine the responses to the monetary surprise component that conveys central bank information to market participants. During times when the interest rate is near zero, the role of communication and signalling acquires even more importance than other times and thus may heighten the spillovers. Second, major central banks tightened their monetary policy stance in lockstep during the recent inflation surge, giving rise to the concern that the interaction of multiple monetary shocks could have amplified spillovers compared to surprises coming from a single central bank (see for instance Obstfeld (2022) and Caldara et al. (2023)).

We examine both of these possibilities below: first, with monetary policy shocks decomposed according to information content; and second, with policy shocks that are synchronized across central banks.

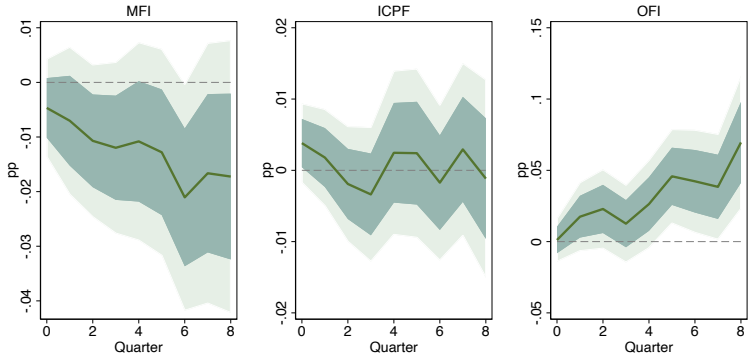
Central bank information shocks and pure monetary shocks So far, we have treated monetary shocks as unexpected changes in the interest rate that impacts the borrowing and lending price between issuers and investors; that is, as a "pure" monetary shock. However, the fact that the central bank deems the 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 7 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), as in Equation (2). As these panels show, investment funds, captured in the OFI group, exhibit stark difference in their reallocation pattern. They allocate less to EME government bonds upon a pure monetary tightening depicted in Figure 7 Panel (a), while a monetary tightening that comoves positively with the stock market increases the portfolio weight as seen in Figure 7 Panel (b).

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) suggest that such shocks may reflect Fed responses 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

Figure 7
Impulse response of EA emerging market government debt allocation (portfolio weights) to identified central bank information shocks and pure monetary shocks



(a) Pure monetary shocks



(b) Central bank information shocks

Source: ECB Securities Holdings Statistics

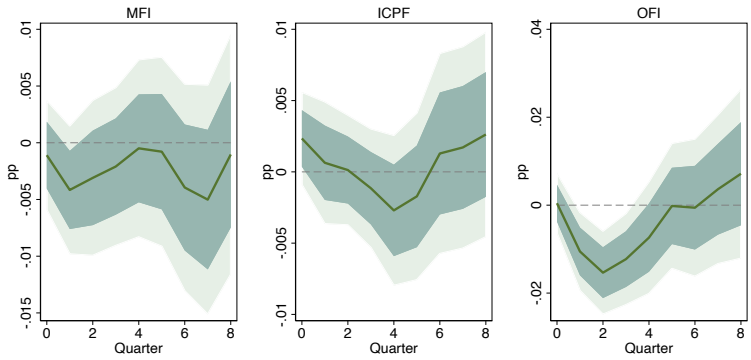
Figure 7 plots impulse responses of Euro Area investors' EME government debt holding (market value) as share of total market value of securities portfolio to a 25bps increase in pure monetary policy shocks (Panel (a)) and central bank information shocks (Panel (b)). We decompose 3-month OIS rate surprises 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.

funds respond to a positive surprise in the information content of ECB tightening by expanding, rather than reducing their risk-bearing capacity.

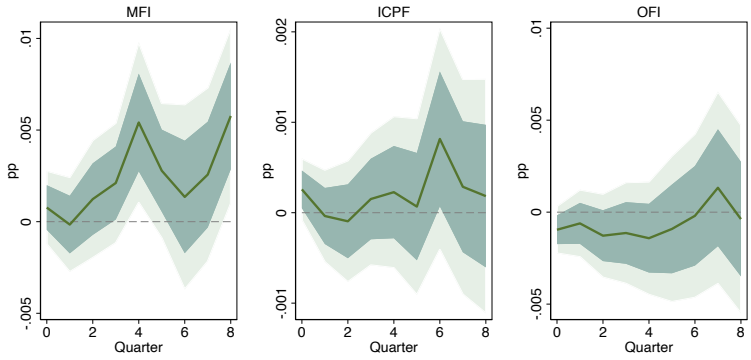
Synchronized policy shocks and spillovers. Another perspective is that spillovers to EME may be stronger when central banks take coordinated actions. By triggering a synchronized rise in interest rate across central banks around the world, the worldwide

increase in inflation may heighten 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) based on coordinated Fed and ECB monetary policy surprises.

Figure 8
Impulse response of EA emerging market debt allocation (portfolio weights) to synchronized policy tightening



(a) Debt issued by all sectors



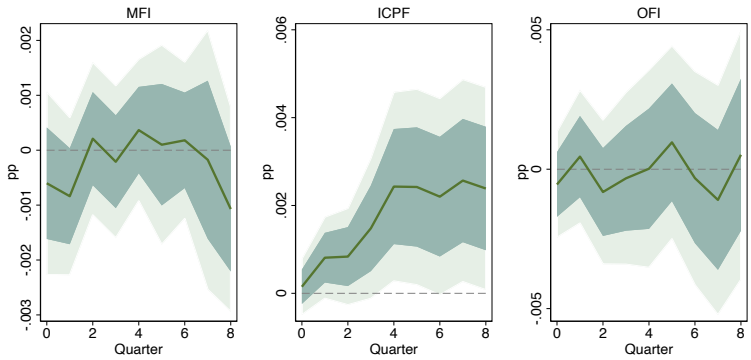
(b) Debt issued by financial corporations

(Panel (c) and (d) are on the next page.)

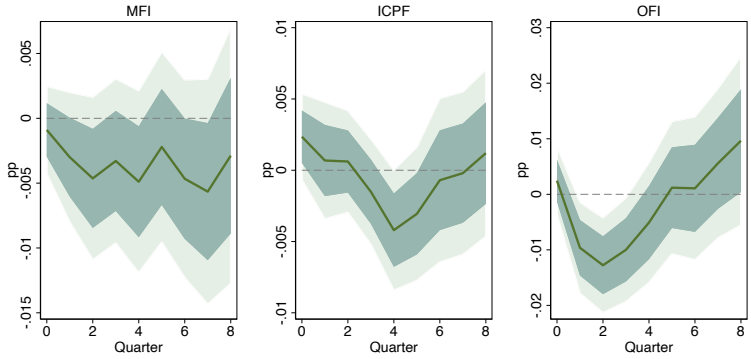
Figure 8 plots impulse responses of Euro Area investors' EME debt holding (market value) as share of total market value of securities portfolio, when both the Fed and the ECB surprisingly tighten monetary policy. The monetary policy surprise is identified via high-frequency movements in the asset prices around ECB and Fed's monetary policy event windows (Altavilla et al., 2019; Bauer and Swanson, 2023). Impulse responses are estimated using the local projection (3) 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 Δm_t with an indicator function $\mathbb{1}\{\Delta m_t^{\text{ECB}} > 0, \Delta m_t^{\text{Fed}} > 0\}$, where m 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 indicator variable $\mathbb{1}\{\Delta m_t^{\text{ECB}} > 0\}$ and $\mathbb{1}\{\Delta m_t^{\text{Fed}} > 0\}$, 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 8
Impulse response of EA emerging market debt allocation (portfolio weights) to synchronized policy tightening (continued)

See the first part of the figure for detailed notes.



(c) Debt issued by non-financial corporations



(d) Debt issued by governments

Source: ECB Securities Holdings Statistics

Figure 8 shows that as before, investment funds (OFI) significantly reduce their holdings, particularly those of sovereigns. However the decline is now significant at shorter horizons. This pattern suggests that part of the rebalance may be due to an increase in the cost of dollar liabilities, as argued by Bertaut, Bruno and Shin (2023).

In the appendix, we show that the term structure of monetary policy surprises could have distinct implications for Euro Area investors' portfolio allocations in EME. Specifically, Appendix Figure A1 shows that a relative high-frequency identified tightening of the long-term interest rate relative to the short-term rate could lead to an expansion of investment funds' and insurance companies and pension funds' EME portfolio holdings. While we leave the question of the exact transmission mechanism to future research, the information content of long-rate shocks, the relationship between long-term interest

rate innovations and permanent monetary shocks, and their positive wealth effect on duration-mismatched institutions such as insurance companies may contribute to this distinct relationship.

6. The Role of Issuer Heterogeneity

Foreign investors' allocation in EME assets is likely to be affected by country characteristics. As we show earlier in Figure 2, country issuers with varying fundamentals face substantially different foreign investor bases. In this section we take a systematic approach, using state-dependent local projection (Equation (4)) to inspect whether the impact of monetary shocks on EME through portfolio investment exhibits heterogeneity across borrowers. For this purpose, we focus on indicators of monetary and fiscal stability.

We begin by measuring monetary stability through two indicators related to exchange rate risk faced by Euro Area investors. For the first indicator, we set $I_{i,t-1}$ in Equation (4) to 1 if an EME is in the Euro Area.[21] Euro Area investors in assets issued by countries in the currency union do not face exchange rate risk since nominal valuations are denominated in euros. This exchange rate risk is substantially different for securities issued by EME outside the Euro Area, as their debt is more likely to be issued in local currency.

As a second indicator, we consider a measure of how much country debt is issued in local currency. Specifically, we construct this indicator function, $I_{i,t-1}$, to take the value of 1 when the country has an above-median share of local currency government debt out of the total debt outstanding issued by the government.[22] This measure could capture the average exchange rate risk faced by euro based investors, especially for investment funds.[23] It can also reflect the risk of surprise inflation for debt dilution according to the theory of currency choice in sovereign debt. Ottonello and Perez (2019), Du, Pflueger and Schreger (2020) and Engel and Park (2022) show that foreign currency borrowing could

21 In this exercise, we also classify Bulgaria inside the Euro Area due to its currency peg.

22 The median is taken over the entire estimating sample. Our results are virtually unchanged if we take the median over each quarter instead.

23 Zhou (2024) shows that banks, insurance companies and pension funds in Germany hold a tiny share of local currency EME sovereign debt.

serve as a commitment device for issuer governments that are prone to inflate away local currency debt.

We also consider a third indicator that is motivated by considerations of fiscal solvency risk. For this measure, we explore the potential role of fiscal vulnerability by setting $I_{i,t-1}$ to 1 if a country has an above-median public debt to GDP ratio.

Figure 9 reports the results for the first measure of $I_{i,t-1}$, indicating whether EME issuers are in the Euro Area or not. Investment funds (OFI) in the Euro Area seem to reallocate away from EME countries, particularly those not in the currency union. By contrast, passive investors in the form of banks (MFI) and particularly insurance and pensions (ICPF) initially maintain a stable weight after monetary shocks, but after a lag of about 4 quarters, step into non-Euro Area issuers and away from Euro Area issuers.

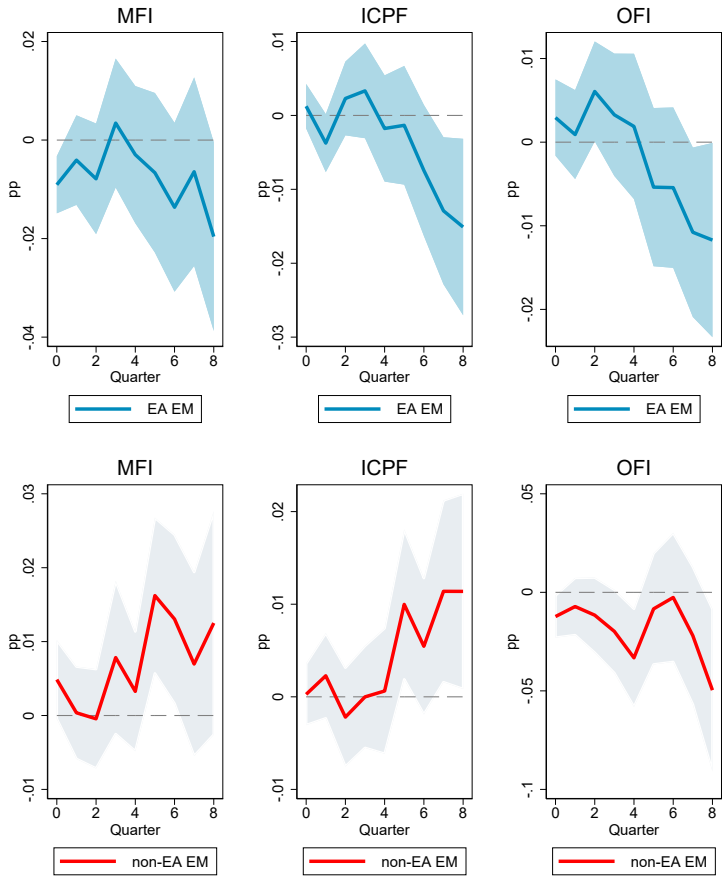
Figure 10 reports the results for the local currency share indicator in Panel (a) and for the public debt-to-GDP indicator in Panel (b). Active investors such as investment funds reduce portfolio weights on countries with a lower share of local currency debt and a higher public debt to GDP ratio. We observe a similar pattern for banks on the fiscal side.

In sum, there is some evidence that monetary shocks could interact with ex-ante country characteristics and result in heterogeneous spillovers across issuers with varying degrees of monetary and fiscal discipline, especially through the portfolio reallocation of active foreign investors such as investment funds.

7. Validation from Security-Level Holding Data

We address potential shortcomings of our baseline analysis through confidential security-level micro data. Three advantages stand out for the micro datasets: First, the data contains information on the face (nominal) value of bond holdings. As a result, the data provides a cleaner separation between actual changes in portfolio holding and valuation effects. Second, both micro datasets (SHS-Base plus and IFS Base) are available at the monthly frequency. Therefore, they can act as a powerful complement to our baseline analysis, by providing more statistical power and tracking the impact of monetary shocks

Figure 9
Response to ECB surprise monetary tightening: Regional heterogeneity



Source: ECB Securities Holdings Statistics

Note: Figure 9 plots the impulse responses of Euro Area investors' long-term debt allocation to EME following a 25 bps surprise ECB monetary tightening, separating the responses between debt issued by Euro Area EME and non-Euro Area EME. The estimation follows the Ramey and Zubairy (2018) state-dependent local projection (4). The unit of the y-axis is percentage point. 68% and 90% confidence interval with robust standard error are reported.

on a month to month basis. Finally, the micro datasets contain an even wider range of issuer countries to allow us to check whether our findings generalize.[24]

Figures 11 shows the impulse responses of German investors' EME portfolios in SHS-Base plus using both debt face values in the top panels and portfolio weights in the bottom panels. For this security-level analysis, we focus on sovereign bonds, as those represent the largest share of euro area investor portfolio investors. Nevertheless, we stick to the same investor classification used so far. As shown in the figures, we observe no significant

24 Table A3 provides information on the additional emerging market economies covered by the security-level data. As both the sample of countries and the time dimension expand substantially, we drop country control variables as they are principally used to tighten the confidence intervals.

decline for long-term, passive investors such as the insurance and pensions (ICPF), while the investment funds (OFI) demonstrate the strongest contraction of their EME portfolio.

As these investment funds are the most responsive, a natural question is: who are the investors responsible for these variations? To answer this question, we exploit the more refined break down of investor categories within the IFS Base. Specifically we consider the individual responses to monetary policy surprises by (a) bond funds, (b) mixed (allocation) funds, (c) retail funds and (d) institutional ones.

Figure 12 shows the results using face values in the top and portfolio shares in the bottom panels. In both the face values and the shares, the mixed funds and the retail investors demonstrate the most significant decline in EME holdings. These results are consistent with the view that these institutions tend to service clienteles that require active rebalancing or are more flexible in their investment mandates.

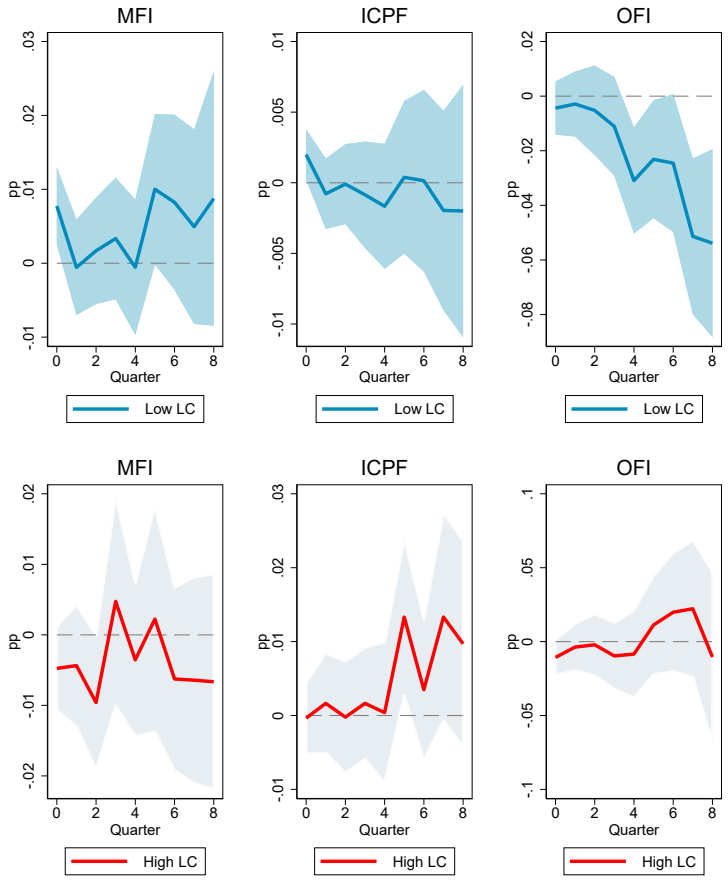
8. Concluding Remarks

We study the monetary spillovers onto foreign securities, with a focus on EME debt, using securities holdings held by different investor types 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, including which investor and asset classes were involved.

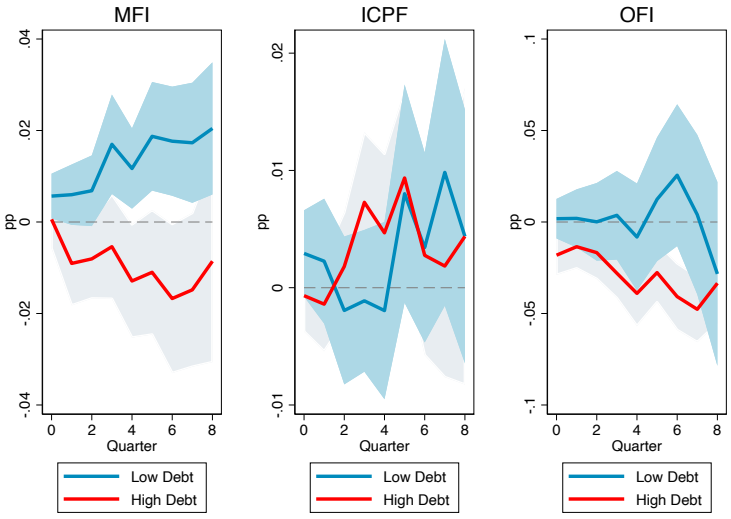
We find no consistent evidence of spillovers to capital flows through EME bond holdings, except for those linked to the changes in the shares held by investment funds (OFI). As a growing literature is showing, these investment funds appear to be the most active investors. Some substitution patterns are 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. Moreover, we find that information shocks induce very different responses 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 10
Response to ECB surprise monetary tightening: Monetary and fiscal position



(a) Local currency government bond share

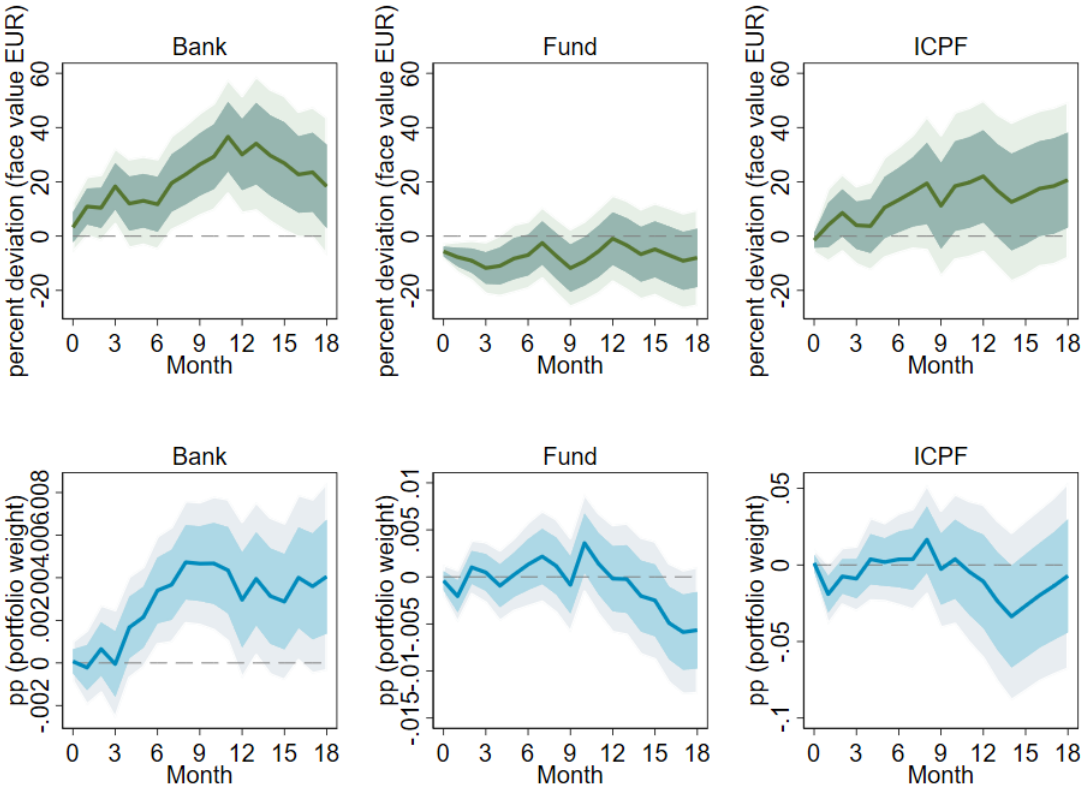


(b) Public debt to GDP

Source: ECB Securities Holdings Statistics

Note: Figure 10 plots the impulse responses of Euro Area investors' long-term debt allocation to EME following a 25 bps surprise ECB monetary tightening, separating the responses between countries with high or local local currency share in their government debt liabilities (Panel (a)), and countries with high or local public debt to GDP ratio (Panel (b). Data on local currency debt share comes from BIS debt securities statistics and Onen, Shin and von Peter (2023). Data on public debt to GDP ratio is obtained from World Bank Quarterly Public Sector Debt database. The estimation follows the Ramey and Zubairy (2018) state-dependent local projection (4). The unit of the y-axis is percentage point. 68% confidence interval with robust standard error is reported.

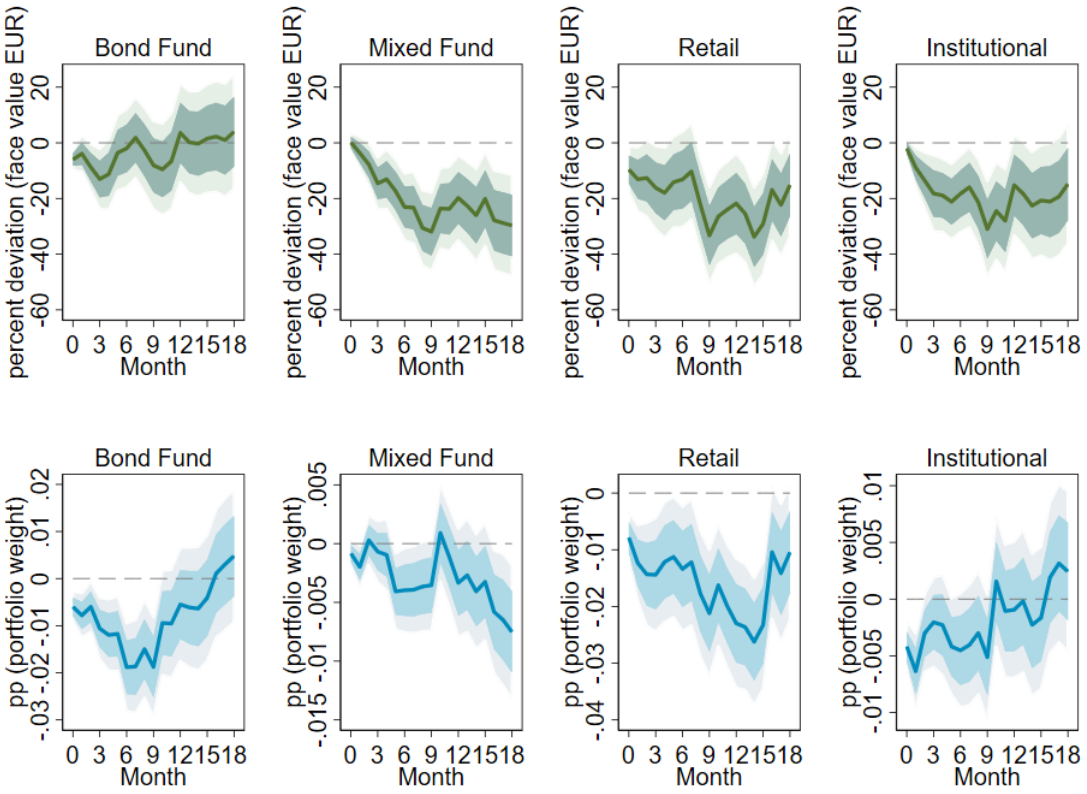
Figure 11
Impulse response of German investors' EME government bonds allocation to monetary surprises



Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Securities Holdings Statistics (SHS-Base plus), 2012M12–2022M6, own calculations.

Note: Figure 11 provides additional evidence on German investors' portfolio allocation to EME government bond using monthly security-level holding data. In the top three panels, the dependent variable is the absolute month to month changes in the face value of holding. The bottom three panels use portfolio weights as the dependent variable. The category "Fund" corresponds to other financial institutions in the baseline ECB data. 68% and 90% confidence interval with robust standard error are reported.

Figure 12
Impulse response of German mutual funds' EME government bonds allocation to monetary surprises, by type of funds



Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Investment Funds Statistics Base, 2012M12–2022M6, own calculations.

Figure 12 plots the impulse responses of German investors' EME debt holding (face value) as share of total market value of securities portfolio, in response to surprise monetary tightening. Investors include all mutual funds and are broken down in Bond Funds, Market Funds, Retail, Institutional. The monetary policy surprise is identified via high-frequency movements in the asset prices around ECB's monetary policy event windows (Altavilla et al., 2019). Impulse responses are estimated using the local projection (1). 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. 68% and 90% confidence interval with robust standard error are reported.

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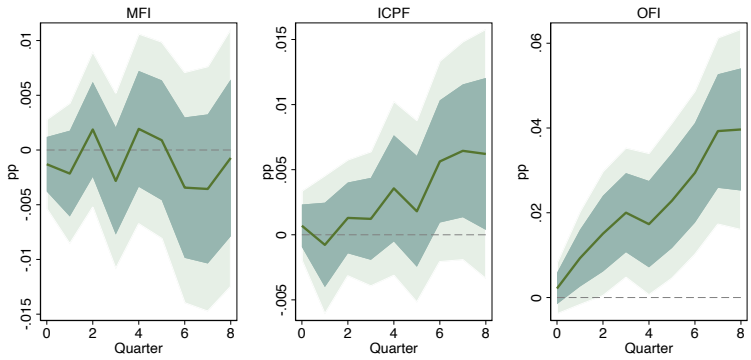
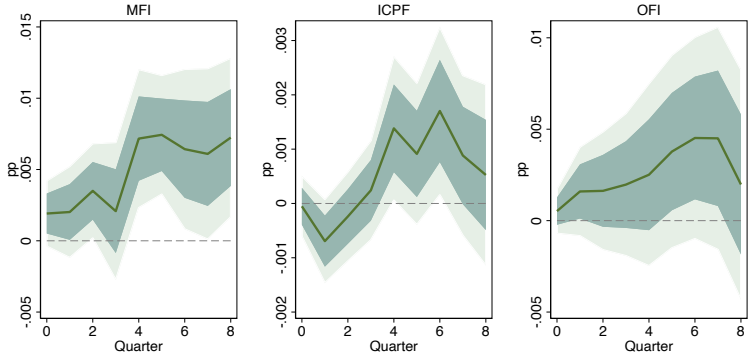
A. Additional Empirical Results

Figure A1
Impulse response of EA Emerging Market debt allocation (portfolio weights) to 25 bps EA long-term rate tightening relative to short rate

Source: ECB Securities Holdings Statistics



(a) Debt issued by all sectors

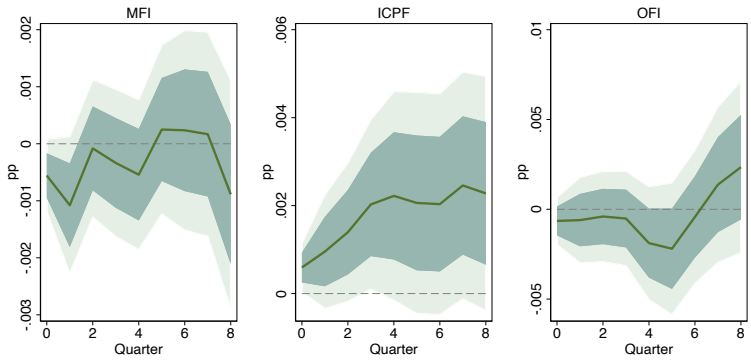


(b) Debt issued by financial corporations

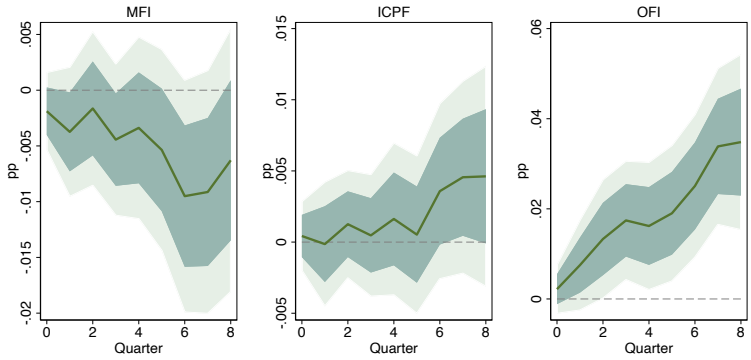
Figure A1 reports impulse responses of Euro Area investors' long-term emerging marekt debt allocation, measured by portfolio weights, towards 25 basis point surprise tightening of 10-year German Bund yield relative to 3-month Bund yield. The impulse responses are estimated following (1) separately for each of the three types of investors. MFI refers to bank and MMF investors. ICPF refers to insurance companies and pension funds, and OFI refers to other financial institutions (investment funds). The control variables include 3 lags of high-frequency identified monetary shocks (Altavilla et al. (2019)), 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 A1
Impulse response of EA Emerging Market debt allocation (portfolio weights) to 25 bps EA 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

Table A1

Summary statistics: Euro Area investor holding of EME securities

Source: ECB Securities Holdings Statistics

	MFI					OFI					ICPF				
	mean	sd	p25	p50	p75	mean	sd	p25	p50	p75	mean	sd	p25	p50	p75
holdings (market value, mil. EUR)	1363.44	(2811.09)	26.21	212.51	1391.16	4350.88	(6921.76)	288.39	1528.11	4184.94	1330.00	(2437.56)	39.52	270.88	1372.52
portfolio weight (%)	0.02	(0.05)	0.00	0.00	0.02	0.04	(0.06)	0.00	0.01	0.04	0.02	(0.03)	0.00	0.00	0.02
Observations	2108					2136					2129				

(a) Emerging market economies sample

	MFI					OFI					ICPF				
	mean	sd	p25	p50	p75	mean	sd	p25	p50	p75	mean	sd	p25	p50	p75
holdings (market value, mil. EUR)	57810.3	(109918.9)	1632.9	7673.3	47265.6	50551.4	(81349.1)	4446.5	13910.3	49161.7	46128.2	(94291.1)	1187.5	9573.5	40044.2
portfolio weight (%)	1.0	(1.9)	0.0	0.1	0.8	0.5	(0.8)	0.0	0.1	0.5	0.7	(1.3)	0.0	0.1	0.5
Observations	2476					2495					2496				

(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.

Table A2

Summary statistics: Controls, shocks, and state indicators

Source: National central banks, International Financial Statistics, World Bank QPSD, Altavilla et al. (2019), Bauer and Swanson (2023).

Variable	Obs	Mean	Std. Dev.	Min	Max	P50
CPI inflation (yoy, %)	698	4.301	7.87	-3.203	55.752	2.625
Unemployment rate change (qoq, %)	666	-.092	.903	-7.82	6.97	-.1
Industrial production index change (qoq, 100*log)	687	.686	5.402	-36.68	32.094	.803
Local currency share of government debt (%)	714	74.339	22.815	17.367	100	78.157
Government debt to GDP ratio (%)	699	52.306	24.72	10.782	129.833	46.739

(a) Emerging market characteristics

Variable	Obs	Mean	Std. Dev.	Min	Max	P50
ECB monetary shocks: 3-month OIS high-frequency response (bps)	34	1.15	2.87	-5.55	11.32	.46
ECB monetary shocks: 10y-3m Bund high-frequency response (bps)	34	-.47	5.25	-16.15	11.2	.2
Bauer-Swanson orthogonalized monetary policy shock (bps)	25	1.91	5.38	-8	11.91	1

(b) Monetary policy shocks

Note: Table A2 reports the summary statistics for country-level characteristics used in the estimation of the local projection (1) and (4) (Panel A), as well as the statistics for the time-series of high-frequency identified monetary policy shocks for both ECB (Altavilla et al., 2019) and the Fed (Bauer and Swanson, 2023). The Bauer and Swanson (2023) U.S. monetary policy shock ends at the end of 2019.

Table A3

List of emerging market economies in the analysis

Country	**In Bundesbank sample**	**In public ECB SHS sample**	**High LC** (2021Q1)	**High public debt** (2021Q1)
Armenia	✓			
Argentina	✓	✓		✓
Azerbaijan	✓			
Bosnia and Herzegovina	✓			
Bulgaria	✓	✓		
Brazil	✓	✓	✓	✓
Belarus	✓			
Chile	✓	✓		
China	✓	✓	✓	
Colombia	✓			
Costa Rica	✓			
Cyprus	✓	✓	✓	✓
Czechia	✓	✓	✓	✓
Dominican Republic	✓			
Ecuador	✓			
Egypt	✓			
Croatia	✓	✓		✓
Hungary	✓	✓	✓	✓
Indonesia	✓	✓		
India	✓	✓	✓	✓
Kazakhstan	✓			
Sri Lanka	✓			
Lithuania	✓	✓	✓	✓
Latvia	✓	✓	✓	✓
Montenegro	✓			
Mexico	✓	✓	✓	
Malaysia	✓			
Peru	✓			
Philippines	✓			
Pakistan	✓			
Poland	✓	✓	✓	✓
Paraguay	✓			
Romania	✓	✓		✓
Serbia	✓			
Russia	✓	✓	✓	
Slovenia	✓	✓	✓	✓
Slovakia	✓	✓	✓	✓
Thailand	✓			
Türkiye	✓	✓		
Ukraine	✓			
Uruguay	✓			
Uzbekistan	✓			
Vietnam	✓			
South Africa	✓	✓	✓	✓

Note: Table reporst the list of emerging market economies included in the confidential Bundesbank sample (column 2) and the public ECB SHS sample (column 3). In column 4 and 5, we illustrate the country split used in the state-dependent local projection (Section 6) by providing a snapshot of countries classified as having a high local currency share of government debt (column 4) and countries having a high public debt to GDP ratio (column 5) as of 2021Q1.