Heterogeneous effects of monetary policy surprises on bond fund flows*

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Abstract

We provide novel empirical evidence on how domestic and foreign monetary policy (MP) surprises influence financial markets through bond funds, using daily MP surprise measures combined with weekly fund flow data. We show that responses to domestic MP surprises vary significantly across countries. Further, foreign MP surprises generate notable cross-border spillovers. Our findings are primarily driven by unexpected policy changes rather than the revealing of new information about central banks' economic assessments. Additionally, contractionary MP surprises cause currency appreciations, which can create balance sheet mismatches and trigger portfolio reallocations. Our findings highlight the role of non-bank financial intermediaries in MP transmission, not only domestically but also globally.
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1 Introduction

Non-bank financial intermediaries (NBFIs) currently hold about half of global financial assets, underscoring their growing role in financial intermediation and capital allocation (FSB, 2023). Investment funds—comprising collective investment schemes and mutual funds—are the fastest-growing segment of the NBFI sector. These funds are highly integrated into international financial markets, exhibiting substantial cross-border linkages and intermediating an increasing share of countries' portfolio liabilities (Schmidt and Yeşin, 2022). The rise of NBFIs necessitates a deeper understanding of their role in propagating monetary policy (MP) surprises, particularly given their growing importance in advanced economies

This paper leverages a multi-country framework to investigate the response of fund flows to MP surprises. We focus on the period from 2010 to 2023 and investigate advanced economies with markedly different currency roles, and financial market dynamics. Using daily MP surprise measures[1] for the Eurozone, Switzerland, the United Kingdom (UK), and the United States (US), coupled with weekly fund flow data, we uncover the heterogeneous responses of bond fund flows to MP surprises. Our analysis distinguishes between the effects of domestic MP surprises—those stemming from the MP decisions of the central bank in the same currency area—and foreign MP surprises, which arise from the policy actions of central banks in other major economies. We also explore the mechanism behind our results and study exchange rate dynamics following MP surprises.

Empirical research on the response of NBFIs to MP surprises has predominantly focused on single-country settings, typically examining how funds domiciled in a given country respond to domestic MP surprises (e.g., Hau and Lai, 2016; Nelson et al., 2018; Xiao, 2020; Giuzio et al., 2021; Ciminelli et al., 2022). While some studies extend the analysis to foreign MP surprises, such as Kaufmann (2023), these remain the exception. To date, no study has adopted a unified multi-country framework that simultaneously analyzes several fund markets in response to multiple central bank MP surprises. As a result, previous findings across countries are difficult to compare, as they rely on different data sources, methodologies, and time periods. Our multi-country dataset addresses this gap by enabling a systematic analysis of MP transmission across several advanced economies, ensuring cross-country comparability through a consistent empirical framework.

Our findings reveal several key patterns. First, fund flows exhibit significant heterogeneity across countries, driven by differences in currency roles and financial systems: contractionary

[1] We measure the MP surprise as the daily change in the prices of three-month interest-rate futures on the date of the central bank's announcement. This measurement enables us to isolate the unexpected component of MP actions, offering an exogenous identification of policy surprises.

domestic MP surprises lead to increased bond flows into Switzerland and the US, while flows to the Eurozone and the UK decline. These results highlight the central role of safe-haven dynamics, as Swiss franc and US dollar-denominated bonds attract inflows during periods of contractionary MP surprises.

Second, fund responses differ by investment strategy: passively managed funds are more sensitive to MP surprises than actively managed funds, reflecting their benchmark-driven nature and limited ability to adjust to market conditions. Third, foreign-domiciled funds respond more quickly and strongly to MP surprises than domestic funds, amplifying the effects of monetary policy shocks across borders. Finally, foreign MP surprises propagate to domestic markets, albeit with smaller magnitudes than domestic shocks, reinforcing the role of global financial integration in amplifying MP transmission.

To understand the mechanisms driving these responses, we explore the decomposition of the surprises into an MP shock component and an information shock component (following Jarociński and Karadi, 2020), and study exchange rate dynamics. We show that the observed fund flow responses are driven predominantly by the MP shock component, rather than the information shock. The MP shock captures policy actions that surprise markets because they were not anticipated, while the information shock reflects new insights about the economic outlook (Jarociński and Karadi, 2020). In addition, exchange rate movements emerge as a key mechanism: contractionary MP surprises often lead to currency appreciations, altering the relative returns on investments denominated in different currencies, and thereby triggering portfolio reallocations.

This paper contributes to the literature in several ways. First, we add to the emerging literature on MP and NBFIs, highlighting the heterogeneous effects of MP across countries, investment strategies, and fund domiciles. Thereby, we provide new insights into the multi-country transmission of MP. Second, we advance the literature on cross-border spillovers. While previous research has focused on spillovers through international banking channels (e.g., Bruno and Shin, 2015a; Bruno and Shin, 2015b; Buch et al., 2019; Hale et al., 2020; Correa et al., 2022), we show that cross-border spillovers also occur through the sizable international linkages of NBFIs.[2] Third, by shedding light on the underlying mechanisms, we contribute to a more precise understanding of the MP transmission via NBFIs, particularly for safe-haven and reserve currencies.

The findings carry important policy implications. The stronger reactions of passive and foreign-domiciled funds to MP surprises suggest potential vulnerabilities in the financial sys-

[2]In particular, (FSB, 2024) shows that cross-border claims of hedge funds, money market funds, and other investment funds are substantial, in aggregate varying between 35 to 80 percent of total assets of these NBFIs.

tem, as these funds may amplify market volatility, as it was the case during the March 2020 turmoil (FSB, 2022). The evidence of cross-border spillovers highlights the need for enhanced coordination among central banks to mitigate unintended global financial disruptions. Moreover, the role of exchange rates in driving fund flows underscores the importance of transparent and predictable MP communication. Lastly, the observed heterogeneity in fund flow responses across countries highlights the need for policymakers to tailor MP to the unique characteristics of their economies and financial markets.

The remainder of the paper is organized as follows: Section 2 discusses MP transmission through NBFIs, while Section 3 describes our data. The empirical approach is described in Section 4 and our main results are presented in Sections 5 and 6. Section **??** explores the underlying mechanisms driving our results. Section 7 illustrates the results of our robustness checks. Section 8 concludes.

2 MP transmission through NBFIs

Traditionally, banks have played a key role in the core functions of financial intermediation, including maturity transformation, liquidity allocation, and credit provision. However, in recent years, NBFIs have increasingly taken on these roles. For instance, NBFIs have financed much of the rise in corporate debt globally in recent years (FSB, 2020). After the global financial crisis, tighter banking regulation, persistently low interest rates, and investors' search for yield, both firms and investors have turned to market-based finance to meet their credit and investment needs, respectively.

Importantly, banks and NBFIs differ substantially in their balance sheet structures—holding different types of assets, with varying levels of liquidity, maturity, and currency denomination. Similarly, their liabilities are structured differently. This diversity in their balance sheets and their regulatory frameworks could lead NBFIs to respond differently than banks to MP surprises, making it essential to understand how these responses affect the transmission of MP to the broader economy (Farhi and Tirole, 2021).[3]

Farhi and Tirole (2021) suggest that, similar to banks, NBFIs' response to MP surprises varies according to the nature of the surprise. During expansionary MP surprises, both banks and NBFIs engage in greater risk-taking. Monetary easing stimulates lending by allowing banks to take advantage of more favorable funding conditions, a mechanism known as the 'bank-lending channel' (e.g., Kashyap and Stein, 2000). At the same time, improved borrower creditworthiness

[3]Interconnections between banks and NBFIs also play a crucial role in the transmission of MP surprises and potential contagion effects. These institutions are linked both domestically and internationally, with funding often flowing in both directions. However, investigating such interconnections is outside the scope of this paper.

supports greater debt issuance, functioning through the 'balance-sheet channel' (e.g., Bernanke and Gertler, 1995). NBFIs could contribute to the transmission of MP via a 'risk-taking channel', whereby they receive inflows from investors who engage in search for yield. As such, NBFIs would be complementing the banks' lending activities and further expand the financial sector. In line with this, Feroli et al. (2014) and Morris and Shin (2015) argue that prolonged periods of MP easing can lead the fund sector - an important part of the NBFIs - to accumulate positions that may cause broader market disruptions when unwound.

However, during contractionary MP surprises, a divergence emerges between the behaviors of banks and NBFIs. Banks typically reduce their credit supply and take on less risk due to regulatory constraints and balance sheet pressures (Bernanke and Gertler, 1995; Drechsler et al., 2017). In turn, NBFIs step in to provide credit and absorb risky assets that banks offload as illustrated in Farhi and Tirole (2021). This leads to an expansion of the NBFI sector as they fulfill roles traditionally played by banks. Farhi and Tirole (2021) emphasize that NBFIs have capitalized on their ability to operate outside traditional regulatory frameworks, allowing them to expand their influence alongside banks. As such, a contractionary MP surprise could unintentionally increase financial fragility by driving deposits into the riskier NBFI sector.

Recent empirical evidence supports these mechanisms. For example, in the Euro area, Giuzio et al. (2021) find that expansionary surprises by the ECB are associated with growth in the investment fund sector. Similarly, Hau and Lai (2016) document that loose monetary conditions lead to outflows from money market funds and inflows into riskier equity funds, reflecting a broader search-for-yield dynamic during periods of low interest rates. Ben Ze'ev et al. (2024) confirm that money market funds in Israel experience inflows while government and corporate bond funds exhibit outflows following a contractionary monetary surprise of the Bank of Israel. For the US, Nelson et al. (2018) find that NBFIs experience asset growth following contractionary Federal Reserve Bank (Fed) surprises, and Xiao (2020) shows that money market fund assets expand during Fed tightening cycles.

Moreover, MP surprises can have significant cross-border effects. This has been well documented for the cross-border bank lending channel (Bruno and Shin, 2015a; Bruno and Shin, 2015b; Rey, 2016; Alper et al., 2020; Correa et al., 2022). Few recent studies document a similar mechanism for NBFIs, with a focus on Fed MP surprises. Specifically, Ciminelli et al. (2022) find that Fed surprises lead to large and persistent outflows from emerging markets. Kaufmann (2023) shows that the investment fund sector in the Euro area expands in response to expansionary Fed surprises.

We contribute to this literature on NBFIs and monetary policy by examining investment

fund flows across different advanced economies under varying MP conditions. This approach allows for a comparative analysis of the dynamics within different monetary regimes, capturing nuances in investor behavior and regulatory environments that single-country studies may overlook. Understanding these dynamics is essential, as the increasing internationalization of financial markets amplifies the potential for policy spillovers, which could exacerbate or mitigate systemic risks across borders.

3 Data

This section describes the data used in the empirical analysis as well as the MP surprise identification. We combine weekly bond fund flows at country level with daily prices of interest rates futures on central banks' policy rates, and monetary policy announcement dates by central banks.

The sample of countries for which we collect fund flows data consists of nine Eurozone countries (Austria, Belgium, France, Germany, Ireland, Italy, the Netherlands, Portugal, and Spain),[4] Switzerland, the UK, and the US. Data on interest rate futures and monetary policy announcements are collected for four central banks: the ECB, the SNB, the BoE, and the Fed. The sample period is from January 2010 to December 2023.

3.1 Fund flows

Our primary data source for fund flows is *EPFR*. Specifically, we use the *Country Flows* dataset for bonds at weekly frequency. This dataset is derived from two fund-level datasets, *Fund Flows* and *Country Allocation*, which EPFR aggregates at the country level. As a result, the *Country Flows* dataset captures total investment flows and positions into each country from all investment funds globally.[5]

Due to their high frequency and short release lags, together with a wide coverage and granular breakdowns, EPFR data are widely used in empirical international macroeconomics and finance (see e.g., Davis and Zlate, 2023; Chari, Dilts Stedman, and Lundblad, 2022; Chari, Dilts-Stedman, and Forbes, 2022a; Forbes et al., 2016; Fratzscher, 2012; and Fratzscher et al., 2012 among many others). One of the important features of the EPFR data is that they capture flows by different types of investment funds (i.e., money market funds, equity funds,

[4] Although Luxembourg is an important domicile country of investment funds, it is not a destination country for investment. In EPFR, country flows to Luxembourg are zero. Therefore, Luxembourg is not included directly. However, country flows originating from funds domiciled in Luxembourg are reflected in other countries' data.

[5] EPFR data has about 90% coverage of the global fund universe as of 2024. EPFR sources the fund-level data either from third party administrators or from funds' reporting and accounting departments. The fund-level data go through layers of internal quality checks before being included in EPFR.

bond funds, mixed funds, hedge funds, and real-estate funds) across the globe with different mandates, regulation, and style.[6] Furthermore, fund flows data are reported net of valuation changes and therefore capture investment decisions. Nevertheless, EPFR data also have some shortcomings (Koepke and Paetzold, 2024). For example, the coverage is not constant over time, i.e., the sample of reporting funds grows over time. In particular, its coverage and quality improves after 2007-2008. Furthermore, country-level flows data may be less precise for some small or emerging market economies. These shortcomings, however, are less relevant in our setting, because our observation period covers 2010 through 2023 and we focus on advanced economies. As such, EPFR data are highly suitable for our purposes due to their high frequency, coverage, breakdowns, and comparability across countries.

As of the end of 2023, the *Country Flows* dataset includes portfolio investment flows by more than 27,000 investment funds, with USD 25.2 trillion assets under management (AUM) globally, in more than 50 countries. Our sample of twelve countries covers approximately 80 percent of the total AUM in the EPFR data. This includes funds domiciled in our sample countries, as well as those from outside our sample, such as Luxembourg and Japan.

The two main variables we focus on are bond flows and bond stocks. Flows refer to net transactions during a given period—purchases minus redemptions of fund shares—while stocks represent AUM, measured as the net asset value of the fund marked to market prices at the end of each period. Flows are net of valuation changes.

EPFR data offers various breakdowns of these two variables through filters. We employ two key breakdowns: the fund's investment strategy (active vs. passive) and the fund's domicile (domestic vs. foreign). First, actively-managed funds aim to outperform their benchmarks through selective securities trading, while passively-managed funds seek to replicate the performance of a specified benchmark index.[7] Consequently, actively- and passively-managed funds may have a different reaction to a MP surprise. Second, the domicile of the fund is the jurisdiction in which the fund is registered. Given their jurisdiction, funds may react to an MP surprise differently due to their different constraint sets in terms of funding and regulation. In our analysis, we differentiate between funds with domestic and foreign domiciles.

Following previous work (Forbes et al., 2015; Chari, Dilts-Stedman, and Forbes, 2022b; Ciminelli et al., 2022), we winsorize the EPFR data to avoid results being driven by extreme outliers. Specifically, we winsorize fund flows and AUM at the country level at the first and the 99th percentile. The tables and figures below provide some statistics of the funds data used in

[6] Pension funds are only indirectly and partially included in EPFR, when their investments are done via an investment fund.

[7] For instance, exchange-traded funds within the passive fund universe track benchmark indices and are traded on stock exchanges.

our analysis. Table 1 shows that fund flows and AUM exhibit a large variation. Fund flows over time and by country range from negative values (USD 305 billion outflows at the 5th percentile) to very large positive values (USD 2 billion inflows at the 95th percentile). Similarly, funds' AUM over time and by country has a large variation ranging from USD 2.8 billion at the 5th percentile to USD 2.2 trillion at the 95th percentile. Interestingly, active funds are bigger than passive funds in terms of average AUM, however, passive funds tend to have larger fund flows than active funds on average. In contrast, foreign-domiciled funds tend to have smaller AUM and smaller flows on average compared to domestically-domiciled funds.

Table 1: Summary statistics of bond fund flows and stocks

		N	***Mean***	***SD***	***p5***	***p95***
Total	*Flows*	8,760	278.82	1,649.45	-308.77	2,070.51
	Stocks	8,760	288,147.50	805,399.70	2,962.54	2,244,969.00
Active	*Flows*	8,760	94.20	1,212.09	-352.78	943.60
	Stocks	8,760	222,696.30	601,856.70	2,608.36	1,882,210.00
Passive	*Flows*	8,760	184.29	954.32	-80.39	913.58
	Stocks	8,760	65,255.00	213,163.80	256.70	344,239.80
Domestic	*Flows*	7,680	252.07	1,505.52	-138.87	2,323.60
	Stocks	7,680	223,486.70	695,698.30	21.84	2,048,311.00
Foreign	*Flows*	8,760	55.43	487.01	-278.11	473.09
	Stocks	8,760	92,138.18	162,287.10	1,689.78	353,774.40

Source: EPFR
Note: This table displays the summary statistics of our fund data. Flows indicate transactions, while stocks indicate Assets under Management (AUM). The mean, standard deviation and the 5th and 95th percentiles are all denoted in USD millions.

Table 2 shows AUM by destination country at the end of our sample period. Not surprisingly, AUM varies widely across countries in our sample. Funds' AUM in the US is the largest with almost USD 4.5 trillion, while funds' AUM in Portugal is the smallest at USD 9.5 billion. Furthermore, the underlying investment strategy and domicile of the funds varies across destination countries. First, the importance of active versus passive funds exhibits a variation across destination country. For example, more than half of funds' AUM in Switzerland is passively-managed, while more than three quarters of funds' AUM in Austria is held by active funds. Second, the prevalence of foreign-domiciled funds' AUM by destination country is heterogeneous. For example, about 20 percent of the funds' AUM origins from foreign-domiciled funds, while more than 90 percent of AUM in the Eurozone is coming from foreign-domiciled funds.

Figure 1 shows that the importance of passively-managed funds and foreign-domicile funds has grown significantly during our sample period in aggregate. First, the share of passive funds

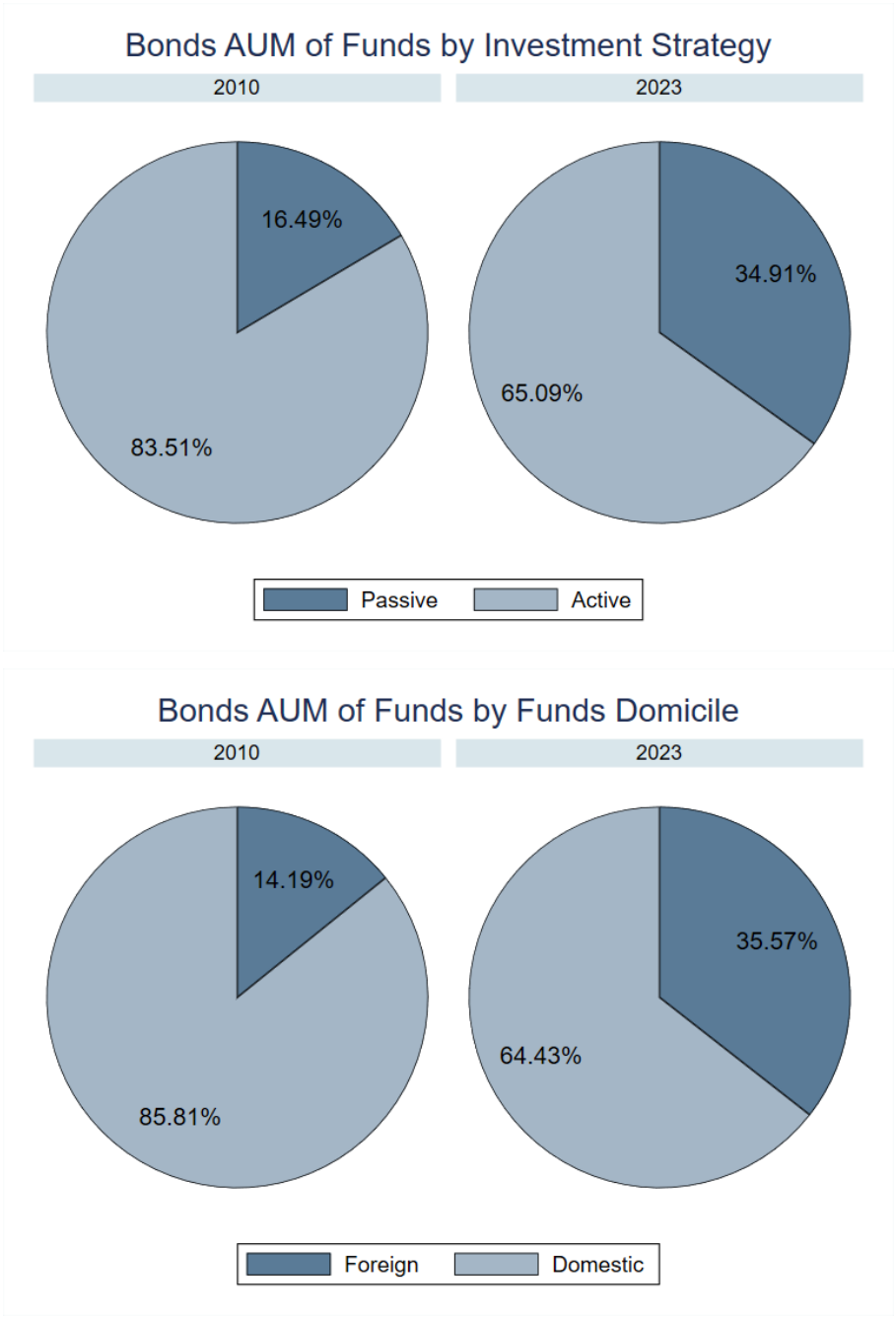
Table 2: Bond Funds AUM by destination country, 2023

Currency	Country	*Total*	*Active*	*Passive*	*Domestic*	*Foreign*
EUR	*AUT*	37,114.13	28,020.84	8,709.57	2,344.16	34,238.63
	BEL	42,962.57	32,652.752	10,309.82	306.63	42,328.60
	DEU	201,211.78	152,202.85	49,008.93	9,115.22	192,096.56
	ESP	152,669.21	119,915.90	32,753.31	31,909.62	120,759.59
	FRA	271,635.78	206,238.82	65,396.96	18,346.15	253,289.62
	IRL	21,136.82	16,166.50	4,970.32	4,034.98	17,101.84
	ITA	164,830.42	124,642.21	40,188.22	NA	164,830.42
	NLD	102,395.12	84,164.42	18,230.70	25,606.80	76,788.32
	PRT	9,521.30	7,215.38	2,305.92	8.05	9,513.24
	Total	1,003,477.10	771,219.67	231,873.75	91,671.63	910,946.84
CHF	*CHE*	134,764.80	65,472.26	69,292.50	111,296.99	23,467.76
GBP	*GBR*	272,622.17	188,373.40	84,248.77	90,137.63	182,484.54
USD	*USA*	4,477,292.00	2,807,164.70	1,670,127.30	3,499,848.60	977,443.39
TOTAL	Total	5,888,156.00	3,832,230.00	2,055,542.30	3,792,954.80	2,094,342.50

Source: EPFR
Note: This table presents the Assets Under Management (AUM) for bond funds across twelve countries included in the sample, as of the end of 2023. All values are displayed in USD millions.

has grown significantly from 16 percent in 2010 to almost 35 percent in 2023. Second, the share of foreign-domiciled funds has grown from 14 percent in 2010 to more than 35 percent in 2023. Both of these developments highlight the changing landscape of portfolio investment. In recent years, passive funds with their lower fees and higher transparency have gained traction among risk-averse retail investors. Furthermore, it is also relatively cheap and easy to hold a diversified portfolio via funds that invest in multiple currencies and countries.

Figure 1: Bonds Assets Under Management (AUM) by investment strategy and by domicile of funds in January 2010 versus in December 2023



Source: EPFR
Note: This figure presents the distribution of Assets Under Management (AUM) for January 2010 (left) and December 2023 (right) for bonds. The top two charts show the breakdown between actively and passively managed funds. The bottom two charts show the breakdown between domestically- and foreign-domiciled funds.

3.2 Interest rate futures and MP announcement dates

To identify MP surprises, we use high-frequency data on market expectations of central bank benchmark rates. Specifically, we collect daily price data on futures contracts tied to policy rates with a three-month maturity from *TickDataMarket*. The three-month maturity is chosen due to market liquidity and sensitivity to MP changes. First, three-month futures contracts are highly liquid, extensively traded, and their price changes primarily reflect shifts in market expectations rather than market tensions. Second, these contracts are particularly sensitive to MP decisions, making them ideal for identifying MP surprises.

We use daily price data on the following interest rate futures contracts:[8] For the ECB, we use Euribor throughout the entire sample period.[9] For the SNB, we use CHF Libor (January 2010–December 2021) and the SARON (January 2022–December 2023).[10] For the BoE, we use GBP Libor (January 2010–December 2021) and the SONIA (January 2022–December 2023). For the Fed, we use USD Libor (January 2010–June 2023) and the SOFR (June 2023–December 2023).

Figure 2 shows the time-series of prices on 3-month future contracts. The time period exhibits significant fluctuations in futures prices for all four currency areas reflecting their heterogeneous and time-varying monetary policy stances over time.

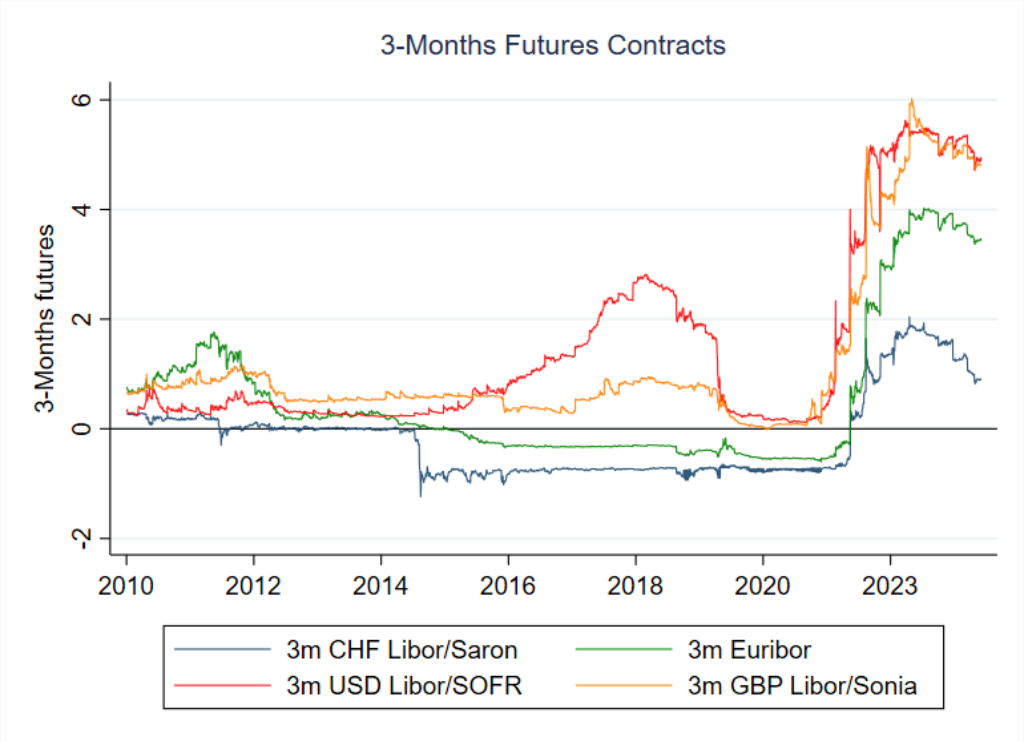
In addition to daily interest rate futures data, we require the precise dates of central bank policy announcements to identify MP surprises. We gather these dates, including both regular policy meetings and extraordinary announcements, for the ECB, SNB, BoE, and Fed. This information is manually collected from the official websites of the respective central banks.

[8] All these contracts are continuous contracts so that the most actively traded contract is used and futures prices are not distorted.

[9] Following Altavilla et al. (2019), we use Euribor because of its comparability with the three-month Libor futures used for other central banks.

[10] See also Borner (2025), Gentner (2024), and Fuhrer et al. (2018) on the CHF futures.

Figure 2: Daily prices on interest rate futures contracts for CHF, EUR, USD and GBP



Source: TickDataMarket
Note: This figures shows prices on futures contracts on central bank policy rates with three-month maturity in our sample from 2010 to 2023. The following data are shown: Euribor (for the entire period); CHF Libor (January 2010-December 2021) and CHF SARON (January 2022-December 2023); GBP Libor (Janaury 2010-December 2021) and GBP SONIA (January 2022-December 2023); and USD Libor (January 2010-May 2022) and SOFR (June 2022-December 2023).

3.3 Identifying MP surprises

Following the established approach in the literature (Kuttner, 2001; Romer and Romer, 2004; Nakamura and Steinsson, 2018; Altavilla et al., 2019; Koeniger et al., 2022), we identify MP surprises by examining changes in financial market expectations within narrow time windows around MP announcement dates.[11] Specifically, we use changes in daily futures contract prices on key interest rates targeted by central banks to capture the effect of MP announcements on the market's expectation of future monetary conditions. We compute the daily change of the price of the futures contract on the day of the MP announcement t as:

$$\text{MP surprise}_t = F_t - F_{t-1} \tag{1}$$

where F_t denotes the price of the futures contract at time t. The choice of a one-day event window balances the need to capture the full adjustment of financial market expectations to the MP announcement while minimizing the influence of other macroeconomic events or news on futures markets. For all t without an MP announcement, the MP surprise is equal to zero.

Using high-frequency data on financial market expectations to measure MP surprises offers several advantages over other identification methods (Kuttner, 2001; Nakamura and Steinsson, 2018; Gertler and Karadi, 2015; Bauer and Swanson, 2022). First, it effectively addresses endogeneity by isolating the unanticipated component of MP surprises, ensuring that broader macroeconomic factors do not confound the results. Since the anticipated component is already priced in, asset price movements reflect only unexpected news, providing a valid instrument for regression analysis (Stock and Watson, 2018). Second, high-frequency identification is relatively simple to implement and minimizes noise from concurrent economic events, even in smaller markets (Ferrari and Ters, 2017). Third, using futures data avoids issues related to model selection and data revisions, providing a more transparent measure of market expectations (Kuttner, 2001). Lastly, for the purpose of this study, financial market data is particularly relevant as we aim to analyze how MP surprises impact investment fund flows.

This identification strategy extends beyond standard interest rate decisions to include announcements on unconventional monetary policy tools such as quantitative easing (QE), quantitative tightening (QT), foreign exchange (FX) interventions, and changes in the remuneration of reserve requirements. This is possible because our approach focuses on measuring the expected value of future monetary conditions, capturing both conventional and unconventional policy actions. By doing so, we are able to account for a broader range of monetary policy

[11] We use the term 'surprise' instead of 'shock' to avoid associations with major financial disruptions.

measures, ensuring that the analysis comprehensively reflects the central bank's influence on market expectations.

Another important aspect is that it includes both positive (i.e., contractionary) and negative (i.e., expansionary) surprises, reflecting the full range of monetary policy actions across tightening and loosening cycles. This is particularly relevant when considering periods near the effective lower bound (ELB), where both positive and negative MP surprises may occur, especially during unconventional easing programs. By capturing the direction and magnitude of surprises, we are able to distinguish between different phases of the monetary policy cycle and examine how market reactions differ between positive and negative MP surprises.

However, a potential concern with this identification approach is that policymakers may hold private information about the state of the economy, which could introduce persistence in the MP surprise series as markets gradually absorb this information. To address this issue, we follow Miranda-Agrippino and Ricco (2021) and purge MP surprises of predictable components by regressing the current surprises on their lagged values. By focusing on the residuals of this regression, we obtain a purged measure of MP surprises that reflects only unanticipated, exogenous changes. This adjustment is crucial for identifying the causal impact of unexpected policy actions on financial markets and capital flows, mitigating concerns about endogeneity arising from central bank responses to underlying macroeconomic trends.

To purge the MP surprise series, we regress the current MP surprises, on their lagged values. Formally:

$$\text{MP surprise}_t = \alpha + \sum_{j=1}^{8} \beta_j \text{MP surprise}_{t-j} + \underbrace{\text{MP surprise}_t^{res}}_{\text{purged MP surprise} = z_t} \tag{2}$$

where $MPsurprise_t$ denotes the MP surprise and $MPsurprise_{t-j}$ denotes the lagged values of the MP surprise on MP announcement days, which may contain some autoregressive elements. Including eight lagged values captures, on average, a lag length of one year.[12] Importantly, $MPsurprise_t^{res}$ are the residuals, the portion of the MP surprises that cannot be predicted by past surprises and therefore that are not coming from a systematic response of central banks to economic conditions. To simplify notation, we denote this term as z_t for the remainder of this paper.

Figure 3 illustrates the identified MP surprises. The bars represent the changes in futures contract prices on policy announcement dates, separated into raw MP surprises (blue bars) and purged MP surprises (red bars). The purged surprises are the measure used in the analysis and

[12] Our results are robust to the inclusion of longer lags.

are adjusted to remove predictable components.

The ECB's MP surprises are clustered around both positive and negative values, typically within a range of 15 basis points. However, larger surprises are observed during significant MP events, such as the European sovereign debt crisis (2011–2012) and the COVID-19 pandemic (2020). The purging significantly reduces the variability of the raw surprises. This indicates that a substantial portion of the raw surprises was predictable based on prior market expectations.

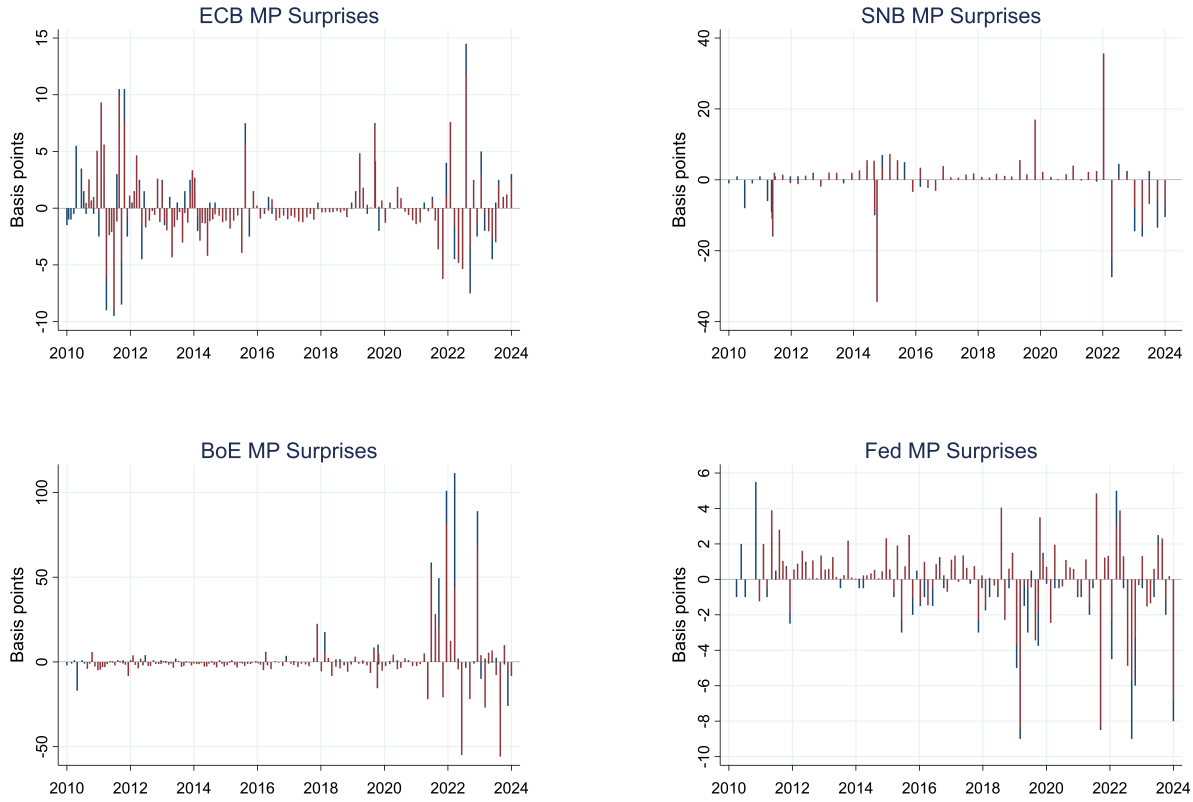
The SNB surprises exhibit a relatively narrow range, mostly within 10 basis points, consistent with the SNB's historically cautious MP stance. The largest deviations occur during key monetary shifts, such as the removal of the CHF/EUR exchange rate floor in January 2015. The purged surprises retain only the truly unexpected components, with notable spikes occurring during periods of heightened economic uncertainty.

The BoE surprises display more substantial variability compared to the ECB and SNB, with some raw surprises exceeding 50 basis points. This reflects the BoE's relatively flexible approach to MP adjustments, particularly in response to Brexit-related uncertainty (2016–2020) and the economic fallout from the COVID-19 pandemic. The purged surprises also exhibit notable spikes, particularly during 2016–2020, indicating that market participants frequently underestimated the magnitude of BoE policy adjustments during this period.

The Fed surprises span a broad range, with raw surprises often exceeding 25 basis points. Notable periods of heightened surprises include the taper tantrum in 2013, the interest rate normalization period (2015–2019), and the aggressive monetary easing in response to the COVID-19 pandemic (2020). The purged surprises remain significant, reflecting the market's frequent difficulty in anticipating the Fed's policy decisions during periods of rapid economic change.

Overall, the BoE and Fed exhibit the largest raw surprises, reflecting their frequent and flexible adjustments to MP in response to domestic and global economic conditions. The SNB shows the smallest surprises, consistent with its more stable and predictable policy approach. Across all four central banks, the purging process reduces the magnitude of the surprises, with the most substantial adjustments observed for the ECB and BoE. This suggests that market participants were generally better at anticipating policy actions by these central banks compared to the Fed and SNB. Further, the consistent differences between raw and purged surprises across central banks underscore the importance of this adjustment. Lastly, the heterogeneity in the magnitude and frequency of MP surprises across central banks highlights the potential for asymmetric cross-border spillovers, particularly during periods of global economic turmoil. This justifies the need to account for both domestic and foreign MP surprises in the empirical analysis.

Figure 3: MP surprises by four central banks



Source: Authors' calculations following Koeniger et al. (2022)
Note: This figures shows MP surprises on policy announcement dates by the SNB, ECB, FED, and the BoE based on changes in prices of futures contracts. Red bars illustrate the purged MP surprises that we use in our empirical analysis. Blue bars indicate the part of the raw MP surprises that get eliminated in the purging process.

4 Methodology

4.1 Local projections

Local projections provide a flexible alternative to VAR models to estimate the dynamic effects of well-defined shocks on outcome variables. This approach involves estimating a series of regressions for different time horizons, allowing for the direct calculation of impulse responses. Unlike VAR models, local projections offer greater flexibility by reducing the risk of model misspecification, which can lead to inaccurate estimates in VAR models (Jordà, 2005).

Local projections are implemented by estimating the following OLS regression for each horizon h:

$$y_{t+h} = \alpha_h + \beta_h z_t + \gamma_h X_t + \epsilon_{t+h}$$

where y_{t+h} is the outcome variable at horizon h, z_t is the shock variable[13], X_t represents a set of control variables, and ϵ_{t+h} is the error term.

This equation is estimated separately for each horizon h, yielding distinct β coefficients. The coefficients can then be plotted to generate an impulse response function over time. Additionally, cumulative impulse responses can be constructed by using the cumulative change in the outcome variable (e.g., $y_{t+h} - y_{t-1}$ on the left-hand side). This methodology is easily adaptable to panel data (Adämmer, 2019).

The appeal of local projections lies in their simplicity and robustness. First, they provide results comparable to VAR models but are simpler to estimate. They avoid the complexities associated with VAR models, which are known to be sensitive to specification errors, especially in the case of panel data (Braun and Mittnik, 1993; Jordà, 2005; Kpodar and Abdallah, 2017). Moreover, local projections impose fewer restrictions on the underlying dynamics of the model (Nakamura and Steinsson, 2018; Barnichon and Brownlees, 2019), and they can easily accommodate non-linear specifications (Auerbach and Gorodnichenko, 2012), making them a versatile tool for analyzing dynamic responses to shocks.

4.2 Empirical specification

We estimate the cumulative response of fund flows into the Eurozone, Switzerland, the UK, and the US to MP surprises. Given that the expansion of the NBFI sector is a relatively recent development, and that central banks' MP frameworks are largely focusing on the banking sector, we can assume that MP decisions are orthogonal to NBFI-specific dynamics. This assumption

[13] Unlike VAR models, local projections do not estimate shocks directly (Adämmer, 2019; Jordà, 2005).

implies that central banks do not directly target NBFI behavior in their MP decisions, making it possible to assess the independent response of the NBFI sector to policy surprises.

Leveraging our panel dataset of fund flows across four currencies and well-identified, exogenous MP surprise measures for the ECB, SNB, BoE, and Fed, we employ panel local projections. This methodology allows us to estimate cumulative responses over time by iteratively running fixed effects regressions across different projection horizons, $h = 0, 1, 2, ..., H$. The local projection regression specification is as follows:

$$\frac{\sum_{k=0}^{h} flows_{i,t+k}}{stocks_{i,t-1}} * 100 = \alpha_i + \mu_t + \boldsymbol{\beta}_j^{(h)} \ (D_j * z_{j,t}) + \sum_{n=1}^{N} \boldsymbol{\delta}_n^{(h)} flows_{i,t-n} + \sum_{n=1}^{N} \boldsymbol{\zeta}_n^{(h)} X_{i,t-n} + \varepsilon_{i,t+h} \quad (3)$$

where $\frac{\sum_{k=0}^{h} Flows_{i,t+k}}{Fund\ \ stocks_{i,t-1}}$ is the cumulative flow-to-lagged-stock ratio of country flow i at time $t + k$.[14] The main explanatory variable, $D_j * z_{j,t}$, is the interaction of the MP surprise $z_{j,t}$ for currency j at time t with the dummy variable D_j that identifies the currency j (i.e., EUR, CHF, GBP, and USD). To construct $z_{j,t}$, we aggregate daily data on MP surprises into weekly values.[15] The term $flows_{i,t-n}$ denotes the flow-to-lagged-stock ratio at lag $t - n$,while $X_{i,t-n}$ is a vector of control variables, capturing lagged changes in the nominal effective exchange rate ($\Delta NEER$), 10-year government bond yields ($\Delta 10yr\ yield$), and the VIX (ΔVIX). To account for unobserved heterogeneity, we also include country fixed effects (α_i) and year-month fixed effects (μ_t). The error term $\varepsilon_{i,t+h}$ is assumed to be heteroskedastic and serially correlated within the same country-week combination. To address this, we cluster standard errors at the level of fund flows by week and by country.

We set H = 8 to capture an eight-week projection horizon. This horizon is appropriate for capturing the short-term dynamics of financial variables, which tend to respond more acutely in the immediate aftermath of MP announcements.[16] We also set N = 8, reflecting eight lags of the flow-to-stock ratio and of the control variables, respectively.

[14] We multiply our dependent variable by 100, following Chari, Dilts Stedman, and Lundblad (2022).

[15] See Section 3.3 for details. Throughout the sample period, there are no instances where two surprises occur within the same week, ensuring that the aggregation does not introduce any bias.

[16] We conduct robustness checks using a 12-week horizon. Results are robust to the choice of the horizon.

5 Results

5.1 Bond flows and domestic MP surprises

We begin by examining how bond fund flows respond to domestic monetary policy (MP) surprises. Figure 4 presents the cumulative response of bond fund flows to a 1 percentage point contractionary domestic MP surprise over an eight-week projection horizon. The results reveal notable heterogeneity in the response of bond flows across countries, both in terms of direction and magnitude.[17]

Specifically, a contractionary domestic MP surprise leads to increased bond fund flows into Switzerland and the US. Switzerland shows the most pronounced effect, with cumulative flows rising by approximately 3 percentage points after eight weeks. Similarly, flows into US bond funds display a steady increase, though the magnitude is smaller than for Switzerland, reaching 2 percentage points after 8 weeks. In contrast, bond flows to Eurozone countries decline sharply, with a cumulative decrease of approximately 3 percentage points after seven weeks. The United Kingdom experiences a relatively muted response, with bond flows declining by only 0.6 percentage points over the same horizon.

These divergent responses across countries likely reflect differences in the role of their currencies in global markets, their economic structures, and financial market dynamics.

The Swiss franc and US dollar are widely regarded as safe-haven currencies, particularly during periods of economic uncertainty Contractionary MP surprises may enhance the appeal of Swiss and US bonds as stable, low-risk investments, driving inflows into bond funds in these countries. This effect is more pronounced in Switzerland, likely due to the relatively small size of its domestic bond market, where even modest capital inflows can result in significant cumulative responses.

In the Eurozone, the decline in bond fund flows following contractionary MP surprises may reflect its heavy reliance on bond markets for financing economic activity. Contractionary shocks reduce bond valuations and increase borrowing costs, which could lead to significant outflows as investors adjust their portfolios away from Eurozone bond markets. This dynamic might also be influenced by concerns over fragmented sovereign debt markets within the Eurozone, where contractionary shocks disproportionately impact countries with weaker fiscal positions. The more muted response in the United Kingdom may be attributed to its equity-oriented financial market structure. Bond markets play a less central role in the UK compared to other advanced

[17] In the Appendix, we show that the heterogenous results are not driven by including Eurozone countries individually in the dataset. Our findings are robust to aggregating the Eurozone countries as shown in Figure A1.

economies, which might dampen the impact of monetary policy surprises on bond fund flows.

Figure 4: Total bond flows cumulative response to a 1pp MP surprise.



Note: Blue lines represent the local projection cumulative response (in pp) of bond flows to a 1pp domestic MP surprise. Blue shaded areas are the 90% confidence interval bands

5.2 Granular perspective

Next, we adopt a more detailed approach by analyzing fund flows along two key dimensions: investment strategy and fund domicile. Specifically, we first examine the responses of flows for actively managed funds compared to passively managed funds. Then, we analyze the responses of flows based on whether the funds are domiciled domestically or abroad.

5.2.1 Investment strategy

Figure 5 shows the results for fund flows by investment strategy. A key finding that emerges for Switzerland and US is the stronger responses of passive fund flows to MP surprises. Following a contractionary domestic MP surprise, and consistent with our baseline results, both active and passive bond flows increase over time. Yet, the responses of passive fund flows are stronger and more significant. For instance, after eight weeks, bond fund flows to the US by passively managed funds increase by approximately 12 percentage points, whereas those by actively managed

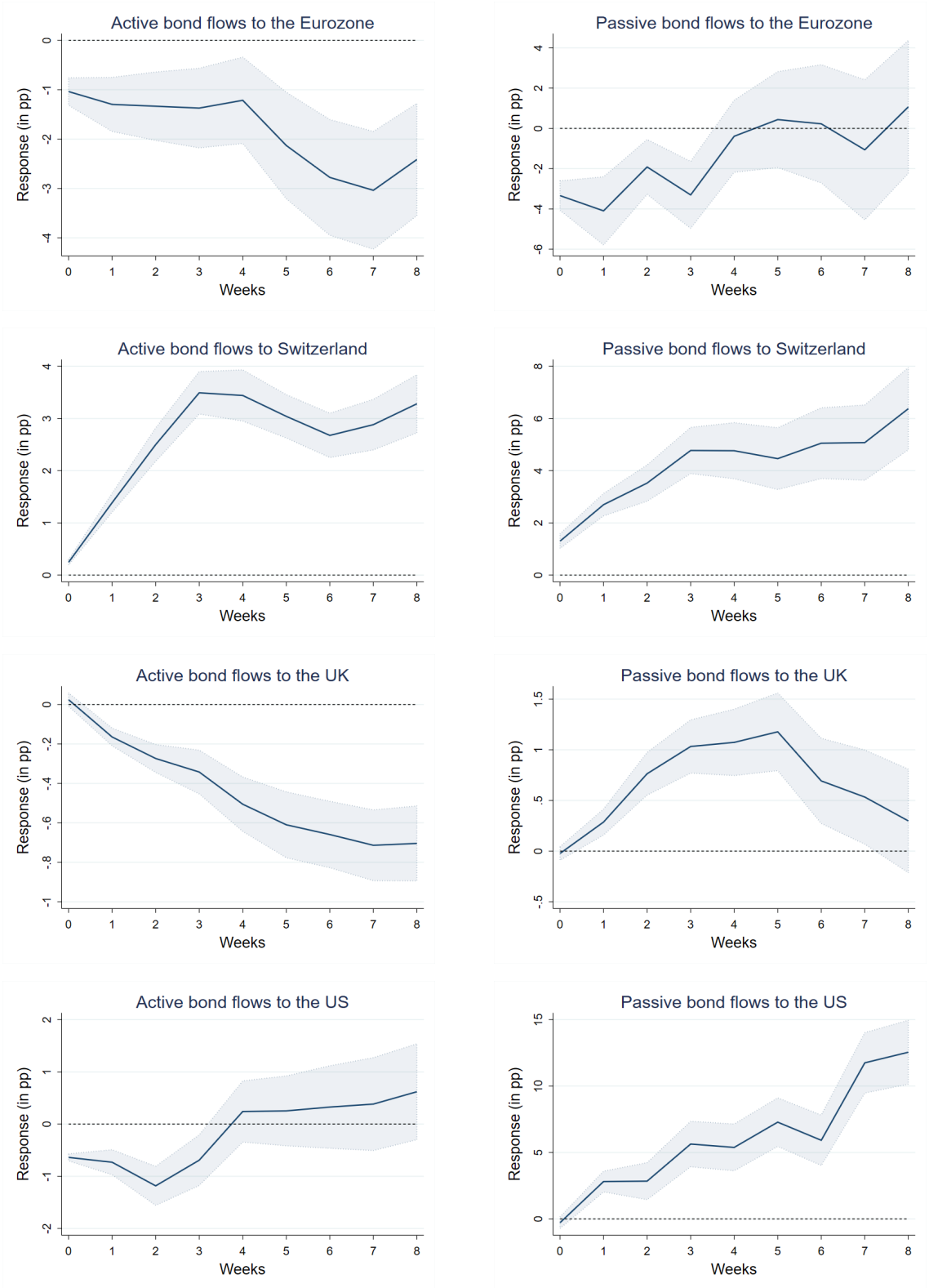
funds increase by less than 1 percentage point which is not statistically significant. Similarly, bond fund flows into Switzerland by passively managed funds increase by more than 6 percentage points after 8 weeks, while those by actively managed funds increase by less than 3.5 percentage points.

Passive funds, due to their benchmark-tracking nature, are more likely to experience large inflows or outflows in response to changes in monetary conditions, as those funds react more mechanically to policy signals. The heightened sensitivity of passive bond funds presents a potential vulnerability in the financial system (Bubeck et al., 2018; Chari, Dilts Stedman, and Lundblad, 2022). As passive funds continue to grow in market share, their tendency to react strongly to policy changes may amplify market volatility during periods of monetary tightening or easing. Regulatory frameworks might need to account for the systemic risks posed by large-scale, rapid reallocations of capital within passive funds in response to MP surprises.

In the Eurozone and the UK, the dynamics differ substantially. The overall impact of bond flows to these regions, as discussed in Section 5.1, is almost entirely driven by the behavior of actively managed funds. For example, while passive bond flows to the UK also increase following a contractionary MP surprise, their response is relatively small in magnitude and lacks persistence. In contrast, flows from actively managed funds exhibit a persistent and statistically significant response, closely mirroring the patterns observed in aggregate bond flows to the UK.

Similarly, in the Eurozone, the response of bond flows to MP surprises is primarily driven by actively managed funds, with passive fund flows playing a minimal role. This divergence likely reflects the high prevalence of actively managed funds investing in the Eurozone and UK bond markets, as illustrated in Figure 2. The dominance of active funds in these regions suggests that fund managers' discretion and strategic adjustments to market conditions are more influential in shaping flow dynamics, particularly in response to monetary policy changes.

Figure 5: Active and Passive flows cumulative response to a 1pp MP surprise.



Note: The lines represent the local projection cumulative response (in pp) of active/passive flows to a 1pp domestic MP surprise. Blue shaded areas are the 90% confidence interval bands.

5.2.2 Fund domicile

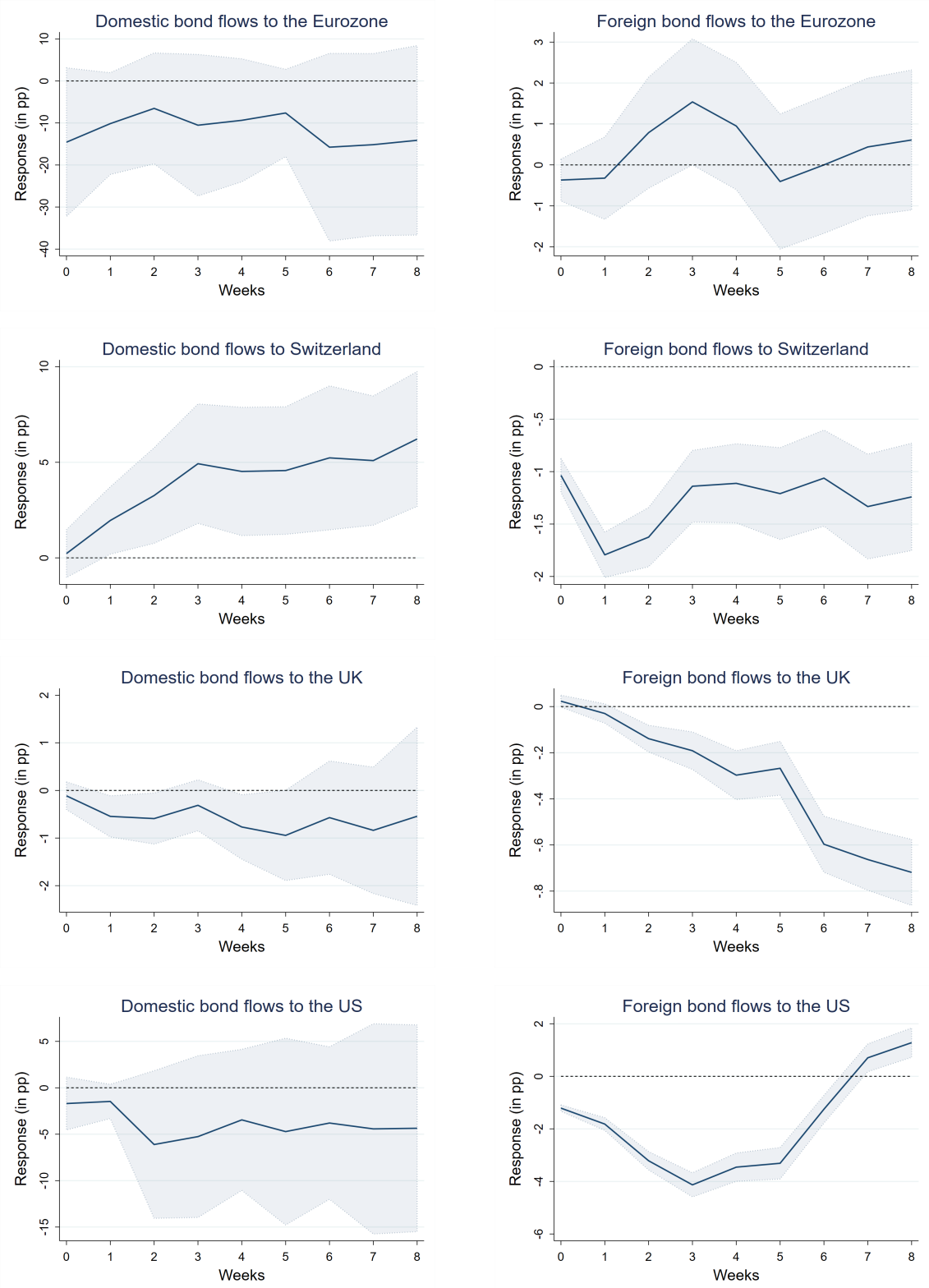
The domicile of a fund may be an important determinant of the fund's response to an MP surprise because it contains some information on potential currency mismatches on the fund's balance sheet. By design, foreign-domiciled funds investing in a given country may have a more diverse portfolio in terms of country and currency composition compared to domestically-domiciled funds investing in the same country. In particular, foreign-domiciled funds would likely have a regional or global focus as investment destination than having a single-country mandate. In addition, their share class currency and investment currency would likely be different from each other generating a currency mismatch between their assets and liabilities. Therefore, an MP surprise may cause a larger currency mismatch in the balance sheet of a foreign-domiciled fund than that of a domestically-domiciled fund. As a result, the need to reallocate the fund portfolio would depend on the domicile of the fund.

Figure 6 illustrates the responses of bond fund flows to a 1 percentage point contractionary domestic MP surprise, disaggregated by the domicile of the fund—whether the funds are domiciled domestically or abroad—and confirms our conjecture above.[18] Flows of domestically-domiciled funds and those of foreign-domiciled funds respond differently to MP surprises in general. In particular, fund flows from foreign-domiciled funds tend to react more than domestically-domiciled funds. Except for Switzerland, flows of domestically-domiciled funds do not exhibit a statistically significant response to MP surprises. In contrast, flows of foreign-domiciled funds respond strongly to MP surprises. For example, fund flows to the UK from foreign-domiciled funds decrease by 7 percentage points after 8 weeks, whereas those to Switzerland decrease by more than 1 percentage point.

The strong and rapid reactions of foreign-domiciled funds to domestic MP surprises underscore the interconnectedness of global financial markets and highlight the potential for MP actions to generate significant cross-border spillovers via the fund sector. Particularly, the growing prevalence of foreign-domiciled funds in recent years can be amplification mechanism potentially exacerbating volatility in local bond markets that policymakers should be aware of.

[18] EPFR data quality in the earlier years of our sample period seems to be low when using this filter, especially for the euro area countries. For this reason, we limit the sample period to after 2016 for this empirical exercise.

Figure 6: Domestic and foreign domiciled funds flows cumulative response to a 1pp MP surprise.



Note: Blue lines represent the local projection cumulative response (in pp) of domestic/foreign flows to a 1pp domestic MP surprise. Blue shaded areas are the 90% confidence interval bands. For this set of results, we only consider the period 2016-2023 due to the low quality of the data before 2015, especially for the euro area countries.

6 Foreign MP spillovers

6.1 Empirical specification

Thus far, our analysis has focused on the effects of domestic monetary policy (MP) surprises on fund flows into the corresponding domestic economy. In this section, we expand the analysis by examining potential cross-border spillover effects resulting from foreign MP surprises. Given the high degree of interconnectedness in global financial markets, it is plausible that MP announcements by one central bank influence fund flows in other economies. Our multi-country panel framework allows us to investigate these spillovers systematically.

To examine the effects of foreign MP surprises while avoiding over-identification, we aggregate foreign surprises into a single variable. Specifically, for each currency area j, we define the net foreign MP surprise as the sum of the MP surprises of the other three currency areas. For example, when analyzing the impact on fund flows into the US, the net foreign MP surprise is constructed by summing the surprises from the ECB, the SNB, and the BoE.

An important consideration in constructing this variable is the potential for overlapping announcements. In cases where two or more central banks announced policy changes within the same week, we exclude these weeks from the analysis. This ensures that our aggregated foreign MP surprise variable captures distinct policy announcements, mitigating concerns about attribution bias or misidentification. With this aggregation method we impose a simplifying assumption that foreign MP surprises have a homogeneous effect on domestic fund flows, regardless of their origin.

To estimate the spillover effects, we adapt the baseline local projection specification (Equation 3) by including the aggregated foreign MP surprise term while still controlling for domestic MP surprises. The baseline regression equation modifies to:

$$\frac{\sum_{k=0}^{h} flows_{i,t+k}}{stocks_{i,t-1}} * 100 = \alpha_i + \mu_t + \boldsymbol{\beta}_j^{(h)} \ (D_j * z_t^{dom}) + \boldsymbol{\gamma}_j^{(h)} \ (D_j * z_t^{for}) + \sum_{n=1}^{N} \boldsymbol{\delta}_n^{(h)} flows_{i,t-n} + \sum_{n=1}^{N} \boldsymbol{\zeta}_n^{(h)} X_{i,t-n} + \varepsilon_{i,t+h} \tag{4}$$

The dependent variable remains the cumulative flow-to-lagged-stock ratio of country i at time $t+h$, expressed as a percentage. The main explanatory variables are z_t^{dom}, the domestic MP surprise for currency j at time t, interacted with the corresponding currency dummy variables D_j, and z_t^{for}, the net foreign MP surprise, aggregated as described above and also interacted with the currency-specific dummy D_j.

As in the baseline specification, we include country fixed effects α_i and year-month fixed effects μ_t to account for unobserved heterogeneity across countries and time periods. The regression also controls for lagged values of fund flows $flows_{i,t-n}$ and other macroeconomic variables, including changes in the nominal effective exchange rate ($\Delta NEER$), 10-year government bond yields ($\Delta yryield$), and market volatility (ΔVIX).

6.2 Results

Figure 7 shows the cumulative response of bond fund flows to a 1 percentage point contractionary foreign MP surprise over an eight-week projection horizon. The responses to foreign MP surprises exhibit several similarities to the baseline results, including the direction of bond flows across countries. In both cases, Switzerland and the United States experience inflows due to their safe-haven status, while the Eurozone sees significant decline in flows and the UK shows only muted responses.

Specifically, for Switzerland, both domestic and foreign MP surprises result in increased bond flows. However, the response to foreign MP surprises is less pronounced, with cumulative inflows peaking at approximately 4 percentage points, compared to 5 percentage points for domestic MP surprises. This smaller magnitude likely reflects the dominance of domestic monetary policy in driving investor behavior in the Swiss bond market. Similarly, bond flows into the United States respond positively to both domestic and foreign MP surprises. However, as in Switzerland, the magnitude of the response is smaller for foreign shocks, with cumulative inflows reaching 2 percentage points compared to 3 percentage points for domestic surprises.

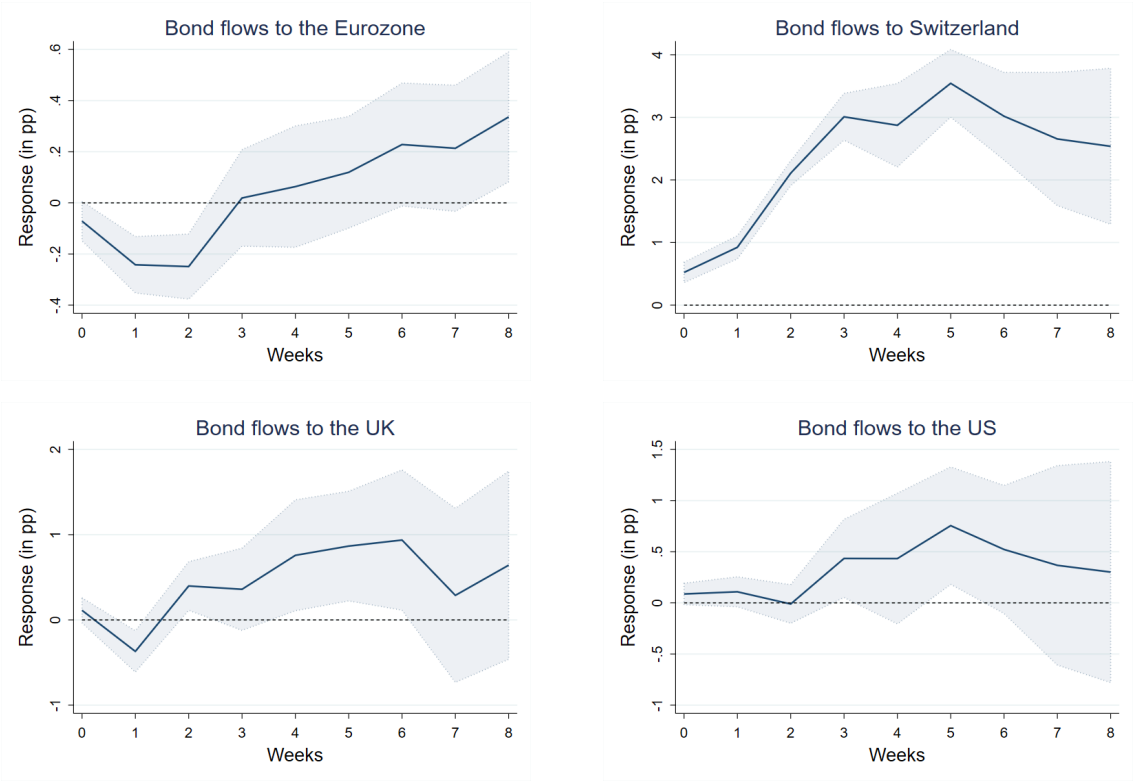
Further, contractionary foreign MP surprises lead to outflows from Eurozone bond funds. However, the magnitude of the response is smaller for foreign MP surprises, with cumulative outflows reaching approximately 3 percentage points after eight weeks, compared to 4 percentage points in the baseline for domestic surprises. This suggests that domestic MP surprises exert a stronger influence on Eurozone bond flows than foreign shocks, though the direction of the response remains consistent. In the UK, bond flows decline slightly in response to both domestic and foreign MP surprises. The magnitude of the response is modest in both cases, with cumulative outflows remaining below 0.5 percentage points. This similarity suggests that the UK's equity-dominated financial market structure reduces the sensitivity of bond flows to both domestic and foreign monetary shocks.

The observed dynamics highlight the interconnected nature of global financial markets while underscoring the dominant role of domestic monetary policy in shaping fund flows. As in the baseline results, Switzerland and the US benefit from their currencies' safe-haven status.

However, the smaller inflows in response to foreign surprises suggest that investors prioritize local monetary conditions when reallocating capital. The Eurozone's vulnerability to both domestic and foreign MP surprises reflects its reliance on foreign capital and the structural fragmentation of its bond markets. While foreign surprises exert less influence than domestic ones, their significant impact indicates that global monetary conditions play an important role in shaping Eurozone fund flows. Lastly, the similarity between the UK's responses to domestic and foreign MP surprises reflects the unique structure of its financial market, which is less dependent on bond flows and thus exhibits limited sensitivity to monetary shocks.

Our findings resonate with the broader literature on international capital flows and cross-border spillovers, which has traditionally focused on global financial cycles driven by changes in investor risk sentiment and US monetary policy (e.g., Bruno and Shin, 2015a; Hale et al., 2020). However, recent work by Chari, Dilts-Stedman, and Forbes (2022b) emphasizes that portfolio flows are also shaped by country-specific regulatory policies, particularly during extreme global risk episodes. Their study shows that tighter macroprudential stances amplify outflows during global risk-off periods and inflows during risk-on episodes, as investors seek less-regulated investment destinations. Our results complement these findings by demonstrating that foreign MP surprises generate similar spillovers through NBFIs. This suggests that while regulatory policy affects capital flows during risk episodes, MP surprises create persistent spillovers through shifts in asset demand and currency mismatches on funds' balance sheets.

Figure 7: Total bond flows cumulative response to a 1pp foreign MP surprise



Note: Blue lines represent the local projection cumulative response (in pp) of bond flows to a 1pp net foreign MP surprise. Blue shaded areas are the 90% confidence interval bands.

7 Robustness

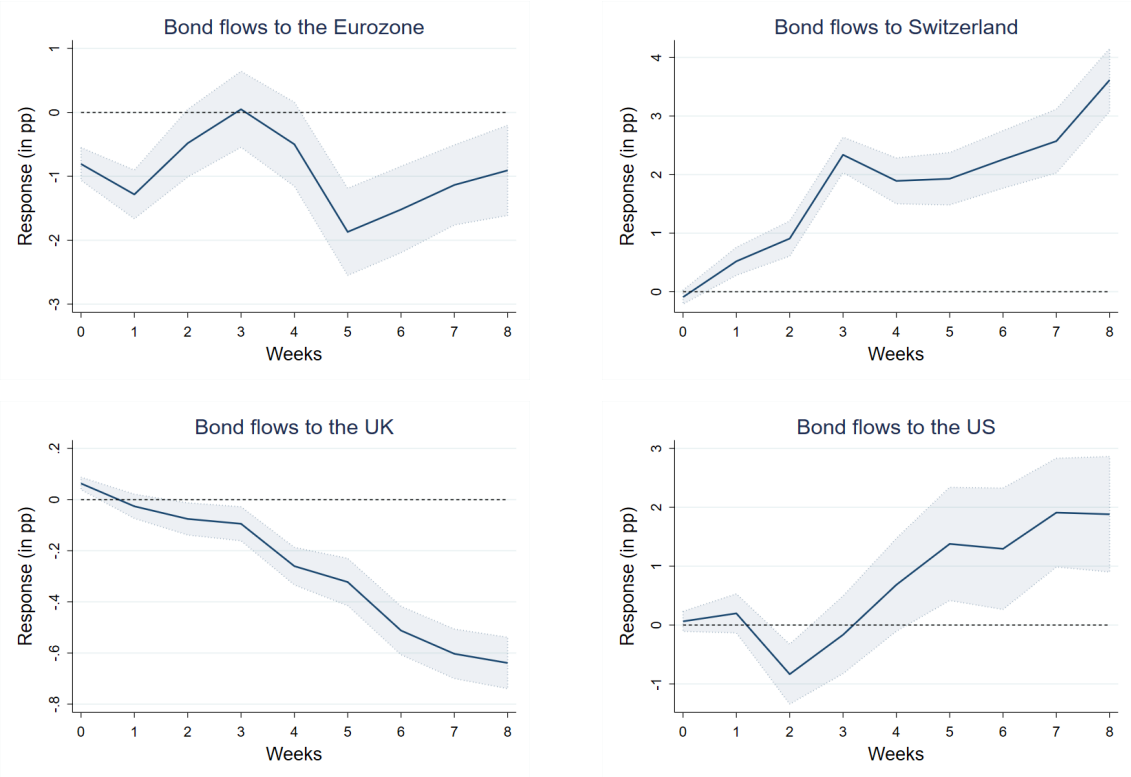
In this section, we conduct a robustness check by considering the latter half of our sample period, specifically from 1 January 2016 to 31 December 2023. The period between 2010 and 2015 was marked by the after-effects of the global financial crisis and unique MP environments in our sample of countries: In Switzerland, the SNB maintained a minimum floor of 1.20 CHF/EUR from September 2011 until January 2015 to counteract excessive appreciation pressures on the Swiss franc, relying on large-scale euro purchases. In the US, the Fed had an extended period of near-zero interest rates following the global financial crisis. And in the Eurozone, the ECB faced the aftermath of the sovereign debt crisis in the first half of our original sample period.

The 2016-2023 window reflects a more stable policy environment across all four central banks, allowing for a cleaner assessment of MP transmission mechanisms in the absence of crisis-driven interventions This subsample analysis thus serves as a robustness check to validate the stability and generalizability of our main results.

7.1 Bond flows and domestic MP surprises

Figure 8 displays the cumulative response of bond fund flows to a 1 percentage point contractionary domestic MP surprise over an eight-week projection horizon for the 2016-2023 sample period. The overall trends are consistent and in line with the results we observe in Section 5.1, but with slightly narrower confidence bands, particularly for Switzerland and the Eurozone. This may suggest that the after-effects of the global financial crisis and unique MP environments blurred the response of fund flows to MP surprises.

Figure 8: Total bond flows cumulative response to a 1pp MP surprise (2016-2023)



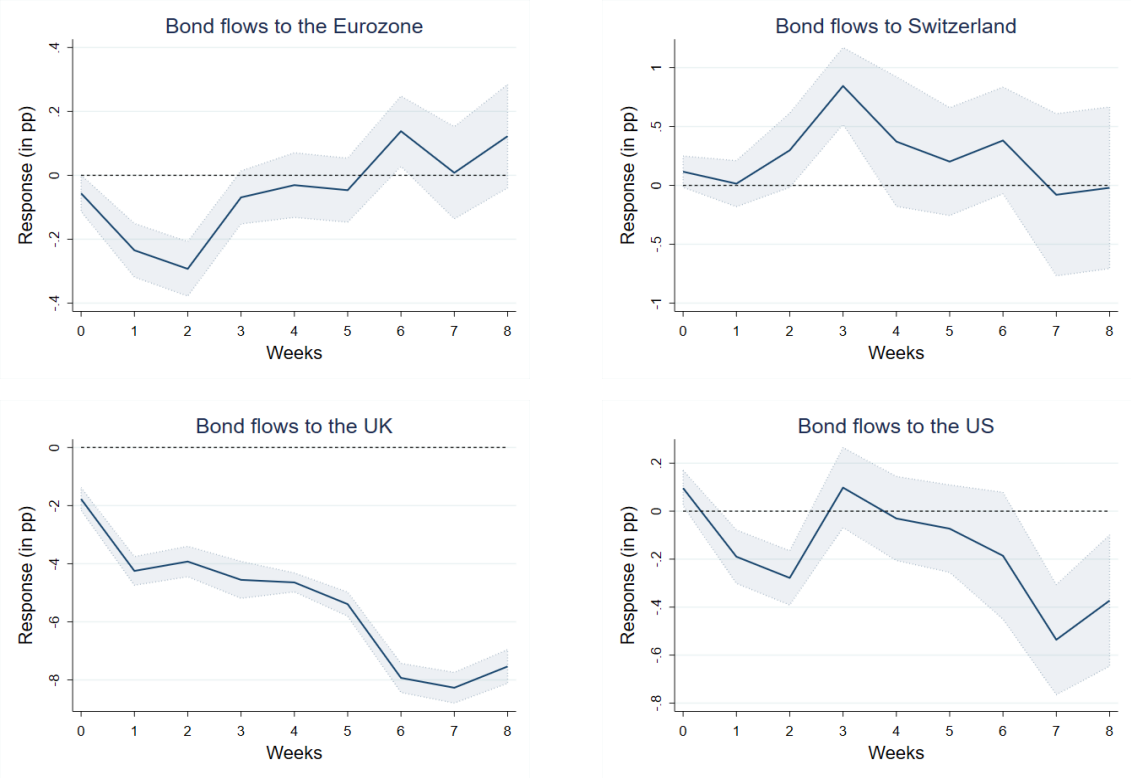
Source: Authors' calculations
Note: Blue lines represent the local projection cumulative response (in pp) of bond flows to a 1pp domestic MP surprise. Blue shaded areas are the 90% confidence interval bands

7.2 Foreign MP spillovers

To further assess the robustness of our findings, Next, we evaluate the impact of foreign MP surprises using our shorter sample period. Figure 9 illustrates the responses of domestic bond fund flows to net foreign MP surprises. Overall, we observe that bond fund flows to the Eurozone behave similarly to our previous results, but with narrower confidence intervals. However, for the other three currencies, there is considerable heterogeneity in the responses. For example, bond flows to Switzerland are less responsive to net foreign surprises compared to those shown

in Figure 7. Specifically, while the response in Switzerland is less persistent, the effects of surprises take longer to materialize. In contrast, bond flows to the US and the UK, which were only weakly affected by net foreign surprises in the baseline case, show a significantly stronger and more pronounced response during the 2016-2023 period, especially in the UK. This suggests that the timing of the specific events, as well as the particular period in question, plays a crucial role in shaping the sensitivity of bond flows to foreign MP surprises.

Figure 9: Bond flows cumulative response to a 1pp foreign MP surprise (2016-2023)



Note: Blue lines represent the local projection cumulative response (in pp) of bond flows to a 1pp net foreign MP surprise. Blue shaded areas are the 90% confidence interval bands.

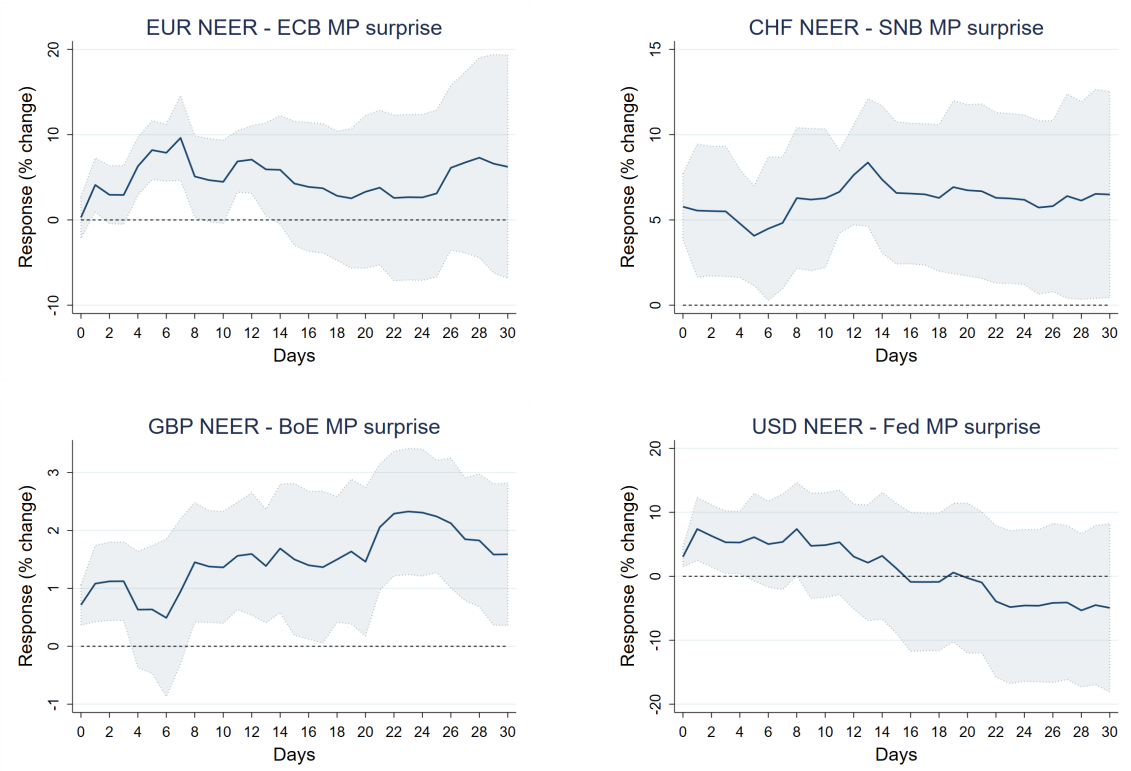
7.3 Exchange rate response

In this paper, we explore the role of exchange rates—specifically, the response of the Nominal Effective Exchange Rate (NEER)—to domestic MP surprises as a mechanism for explaining our bond flow dynamics (see Section **??**). Exchange rates are an essential channel in our framework as safe-haven effects seem to drive some of our results. As part of our robustness analysis, we investigate wether the reactions of exchange rates differs considering only the later years. This allows us to assess whether the relationship between domestic monetary policy and exchange rate movements has changed over time, and how such changes might impact the broader mechanisms driving bond flows.

7.3.1 NEER and domestic MP surprise

First, we focus on the response of NEER to our domestic MP surprises. We replicate the results from Figure **??** for the 2016-2023 sample period. The different responses are shown in Figure 10.

Figure 10: NEER cumulative responses to a 1pp MP surprise (2016-2023)



Note: Blue dashed lines represent the local projection cumulative response (in pp) of EUR, CHF, GBP and USD NEER to a 1pp domestic MP surprise. Shaded areas represent the 90% confidence interval.

Overall, we observe similar responses to our baseline results, though some differences emerge. On one hand, the NEER responses for the EUR, GBP, and USD become somewhat less significant and persistent after 2016. We still observe an appreciation of those currencies, but the persistence decreases. On the other hand, the CHF NEER, which showed no significant response to MP surprises over the full sample period, now exhibits a strong and significant appreciation. This shift is consistent with the minimum CHF/EUR exchange rate policy implemented by the Swiss National Bank until January 2015, which probably dampened fluctuations in the CHF NEER response. These results suggest that our main findings are robust to the sample period, with the exception of Switzerland, which represents a special case due to the exchange rate policy that was in place at the time.

7.3.2 NEER and News vs Information shocks

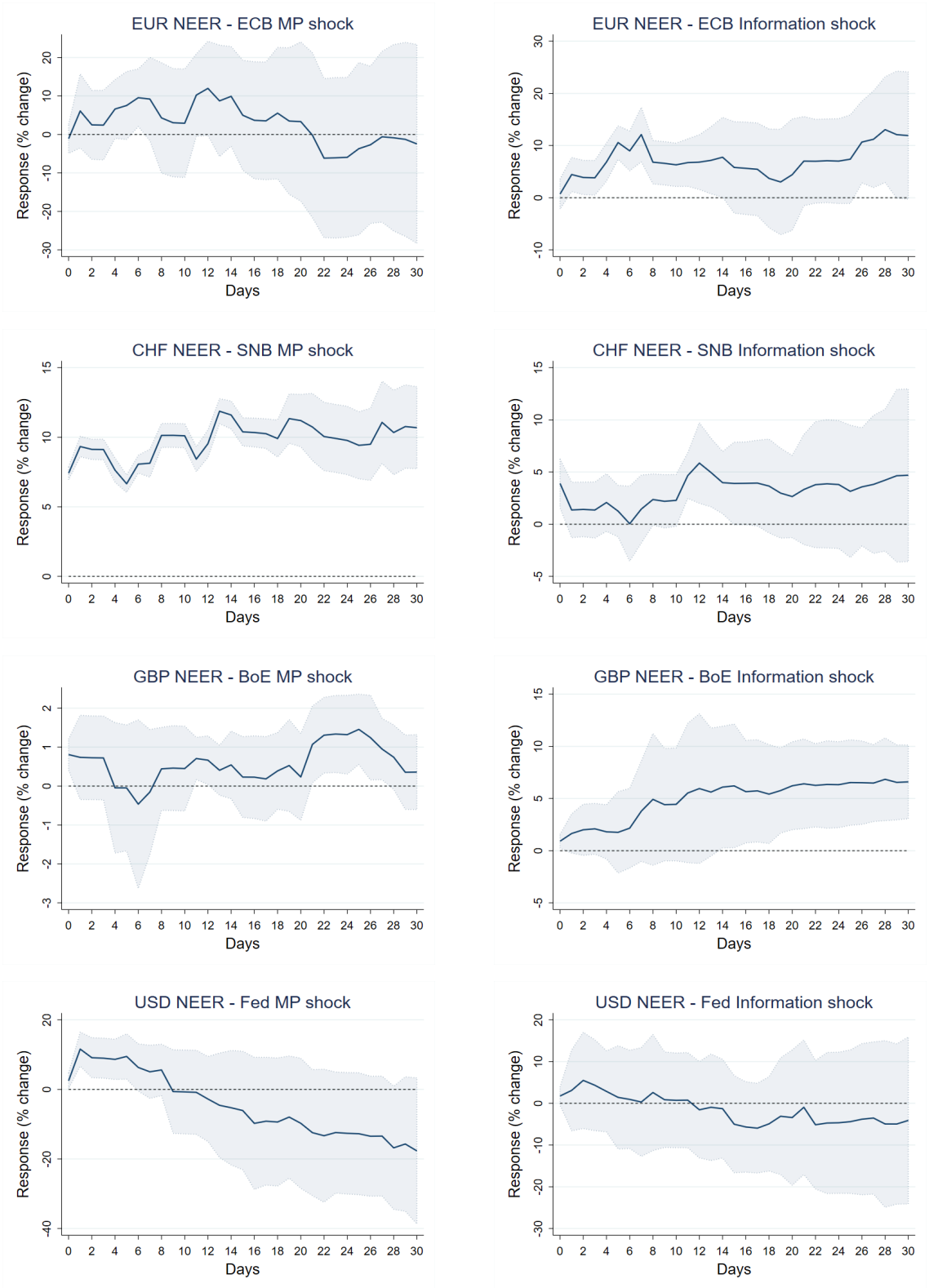
Finally, in addition to examining the overall exchange rate responses, we investigate how the different components of MP surprises—namely, pure MP shocks and central bank information (CBI) shocks—contribute to explaining the bond flow response. While our main analysis estimates the direct effects of these two types of shocks on bond flows, here we focus on their impact on exchange rates, as they represent a key channel through which our results are transmitted.

Consistent with the previous sections, we replicate the results from Section **??** by focusing on the 2016-2023 period, where we observe how NEER responses evolve in the context of MP versus information shocks. Figure 11 displays the results for this shorter sample period.

We observe similar patterns to those in the previous section, which underscores the robustness of our results. Overall, the shapes and magnitudes of the NEER responses are consistent with those observed for the full sample period (see Figure **??**) for both MP and information shocks. However, for MP surprises, we note a slight reduction in persistence during the second half of the sample period, particularly for the EUR, GBP, and USD. In contrast, the CHF NEER response to MP shocks becomes even more significant and persistent, while the response to information shocks gains some significance after a few days. These observations for Switzerland align with our previous findings.

In general, most of the results remain robust across the sample periods. However, we observe some heterogeneity, particularly in terms of foreign spillover effects and the CHF's unique response dynamics. Specifically, the CHF stands out due to its increased sensitivity to MP shocks in the post-2016 period, likely reflecting the post-2015 changes in SNB policy. This heterogeneity highlights the importance of considering both global and country-specific factors when analyzing exchange rate responses.

Figure 11: Various NEER cumulative responses to a 1pp MP and Information shock (2016-2023)



Note: Blue dashed lines represent the local projection cumulative response (in pp) of EUR, CHF, GBP and USD NEER to a 1pp domestic MP (left) and information (right) shocks. Shaded areas represent the 90% confidence interval.

8 Conclusion

This paper provides a comprehensive analysis of how domestic and foreign monetary policy (MP) surprises influence bond fund flows across several advanced economies with distinct currency roles, economic structures, and financial market dynamics. Using high-frequency MP surprise measures and a multi-country dataset of weekly fund flows, we identify substantial heterogeneity in fund flow responses. Our findings highlight the crucial role of NBFIs in MP transmission, not only through domestic policy channels but also through significant cross-border spillovers.

Our results reveal three key takeaways. First, we confirm that investment funds play a critical role in the transmission of monetary policy. However, the transmission of MP surprises through NBFIs exhibits marked heterogeneity across countries: contractionary MP surprises lead to increased bond flows into Switzerland and the US, but decreased flows into the Eurozone and the UK. The increased demand for Swiss and US bonds can be interpreted through the balance sheet channel, improving the balance sheet strength of investors holding low-risk assets. Decreased flows to the Eurozone and the UK align with the bank lending channel, where contractionary MP surprises lead to tighter credit conditions and reduced risk-taking by financial institutions.

Second, we show that the nature of fund responses depends on investment strategies and fund domicile. Passively managed funds respond more strongly and quickly to MP surprises than actively managed funds, reflecting their benchmark-driven investment mandates and limited ability to adjust their portfolios. Similarly, foreign-domiciled funds react more sharply and persistently than domestic funds, highlighting the role of cross-border financial integration in amplifying MP spillovers. This behavior suggests that the growing presence of passively managed and internationally domiciled funds may exacerbate capital flow volatility during periods of monetary easing and tightening. It also underscores the importance of considering the specific frictions that investment funds face, such as currency and maturity mismatches, and how these frictions affect the way they propagate MP surprises.

Third, we provide evidence of cross-border spillovers from foreign MP surprises. Notably, this finding holds not only for the Federal Reserve but also for the European Central Bank, the Swiss National Bank, and the Bank of England. This underscores the need to consider the role of major central banks beyond the Fed when analyzing global financial stability.

Our analysis identifies two key mechanisms driving these patters. First, we show that fund flows respond predominantly to the 'true' MP surprise-driven changes in interest rate expectations rather than to information shocks about the economic outlook conveyed by central banks in their MP announcements. This highlights the central role of MP actions, rather than

market expectations about future economic conditions, in driving fund flows. Second, exchange rate reactions emerge as a critical transmission channel: contractionary MP surprises cause currency appreciations, altering the returns on foreign-currency denominated investments and creating currency mismatches on funds' balance sheets. These mismatches trigger portfolio reallocations, amplifying fund flow responses across borders.

Our findings have important policy implications. First, the heterogeneity in fund responses across countries highlights the need for tailored policy frameworks that reflect the unique characteristics of individual economies and their financial systems. Second, the stronger and faster reactions of passive and foreign-domiciled funds to MP surprises suggest potential vulnerabilities in the global financial system, as these funds may amplify market volatility during periods of synchronized monetary tightening. Third, the significant cross-border spillovers we document emphasize the need for enhanced coordination among central banks to mitigate unintended disruptions in financial markets.

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Appendix

Aggregation of the Eurozone countries

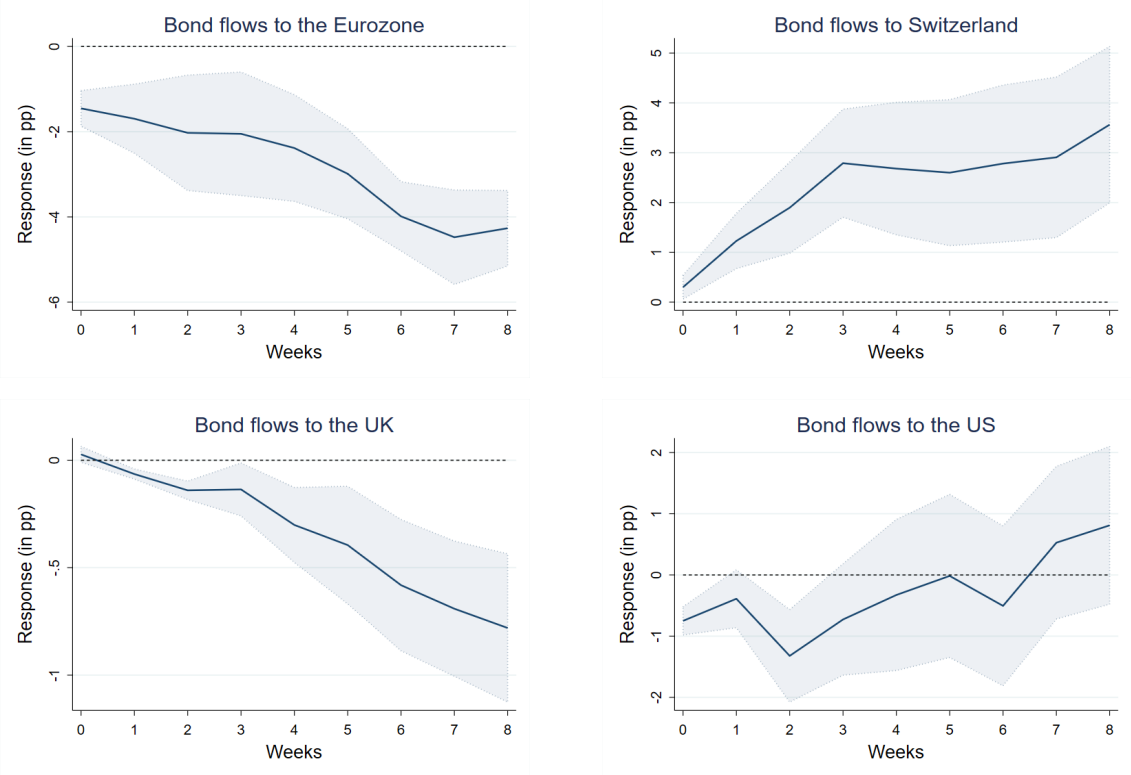
We investigate whether our results are sensitive to our treatment of the Eurozone. In the main analysis, each of the nine Eurozone countries (i.e., AUT, BEL, DEU, ESP, FRA, IRL, ITA, NLD, PRT) is considered individually in the panel local projections. However, given their shared currency and monetary policy framework, we perform a robustness check of our results by aggregating the Eurozone countries into a single Eurozone entity.

By aggregating the Eurozone countries before estimating the local projections, we obtain the average effect of MP surprises for the Eurozone as a whole, rather than the average of individual country-level effects. This approach accounts for the possibility that monetary policy transmission may be more uniform across these countries due to the common currency and centralized monetary policy decisions. It also reduces potential noise stemming from country-specific factors, allowing us to focus on broader regional patterns. Further, it provides insight into whether the effects observed in the baseline analysis are driven by outliers or heterogeneities among individual Eurozone countries. The results from this aggregated approach are displayed in Figure A1 for bond flows.

We observe similar overall trends to our baseline results as shown in Figure 4. However, a few key differences emerge. First, the response of bond flows to the US loses its significance, suggesting a weaker or more muted relationship when considering the Eurozone as a single entity. Additionally, the confidence intervals are generally wider, likely due to the reduced number of observations in this aggregated approach compared to the baseline, which analyzed each country individually.

In terms of effect size, aside from the diminished significance in the US response, the responses are largely comparable to the baseline. Notably, the decrease in bond flows to the Eurozone appears stronger after eight weeks, with a cumulative decrease of around 8 percentage points compared to 5 percentage points in the baseline case.

Figure A1: Cumulative response of total bond flows to a 1 pp MP surprise



Note: Blue lines represent the local projection cumulative response (in pp) of bond flows to a 1 pp domestic MP surprise. Blue shaded areas are the 90% confidence interval bands. Eurozone countries (i.e., AUT, BEL, DEU, ESP, FRA, IRL, ITA, NLD, PRT) are aggregated taking the sum of flows and stocks in each period prior to the local projection estimation.