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Investment funds and the monetary-macroprudential policy interplay

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Abstract

Is there an undesired side-effect of banking regulation on the non-bank sector? How effective is the non-bank transmission channel of monetary policy in the presence of macroprudential policy? Using a state-dependent local projection approach and a rich dataset capturing macroprudential tightening across euro area countries, we present strong cross-country heterogeneity. In financially conservative markets (Germany, France, the Netherlands), tight monetary policy combined with stricter macroprudential measures significantly contracts investment fund assets. Conversely, financial hubs (Luxembourg, Ireland, Italy) experience counterintuitive expansions under the same policy mix. We introduce a simple balance-sheet framework that shows how interacting funding-cost and collateral-constraint channels generate these opposing responses. Further disaggregation shows that equity funds are more vulnerable to joint tightening in conservative systems, while bond funds partly offset contractionary forces in hubs through higher yields.

Keywords: Non-bank financial intermediaries, macroprudential policy, monetary policy, state-dependent local projections

JEL Codes: E58, G21, G28, G51

Non-technical summary

Over the past decade, investment funds in the euro area have grown rapidly, nearly tripling in size. This expansion has likely been driven by investors' demand for diversified products, regulatory changes, and the long period of very low interest rates. As a result, investment funds have become key players in financial markets, shaping liquidity, asset prices, and even financial stability. Understanding how monetary policy and macroprudential regulation affect these funds is therefore increasingly important. This paper examines how monetary policy and tighter macroprudential regulations interact to influence investment funds activity across six euro area countries. Using monthly data and a country-specific approach, we find that identical policy actions can produce sharply different outcomes depending on the structure of each national market. In countries with stronger bank-based financial systems like Germany, France, and the Netherlands, higher interest rates combined with stricter macroprudential regulations lead to fund outflows and slower sector growth. By contrast, in financial hubs like Luxembourg, Ireland, and (to some extent) Italy, the same policy mix tends to attract inflows. In these markets, deep cross-border funding networks and greater flexibility allow funds to shift activity across jurisdictions, offsetting the impact of tighter domestic conditions. We also find that the type of regulation matters. Liquidity-focused measures, i.e. those aimed at funding and liquidity risks, tend to trigger faster, more pronounced reactions in fund assets, while capital-based measures like those affecting leverage and risk buffers, lead to more gradual but lasting effects. Moreover, equity funds are more sensitive to these policy shifts than bond funds, which often prove more resilient, especially in global hubs. To explain these patterns, we propose a simple balance-sheet framework with two main channels. First, higher interest rates raise funding costs and reduce leverage (i.e. a funding-cost channel). Second, tighter regulation raises collateral requirements and limits borrowing, a haircut channel. In bank-centric markets, both forces reinforce each other, leading to persistent outflows. In global hubs, however, easier access to international funding and less binding domestic constraints can reverse the effect, turning outflows into inflows. Our findings have important policy implications. Measures designed for banks can have unintended consequences for investment funds, depending on local market structures and cross-border linkages. A one-size-fits-all approach risks either tightening too much in some countries or too little in others. Policymakers should therefore coordinate monetary and regulatory policies across both banks and non-bank financial intermediaries, strengthen cross-border cooperation, and improve data and stress-testing frameworks for large fund complexes. Such coordination would help reduce regulatory arbitrage, contain spillovers, and enhance the resilience of the euro-area financial system as a whole.

1 Introduction

Over the past decade, the euro-area investment-fund sector has grown explosively, with assets under management nearly tripling to new highs (Figure 1). This expansion has been driven by various factors, including increased investor demand for diversified financial products (Greenwood and Scharfstein, 2013; Barber et al., 2016), regulatory shifts (Aiyar et al., 2014; Bengui and Bianchi, 2022; Gebauer and Mazelis, 2023), and the search for yield in a prolonged low-interest-rate environment (Martinez-Miera and Repullo, 2017; Malovaná et al., 2023). Investment funds have evolved into essential players in financial markets, not only providing liquidity but also influencing asset prices and financial stability. As a result, the role of these funds in financial intermediation and their potential impact on systemic risk have garnered considerable attention from policymakers and researchers alike.

Building on this backdrop, we apply state-dependent local projections on monthly data for six euro-area countries to uncover how surprise shifts in interest rates interact with macroprudential tightening to shape fund-sector dynamics. We contribute to the literature studying the effects of monetary policy on investment funds, (e.g. Giuzio et al., 2021; Kaufmann, 2023; Tillmann and Tiza Mimun, 2023; Tiza Mimun et al., 2025) and include a country-specific approach that captures how identical policy mixes yield sharply divergent outcomes across jurisdictions. We distinguish "conservative" markets (Germany, France, the Netherlands), where tighter buffers amplify fund outflows, from "global hubs" (Luxembourg, Ireland, Italy), where deep international funding channels can reverse the contraction into net inflows. These two groups have followed markedly different long-run paths: although both sets of markets grew strongly after 2009, the share of total assets held by the three hubs overtook that of the conservative trio around 2014 and has steadily widened since.

Our country-specific local projections reveal that surprise rate tightening combined with macroprudential hikes have sharply divergent effects across domiciles. In the "conservative" trio of Germany, France and the Netherlands, a joint policy shock reduces assets of the sector by roughly 0.1–0.2% at impact but deepens to a 0.4–0.6% contraction at its peak, with outflows persisting for several months. By contrast, in the "global hubs" of Luxembourg, Ireland and Italy the identical policy mix delivers a statistically significant, sustained inflow of 0.5–1%.

Our heterogeneity analyses uncovers two complementary sources of cross-jurisdictional variation. First, when we re-estimate the interaction separately for capital-based versus liquidity-based tightening episodes [1], we find that liquidity-based tools tend to trigger

[1] Capital-based measures include requirements such as risk weights, systemic risk buffers, and min-

sharper immediate adjustments in total fund assets, effects that, in conservative markets, fade within a few months, whereas capital-based episodes produce more moderate but longer-lasting contractions. In global hubs, the same split suggests that liquidity squeezes are particularly prone to induce net inflows as managers reroute activity across borders, with capital actions playing a smaller, more gradual role in reversing outflows.

Second, disaggregation by fund type reveals that equity-fund assets are generally more sensitive to tightening, especially under capital-based measures in conservative systems, while bond-fund assets, buoyed by higher yields and international funding networks, display greater resilience and, in hubs, often record net inflows under liquidity-focused episodes. Together, these patterns illustrate how both the nature of macroprudential intervention and the asset composition of funds shape the non-bank transmission of monetary and regulatory shocks across a heterogeneous euro-area landscape.

To rationalize the baseline sign reversal, we propose a simple balance-sheet framework highlighting two key channels. First, higher interest rates increase funds' funding costs, compressing net worth and curbing leverage (the "funding-cost" channel). Second, macroprudential tightening reduces the maximum allowable leverage by raising effective haircuts (the "haircut" channel). In conservative markets, where domestic funding networks are relatively shallow and cross-border funding is limited, these channels reinforce each other, amplifying outflows. In global hubs, however, domestic haircuts tend to be less binding and deep international funding networks allow managers to reroute borrowing, so the additional collateral constraint is more than offset by cross-border arbitrage, generating a net inflow.

Our paper makes two key contributions. First, by shifting the focus from banks to investment funds, an increasingly large segment of non-bank financial intermediation, we extend the growing literature on monetary-macroprudential interactions into a previously underexplored domain (e.g. Malovana and Frait 2017; Altavilla et al. 2020; Bussière et al. 2021). Building on studies of regulatory arbitrage in shadow banking (e.g. Acharya et al. 2013; Irani et al. 2021a; Gopal and Schnabl 2022; Rendon et al. 2024; Buchak et al. 2024), we show how shifts in banking regulation can spill over into fund flows, altering the transmission of monetary policy surprises. Most importantly, we show that the same policy mix can sharply contract assets in some jurisdictions while triggering inflows in others.

Second, our results underscore that as non-bank financial intermediaries now rival banks in size and interconnectedness, macroprudential frameworks must evolve beyond a bank-only focus. In particular, extending select capital and liquidity tools, or at least

imum capital requirements. Liquidity-based measures encompass policies targeting systemic liquidity and funding risks, such as liquidity coverage ratios, liquid asset ratios, and net stable funding ratios.

enhanced reporting and stress testing, to large investment-fund complexes could curb the regulatory arbitrage we observe, where joint policy tightening deepen outflows in some jurisdictions but spur inflows in others. Equally important is tailoring tool calibration to domestic market structures, combining durable capital buffers with targeted liquidity measures, and bolstering cross-border coordination and real-time monitoring through international regulatory bodies. Such a calibrated approach would help contain spillovers, limit arbitrage, and strengthen the resilience of the broader financial system.

The remainder of the paper is organized as follows. Section 2 describes the data. Section 3 introduces our methodological framework. Section 4 presents the empirical findings. Section 5 discusses the results and their policy implications. Finally, Section 6 concludes.

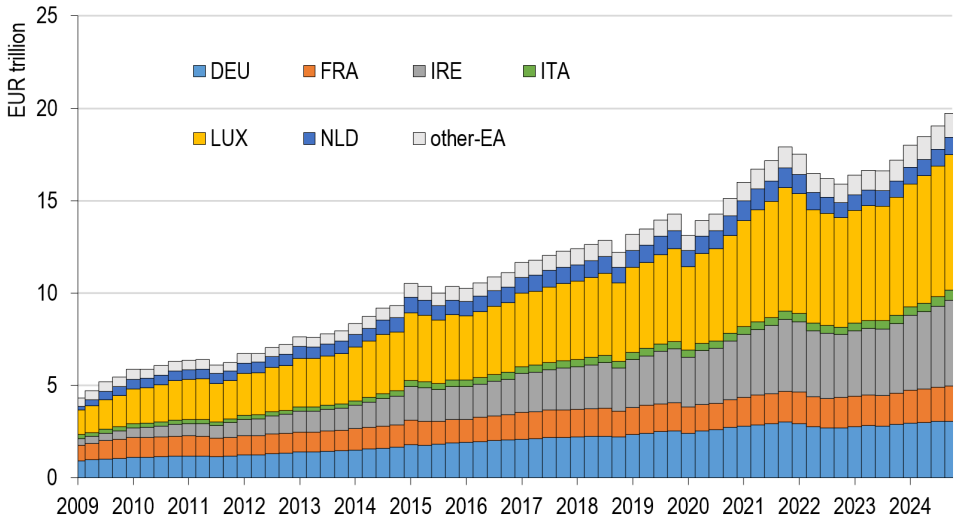
2 Data

Our analysis is based on country-level data for the six largest euro-area investment fund markets, drawn from the ECB's data portal. For each country, i.e. Germany, France, the Netherlands, Luxembourg, Ireland and Italy, we collect total assets under management, and further split these into equity-fund and bond-fund assets (see Figure 2 for a visualization). Our sample runs from January 2009 to December 2021, covering the period of post-crisis regulatory reforms and the expansion of non-bank intermediation in Europe (Hodula et al., 2020). Over this time window, these six countries account for roughly 90–93% of the euro-area fund sector, ensuring that our results capture virtually the entire market. Summary statistics for our sample are available in the Appendix A.

In our empirical specification, the dependent variable are total fund assets rather than raw flows. We prefer this specification for two reasons. First, total assets smooth high-frequency noise in flows, likely driven by rebalancing and valuation effects, and highlights the more persistent adjustment of stocks to policy shocks. Second, stock-based vales capture both net inflows and price (valuation) changes in one measure, making our estimates directly comparable to standard macro–financial indicators (e.g. credit or GDP growth). For these reasons, all impulse-response functions in this paper trace changes in fund assets.

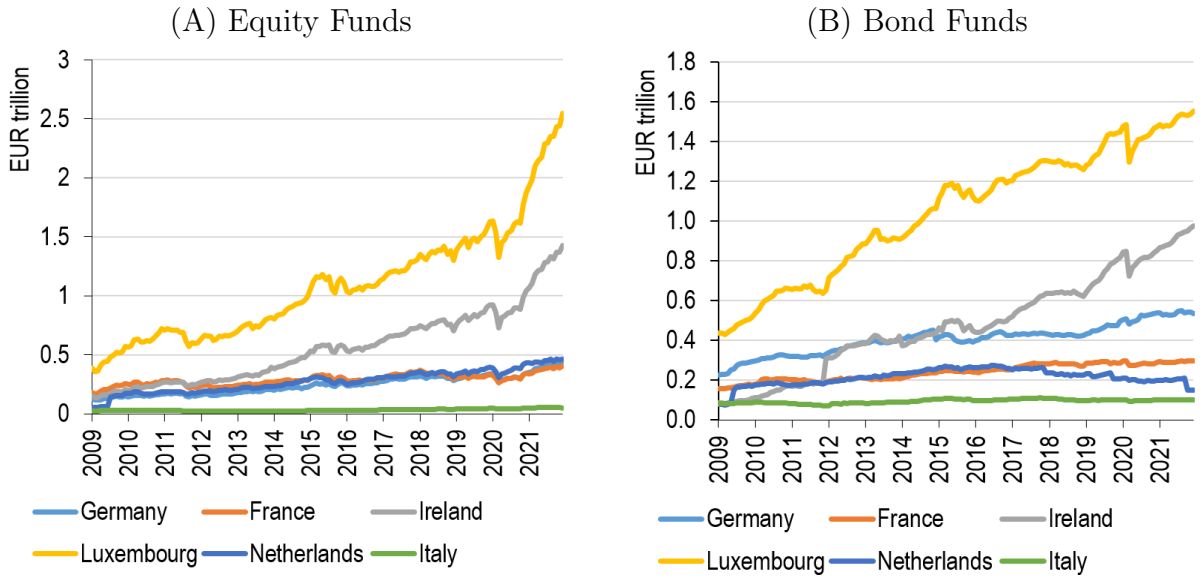
Macroprudential tightening. To capture the effect of macroprudential tightening episodes on fund-sector dynamics, we include a state-dependent dummy that equals one in any month when a country introduces or tightens one or more macroprudential measures, and zero otherwise. We consolidate all measures within a month into this single indicator for clarity, highlighting discrete regime shifts without imposing arbitrary weights on heterogeneous tools, and focus on how monetary transmission differs during tightening

Figure 1: Investment Funds in Euro Area



Source: ECB Data Portal; author's calculations.

Figure 2: Investment Funds in Selected EA Countries: Fund Type Breakdown



Note: Panel A shows the total assets of equity funds in different euro area countries, while Panel B illustrates the total assets of bond funds.
Source: ECB Data Portal; author's calculations.

episodes. All measure dates come from the IMF's iMaPP database, which records each policy introduction, recalibration and removal on a monthly timeline. Because different tools are likely to operate through separate channels, we decompose the dummy into two: (i) Capital-based tightening: months in which authorities raised risk weights, systemic or countercyclical buffers, or minimum capital ratios; and (ii) Liquidity-based tightening: months in which they imposed or increased liquidity coverage ratios, net stable funding ratios, or short-term debt charges.

By estimating impulse responses separately for capital-based and liquidity-based tools, we pinpoint how rate surprises interact with each regulatory dimension, showing, for example, whether borrowing-cost adjustments under monetary shocks are amplified more by haircut changes or by shifts in long-run capital requirements.

Monetary Policy Surprises. We identify monetary-policy shocks via high-frequency movements in the German 10-year Bund yield around ECB Governing Council announcements, extending the short-rate approach of Altavilla et al. (2019) and following the "long-end" strategy recently used in Giuzio et al. (2021). A 10-year surprise captures not only changes in policy expectations and term premia but also the valuation channel most relevant for both bond and equity funds. For bond funds, long-end yields directly mark-to-market medium- and long-maturity holdings. For equity funds, a rise in the 10-year rate feeds through higher discount rates on future dividends and induces portfolio rebalancing toward higher-yielding fixed-income assets.

Formally, let

$$\text{shock}_t = \begin{cases} y_{t,d}^{\text{after}} - y_{t,d}^{\text{before}}, & \text{if a Governing Council meeting occurs in month } t, \\ 0, & \text{otherwise,} \end{cases}$$

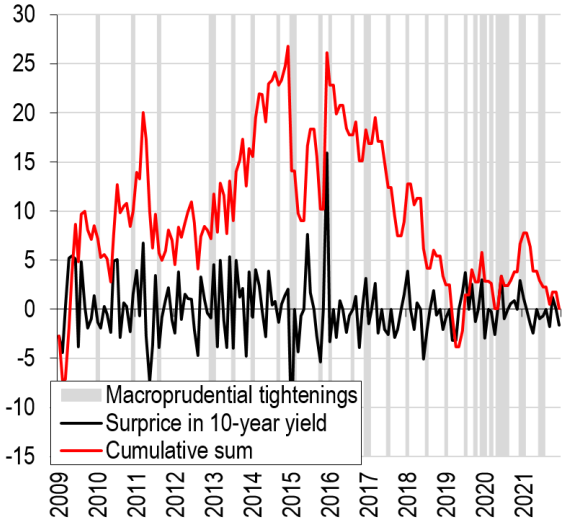
where $y_{t,d}^{\text{before}}$ and $y_{t,d}^{\text{after}}$ are the 10-year yield immediately before and after the press conference on day d. This yields a monthly series of truly unanticipated shocks that we feed into our state-dependent local projections.

Figure 3 presents two complementary views of this series. Panel A plots the raw surprises (black) and their cumulative sum (red) over Jan2009–Dec2021, with grey bars for macroprudential tightenings. Spikes around key ECB events (e.g. the 2015 asset-purchase programme, the 2020 pandemic measures) demonstrate that most variation in our shock series indeed coincides with major policy announcements. Panel B scatters each surprise against the subsequent 12-month percentage change in the EuroStoxx50 index. The near-flat cloud of points mirrors the null correlation found by Giuzio et al. (2021), underscoring that our 10-year shocks are orthogonal to contemporaneous equity-market

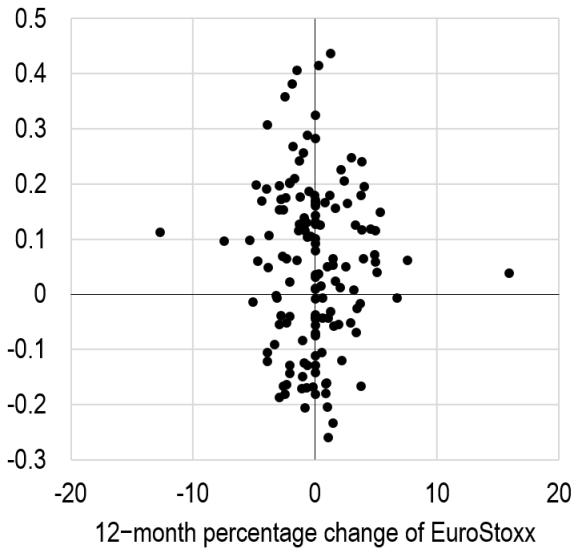
news and thus valid instruments for both bond and equity-fund responses.

Figure 3: Monetary Policy Surprises and Equity-Market Response

(A) Yield Surprises and Cumulative Sum



(B) Surprises vs. 12-month EuroStoxx



Panel A shows the monthly surprise in the German 10-year Bund yield (black) and its cumulative sum (red), with grey bars marking months of macroprudential tightenings (iMaPP). Panel B plots each surprise against the following 12-month percentage change in the EuroStoxx50 index.
Source: ECB Data Portal, Altavilla et al. (2019); author's calculations.

3 Econometric Methodology

For our analysis, we adopt the state-dependent local projection methodology introduced by Ramey and Zubairy (2018). This approach provides a flexible framework to estimate the dynamic effects of monetary policy shocks while accounting for different states of macroprudential policy. The primary advantage of this method lies in its ability to accommodate non-linearities by distinguishing between states with tightening macroprudential policy measures and those without any macroprudential tightening, allowing us to directly assess the heterogeneous effect of monetary policy shocks across these regimes.

$$\begin{aligned} y_{t+h} = I_{t-1}[\alpha_{A,h} + \theta_{A,h}(L)z_{t-1} + \beta_{A,h}shock_t] + \\ (1 - I_{t-1})[\alpha_{B,h} + \theta_{B,h}(L)z_{t-1} + \beta_{B,h}shock_t] + \varepsilon_t \end{aligned} \tag{1}$$

where y_{t+h} is the monthly (log) of total assets, equity, or bond fund assets; I_{t-1} is a dummy indicating any macroprudential tightening in the previous month; and shock_t captures the unanticipated component of policy, measured by changes in the German 10-year yield around ECB announcement windows (Altavilla et al., 2020). The lag polynomial

$\theta(L)$ on the control vector z_{t-1} (including lags of y, euro-area industrial production, consumer prices, and the CISS index) accounts for prevailing macroeconomic and financial conditions.

By estimating separate coefficients $\beta_{A,h}$ and $\beta_{B,h}$, we trace the full path of the impulse response in tightening versus non-tightening regimes without imposing restrictive dynamic assumptions. This flexible framework captures potential nonlinear amplification or dampening when funding-cost and collateral constraints bind, and delivers transparent, horizon-by-horizon estimates that facilitate comparison across countries, fund segments and policy tools. [2]

By directly modelling the differential effects of monetary shocks across macroprudential regimes, our approach offers a uniquely granular view of policy transmission. Unlike pooled panels or aggregate VARs, it uncovers state-dependent nonlinearities and jurisdictional heterogeneity in one coherent framework. This precision not only enhances causal identification by isolating the unanticipated policy ripple in distinct regulatory contexts, but also generates immediately interpretable impulse responses for each horizon, making our findings readily accessible and actionable for both researchers and policymakers.

3.1 Event-study

To motivate our empirical analysis, we implement a panel event-study that isolates the dynamic profile of fund-asset growth around months in which a monetary-policy surprise tightenings coincide with macroprudential tightenings. Specifically, we estimate the average response in a ±5-month window around each joint-shock event. Our sample is the balanced panel of six countries from January 2009 to December 2021, and we include country fixed effects to absorb time-invariant heterogeneity.

An event is defined by the interaction:

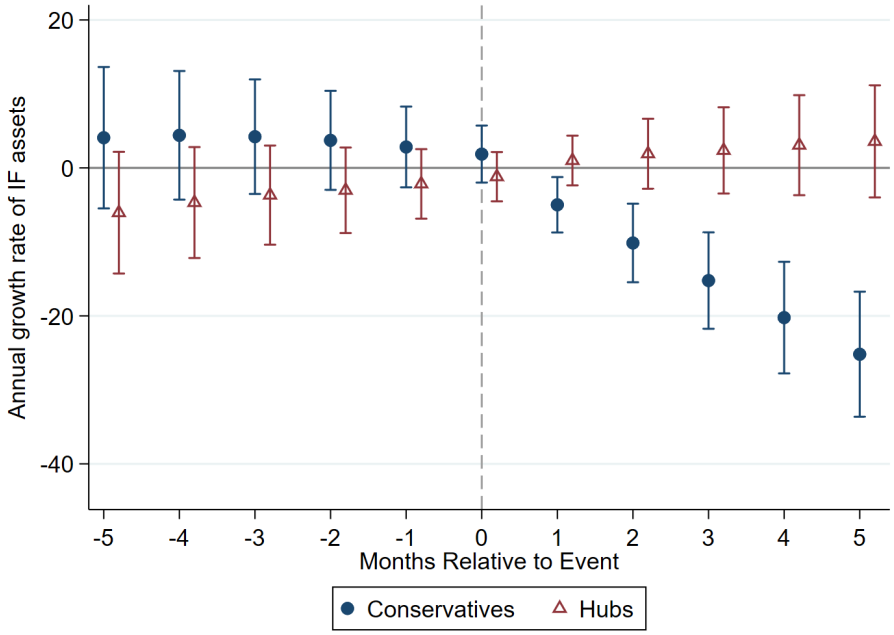
$$\text{Event}_{c,t} = \text{shock}_t \times \mathbf{1}\{\text{MAPP}_{c,t} = 1\}, \tag{2}$$

where $\text{MAPP}_{c,t}$ is the binary macroprudential-tightening dummy and shock_t is the 10-year yield surprise in month t. Because shock_t remains in its original magnitude, high-frequency surprises that coincide with tightenings enter with greater weight, reflecting the calibrated economic intensity of the joint policy move.

[2] Throughout all our estimations, we plot the estimated coefficients along with 68 percent confidence intervals over a five-months period. An advantage of the local projection approach is that it allows for straightforward computation of confidence intervals without relying on Monte Carlo simulations or asymptotic approximations. However, a known limitation of the LP method is that the confidence bands tend to widen at longer horizons. Consistent with the framework described by Cevik and Jalles (2024), we rely on 68 percent confidence bands which offer a more informative and precise view of the true underlying uncertainty.

Figure 4 displays the event-study coefficients, i.e. the average annualized growth rate of total fund assets at each relative month $\ell = -5, \ldots, 5$, separately for conservative markets (Germany, France, the Netherlands; blue circles) and global hubs (Luxembourg, Ireland, Italy; red triangles). In the five months before the event, both groups hover around zero, confirming parallel pre-trends. Immediately after $t = 0$, however, conservative markets experience a sharp contraction: fund-asset growth falls by roughly 5 pp at one month and deepens to over 20 pp by month 5. Global hubs, by contrast, show mild positive responses that gradually strengthen, reaching a modest 5 pp increase by month 5. The 95 percent confidence bands (vertical lines) exclude zero for horizons $h \geq 1$ in both groups, underscoring statistical significance.

Figure 4: Impulse responses of Euro area investment funds



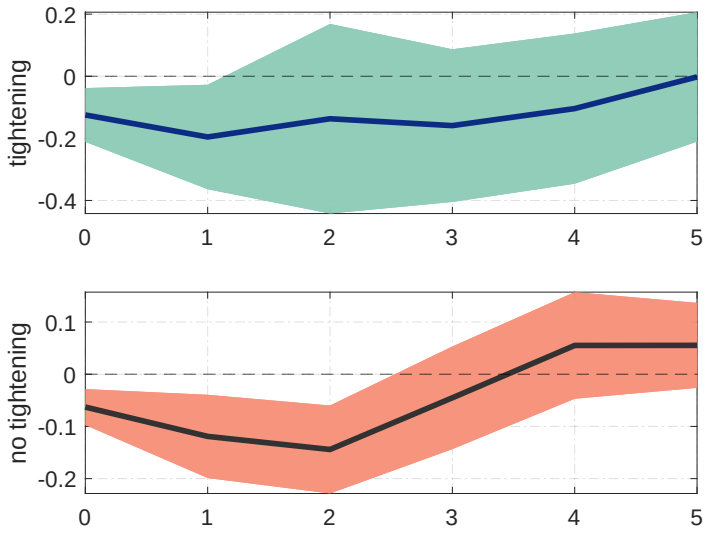
Notes: Coefficients from a panel event-study (xtvent) with country fixed effects, plotting the average annualized growth rate of total fund assets in months $\ell = -5, \ldots, 5$ relative to the joint-shock event shock$_t \times \mathbf{1}\{\text{MAPP}_t = 1\}$. Blue circles: average for Germany, France, Netherlands (conservatives); red triangles: Luxembourg, Ireland, Italy (hubs). Vertical bars are 95 percent confidence intervals.

4 Results

We begin with a conventional panel local projection that includes all six countries in our sample to estimate the their total asset response to a monetary policy shock. In the "no-tightening" regime (Figure 5, bottom panel), the impulse response function shows

a modest 0.15% decline after two months, fully reverting to zero within three months. Once we condition on months with macroprudential tightening (top panel), however, the picture becomes both noisier and more ambiguous. The point estimate also suggests additional drag, around 0.2% at its trough, but the confidence band expands markedly, straddling zero at almost every horizon. In effect, the panel tells us that under tightening episodes the average effect is indistinguishable from zero, yet the wide uncertainty conceals potentially large, but offsetting, country-level responses.

Figure 5: Impulse responses of Euro area investment funds



Notes: The figure shows the estimated β_h coefficients in a tight macroprudential policy state (upper panel) and in a state without any macroprudential policy measures included (lower panel). The figure also shows 68% confidence bands.

This contrast between the uniform slowdown in the non-tightening state and the blurred, statistically imprecise impulse response function under tightening motivates our shift to country-specific projections. By unpacking the panel, we can reveal the deep contractions in conservative markets and the surprising inflows in global hubs that cancel out in the aggregate, restoring both precision and economic insight.

4.1 Country-specific responses

Figure 6 illustrates the impulse responses of the investment funds sector in several European countries to monetary policy shocks, under both tightening and no tightening macroprudential policy regimes. Specifically, it shows the estimated β_h coefficients, rep-

resenting the effect of a monetary policy shock on the investment funds assets. In the no tightening macroprudential policy regime, our analysis reveals that monetary policy tightening leads to a decrease in investment fund sector across all countries studied. The immediate impact varies, with Germany experiencing a modest decline of -0.05% and the Netherlands facing a larger decrease of -0.15%. Notably, in Germany, France, and the Netherlands, the negative response is short-lived, the investment fund sector reverts to its pre-shock levels within five months. This quick reversion suggests that the investment fund sector in these countries absorbs the monetary policy shocks rather quickly, possibly due to robust economic fundamentals or strong investor confidence. Conversely, Ireland, Italy, and Luxembourg exhibit a more persistent negative response to the monetary policy tightening. This prolonged effect may stem from structural vulnerabilities, less diversified financial markets, or heightened investor risk aversion, making their fund sectors more sensitive to monetary policy tightening when macroprudential policy is not tightening.

Introducing macroprudential tightening transforms this uniform response into a striking divergence. In conservative markets (Germany, France, the Netherlands), the joint policy shock deepens and prolongs the downturn: peak contractions reach –0.30 to –0.40%, and recovery takes noticeably longer, consistent with higher funding costs interacting with tighter collateral or leverage constraints to force more aggressive deleveraging. By contrast, in the hub economies of Luxembourg, Ireland, and Italy the same monetary–macroprudential mix flips the sign. Total assets jump by over 1% after one month and remains elevated for several months. That reversal, given that pure monetary tightening initially depresses total assets in these hubs, points to offsetting forces: tighter regulation on banks may shift activity or capital toward well-connected fund domiciles, and the relative appeal of those hubs can rise when other jurisdictions face tighter buffers. Their deep cross-border funding networks make such substitution operationally feasible, helping to offset the funding-cost drag. We do not claim to pin down the dominant channel; the reduced-form framework that follows is flexible enough to accommodate both.

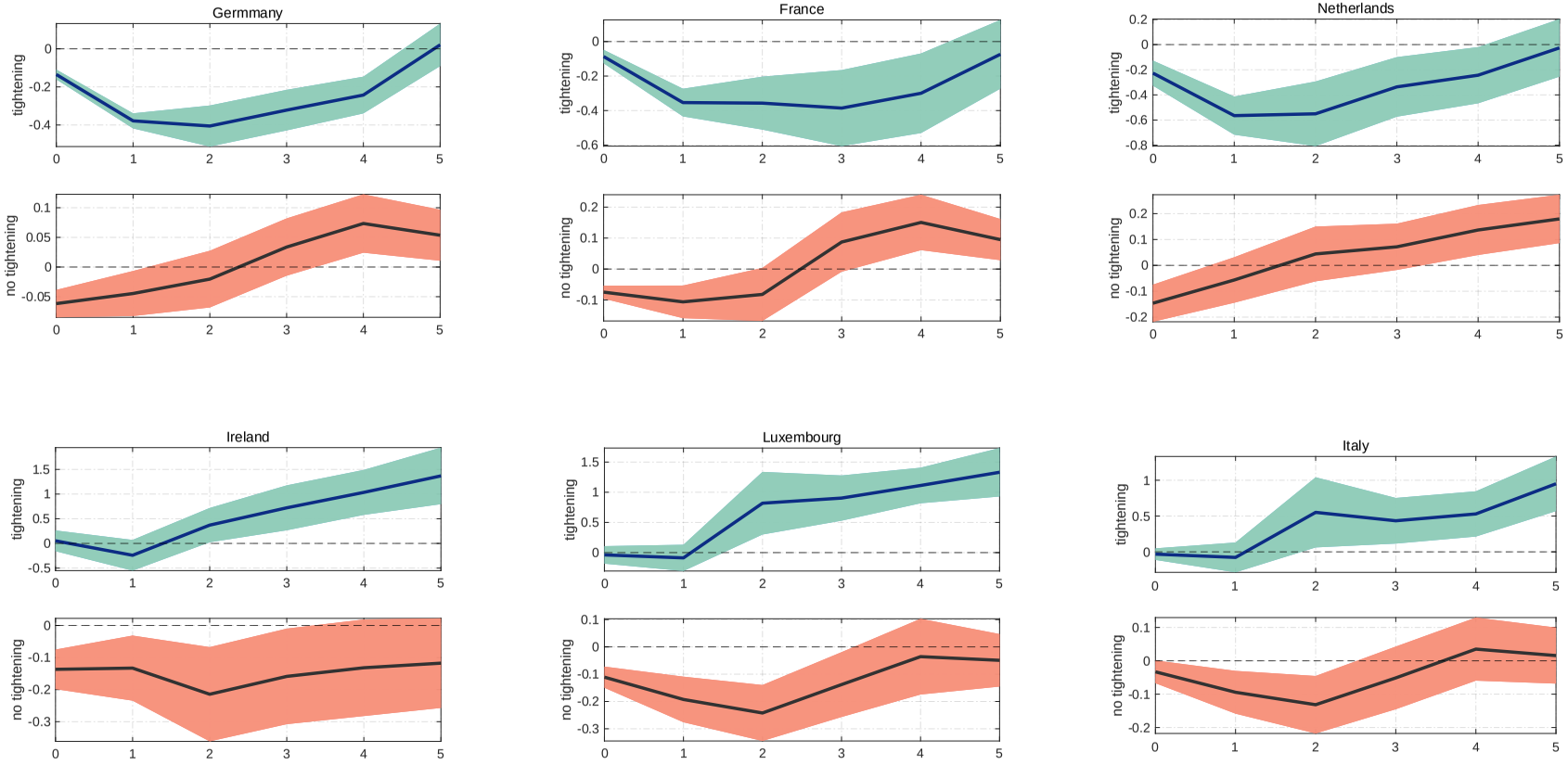
To rationalize these opposing patterns, we draw on a simple balance-sheet framework with two key channels. First, a monetary tightening raises short-term funding costs, squeezing funds' net worth and curtailing leverage (the funding-cost channel). Second, macroprudential tightening increases effective haircuts, mechanically limiting permissible borrowing (the haircut channel). In reduced-form, this interaction is captured by:

$$\Delta A_t \approx \underbrace{\frac{\partial A_t}{\partial i_t}}_{\text{funding-cost}} \Delta i_t + \underbrace{\frac{\partial A_t}{\partial \phi}\,\phi'(M_t)}_{\text{haircut}} \Delta M_t + \underbrace{\frac{\partial^2 A_t}{\partial i_t\,\partial M_t}}_{\text{interaction}} \Delta i_t\,\Delta M_t, \tag{3}$$

where $\phi'(M_t) < 0$ captures how tighter macroprudential buffers reduce allowable leverage. Crucially, the same tightening ΔM_t need not bite equally everywhere: in conservative markets, shallow domestic funding networks and binding haircuts make $\phi'(M)$ strongly negative, so both the pure monetary term and the interaction term in (1) are negative, amplifying outflows. In global hubs, by contrast, domestic haircuts are less binding ($\phi'(M) \approx 0$) and deep cross-border funding avenues allow managers to re-leverage abroad; this external arbitrage can more than offset the funding-cost squeeze, turning the interaction term in (1) positive and generating net inflows. This framework therefore not only explains the sign reversal but also underlines why haircut effectiveness, and the ability to sidestep it—drives the heterogeneous transmission we document. For a full derivation, see Appendix B.

By combining our two-channel framework with state-dependent, country-level impulse responses, we extend the literature on regulatory leakage (Irani et al., 2021b; Gebauer and Mazelis, 2023; Hodula and Ngo, 2024) and on monetary shocks in shadow banking (Nelson et al., 2018; Hodula and Libich, 2023) to show precisely how surprise rate moves and bank-focused buffers interact to generate opposite fund-flow outcomes in conservative markets versus global hubs. Since macroprudential and monetary tools are deployed together, treating them in isolation misses key feedback, our joint analysis reveals that interest-rate surprises can amplify or mute regulatory leakages (and vice versa), producing dynamics that static, single-policy studies cannot capture.

Figure 6: Impulse Responses of Selected Investment Funds Sectors



Notes: The figure shows the estimated β_h coefficients in a tight macroprudential policy state (upper panel) and in a state without any macroprudential policy measures included (lower panel). The figure also shows 68% confidence bands.

4.2 Equity Funds and Bonds Funds

Equity funds and bond funds could differ fundamentally in their sensitivity to funding-cost and valuation channels: equity funds bear the full force of discount-rate increases, while bond funds can partially offset higher funding costs through improved coupon returns. Disaggregating our results by asset class thus uncovers which fund types drive the average response.

Figures 7 and 8 present our state-dependent impulse responses for country-level equity and bond funds under both benign and tight macroprudential regimes. In the absence of any macroprudential tightening, a monetary policy tightening causes both equity funds and bond funds to contract across almost all countries, though the depth and duration of those contractions vary markedly by asset class and domicile. In Germany, France and the Netherlands, equity-fund assets fall sharply on impact, peaking at roughly a 0.2–0.4% decline, and then rebound within three to five months. This suggests that strong fundamentals and deep domestic investor bases restore flows relatively quickly. Bond funds in these conservative markets see more muted peak declines (around 0.1–0.2%) and recover gradually as higher yields lure fresh capital.

In Italy and Luxembourg, equity funds contract on impact as higher funding costs and tighter haircuts prompt an initial pull-back, but both recover by months 4–5. In Luxembourg, this rebound aligns with its role as an internationally integrated fund center, where cross-border funding can replenish liquidity once the immediate squeeze passes. Italy's equity funds also regain ground after a few months, consistent with investors reallocating toward higher-yield opportunities as market conditions normalize.

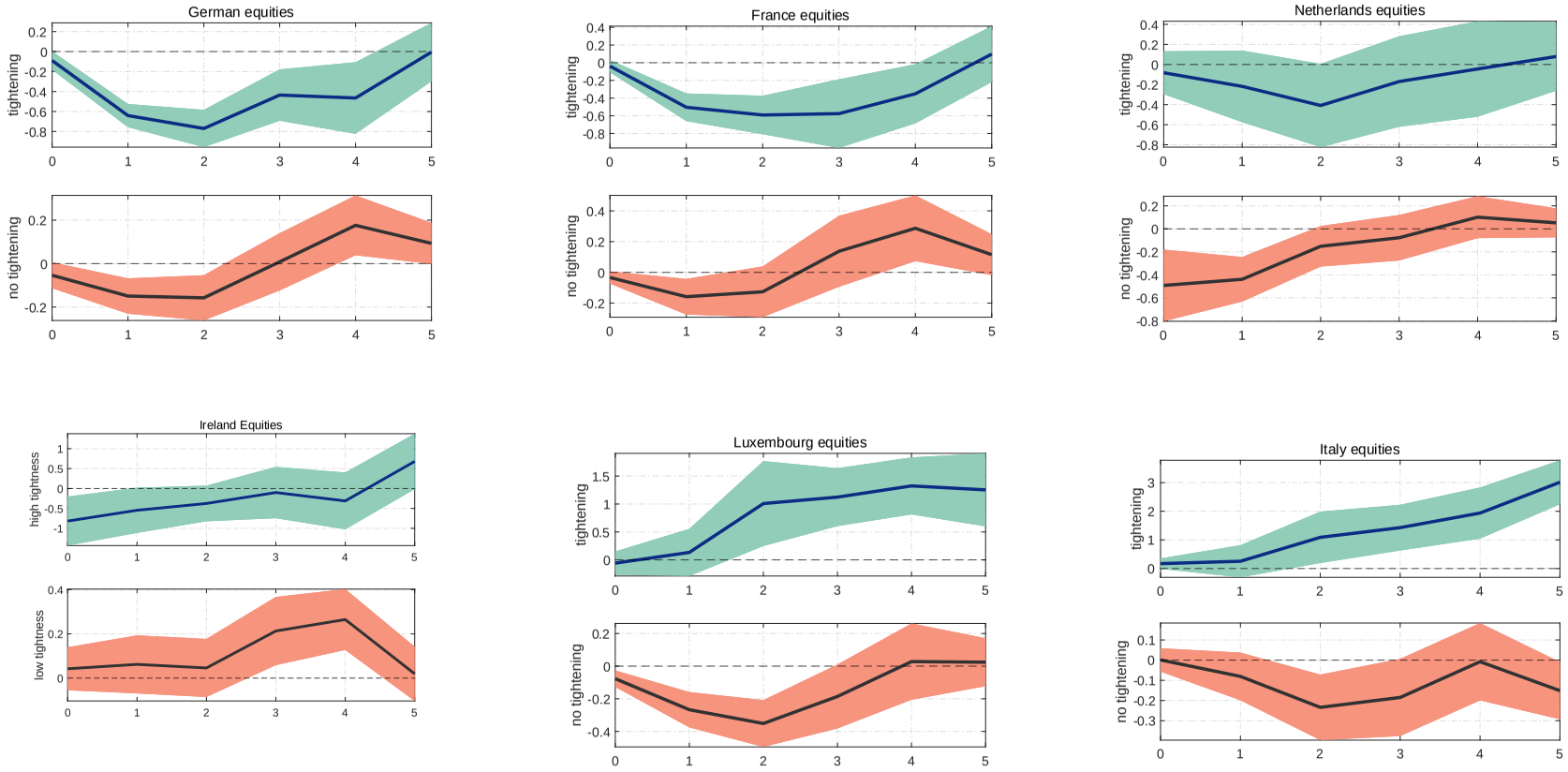
Bond funds show a different pattern. In all three countries, bond-fund assets continue to decline for several months following the monetary policy shock, even in the Netherlands and Luxembourg, where markets are deep. This may reflect the dominant negative duration effect on existing holdings. Although higher coupons would ordinarily attract new investment, tighter liquidity and collateral constraints delay portfolio rebuilding, prolonging the downturn until managers can roll down durations and reinvest under the new rate regime.

When we add simultaneous macroprudential tightening, these dynamics intensify in conservative markets: both equity funds and bond funds contractions deepen and their half-lives lengthen as stricter haircuts compound the funding-cost squeeze. Bond funds suffer a particularly pronounced slump because tighter collateral limits restrict new leverage precisely when higher yields would otherwise encourage reinvestment, creating a timing mismatch that postpones any coupon-driven recovery.

In hub countries, both equity funds and bond funds show positive responses following

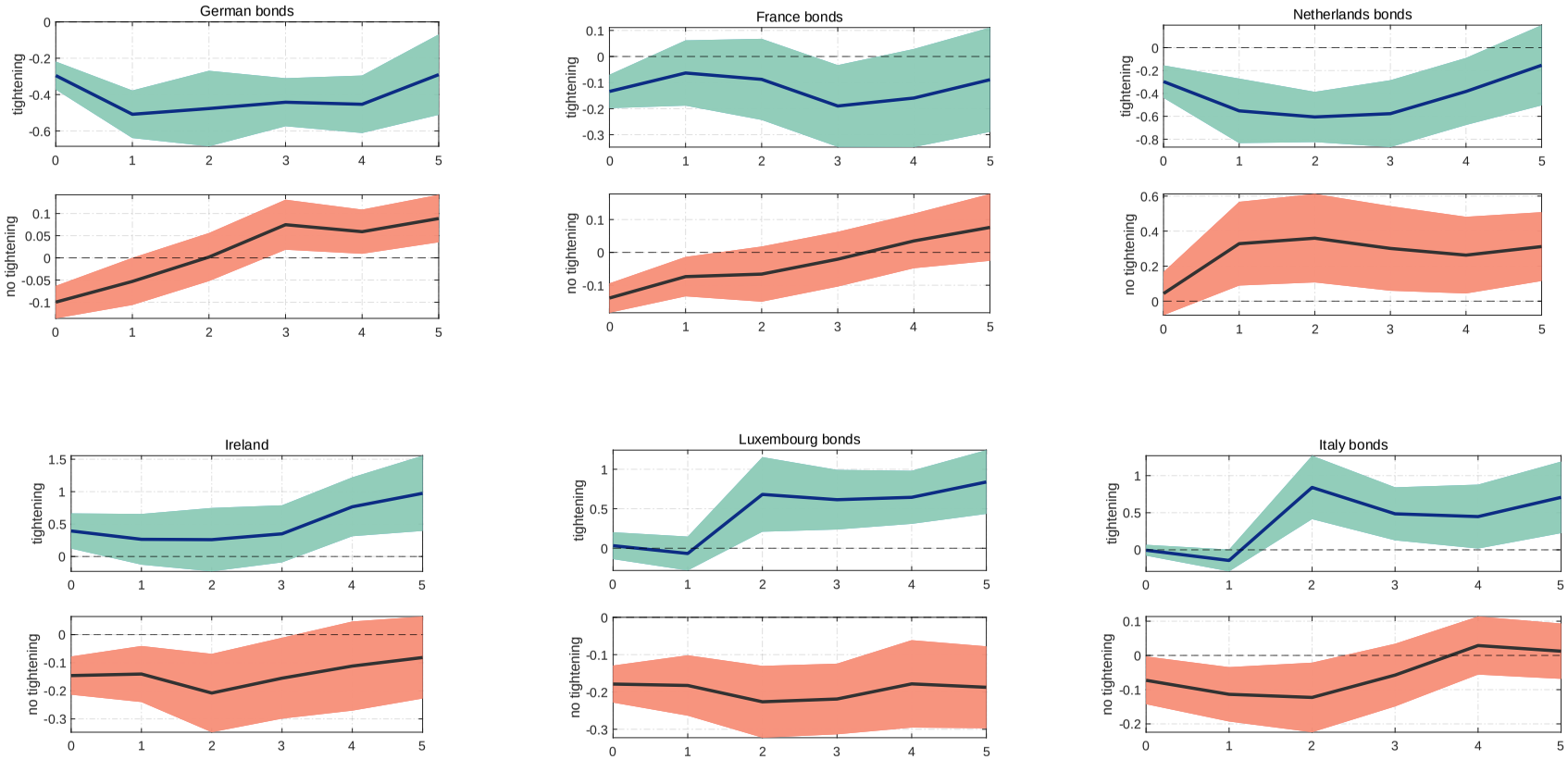
joint monetary-macroprudential shocks, indicating net inflows. In Ireland, this response is driven more strongly by bond funds, which may reflect investors reallocating toward higher-yielding fixed-income products even as regulatory buffers tighten. Luxembourg shows positive growth in both equity funds and bond funds, suggesting that its large, internationally integrated fund complex is able to attract new capital under combined policy shocks. Italy's fund sector, previously more subdued under pure monetary surprises, also posts modest positive growth in both asset classes when macroprudential measures are tightened alongside rate hikes. While the precise drivers of these inflows are not directly observed in our data, the results are consistent with the notion that globally connected fund centers can, under certain conditions, draw in capital despite, and sometimes because of stricter regulatory requirements.

Figure 7: Impulse Responses of Selected Investment Funds Sectors: Equity Funds



Notes: The figure shows the estimated β_h coefficients in a tight macroprudential policy state (upper panel) and in a state without any macroprudential policy measures included (lower panel). The figure also shows 68% confidence bands.

Figure 8: Impulse Responses of Selected Investment Funds Sectors: Bond Funds



Notes: The figure shows the estimated β_h coefficients in a tight macroprudential policy state (upper panel) and in a state without any macroprudential policy measures included (lower panel). The figure also shows 68% confidence bands.

4.3 Liquidity- and Capital-related Macroprudential Policies

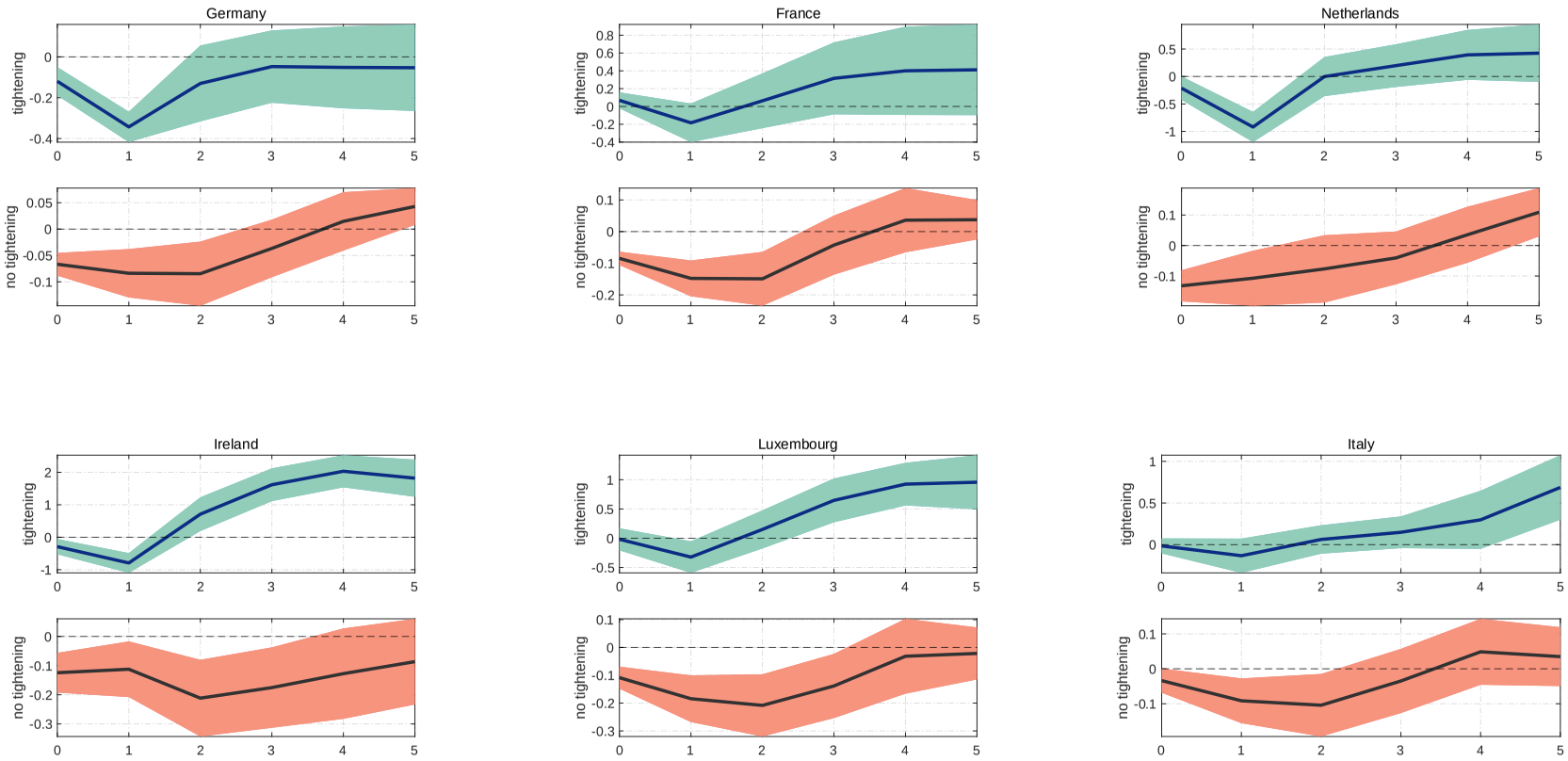
Macroprudential policy comprises a diverse toolkit: liquidity-based measures tighten short-term funding and collateral constraints, whereas capital-based measures curb long-run risk-taking capacity. By estimating separate impulse response functions for each category, we include the distinct channels through which monetary and regulatory shocks interact, revealing, for example, that liquidity squeezes trigger sharp but transient pull-backs, while capital buffers impose a deeper, more persistent drag on fund assets.

Our results in Figures 9 and 10 reveal that the nature of the macroprudential tool fundamentally alters the joint effect of monetary tightening on fund-sector dynamics.

When liquidity-based measures are in place, i.e. as increased liquidity-coverage ratios or short-term funding surcharges, the immediate response to a monetary-policy surprise is a sharp contraction in total assets across the three conservative markets (Germany, France, the Netherlands). Liquidity constraints tighten funding lines, forcing rapid, if temporary, deleveraging. Yet these same markets also stage the quickest recoveries: by months 2-3, funds assets begin to rebound, as investors and managers adjust portfolios, tap alternative funding sources, and rebuild liquidity buffers. Under capital-based macroprudential tightening regime, such as higher risk weights or elevated capital buffers, the initial contraction in conservative markets is both deeper and more persistent. These measures directly curtail risk-taking capacity, so the funding-cost shock combines with a binding leverage cap to produce a sustained downturn. Germany and France, in particular, see funds assets remain well below baseline for at least five months, while the Netherlands also trails off more gradually.

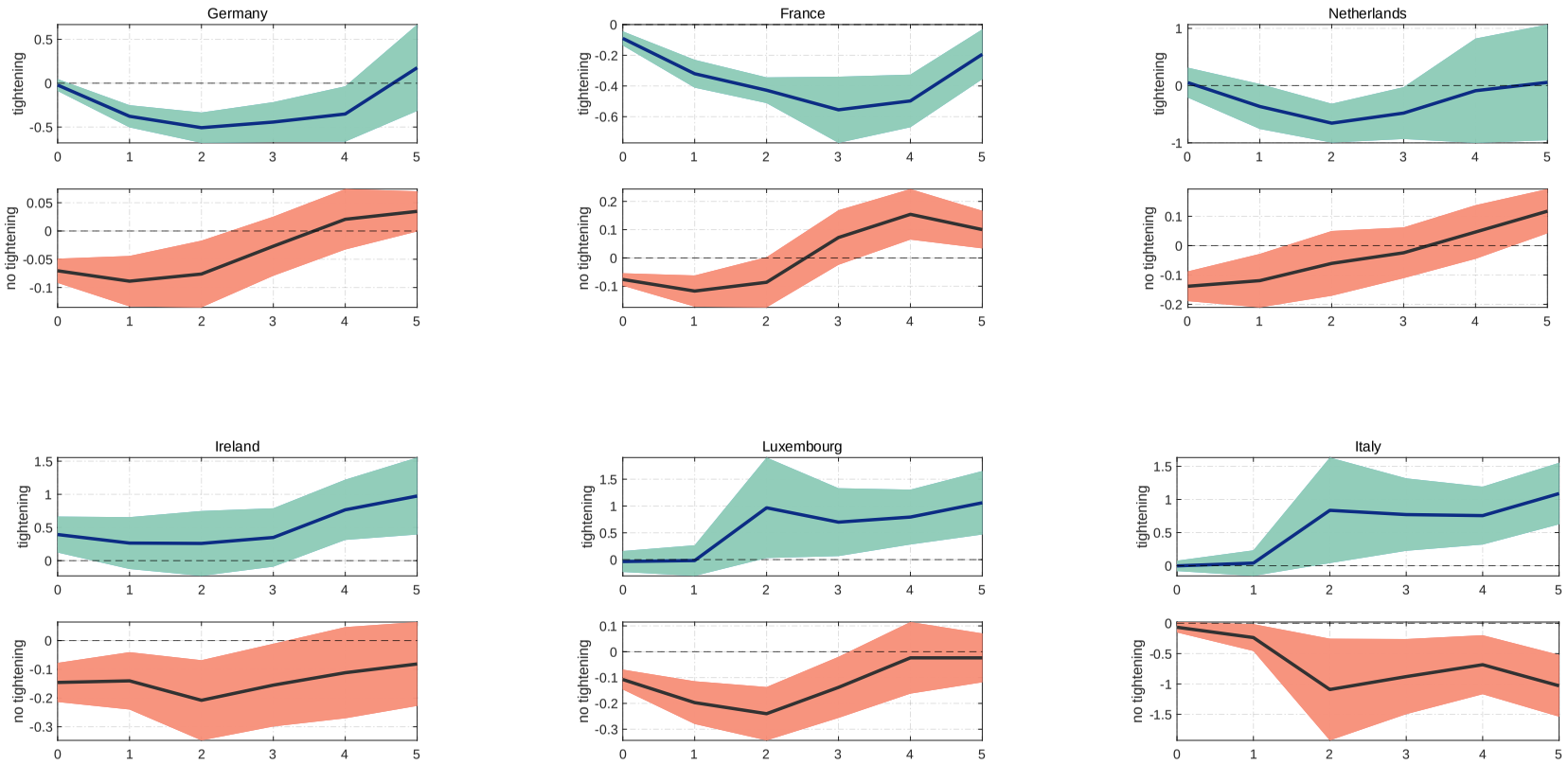
In the global hubs (Luxembourg, Ireland, and Italy), by contrast, neither liquidity- nor capital-based tightening leads to substantial, persistent contractions. Under liquidity-focused measures, these markets often exhibit small positive responses following the initial decline. Even when capital buffers are raised, fund assets in hubs tend to stabilize or edge higher rather than fall sharply. These results suggest that deeper, more diversified funding networks in hub jurisdictions help cushion the combined impact of monetary and macroprudential shocks, resulting in neutral or modestly positive net inflows.

Figure 9: Impulse Responses of Selected Investment Funds Sectors: Liquidity-based policies



Notes: The figure shows the estimated β_h coefficients in a tight macroprudential policy state (upper panel) and in a state without any macroprudential policy measures included (lower panel). The figure also shows 68% confidence bands.

Figure 10: Impulse Responses of Selected Investment Funds Sectors: Capital-based policies



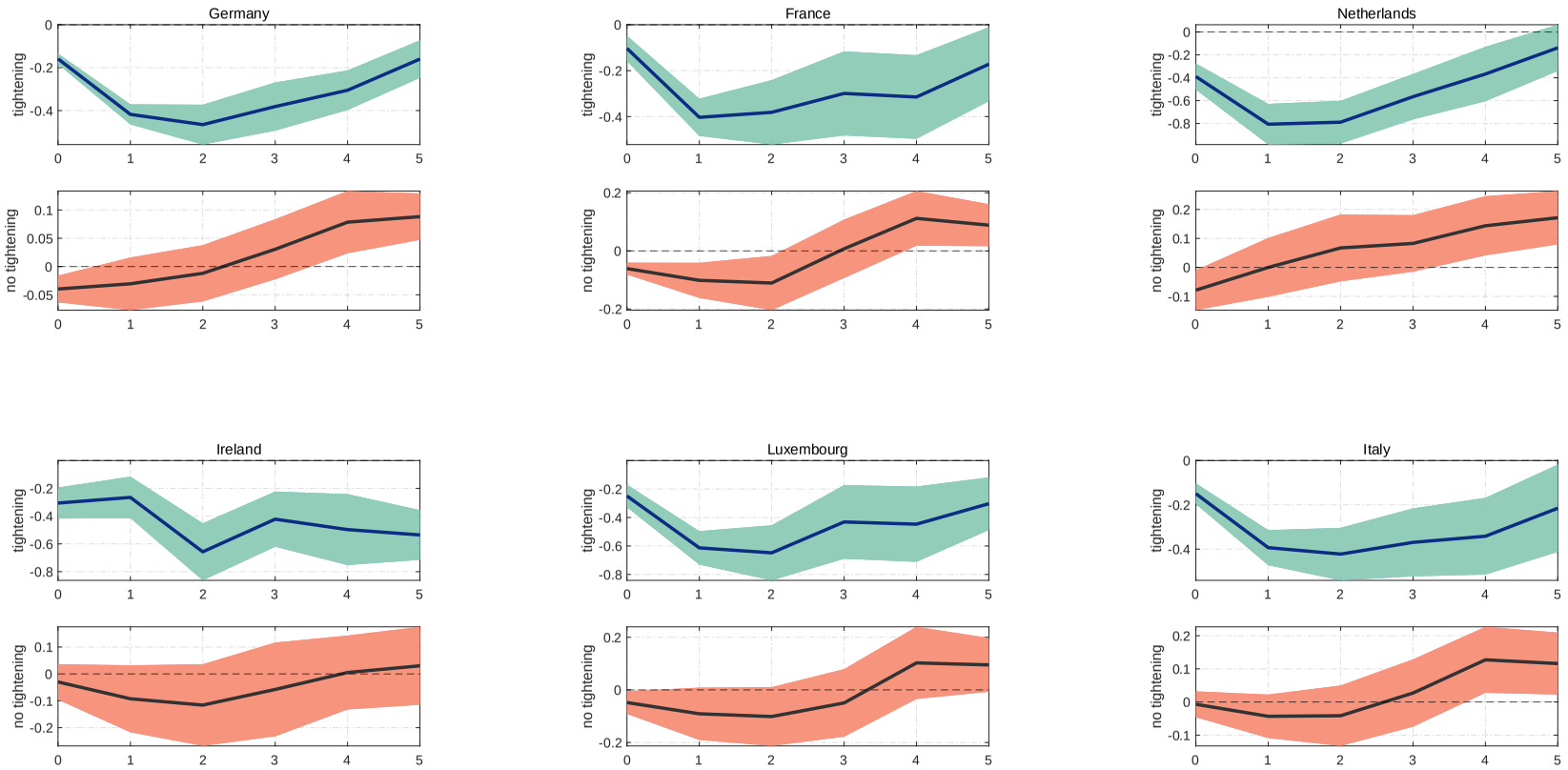
Notes: The figure shows the estimated β_h coefficients in a tight macroprudential policy state (upper panel) and in a state without any macroprudential policy measures included (lower panel). The figure also shows 68% confidence bands.

4.4 Extension

To assess whether the hub inflows under domestic tightening depend on uneven regulation, we construct an alternative, "broad" euro-area macroprudential indicator. Instead of turning on whenever any single country tightens, the dummy equals one only in months when at least three out of the six sample countries simultaneously introduce macroprudential tightening. This threshold is meant to capture a more coordinated euro-area stance and avoid overstating the aggregate tightening when only isolated national actions occur. The setup therefore allows us to estimate country-level responses to monetary surprises conditional on a more synchronous macroprudential tightening across key jurisdictions.

Figure 11 plots the resulting impulse responses for total investment fund assets. Unlike the baseline country-specific interaction, the hubs (Ireland, Luxembourg, and Italy) no longer exhibit inflows, instead, total assets decline following the joint monetary-macroprudential shock, mirroring the behavior in conservative markets. This attenuation of the previous positive reversal is consistent with the idea that once multiple core jurisdictions tighten together, cross-border arbitrage opportunities shrink and the relative advantage of hubs dissipates. Figures B2 and B3 in the appendix show the corresponding equity- and bond-fund responses and display a similar pattern, reinforcing the same interpretation. Taken together, the exercise underscores that partial or asynchronous macroprudential tightening can create loopholes that hubs exploit, whereas more harmonized action limits those regulatory arbitrage channels.

Figure 11: Impulse Responses of Selected Investment Funds Sectors



Notes: The figure shows the estimated β_h coefficients in a tight macroprudential policy state (upper panel) and in a state without any macroprudential policy measures included (lower panel). The figure also shows 68% confidence bands.

5 Discussion and policy implications

The immediate pass-through of macroprudential tightening to investment funds hinges on where and how those funds source their short-term financing. In conservative markets such as France, Germany, and the Netherlands, investment funds rely heavily on a small number of domestic banks for repos, margin lines and other secured funding. When regulators raise capital buffers or impose tighter haircuts on those banks, the cost and availability of repo financing deteriorate sharply. Funds in these jurisdictions thus face a dual squeeze, i.e. higher policy rates and more stringent bank collateral requirements, with few alternative lenders to soften the blow. The result is a pronounced contraction in both equity funds and bond funds assets that deepens and persists until domestic funding conditions normalize.

By contrast, Ireland and Luxembourg have spent decades cultivating globally integrated prime-broker and repo networks, coupled with EU-wide passports that ease cross-border activity. In these hubs, a resident fund facing tighter domestic bank regulation can often reroute its short-term borrowing to international branches of major banks or non-bank liquidity providers. This operational flexibility allows fund managers to replace any lost domestic funding almost seamlessly, turning what would be a binding haircut in a conservative market into a largely symbolic constraint in a hub. At the same time, higher bank capital requirements abroad can signal greater overall financial stability, prompting global investors to redirect capital into these well-regulated domiciles rather than withdraw it. As a result, combined monetary-macroprudential shocks in hubs tend not to produce net outflows, in some cases, they coincide with modest net inflows as investors chase both yield and regulatory safety.

Of course, this cross-border arbitrage channel is neither costless nor universal. Smaller managers without global prime-broker relationships, sudden spikes in global risk aversion, or simultaneous tightening of correspondent-bank conditions can all limit the ability to reroute funding. Moreover, legal, tax and operational frictions, such as differing insolvency regimes or collateral-mobility rules, can still impede arbitrage in practice. Nonetheless, the stark contrast between conservative markets and hubs in our empirical results aligns closely with these structural differences in funding architectures. It highlights the importance of accounting for non-bank funding networks and regulatory spillovers when assessing the true reach of macroprudential policy.

Our results carry several important policy implications. First, they highlight that bank-focused macroprudential measures can have unintended spillovers into the non-bank sector, varying sharply by market structure: in jurisdictions with shallow domestic funding, tighter bank buffers amplify the contractionary effect of rate hikes on invest-

ment funds, whereas in internationally integrated hubs the same policies may be offset, or even reversed, through cross-border arbitrage. This suggests that macroprudential authorities should broaden their lens beyond banks alone and consider coordinated frameworks that encompass key non-bank intermediaries, particularly in systemically important fund domiciles. Second, our evidence underscores the need for greater cross-border regulatory cooperation: unilateral tightening in one country can simply displace risk into less-regulated or more open markets, potentially undermining the goals of financial stability. Finally, central banks and macroprudential agencies should jointly assess the state-dependent interaction between policy rates and buffer requirements, calibrating the timing and intensity of interventions to avoid exacerbating stress in more vulnerable, bank-centric markets while ensuring that global hubs do not inadvertently become conduits for regulatory leakage.

6 Conclusions

This paper presents empirical evidence that the joint effects of monetary policy and macroprudential tightening on investment fund assets are deeply state- and structure-dependent. Using state-dependent local projections for six euro-area countries, we document that in financially conservative, bank-centric markets (Germany, France, the Netherlands) a monetary policy shock combined with tighter bank buffers produces substantially larger and more persistent contractions in both equity and bond funds. By contrast, in global fund hubs (Luxembourg, Ireland and, under certain conditions, Italy), the same policy mix often coincides with net inflows, as deep cross-border funding networks and regulatory arbitrage opportunities allow these domiciles to absorb, or even reverse, the pure funding-cost shock.

To make sense of these divergent responses, we develop a simple balance-sheet framework that highlights two key channels: a "funding-cost" channel, whereby higher short-term rates squeeze net worth and reduce leverage, and a "haircut" channel, whereby tighter bank regulation raises effective collateral constraints. In conservative markets, shallow funding networks and binding domestic haircuts reinforce one another, amplifying outflows. In hubs, by contrast, loose haircuts and abundant international liquidity buffers allow funds to re-leverage abroad, flipping the interaction term positive.

Our findings carry clear policy lessons. First, macroprudential measures aimed at banks can spill over into non-bank financial intermediation in starkly different ways depending on local market architecture. Second, a uniform policy stance risks either over-tightening in some jurisdictions or under-regulating in others; instead, authorities should coordinate monetary and macroprudential actions across sectors and borders, and

explicitly incorporate non-bank funding channels into their stability assessments.

Looking forward, further work might examine the role of cross-border supervisory cooperation, the impact of specific regulatory instruments on different fund structures, or the feedback from fund flows back into bank resilience. As non-bank intermediaries continue to grow and the lines between banking and asset management blur, unpacking these interactions will be essential to preserving financial stability in an integrated euro-area market.

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A Summary Statistics

The tables in this appendix provide detailed summary statistics for our main variables over the full sample period (01/2009–12/2021). Table A1 reports the distribution of end-of-month total assets (in million EUR) for equity and bond funds in each country. Table A2 then summarizes our control variables, i.e. industrial production, HICP inflation, the euro-area financial stress index (CISS), and the high-frequency German 10-year yield surprise, all of which enter our local-projection regressions. Finally, Table A3 displays the frequency and variability of macroprudential tightening episodes, distinguishing overall tightening from capital-based versus liquidity-based measures.

Table A1: Summary Statistics of Investment Fund Assets by Country and Asset Type (million EUR)

Country	Asset Type	Mean	SD	25th	Median	75th
Germany	Equities	243 402.5	78 668.4	169 440.5	243 074.5	304 956.5
	Bonds	406 592.7	75 927.4	349 056.5	420 085.0	442 050.0
France	Equities	289 635.7	48 120.8	252 635.0	286 028.5	324 598.0
	Bonds	240 038.1	41 030.1	205 016.0	243 505.5	282 003.5
Ireland	Equities	558 180.6	310 795.1	275 406.5	537 205.0	764 393.0
	Bonds	478 759.2	247 282.1	326 868.0	453 594.5	641 215.5
Luxembourg	Equities	1 088 972	485 860.1	683 613.5	1 056 500	1 379 369
	Bonds	1 048 649	325 083.3	748 467.5	1 127 731	1 298 168
Netherlands	Equities	273 980.9	94 512.5	192 837.5	273 873.0	343 884.0
	Bonds	214 421.8	40 683.4	189 660.5	215 509.0	250 539.5
Italy	Equities	32 788.4	9 372.0	24 024.0	30 848.0	39 393.5
	Bonds	94 410.8	9 964.5	85 548.0	97 626.5	101 946.5

Table A2: Summary Statistics: Controls and Monetary-Policy Shock

Variable	Mean	SD	25th	Median	75th
Industrial Production (IP)	99.511	5.118	96.842	99.942	104.041
HICP Inflation (HICP)	100.071	4.599	97.775	100.115	104.030
Financial Stress (CISS)	0.186	0.166	0.069	0.120	0.265
10-Year Bund Surprise (DE_10Y)	0.001	3.117	-2.050	0.000	1.425

Notes: Statistics are computed over 01/2009–12/2021. IP and HICP are index levels (base 100); CISS is the composite financial stress index; DE_10Y is the high-frequency surprise in the German 10-year yield around ECB events, in basis points.

Table A3: Summary Statistics for Macroprudential Tightening Dummies

Country	Overall Dummy		Capital-Based Dummy		Liquidity-Based Dummy	
	Mean	SD	Mean	SD	Mean	SD
Germany	0.0769	0.2673	0.0321	0.1767	0.0321	0.1767
France	0.1026	0.3044	0.0705	0.2568	0.0321	0.1767
Netherlands	0.0962	0.2958	0.0256	0.1586	0.0128	0.1129
Luxembourg	0.0897	0.2867	0.0641	0.2457	0.0385	0.1929
Ireland	0.0962	0.2958	0.0513	0.2213	0.0128	0.1129
Italy	0.0833	0.2773	0.0513	0.3171	0.0321	0.1767

B Stylized Theoretical Framework

In this section, we present a simple, illustrative balance-sheet framework for a representative non-bank fund. This is not a full general-equilibrium model, but rather a reduced-form sketch that highlights the two key channels—funding costs and collateral constraints, through which monetary and macroprudential policies can interact. It is meant purely to motivate our empirical specification and to shed light on why the interaction term may have opposite signs in different country groups.

B.1 Framework Setup

We consider a representative fund that chooses its portfolio size A_t and leverage L_t to maximize expected utility of end-of-period equity E_{t+1}. In period t, the fund holds risky assets worth A_t, financed by its own capital E_t and by short-term debt L_t. Formally:

$$\max_{A_t,\, L_t} \; \mathbb{E}_t\big[U(E_{t+1})\big] \quad \text{subject to}$$

$$A_t = E_t + L_t, \quad E_{t+1} = (1 + R_t)\, A_t - (1 + i_t)\, L_t, \quad L_t \le \phi_c(M_t)\, A_t.$$

Here R_t is the realized return on the risky portfolio and i_t the short-term funding rate; M_t denotes the country-specific macroprudential stance, and $\phi_c(M_t)$ the maximum debt-to-asset ratio allowed, with $\phi_c'(M) < 0$. Under CRRA utility $U(E) = E^{1-\gamma}/(1-\gamma)$, the first-order conditions imply that both optimal leverage and asset choice decline with higher funding costs i_t (the *funding-cost channel*, as in Adrian and Shin 2010; Brunnermeier and Sannikov 2014) and with tighter collateral constraints $\phi_c(M_t)$ (the *haircut channel*, in the spirit of Farhi and Tirole 2012; Farhi and Tirole 2021).

B.2 Impulse Response Decomposition

Let $A^*(i_t, M_t)$ denote the policy function mapping the monetary and macroprudential states into the fund's optimal asset position implied by the problem in Section B. When the collateral constraint binds, $A_i \equiv \partial A^*/\partial i < 0$ and $A_M \equiv (\partial A^*/\partial \phi_c)\phi_c'(M) < 0$. Because the marginal value of relaxing the constraint depends on the funding cost, the cross-partial $A_{iM} \equiv \partial^2 A^*/(\partial i\, \partial M)$ is generally non-zero.

Approximating $A^*(i_t, M_t)$ around a steady state $(\bar{i}, \bar{M})$ with a *second-order* Taylor expansion yields

$$\Delta A_t = A_i\, \Delta i_t + A_M\, \Delta M_t + \tfrac{1}{2} A_{ii} (\Delta i_t)^2 + \tfrac{1}{2} A_{MM} (\Delta M_t)^2 + A_{iM}\, \Delta i_t\, \Delta M_t. \tag{B1}$$

The first two terms in (B1) correspond to the *funding-cost* and *haircut* channels, while the cross-term $A_{iM}\, \Delta i_t\, \Delta M_t$ represents their *interaction*. In our empirical setup, M_t is a discrete macroprudential-tightening indicator and Δi_t is small, so we focus on the interaction term $A_{iM}\, \Delta i_t M_t$, which captures how the funding-cost effect of a monetary shock depends on the tightness of macroprudential policy. This term maps directly to the interaction coefficient $\beta^{(1)}_{h,\ell}$ in the local projections used in the main text.

B.3 Heterogeneity Across Country Groups

We distinguish:

- **Conservative markets (DE, FR, NL):** Domestic repo and prime-broker networks are relatively shallow, making haircuts binding ($\phi'_{\text{cons}}(M) \ll 0$) and leaving little scope for cross-border re-leverage, so $\beta^{(1)} < 0$.
- **Global hubs (LU, IE, IT):** Deep international funding networks and regulatory arbitrage mean haircuts bite less ($\phi'_{\text{hub}}(M) \approx 0$) and can be offset by external borrowing, yielding $\beta^{(1)} > 0$.

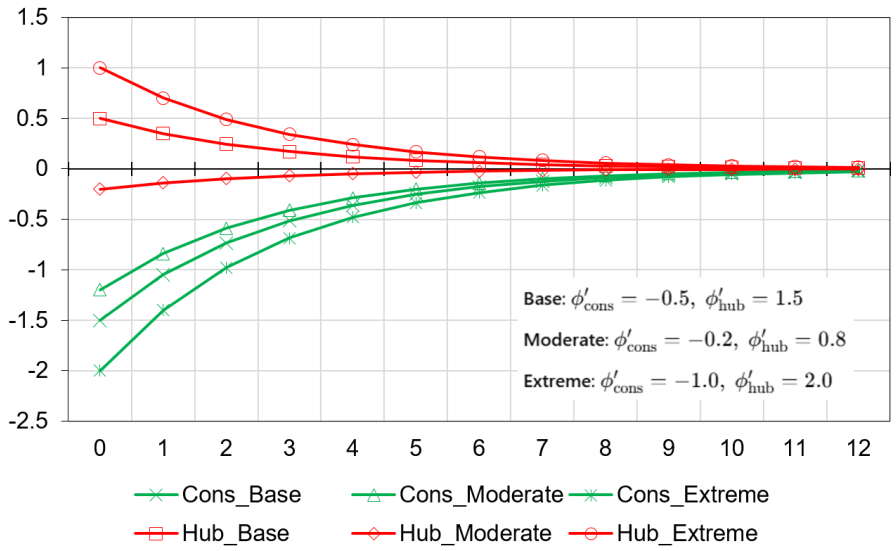
B.4 Calibrated Simulation

To illustrate the quantitative relevance of the interaction channel, we simulate a one-unit surprise in Δi and ΔM over 12 months with baseline impact $\alpha = -1$ and decay factor $\delta = 0.7$. Varying the haircut sensitivities ϕ'_c yields:

- Base: $\phi'_{\text{cons}} = -0.5$, $\phi'_{\text{hub}} = +1.5 \rightarrow$ net impacts -1.5 vs. $+0.5$.
- Moderate: $\phi'_{\text{cons}} = -0.2$, $\phi'_{\text{hub}} = +0.8 \rightarrow$ net impacts -1.2 vs. -0.2.
- Extreme: $\phi'_{\text{cons}} = -1.0$, $\phi'_{\text{hub}} = +2.0 \rightarrow$ net impacts -2.0 vs. $+1.0$.

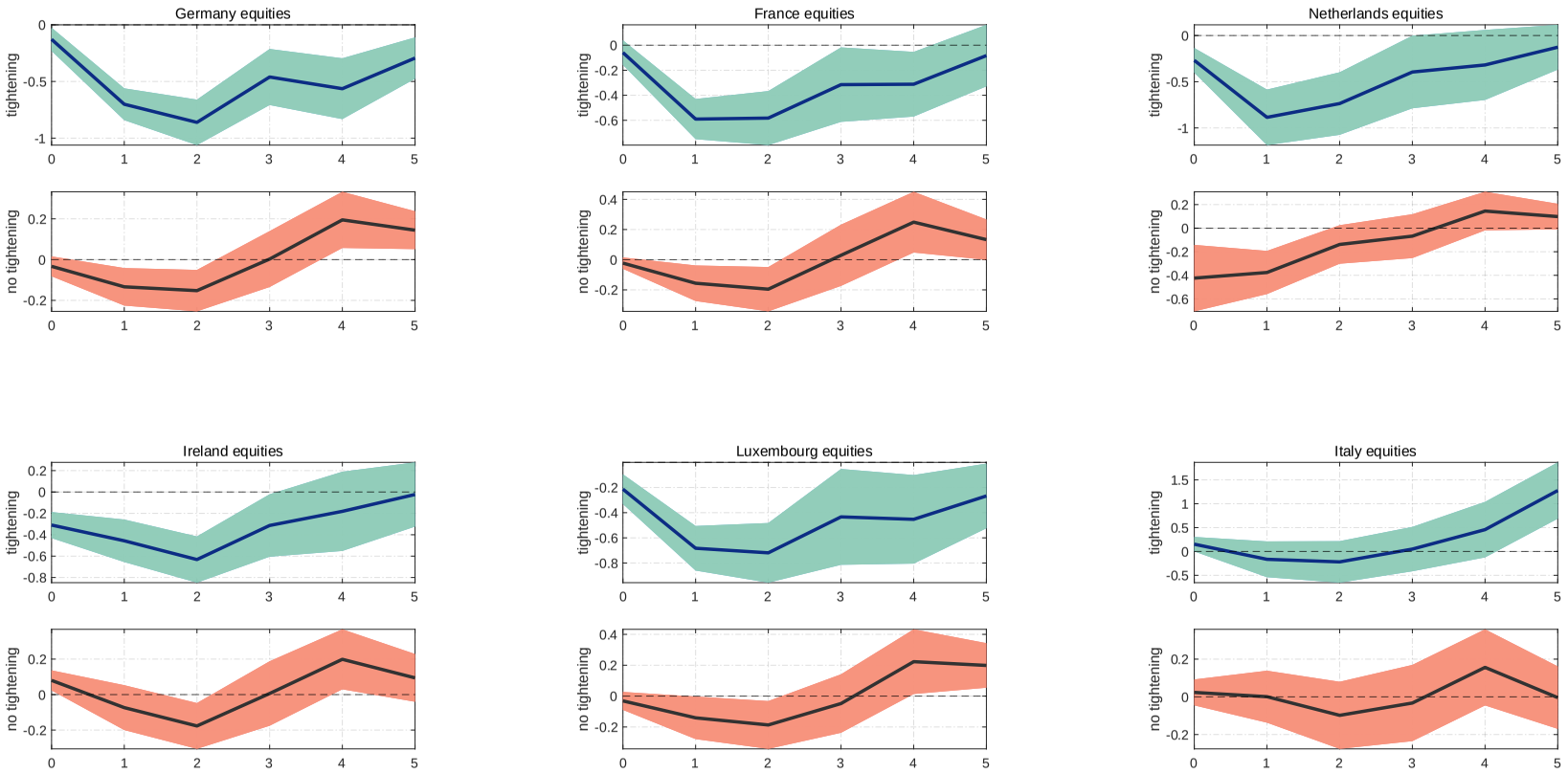
Figure B1 displays the resulting impulse response functions for both country groups, highlighting how varying ϕ'_c alters both magnitude and persistence of ΔA_t.

Figure B1: Simulated Impulse Responses of Fund Assets to Monetary and Macroprudential Tightening



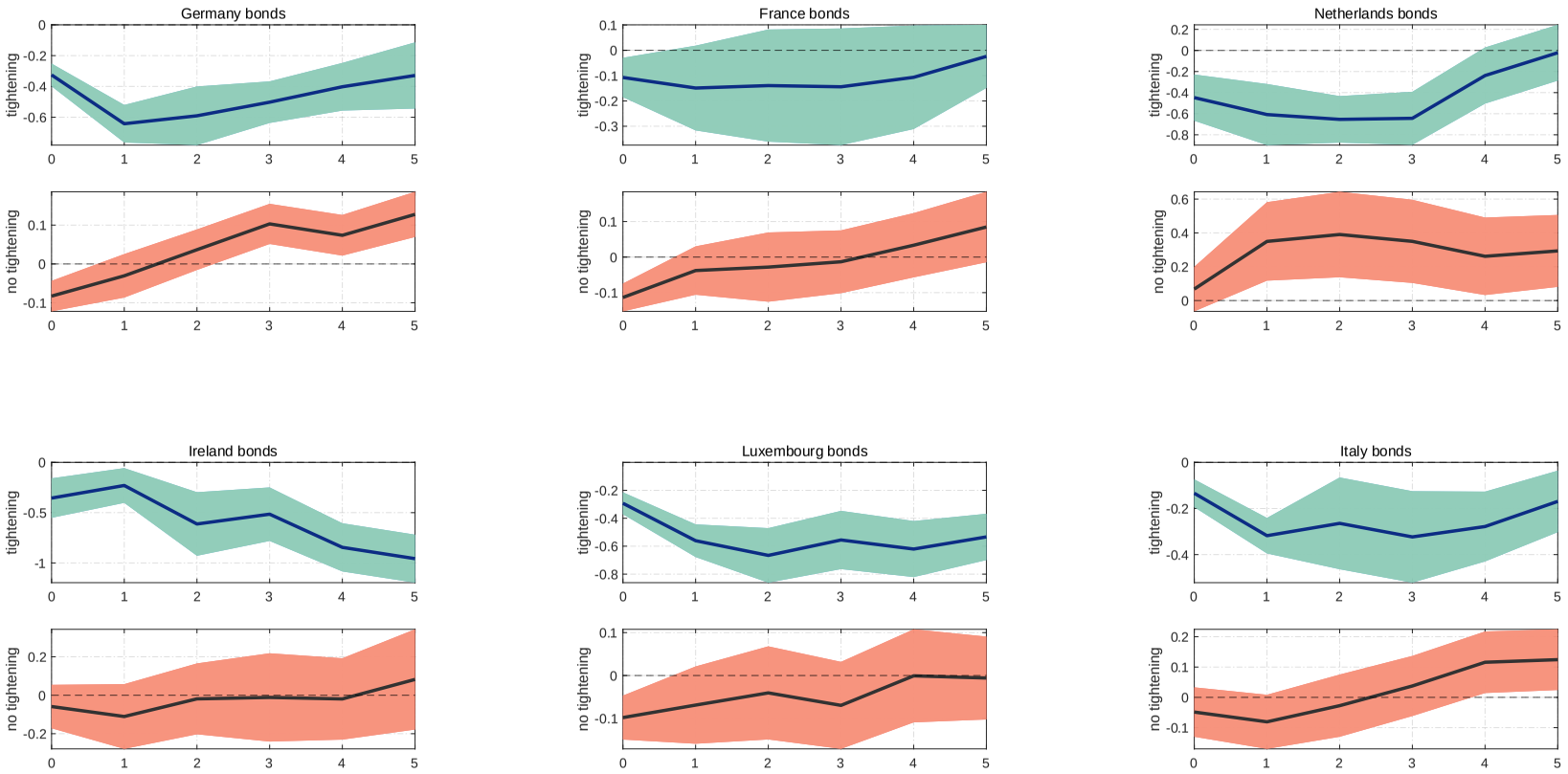
C Extension - additional results

Figure B2: Impulse Responses of Selected Investment Funds Sectors: Equity funds



Notes: The figure shows the estimated β_h coefficients in a tight macroprudential policy state (upper panel) and in a state without any macroprudential policy measures included (lower panel). The figure also shows 68% confidence bands.

Figure B3: Impulse Responses of Selected Investment Funds Sectors: Bonds funds



Notes: The figure shows the estimated β_h coefficients in a tight macroprudential policy state (upper panel) and in a state without any macroprudential policy measures included (lower panel). The figure also shows 68% confidence bands.

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