Board of Governors of the Federal Reserve System

International Finance Discussion Papers

ISSN 1073-2500 (Print)
ISSN 2767-4509 (Online)

Number 1400

November 2024

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Please cite this paper as:
Pradhan, Swapan-Kumar, Előd Takáts, and Judit Temesvary (2024). "How Does Fiscal Policy affect the Transmission of Monetary Policy into Cross-border Bank Lending? Cross-country Evidence," International Finance Discussion Papers 1400. Washington: Board of Governors of the Federal Reserve System, https://doi.org/10.17016/IFDP.2024.1400.

How Does Fiscal Policy affect the Transmission of Monetary Policy into Cross-border Bank Lending? Cross-country Evidence *

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October 2024

Abstract: We use a rarely accessed BIS database on bilateral cross-border bank claims by bank nationality to examine the interaction of monetary and fiscal policies. We find significant interactions: the transmission of the monetary policies of major currency issuers is significantly influenced by the fiscal stance of source (home) lending banking systems. Fiscal consolidation in a source country amplifies the effect of currency issuers' monetary policy on lending. For instance, a reduction in the German debt-to-GDP ratio amplifies the negative impact of US monetary policy tightening on USD-denominated cross-border bank lending outflows from German banks. The interaction effects are the strongest for US monetary policy.

Keywords: Monetary policy; Government debt; Cross-border claims; Difference-in-differences

JEL Codes: E63; F34; F42; G21; G38

* The views expressed in this paper are solely those of the authors and shall not be interpreted as reflecting the views of the Board of Governors of the Federal Reserve System or of the Bank for International Settlements. The BIS confidential data was obtained by Swapan-Kumar Pradhan and Előd Takáts under the purview of their association with the BIS. The remaining co-author, Judit Temesvary, did not have any unauthorized access to this data while working on this paper/project. We are grateful for comments from Goetz von Peter, from Francesco Ferrante, and from seminar participants at the Bank for International Settlements and at Cornell University.

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1 Introduction

Government debt-to-GDP ratios are at their highest levels since the post-war period and saw a particularly large increase during the COVID pandemic, as governments implemented stimulus measures to support the economy. At the same time, policymakers undertook unprecedented monetary policy easing measures to stimulate the economy both before and during the pandemic. And, as inflationary pressures rose globally after the pandemic, central banks tightened monetary policy in a lockstep. These large-scale fiscal and monetary policy actions give rise to the following two important questions: how do monetary and fiscal policies interact? How should central banks account for changes in the government debt-to-GDP ratio when making their policy decisions?

A fundamental challenge in identifying such fiscal-monetary interactions is that, within a country, changes in both monetary and fiscal policies respond to similar drivers, such as the cyclical stage of the economy. This challenge, together with the lack of available data, has hindered efforts in identifying these policies' interaction effects in cross-border lending.

In this paper, we are uniquely able to tackle this identification issue and shed empirical light on the interdependence of evolving fiscal debt and monetary policy. We employ a novel identification strategy using a unique and rarely accessed dataset that contains a network of cross-border claims (by bank nationality) on borrowers in individual counterparty countries with breakdown by currency denomination and by counterparty sector (from the Stage 1 and Stage 2 Enhancements to the Bank for International Settlements' International Locational Banking Statistics by Nationality). We combine this data with country-specific quarterly measures of government debt-to-GDP ratios (mostly from Eurostat) and shadow policy interest rate measures for the major international currencies from Krippner (2024).

We find that a tightening fiscal stance in the source country (measured by declines in debt-to-GDP ratios) amplifies the negative effect of tightening monetary policy on cross-border bank lending. We also show that the interaction effects are significantly stronger for US monetary policy and USD-denominated bank lending compared to other major international currencies. Furthermore, we document a strong and robust transmission effect on lending to non-banks, a finding that enhances the policy relevance of our results given that credit to the private sector is particularly important for real economic growth (Peek and Rosengren, 2000). The relationships we identify are robust across a range of alternative policy measures and specifications.

We build our hypothesis based on the extensive bank lending channel literature. The concept of the international bank lending channel posits that monetary policy exerts strong lending effects especially for those banking systems that are liquidity or balance sheet constrained and have limited access to additional funding (Takats and Temesvary, 2020), perhaps in part because financial markets perceive them as riskier or less resilient (Temesvary et al., 2018). Banks' holdings of government bonds (issued by the fiscal authorities of lending banking systems) provide them with assets that improve their balance sheet liquidity and lending ability (Affinito et al, 2022; Filardo et al, 2013). As such, government debt (issuance) can change the strength of monetary policy effects on lending. Therefore, we hypothesize that by providing additional liquidity to bank balance sheets, government debt issuance in a source banking system weakens the bank lending channel, and thus mitigates the impact of monetary policy on cross-border outflows.[1]

[1] In addition, the financial repression literature posits that additional fiscal spending constitutes a burden on bank balance sheets, reducing their ability to lend and making them less attractive to investors (Yörükoğlu and Kılınç, 2012). As such, financial repression-induced expansion of government debt on bank balance sheets would weigh on banks' ability to adjust their lending after changes in funding costs – further supporting our conjecture that additional government debt issuance may mitigate the bank lending channel of monetary policy.

Our identification strategy focuses on the interaction of a monetary policy that is exogenous to the fiscal policy – yet affects the same lending flows. We extend the currency dimension of the international bank lending (CDIBL) channel, a generalization of the bank lending channel hypothesis developed by Kashyap and Stein (2000). This approach, developed in Takats and Temesvary (2020), posits that monetary policy tightening by the issuer of a reserve currency lowers cross-border lending flows in that currency, even when neither the lending banking system nor the borrowers' country uses that currency as its own. As an example, US monetary policy affects German banks' USD-denominated lending to Malaysia even though the USD is not used as an official currency either by Germany or by Malaysia.

Building on the CDIBL channel, we study how changes in outstanding government debt affect the potency of monetary policy transmission. We focus on cross-border bank lending denominated in US dollars (USD), euros (EUR), Japanese yen (JPY); British pound (GBP), and Swiss franc (CHF). We examine how changes in the monetary policies of these currency issuers interact with changes in the government debt of the domestic jurisdictions of global banks to influence cross-border bank lending to borrowers in different countries. As an example, we examine how US monetary policy (as captured by changes in the Krippner shadow interest rate) and German fiscal policy (as captured by changes in the German government debt-to-GDP ratio) interact in driving cross-border bank lending of German banks to Malaysia. The examination of the interaction between currency-specific monetary policy and country-specific fiscal developments (in our example, changes in US monetary policy and in German government debt-to-GDP) creates an exogenous identification opportunity which would not be feasible in a single-country setup.

The currency breakdown of bilateral claims in our dataset has multiple identification benefits. First, studying multiple currencies lets us generalize conclusions across denominations and allows us to apply borrowers' country*time fixed effects to control for simultaneous changes in credit demand (for instance, by Malaysian borrowers). Second, the monetary policies of central banks that issue the top global lending currencies, due to their economic centrality and size, are arguably little affected by changes in the fiscal policies of other countries (in our example, US monetary policy is autonomous to changes in German government debt). This separation ensures the exogeneity of policies that we need for identification.

We implement our identification strategy by accessing granular data from the "Stage 1and Stage 2 Enhancements" to the International Locational Banking Statistics by Nationality (LBSN) of the Bank for International Settlements (BIS). We focus on bilateral cross-border claims denominated in each of the top five reserve currencies from 17 lending banking systems on 188 borrowers' countries starting in Q2 2012. The dataset provides a unique, four-dimensional crossing of claims by (1) lending banking system, (2) borrowers' country, (3) borrowers' sector, and (4) currency. This feature allows for a cleaner identification of the interaction of fiscal and monetary policies, as it enables us to control for credit supply factors through dimension (1), demand factors through dimensions (2) and (3), and variation across currencies through dimension (4). We use data through Q4 2023, the last available quarter at the time of our analysis.

In order to ensure consistent data coverage for government debt, we focus on the 16 advanced-economy lending banking systems in the Eurostat database and add the United States – a set of countries for which reliable, consistent, and comparable quarterly data on debt-to-GDP ratios are available. Thereby, our home (source) countries encompass the two largest currency areas, the USD and the EUR. Given that our sample contains years during which the effective

(zero) lower bound on monetary policy rates was binding (Lhuissier et al, 2019), we use shadow interest rates (Krippner (2024), based on Krippner (2013)) to capture the stance of post-crisis unconventional monetary policy. These rates are available for all five major reserve currencies.

We employ a particularly stringent set of fixed effects to strengthen our identification, including at the borrower country*time, source lending system*time, and currency*time levels. These fixed effects are more stringent than those employed in most related papers (Cetorelli and Goldberg, 2011; Cerutti and Claessens, 2017) and help separate factors which impact banks' supply of cross-border credit from macroeconomic developments impacting borrowers' demand for loans.

Consistent with our hypothesis, we find strong and robust evidence of monetary and fiscal policy interactions: the monetary policies of reserve currency issuers interact with changes in the government debt of lending banking systems' home countries, influencing cross-border lending flows. As we hypothesized, an increase in government debt-to-GDP ratio mitigates the lending impact of monetary policy. Referring back to our example, our results suggest that an increase in the German government's debt-to-GDP ratio mitigates the negative impact of US monetary policy tightening on USD-denominated cross-border lending outflows from the German banking system to borrowers in other countries (for instance, Malaysia). Consistent with the theory of the global financial cycle (Miranda-Agrippino and Rey, 2020), we show that these policy effects and interactions are significantly stronger for US monetary policy than for the monetary policies of the other reserve currency-issuing central banks.

Our results are economically significant: following a 100 basis point monetary policy tightening over four quarters, cross-border lending outflows decline by around 0.6 percentage points (p.p.) less in a source banking system that sees a relatively high increase in government

debt-to-GDP ratios compared to one with a lower increase. For instance, this would imply that following a 100 bps rise in the shadow short-term US rate in Q2 2014, the Netherlands, which had a debt-to-GDP growth rate at the 75th percentile of the cross-sectional distribution, would have seen its banking system's USD outflows decline by 1.5 percentage points *less* than Germany, which had a debt-to-GDP growth at the 25th percentile of the distribution. This differential impact is substantial, as the average quarterly growth in claims is -0.12 percent.

Our results are relevant for policy makers. First, the identified interactions help policy makers in borrowing countries to better understand the spillovers from major bank lending systems. In our earlier example, Malaysian policy makers could anticipate how changes in US monetary policy, combined with changes in German government debt-to-GDP ratios, might affect cross-border USD loan supply from German banks to their economy. Such early recognition could help calibrate a timely domestic policy response. Second, understanding this interaction is important for regulators of global banks to gauge how evolving government debt impacts lending outflows from their banking systems. In our example, factoring in changes in German government debt enables German regulators to consider cross-border lending effects when forecasting the impact of credit outflows on financial conditions. Third, central banks associated with the reserve currencies may also benefit: gauging the role of fiscal stance changes in the global transmission of their monetary policies allows them to more precisely assess spillbacks into their financial systems.

The paper proceeds as follows. In Section 2, we review our contributions in the context of the related literature. In Sections 3 and 4, we describe the data and methods. In Section 5, we detail our results and discuss robustness in Section 6. We conclude and summarize in Section 7.

2 Literature review and hypothesis development

2.1 Literature review

We connect our work to three strands of the literature: 1) papers on the bank lending channel and its international extension; 2) studies on how monetary and fiscal policies interact; and 3) works on the role of government debt on bank balance sheets (liquidity creation and financial repression).

Regarding the first strand: in addition to extensive research on the domestic lending effects of monetary policy (dating back to Kashyap and Stein, 2000), papers on the international impact of domestic monetary policy have identified cross-border bank lending as a spillover channel (Miranda-Agrippino and Rey, 2012; Forbes and Warnock, 2012; Bruno and Shin, 2015a; 2015b; Temesvary et al., 2018). The monetary policy of a currency issuer can transmit into lending in that currency in foreign countries as well (Ongena et al, 2021; Avdjiev and Takats, 2019; Avdjiev et al., 2016; Brauning and Ivashina, 2020). More broadly, a set of related papers studies the source and borrowers' country-specific drivers of cross-border bank lending (De Haas and van Lelyveld, 2014; Rose and Wieladek, 2014; Cetorelli and Goldberg, 2012; Giannetti and Laeven, 2012; De Haas and van Horen, 2012; Buch et al., 2014; Cerutti et al., 2014; Cerutti et al., 2015).[2]

Regarding the second strand of works on how monetary policy and fiscal policy interact: research findings on the joint roles of monetary policy and government debt have converged little, even as assessing these policies' interaction (key for fine-tuning the policy effects) has become increasingly policy relevant (Blinder, 1982). Various models have proposed how monetary policies could interact with fiscal policy (Davig and Leeper, 2011; Dosi et al, 2015; Cochrane, 2018; Cui, 2016; Kocherlakota, 2022; Beetsma and Jense, 2005; Traum and Yang, 2011).

[2] For instance, Baskaya et al. (2017) find that foreign capital flows have a large effect on lending through domestic banks in Turkey using credit registry data.

However, only a handful of theoretical papers have studied the role of fiscal stance in monetary policy (for instance, Adam, 2011; Andalfatto and Martin, 2018). Empirical papers on this topic are even more scarce. Afonso et al (2019) document monetary policy's dependence on debt levels in Europe and find a currency dimension of how interactions operate. Marques et al (2023) find that higher government debt makes monetary policy less effective, consistent with our results. Filardo et al (2012) examine the role that the composition of debt plays in bank lending and monetary policy effectiveness and discuss a positive link between liquid bonds on banks' books and their lending. Similarly, Affinito et al (2022) show that government debt has liquidity benefits that enhance banks' lending ability. Basu and Kimball (2003) analyze how investment setup costs affect the transmission of monetary and fiscal policies.

The third strand of papers examine financial repression – that is, government policies that affect banks' balance sheet composition and lending. Jeanne (2023) presents a theory of optimal financial repression in a model of government debt and default. Roubini and Sala-i-Martin (1995) model the relationship between financial repression and long-term growth. Chari et al (2020) show that such policies are rarely optimal, as they suppress optimal investments. Reinhart et al (2011) examine historical episodes of repression and document such policies' return during the Global Financial Crisis. Aloy et al (2014) show that financial repression makes it easier to reduce government debt, and Drelichman and Voth (2008) find similar results in a historical UK context.

2.2. Hypothesis development

The broad bank lending literature (Kashyap and Stein, 2000), and its international extension (CDIBL, developed in Takats and Temesvary, 2020; 2021) posits that monetary policy tightening removes liquidity from the financial system, raising bank funding costs across the board. In

addition, Avdjiev et al (2019) show that a stronger dollar (a correlate of tighter monetary policy) corresponds to contractions of cross-border bank lending in dollars. In a similar spirit, Bruno and Shin (2015a, b) demonstrate a mechanism whereby dollar depreciation (a correlate of monetary policy easing) leads to an increase in the supply of dollar credit via the risk-taking channel. Avdjiev et al (2018) show that US monetary policy easing fuels cross-border lending in USD. Based on this collective evidence, we hypothesize that *tighter (easier) monetary policy in a currency reduces (raises) lending in that currency around the world (Hypothesis 1).* We find strong evidence consistent with this hypothesis.

Second, we examine predictions for the possible cross-border lending effects of government debt. Government spending may crowd out domestic investment (Friedman, 1978) – especially over time (Traum and Yang, 2015). As such, it follows that lending abroad becomes relatively more attractive as government spending crowds out domestic investment opportunities, suggesting *a positive relationship between changes in government debt-to-GDP ratios and cross-border outflows (Hypothesis 2*). Consistently, our results show a strong positive relationship between government debt-to-GDP ratios and cross-border lending flows.

Next, we turn to hypotheses related to interaction effects; that is, the role of government debt in the strength of monetary policy transmission. Recall that the bank lending channel arises due to frictions: after a tightening, less liquid banks may have to borrow more due to limited balance sheet mobility, or financial markets may charge them disproportionately higher funding costs if investors observe these banks as riskier (Kashyap and Stein, 2000; Takats and Temesvary, 2020). Therefore, to inform our interaction hypothesis, it is key to examine how government debt might impact bank balance sheet liquidity and resilience. A friction-easing effect of government debt may arise if government debt plays a balance sheet liquidity-enhancing role. In support of

this view, Filardo et al (2012) describe a positive relationship between liquid bonds on banks' books and their lending. Affinito et al (2022) show that government debt has many liquidity benefits that enhance the lending ability of financial institutions.[3] Another argument for the friction-easing effect of government debt is based on papers in the financial repression literature. If governments exert effective lending limits or strategically direct bank lending (as forms of financial repression), government debt on bank balance sheets may limit banks' ability to engage in productive lending/investments (Chari et al, 2020). This would imply that all else equal (that is, for a given stance of reserve currency monetary policy), higher debt in the context of financial repression would translate into weaker ability of banks to adjust investments. Based on these arguments, we posit a *mitigating effect of government debt-to-GDP ratios on monetary policy transmission (that is, a positive interaction term; Hypothesis 3)*. In other words, more government debt (on banks' books) translates into weaker monetary policy transmission.[4] Consistently, we show that higher debt-to-GDP ratios consistently translate into weaker monetary policy transmission.

Next, we examine predictions for delineating the data by sector of borrowers. Based on the findings of Takats and Temesvary (2020), we posit that *transmission works mainly through lending to non-banks* (*Hypothesis 4).* Weaker transmission into lending to banks would be consistent with findings on compositional differences reflecting the greater share of unsecured loans and repos in interbank lending (Avdjiev et al, 2017) as well as banks' reliance on FX derivatives markets (Aldasoro and Ehlers, 2018). Understanding differential transmission effects

[3] This hypothesis hinges on the conjecture that government debt issuance raises banks' holdings of such debt. Consistently, as described below, in Table A1 we find a strong positive relationship between growth in government debt at home and growth in banks' holdings of sovereign debt.

[4] Hofmann et al (2021) show that at the zero lower bound of policy rates, fiscal policy needs to intervene more aggressively to compensate for less potent monetary policy, leading to higher and more volatile public debt.

across sectors is highly relevant as potent transmission to the non-financial sector can yield significant real economic effects. Conversely, potent transmission to non-bank financial institutions (NBFIs) may be particularly concerning given the ongoing risk migration to that sector (Goldberg, 2023). Consistent with our hypothesis, we document strong and robust transmission and interactions in lending to non-banks (to both NBFIs and the non-financial sector). We show significant overall transmission to banks as well, but also find that such results are purely driven by interoffice lending, as expected based on Takats and Temesvary (2020).

Regarding cross-currency differences in transmission strength, we posit that *US monetary policy/lending in USD exhibits stronger transmission and interaction effects than other monetary policies associated with the top reserve currencies (Hypothesis 5).* Our thinking is guided by the operation of the global financial cycle (Miranda-Agrippino and Rey, 2020). Accordingly, a tightening in US monetary policy leads to a surge in global investor risk aversion.[5] That is, bank lending channel logic-implied investor risk aversion effect (that leads to differing bank funding costs based on perceived banking system risks) is especially heightened for US monetary policy. In other words, based on the logic of the bank lending channel detailed above, it follows then that the resilience-enhancing (that is, the relative funding cost reducing) effect of higher government debt-to-GDP ratios is stronger for US monetary policy/lending in USD than for other monetary policies/currencies. In addition to this differential risk aversion effect, also important in guiding our thinking are the results of Bruno and Shin (2015a, b) and Avdjiev et al (2019), who show unique cross-border flow effects arising specifically from changes in the value of the USD. Consistent with Hypothesis 5, we find that US monetary policy/lending in USD exhibits stronger

[5] According to the operation of the global financial cycle, a tightening in US monetary policy results in a surge in aggregate risk aversion in global asset markets, contributing to a significant deleveraging of global financial intermediaries, a decline in the provision of domestic credit globally, strong retrenchments of international credit flows, and tightening of foreign financial conditions.

lending effects in response to changes in monetary policy and debt-to-GDP ratios, as well as stronger interactions of these policies.

Lastly, we posit that *policy transmission and interaction effects depend not only on changes in debt, but also on the existing level of government debt (Hypothesis 6)*. Our thinking in this regard is motivated by the findings of Bi et al (2016) who show that fiscal easing effects depend on the existing level of government debt. In addition, Bernardini and Gert-Peersman (2018) find that the existing level of debt also significantly affects the marginal effect of additional government spending. Consistent with this literature and with our Hypothesis 6, we find that transmission and interaction effects are significantly different at higher levels of indebtedness.

3 Data

3.1 Data description

3.1. Dependent variable: Cross-border bank claims and flows

We use granular bilateral data from the enhanced BIS International Banking Statistics by Nationality (Takats and Temesvary, 2020; 2021).[6] To ensure data consistency, we focus on the set of advanced economy lenders that includes the US and European banking systems. Our lending sample consists of bilateral cross-border exposures of these banking systems to borrowers in over 180 countries over the Q2 2012 – Q4 2023 period. As described above, for each banking system and country of borrowers, our dataset is broken down by currency denomination and borrower

[6] In our main specifications, we use nationality-based data rather than residence-based data because we focus on the decision-making unit, i.e. the banking conglomerate as a whole. In other words, we are interested in how government debt holdings by the parent bank, on a consolidated basis, affect its lending decisions. Furthermore, we examine the role of source (parent) country fiscal policy because, insofar as financial repression exists, fiscal pressure to hold government debt would be applicable mostly for the country's own banking system. However, in additional estimations (shown in Table A7), we confirm that our benchmark results hold robustly when using the residence-based data as well.

sector. We focus on the top five currencies of global lending (USD, EUR, JPY, GBP, and CHF) and the two main target sectors of borrowers (banks and non-banks).[7]

This dataset is unique as it simultaneously provides the four dimensions we need to answer our research questions: (A) the currency composition of cross-border claims; (B) the residence of borrowers, (C) the sector breakdown of borrowers, and (D) the nationality of lending banking systems (Committee on the Global Financial System, 2012). Dimension (A), currency composition, allows us to map the relevant networks and flows in each currency, that is, to map bilateral claims in USD, EUR, JPY, GBP, and CHF and their evolution over time, purged of valuation effects. Dimension (B), the residence of borrowers, enables us to account for the (borrower) country-specific drivers of cross-border bank lending. As such, we can even apply borrowers' country*time fixed effects in most of our estimations to account for changes in credit demand. Dimension (C), the sector of borrowers, allows us to identify effects across sectors, an important feature and the bank vs non-bank sector can have notably different economic relevance. Dimension (D), the lender's nationality, enables us to identify the headquarters, i.e. the highest-level banking entity in the corporate chain, of the lending banking systems. This allows us to identify the decision-making unit (Fender and McGuire, 2010; Cecchetti et al., 2010; Committee on the Global Financial System, 2011) and to control for the possible confounding effects of financial centers.

Our sample set of source lending systems is defined by the availability of consistent data coverage for fiscal statistics (from the FRED database for the US, and the Eurostat database for

[7] We use data from the Stage 1 and Stage 2 Enhancements to the Bank for International Settlements' International Locational Banking Statistics by Nationality. Stage 1 enhancements include a breakdown of counterparties by country and local currency positions by bank nationality, starting from Q2 2012, covering counterparty sector breakdowns such as banks, interoffice, central banks, unrelated banks, and aggregated nonbanks. Stage 2 enhancements, introduced in Q4 2013, add a subsector breakdown for the nonbank sector, distinguishing between non-bank financial institutions and non-financial sectors, with further details, on an encouraged basis, for corporates, governments, and households.

European countries). To our knowledge, these sources provide the only reliably comparable set of data for quarterly government debt-to-GDP ratios. The included set of source countries (European Union countries; Nordic countries; and the United States) make up over 50 percent of total cross-border bank claims (54 percent of claims on banks and 56 percent of claims on non-banks). In our estimations we exclude claims that are denominated in the banking system's own currency (for instance, we exclude euro area banks' EUR claims, due to policy endogeneity concerns).

The currency composition of claims in our estimation sample is closely comparable to the composition observed in the full set of countries. As Graph 1 shows, among the five currencies we focus on in our sample, the USD and EUR are clearly dominant, with shares of 49 percent and 28 percent, respectively at end-2022 (comparable respective shares in the full data are 51 percent and 36 percent). The other three currencies in our sample have notably lower shares; the GBP, JPY, and CHF make up 12 percent, 8 percent, and 3 percent, respectively, at end-2022.

In terms of borrowers' sectors, lending to banks and non-banks make up 55 percent and 45 percent of claims in our sample, respectively, at end-2022 (the sectors have about equal shares in the full data). Since 2012, the share of claims on banks has declined and the share of claims on non-banks has increased in both our sample and the full data.

We define bilateral cross-border lending flows (the main outcome/dependent variable of interest) as the quarterly percent change in bilateral cross-border bank claims from a source banking system to borrowers in a given country, denominated in one of the five reserve currencies. Even after careful data cleaning and accounting for outliers, we see substantial variation in quarterly cross-border lending flows (Table 1). The average quarterly bilateral flow is -0.12 percent – and, with a standard deviation of 35 percent, ranges from -80 to 85 percent in the sample.

Across countries, the average flows vary over time as well, ranging from -5 percent to 5 percent at times.

3.2.2 Changes in monetary policy

For part of our sample period, unconventional/balance sheet-focused monetary policy actions by the Federal Reserve, European Central Bank, the Bank of Japan, the Bank of England, and the Swiss National Bank drove policy rates to zero or into negative territory. Therefore, to measure monetary policy changes associated with these five currencies, we cannot simply use changes in the headline policy interest rates. Given that interaction and transmission effects of monetary policy (Takats and Temesvary, 2020) and fiscal policy (Hofmann et al, 2021; Wang, 2018) can be very different during unconventional monetary policy regimes, it is important to capture liquidity conditions accurately even when the policy interest rate is at the zero lower bound.

Therefore, as is now standard in the related banking literature (Temesvary et al, 2018; Lhuissier et al, 2019, among others), we use shadow interest rates to measure changes in financial market liquidity conditions related to monetary policy actions during periods of binding effective lower bounds. We employ shadow rates constructed by Krippner (2024) which are available consistently across the five major reserve currencies over our full sample period. In robustness checks, we employ the Wu-Xia shadow rates (Wu and Xia, 2016) as alternative measures; however, these shadow rates are available for only a subset of the currencies we examine.

As the short-term shadow rates are not subject to the zero lower bound (ZLB), they can capture expansionary monetary policy actions by turning negative (Graph 2). By construction, the shadow rates are identical to the policy rates during conventional (non-ZLB) periods, and negative in times of binding ZLB. All five shadow rates fell below zero during the period when monetary

conditions continued to ease, and the nominal policy interest rates hit the zero lower bound. During our sample period, the average short-term shadow rate was -0.69 percent; in contrast, the average central bank policy rate for the major reserve currencies was 1.32 percent (Table 1).

We measure changes in the monetary policy stance as quarterly changes (from one quarter to the next, in percentage points) in the currency-specific shadow interest rates. Across currencies, monetary policy was characterized by a slightly contractionary stance in our sample (albeit among broadly ample liquidity conditions), with average quarterly increases of 12 basis points, ranging from -1.8 to 2.6 percents in the sample. In additional checks, we replace changes in the shadow rates with changes in the central bank policy rates associated with the five currencies of lending.

3.2.3 Changes in government debt

Our main fiscal measure is defined as quarterly changes in (source) country government debt-to-GDP ratios (in percentage points). In order to obtain quarterly data, we use statistics from the Eurostat statistical database, available online. We add quarterly debt-to-GDP data from the FRED database for the United States to cover the major USD lender. While other proprietary sources contain imputed quarterly values for a small set of additional countries, their calculations rely on assumptions and source-specific methods; therefore, we choose to focus solely on the set of countries included in the Eurostat coverage and the United States, to ensure data consistency.

Across countries and over time, in our sample government debt-to-GDP ratios stood at 88 percent; but with substantial variation, ranging from 20 percent to over 200 percent. Across countries at a given point in time, the average ratio ranged from 82 percent to 98 percent, depending on the quarter. The quarterly change in debt-to-GDP ratios also ranged widely, from a decline of 10 percentage points to an increase of 26 percentage points across all countries and time

periods. The median quarterly change in the debt-to-GDP ratio was -0.4 percentage points. Across countries, the quarterly change ranged from an increase of 8.8 percentage points (in the wake of the COVID crisis) to a decline of 3 percentage points (at end-2023).

In alternative specifications, we use quarterly changes in the fiscal deficit-to-GDP ratio (also from Eurostat and FRED) as our fiscal measure. The fiscal deficit-to-GDP ratio ranged from a deficit of 35 percent to a surplus of 31 percent, with a median sample deficit ratio of 2.2 percent. The quarterly change in this ratio ranged from a decline of 23 to an increase of 38 percentage points, with a median quarterly change of 0.15 percentage points.

In additional estimations to validate our hypothesis, we examine and confirm the positive relationship between changes in government debt at the country level and changes in that country's banks' holdings of government debt. In these estimations, we measure banks' holdings of government debt as the sum of a banking system's holding of domestic sovereign debt at the headquarters and holdings of source country debt by the banks' subsidiaries abroad.

3.2.4 Additional controls

We include changes in the bilateral exchange rate between the currencies of the source country and borrowers' country among our controls, as such valuation changes can have important confounding effects on the strength of transmission and policy interactions (Leith and Wren-Lewis, 2008) – including the possibility that foreign assets becoming cheaper due to a domestic currency appreciation might be driving lending outflows. Across currencies and on average, we saw a 0.55 percent appreciation of the source country currency relative to the currency of the borrowers' country during our sample period.

We also include quarterly changes in the central bank policy rate of the source country of banking systems, as controls. During the same period, on average, the central bank policy rates of the source lending systems stood at 0.58 percent and increased by 7 basis points per quarter.

4 Estimation methodology: Panel regressions

A fundamental identification challenge is the potential endogeneity of monetary policy to changes in fiscal debt/policy. In a domestic context of a single country, it is very difficult to disentangle these policies and perhaps impossible to examine interactions between them. Both monetary and fiscal policies react to and affect the cyclical fluctuations of the economy. Action from one can affect the optimal course of action in the other policy: for instance, fiscal consolidation might lessen the need for monetary tightening, whereas fiscal profligacy might compel monetary policy to tighten sooner or stronger. Due to this endogeneity, when we investigate interactions with changes in source fiscal or debt policy, we need to focus on the effects of a monetary policy that is not connected to and is not affected by conditions in the source bank lending system.

Our main dependent variable of interest is quarterly changes in bilateral cross-border lending flows. This variable, *Δclaims* is the quarterly change in the natural logarithm of bilateral claims between the source lending banking system *i* and borrowers' country *j*, denominated in currency *c*. Our main explanatory variables are (1) the change in the source country-specific government debt-to-GDP ratio (*fiscal)*, as defined in Section 3 above, and (2) the change in the monetary policy stance (*monetary*) associated with the major currencies of lending (USD, EUR, JPY, GBP, and CHF) as measured by the Krippner (2024) shadow interest rates. Following the standards of the bank lending literature, we consistently add four lags of the dependent variable to the right-hand side to account for potential persistence in lending flows.

To strengthen identification, we restrict all our estimations to exclude both same country lending and own currency lending (in the terminology of Takats and Temesvary (2020)). These two sets of lender-borrower pairs could potentially confound identification. First, same country lending (e.g. US-owned bank subsidiaries lending back to US-based borrowers) suffer from a more severe endogeneity of monetary and fiscal policies (e.g. US borrowers' credit demand is very likely affected by US fiscal policy). Second, own currency lending, i.e. German bank lending in EUR or US banks' lending in USD, might confound the country and currency-specific impact of monetary policy. For example, US monetary policy reacts to US developments and thus its impact on USD lending is driven by factors other than the currency dimension of the bank lending channel.

4.1 Baseline estimations

Our baseline estimable equation examines lending flows as a function of changes in the fiscal stance in source bank lending system *i* ($\Delta fiscal_{it}$) and monetary policy by currency issuer *c* ($\Delta monetary_{ct}$). Importantly, to allow for policy interdependencies, we also include the interaction of these two key explanatory variables: $\Delta monetary_{ct} * \Delta fiscal_{it}$. Our set of control variables include monetary policy changes associated with the source bank lending system *i* (Δcb_rate_{it}). We also account for the fact that valuation effects between the currency of source lending system *i* and that of borrowers' country *j* could meaningfully drive cross-border lending outflows; for instance, a relative depreciation of the currency of the borrowers' country would make foreign assets become cheaper and thus more attractive as investments. Therefore, we include quarterly changes in bilateral exchange rates ($\Delta exch\_rate_{ijt}$). Equation (1) is written as:

1. $$\Delta claims_{ijct} = \sum_{k=1}^{4}(\boldsymbol{\gamma_{1k}\Delta monetary_{ct-k}} * \Delta \boldsymbol{fiscal_{it-k}} + \\ + \gamma_{2k}\Delta monetary_{ct-k} + \gamma_{3k}\Delta fiscal_{it-k} + \\ + \gamma_{4k}\Delta cb\_rate_{it-k} + \gamma_{5k}\Delta exch\_rate_{ijt-k}) + FE_{i/j/c/t} + \varepsilon_{ijct}$$

The set $FE_{i/j/c/t}$ includes various combinations of source country *i*, borrowers' country *j*, currency *c* fixed effects, as well as subsets of source country*time, borrowers' country*time, or currency*time fixed effects. The inclusion of changes in source lending system fiscal debt/policy that is contemporaneous to changes in reserve currency monetary policy helps to further alleviate concerns that one type of policy may respond to the other.

Based on our hypothesis development discussed above, we expect to find a positive sum of coefficients on the policy interaction terms. In addition, predictions for the cumulative effects of interest rate changes and debt-to-GDP ratio changes are negative and positive, respectively.

4.2 Estimations by borrowers' sector

Next, we examine how transmission strength and interactions depend on the sector of lending, denoted by superscript *s*. Accordingly, we estimate Equation (2) as follows:

2. $$\Delta claims^{S}_{ijct} = \sum_{k=1}^{4}(\boldsymbol{\phi_{1k}\Delta monetary_{ct-k}} * \Delta \boldsymbol{fiscal_{it-k}} + \\ + \boldsymbol{\phi}_{2k}\Delta monetary_{ct-k} + \boldsymbol{\phi}_{3k}\Delta fiscal_{it-k} + \\ + \boldsymbol{\phi}_{4k}\Delta cb\_rate_{it-k} + \boldsymbol{\phi}_{5k}\Delta exch\_rate_{ijt-k}) + FE^{S}_{i/j/c/t} + \varepsilon_{ijct}$$

where the superscript *S* denotes the target sector of lending. As discussed in the hypothesis development above, based on Takats and Temesvary (2020) we expect to find more robust policy transmission into flows to the non-bank sector compared to flows to the bank sector.

4.3 Special role of US monetary policy/lending in USD

Lastly, motivated by the global financial cycle literature (Miranda-Agrippino and Rey, 2020), and the risk-taking channel (Bruno and Shin, 2015a, 2015b; Avdjiev et al, 2019) we examine whether US monetary policy/USD lending flows exhibit significantly different transmission effects compared to the other currencies. Accordingly, we estimate Equation (3) as follows:

3. $$\Delta claims_{ijct} = \sum_{k=1}^{4} \boldsymbol{USD_{t-k}} \times [\boldsymbol{\delta_{1k}} \Delta \boldsymbol{monetary_{ct-k}} * \Delta \boldsymbol{fiscal_{it-k}} + \\ + \delta_{2k} \Delta monetary_{ct-k} + \delta_{3k} \Delta fiscal_{it-k} + \\ + \delta_{4k} \Delta cb\_rate_{it-k} + \delta_{5k} \Delta exch\_rate_{ijt-k}] + FE_{i/j/c/t} + \varepsilon_{ijct}$$

where USD_t is an indicator of USD-denominated flows. As discussed above, we expect to find significantly stronger transmission and interaction effects for US monetary policy/USD flows.

4.4 Saturating the model with increasingly stringent fixed effects

In all of our specifications, we rely on an extensive, and increasingly stringent set of fixed effects to strengthen identification. Specifically, we introduce various combinations of source country, borrowers' country, currency, source country*time, borrowers' country*time and currency*time fixed effects:

- In Model 1, we include time fixed effects for each quarter (FE_t) to control for unobserved global factors. Our inclusion of time fixed effects controls for time-varying global shocks that might confound both types of policies.
- In Model 2, we add in fixed effects for each source bank lending system (FE_i) to capture any time-invariant level differences.
- In Model 3, we add fixed effects for each country of borrowers (FE_j) to capture any time-invariant level differences across borrowers' countries, in addition to time fixed effects.
- In Model 4, in addition to time fixed effects, we include a fixed effect for each source lending system–borrowers' country pair (FE_{ij}), to capture any potential bias stemming from historical lending relationships. In our previous example, this controls for the time-invariant specifics of the Germany–Malaysia lending relationship.
- In Model 5, in addition to time fixed effects, we include a fixed effect for each source lending system–borrowers' country–currency pair (FE_{ijc}), to capture any unobservable features related to historical lending relationships in a particular currency denomination. In our previous example, this controls for the time-invariant specifics of the Germany–Malaysia lending relationship in US dollars. This specification accounts for all cross-sectional variation in the sample (that is, the panel dimension).
- In Model 6, we include a lending banking system-specific time fixed effect (FE_{it}) to capture all lending banking system-specific supply factors that might confound our results, further sharpening our identification.
- In Model 7, we include borrowers' country* time fixed effects (FE_{jt}) in order to control for any potential time-varying credit demand changes in the borrowers' country. This fixed effect absorbs any macro-related changes at the level of borrowers' country j. Inclusion of

these fixed effects expands the logic outlined in Khwaja and Mian (2008), where identification relies on a firm borrowing from different banks. In our analysis, borrowers in a country obtain credit from different source lending systems. This feature allows us to control for borrower-specific demand factors through fixed effects.

- In Model 8, we introduce a currency*time fixed effect (FE_{ct}) to address the potential concern that some unobserved changes across the main reserve currencies may drive our result. This currency*time fixed effect also absorbs the currency-specific monetary policy changes, and the individual currency and time fixed effects.

5 Results

5.1 Benchmark Results

Table 2 shows our benchmark results, each column corresponds to the set of fixed effects described in Section 4.4 above. Moving from left to right in the table, each column includes increasingly stringent sets of fixed effects.

We find consistent evidence, as shown in the first row of the table, that an increase in the shadow interest rate associated with the currency of lending over a four-quarter period leads to subsequently lower cross-border lending outflows in a currency, consistent with the liquidity-reducing effect of monetary policy tightening. The marginal effect of a 100-basis point increase in the short-term shadow interest rate over four quarters on subsequent lending outflows ranges from a lending decline of 0.61 percentage points (henceforth, pp; model 3, with borrowers' country and time fixed effects) to 1.71 pp (in model 6, with the demanding source country*time fixed effects). These results strongly support Hypothesis 1. Furthermore, these effects are stronger than what the CDIBL would have predicted. In other words, the CDIBL does not necessarily require such

significant direct effects; only a significant interaction of this direct effect with funding constraints. The reason is that the identification of the CDIBL is based on differing policy responses across more vs less constrained source banking systems.

The main focus of our paper is the interaction between our monetary and fiscal variables; that is, to understand how the transmission strength of monetary policy depends on changes in debt-to-GDP ratios. Our Hypothesis 3 above posits that growth in government debt mitigates monetary policy transmission; this is in part due to the additional liquidity on bank balance sheets from holding more sovereign debt as domestic government debt grows (a positive relationship that we confirm in Table A1). The consistently positive and significant interaction effects in the second row of Table 2 show convincing evidence that higher government debt-to-GDP ratios mitigate the transmission of monetary policy, consistent with Hypothesis 3. A one pp increase in the debt-to-GDP ratio subsequently reduces the negative effect of a 100 bps monetary policy tightening on lending flows by a magnitude ranging from 0.3 pp (in model 8) to 0.87 pp (in model 6).

Furthermore, we find consistent evidence throughout the table that growth in government debt-to-GDP ratios over a four-quarter period leads to subsequently higher cross-border lending outflows in a currency. As shown in the third row, the marginal effect of a one pp increase in the source country government debt-to-GDP ratio on lending outflows ranges from a lending increase of 0.55 pp (model 2, with source and time fixed effects) to 0.86 pp (in model 8, with the demanding currency*time fixed effects). These results strongly support Hypothesis 2 above.[8]

[8] In Table A8, we repeat the Table 2 specifications using monetary policy surprises (shocks) based on Jarocinski and Karadi (2020). We confirm that our results are robust to this alternative (exogenous) monetary policy measure.

5.2 Results by sector of borrowers

Table 3 shows the results of estimating Equation (2), where we examine lending to bank (Panel A) and non-bank (Panel B) borrowers separately.

The main takeaway from Table 3 is that the results we documented in Table 2 hold for cross-border lending to both bank and non-bank borrowers. Accordingly, a tightening in the monetary policy associated with the currency of lending translates into subsequently lower cross-border lending flows in that currency (first rows) in lending to both sectors. In addition, higher government debt-to-GDP ratios in source lending systems significantly mitigate the monetary policy transmission effects (second rows), and such higher debt ratios also contribute to higher cross-border lending flows (third rows).

In Table 4, we further delineate lending to non-banks by whether credit goes to non-bank financial institutions (NBFIs, in Panel A) or to the non-financial sector (in Panel B). Results show that Hypothesis 3 holds strongly for both subsectors, with consistently positive coefficients on the interaction of monetary policy and debt-to-GDP changes (second rows). We also see support for Hypothesis (2) (third row). However, we observe the consistent negative relationship between changes in monetary policy and lending flows only for lending to NBFIs (first rows).

In additional estimations (not shown), we delineate flows to banks as well, into interoffice flows vs. flows to unrelated banks. As posited in Hypothesis 4, and consistent with Takats and Temesvary (2020), we find that the results shown in Panel A are driven solely by interoffice flows.

5.3 Uniqueness of US monetary policy effects/USD lending

Next, we turn to our analysis of whether transmission effects are significantly different for US monetary policy effects (on USD lending), following the logic that we develop in Hypothesis 5.

Table 5 shows the results of estimating Equation (3) according to our eight models. We report coefficients that reflect interaction effects with a US dollar dummy, that is, the "extra effects" observed for US monetary policy/USD lending.

The first row of Table 5 suggests that Hypothesis 1, i.e. the negative relationship between interest rate changes and lending flows, holds particularly strongly for US monetary policy. In addition, the coefficients on the interaction terms in the second row are consistently positive and significant, implying that policy interaction effects are significantly stronger for US monetary policy. Lastly, the positive and significant coefficients in row 3 imply that the positive relationship between changes in debt-to-GDP and lending outflows also holds for USD lending the strongest.

Overall, the results in Table 5 provide ample evidence in support of Hypothesis 5: US monetary policy effects are significantly stronger than those of monetary policies associated with the other reserve currencies. In the context of the bank lending channel, these findings are consistent with the observation that US monetary policy tightening raises investor risk aversion globally, as described in Section 2 (Miranda-Agrippino and Rey, 2020) and that US monetary easing encourages bank risk taking (Bruno and Shin, 2015a, b) – yielding significantly stronger bank balance sheet frictions, and thus policy interaction effects, for US monetary policy.

Lastly, in Table 6 we examine potential non-linearities in the role of fiscal tightening in monetary policy transmission. In other words, we estimate to what extent the policy transmission and interaction effects we document depend on the existing level of indebtedness of source countries (Brandao-Marques et al, 2024). To do so, we run a version of Equation (3) where we interact all the right-hand side model variables with the level of the source government debt-to-GDP ratio. Doing so, we find consistent evidence that higher debt mitigates the monetary-fiscal policy interactions. In addition, banking systems in countries with higher debt levels see stronger

direct lending effects of interest rate changes. Furthermore, the direct effect of fiscal policy weakens as debt levels rise. These results are consistent with fiscal policy becoming less potent at higher debt levels (Adrian et al, 2024).

6 Alternative specifications and robustness checks

We run a set of additional specifications to ensure the robustness of our results. As we describe below, we explore alternative measures of both monetary policy and of fiscal stance, we examine the role of sovereign risk, and we explore alternative estimation methods.

6.1 Alternative monetary policy measure

In Table A2, we show results of estimations that (compared to Table 2) replace changes in the short-term shadow rate with changes in the central bank policy rate of the currency of lending. We argued above that the shadow rate is superior in the presence of periods subject to the zero lower bound (Graph 2); however, to alleviate concerns about the possible confounding effects of this imputed rate, we also run specifications with the central bank policy rates.

We find strong evidence that the monetary policy transmission effects we documented in Table 2 remain robust even with this alternative monetary policy measure (Table A2). The direct monetary policy effects are negative and significant (first row), and higher debt ratios mitigate these effects (second row). Effects of higher debt-to-GDP ratios remain positive and significant.

6.2 Alternative fiscal measure

In Table A3, we replace changes in the government debt-to-GDP ratio with changes in the fiscal deficit-to-GDP ratio (multiplied by -1 so that positive values correspond to increases in the deficit ratio). We find strong evidence that our benchmark results remain robust to this alternative fiscal measure. The results continue to show strong monetary policy transmission effects (first row), which are significantly smaller for source lending systems with increases in their deficit-to-GDP ratio (second row). Higher deficit-to-GDP ratios lead to higher lending outflows (third row).

6.3 Alternative monetary policy and fiscal measure

In Table A4, we replace both the monetary and the fiscal measures with the alternative proxies simultaneously. That is, we replace the shadow rate with the central bank policy rate and the government debt-to-GDP ratios with the deficit-to-GDP ratios, respectively.

We continue to find significantly negative direct monetary policy effects (first row). The interaction effects in the second row are more mixed than before; however, a significant positive coefficient is still estimated for model 6 (one of our most demanding specifications, with source country*time fixed effects). The positive effects of higher deficit-to-GDP ratios on lending prevail.

6.4 Alternative estimation method: Arellano-Bond regressions

We re-estimate our models using the Arellano-Bond estimation method, which is a consistent generalized method of moments (GMM) estimator designed for datasets with many panels and few periods. These linear dynamic panel-data models include four lags of the dependent variable

as covariates and incorporate unobserved panel-level effects. This method also accounts for the correlation of unobserved panel-level effects with lagged dependent variables (StataCorp, 2013).

The results in Table A5 show the Arellano-Bond estimation results. Note that the coefficients for models 1 through 5 are identical across models, because the dynamic estimation method differences out the time-invariant fixed effects that would otherwise be the source of variation across these models. For models 1-5, we see that the cumulative effect of monetary tightening continues to be negative and significant (first row), and this effect is smaller for source countries with higher debt-to-GDP ratios (second row). While models 6 and 7 show insignificant interaction effects, the highly demanding model 8 (including currency*time fixed effects) shows significant positive interactions, consistent with our main results. We also see that higher debt-to-GDP ratios continue to yield higher cross-border outflows (third row).

6.5 Accounting for changes in sovereign risk

In Table A6, we address potential concerns that changes in source government debt-to-GDP ratios (our main fiscal measure) may be proxying for changes in perceived sovereign risk. We do so by running two types of estimations. In Panel A, we replace the changes in government debt-to-GDP ratio variable with changes in the source country's sovereign CDS spread. We don't see any significant interaction effects, leading us to conclude that changes in sovereign risk are not the drivers of our main results. In Panel B, we repeat the benchmark specifications, but now include changes in source sovereign CDS spreads as controls. Our benchmark results prevail robustly.

6.6 Using residence-based banking statistics

In our main specifications, we use nationality-based data that assigns banks to countries based on the location where they are headquartered. (As an example, this approach would treat a German bank's UK branch as a German bank). An alternative formulation would be to use residence-based statistics that assign banks to the location of their residence, regardless of parent nationality. (As an example, this approach would treat the German bank's UK branch as a UK bank.) We argue that for our research question, the nationality-based data is appropriate because we are interested in how government debt holdings by the parent bank, on a consolidated basis, affects its lending decisions. Furthermore, we examine the role of source (parent) country fiscal policy because, insofar as financial repression exists, fiscal pressure to hold government debt would be applicable mostly for the country's own banking system. As an additional check, in further estimations (shown in Table A7), we confirm that our benchmark results hold robustly when using the residence-based data as well. In results not shown, we also re-estimate the specifications in Tables 3-6 on the residence-based data and find that our results hold up robustly.[9]

6.7 Monetary policy surprises as exogenous proxies of monetary policy

In the latter part of our sample, central banks around the world responded to common demand and supply-side shocks affecting the world economy (Caldara et al, 2024). To exclude the possible confounding effects of these co-movements, in Table A8 we repeat the Table 2 specifications using

[9] Of note, coefficient estimates in the residence-based estimations are highly significant but smaller in magnitude than those in the benchmark tables. This may be in part because these estimations pick up only partially on the parent bank's decisions; for instance, these estimations examine the effect of German government debt on banks in Germany, including the German subsidiaries of UK banks. As such, they exclude fiscal influences on the ultimate decision-making unit: the parent bank (in this case, in the UK).

monetary policy surprises (shocks). Using Jarocinski and Karadi (2020)'s policy surprise measures derived for ECB and Fed monetary policy, we confirm that our results are robust to various formulations of this alternative (exogenous) monetary policy measure.

7 Conclusion

We combine a rarely accessed BIS database on bilateral cross-border lending flows with cross-country data on monetary policy and fiscal debt. We show that the transmission of the monetary policy of major international currency issuers (USD, EUR, JPY, GBP, and CHF) significantly interacts with changes in the fiscal stance of source banking systems. We show that fiscal consolidation in a home country amplifies the effect of currency issuers' monetary policy on lending. For instance, a reduction in German debt-to-GDP ratios amplifies the negative impact of US monetary policy tightening on USD-denominated cross-border bank lending outflows from German banks. We document significantly stronger transmission effects via US monetary policy and find particularly broad and robust transmission into lending to non-banks.

Our results are policy relevant. First, the dependence of monetary policy transmission on the evolution of government debt matters for central banks in the countries of borrowers who need to assess credit supply conditions. Second, these interactions matter for regulators of global banks, in gauging the effects that evolving sovereign debt has on lending outflows from their banking systems. Lastly, understanding the role of changes in source country fiscal stance also matters for the central banks of the top lending currencies, in part to more precisely assess spillback effects.

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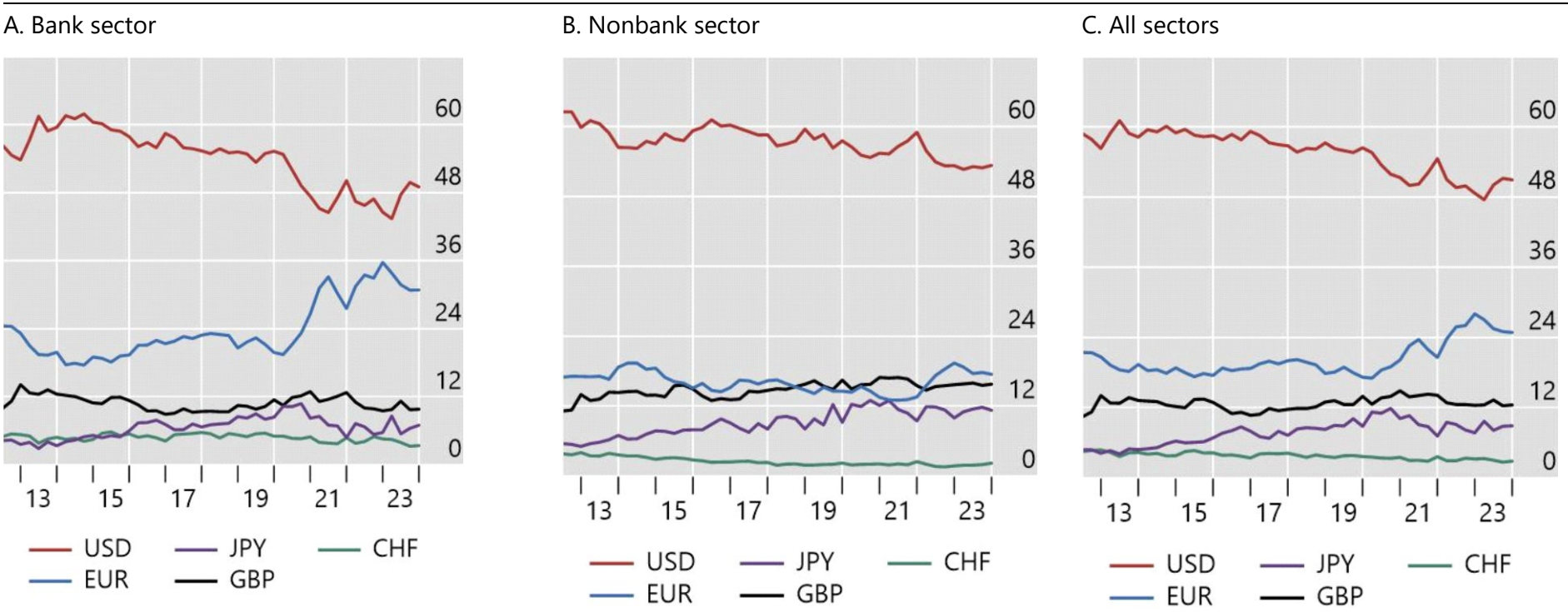
Graph 1: Currency share of cross-border claims[1] (In % of total in all currencies)

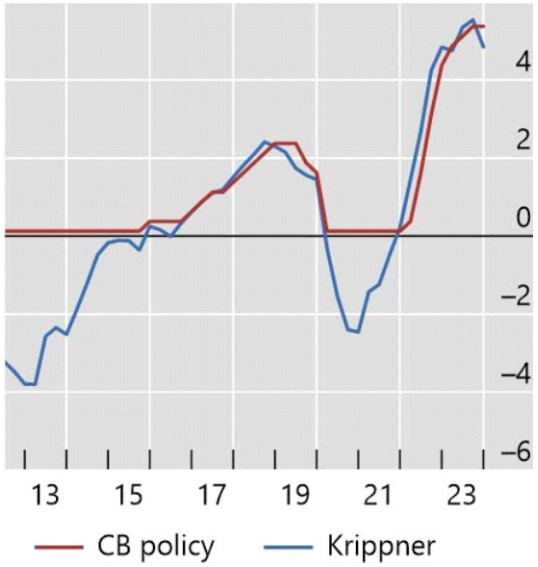


[1] Relates to total of 17 bank nationalities in the sample with currency positions denominated in USD, EUR, JPY, CHF and GBP. Excludes cross-border claims in home currency (ie EUR-denominated claims by euro area banks are excluded).

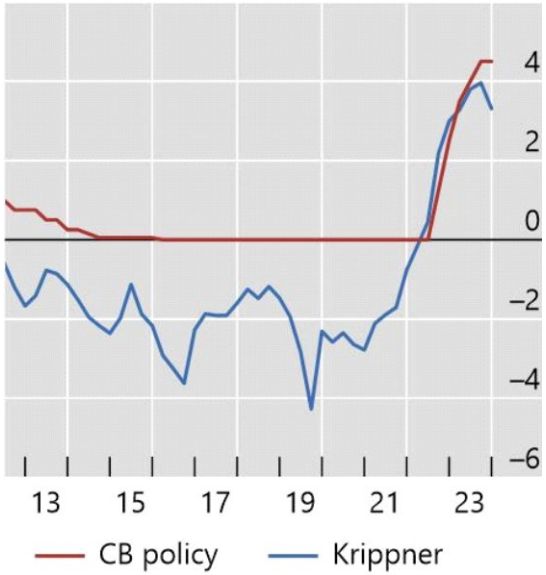
Sources: BIS locational banking statistics (by nationality); authors' calculations.

Graph 2: Central bank policy rate and Krippner shadow short rate by currency (In percentage)

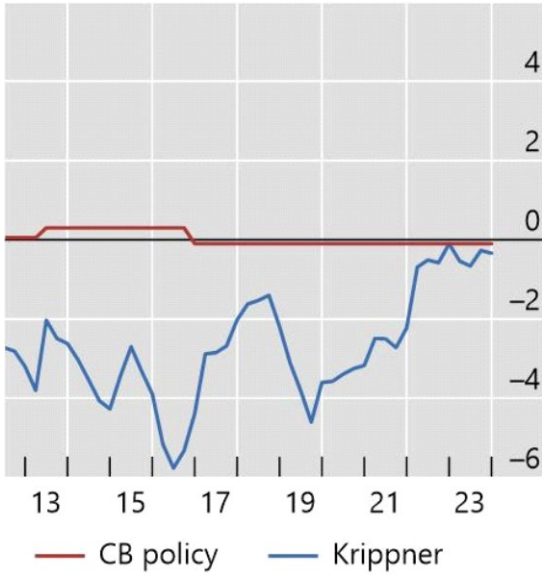
A. USD



B. EUR

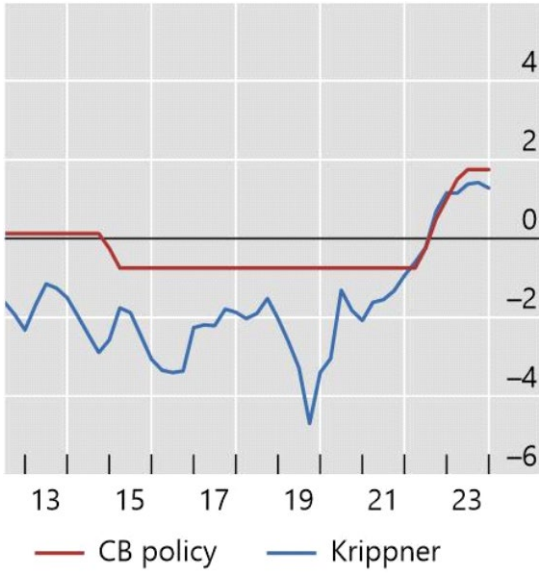


C. JPY



D. GBP

E. CHF

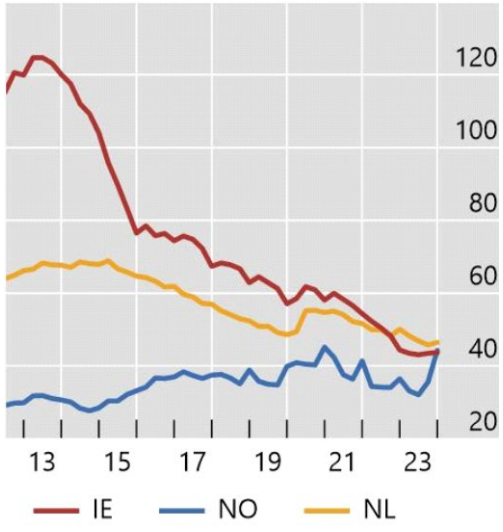


Sources: Leo Krippner (2020) ; IMF ; BIS

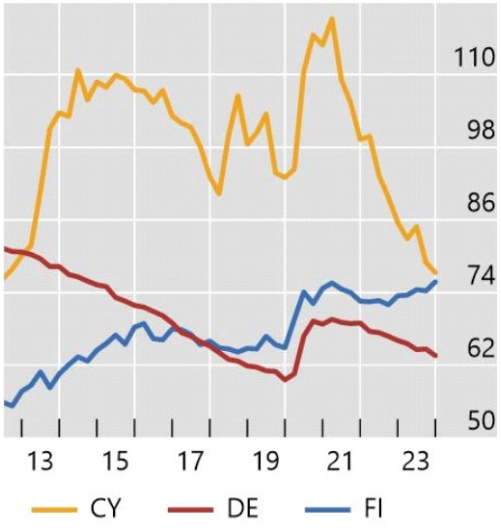
Graph 3: Government debt to GDP by source country (In percentage)

A. DK, LU and SE

B. IE, NO and NL

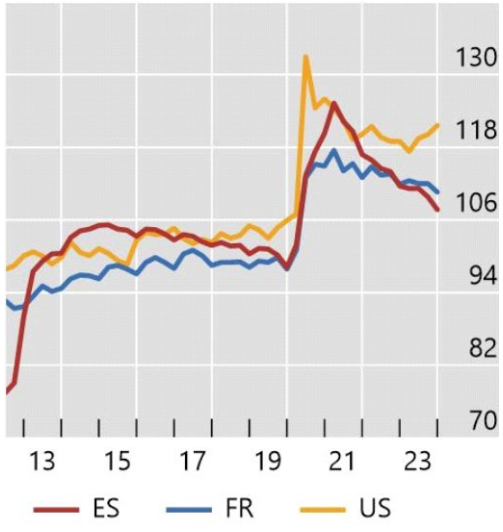


C. CY, DE and FI

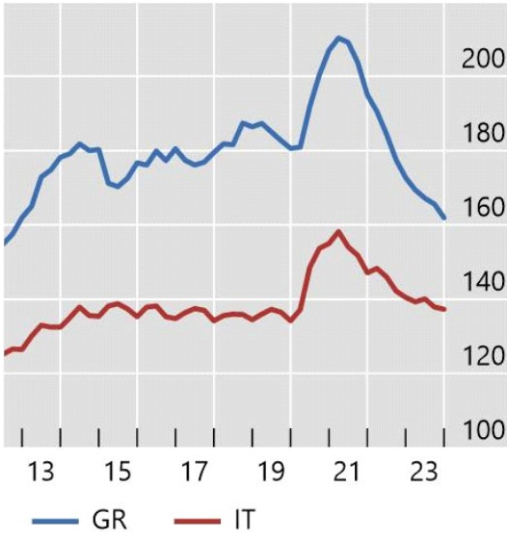


D. AT, BE and PT

E. ES, FR and US



F. GR and IT



Sources: Eurostats , FRED

Table 1: Variable descriptions and summary statistics

Variable	Description	N	Mean	Median	Std. deviatio	Min	Max
Δ claims	Winsorized value of quarterly change in bilateral cross-border claims, from the BIS locational by nationality banking statistics.	281,262	-0.12	0.00	35.27	-80.36	85.39
Cross-border weight (share)	Percentage share in bilateral outstanding claims of bank nationality across all currencies and all sectors	304,189	0.01	0.00	0.05	0.00	2.26
Source govt debt-to-GDP ratio	Geneneral government debt of banks' parent country, in % of GDP, from Eurostat	304,189	88.25	96.90	35.91	19.60	210.30
Δ Source govt debt-to-GDP ratio	Difference in govdebtgdp_source in t from (t-1)	281,262	0.04	-0.40	2.73	-10.00	25.97
Source fiscal deficit-to-GDP ratio	Fiscal deficit of banks' parent country, in % of GDP, from Eurostat	304,189	2.67	2.20	-5.35	-31.20	34.80
Δ Source fiscal deficit-to-GDP ratio	Difference in fisdeficitgdp_source in t from (t-1)	281,262	0.02	0.15	5.82	-23.50	38.36
Shadow interest rate	Krippner SSR by lending currency (USD, EUR, JPY, GBP, CH), from Krippner (2024)	304,189	-0.69	-1.25	2.29	-5.76	5.85
Δ Shadow interest rate	Difference in shadow interest rate in t from (t-1)	281,262	0.12	0.06	0.65	-1.76	2.58
Source central bank policy rate	Central bank policy rate of banks' parent country, from BIS	304,189	0.58	0.05	1.24	-0.75	5.38
Δ Source central bank policy rate	Difference in central bank policy rate in t from (t-1)	281,262	0.07	0.00	0.33	-1.50	1.50
Currency central bank policy rate	Central bank policy rate associated with the currency of lending, from BIS	304,189	1.32	1.07	1.05	-0.01	5.16
Δ bilateral exchange rate	Difference in bilateral exchange rate in t from (t-1), from BIS	281,262	0.55	0.00	11.26	-250.99	1,122.34
Δ source sovereign CDS spread	Difference in source sovereign CDS spreads in t from (t-1), from Fitch	270,230	-5.18	-0.90	128.02	-2,880.58	3,261.57

Table 2: Main specifications: Effect of monetary policy and government debt-to-GDP on cross-border lending flows

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Dependent variable: Bilateral cross-border lending flows								
Σ∆ Shadow Interest Rate {t-1 to t-4}	-1.234***	-1.360***	-0.608***	-0.914***	0.01	-1.707***	-1.422***	np
	[0.231]	[0.232]	[0.236]	[0.238]	[0.255]	[0.235]	[0.261]	np
Σ[∆Shadow Interest Rate * ∆ Source Govt. Debt-to-GDP] {t-1 to t-4}	0.723***	0.757***	0.580***	0.665***	0.497***	0.871***	0.420***	0.295***
	[0.050]	[0.050]	[0.051]	[0.052]	[0.056]	[0.055]	[0.055]	[0.074]
Σ∆ Source Govt. Debt-to-GDP {t-1 to t-4}	0.848***	0.553***	0.727***	0.599***	0.800***	np	0.735***	0.861***
	[0.058]	[0.070]	[0.059]	[0.070]	[0.070]	np	[0.061]	[0.058]
Observations	179,440	179,440	179,440	179,440	179,440	179,440	179,440	179,440
Time FE	Yes	Yes	Yes	Yes	Yes	--	--	--
Source FE	No	Yes	No	--	--	--	No	No
Borrower FE	No	No	Yes	--	--	No	--	No
Source* Borrower FE	No	No	No	Yes	--	No	No	No
Source* Borrower* Currenc	No	No	No	No	Yes	No	No	No
Source* Time FE	No	No	No	No	No	Yes	No	No
Borrower* Time FE	No	No	No	No	No	No	Yes	No
Currency* Time FE	No	No	No	No	No	No	No	Yes
Currency FE	No	No	No	No	No	No	No	--

Standard errors in parenthe *** p<0.01, ** p<0.05, * p<0.1

"np" indicates that the variable is subsumed by the included set of fixed effects.

Table 3: Effect of monetary policy and government debt-to-GDP on cross-border lending flows by borrower sector

Panel A: Banks

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Dependent variable: Bilateral cross-border lending flows to banks								
ΣΔ Shadow Interest Rate {t-1 to t-4}	-1.289***	-1.500***	-0.226	-0.816*	0.192	-1.427***	-1.400***	np
	[0.411]	[0.413]	[0.421]	[0.423]	[0.454]	[0.411]	[0.456]	np
Σ[ΔShadow Interest Rate * Δ Source Govt. Debt-to-GDP] {t-1 to t-4}	0.767***	0.781***	0.539***	0.654***	0.430***	0.795***	0.194**	0.429***
	[0.091]	[0.091]	[0.093]	[0.094]	[0.101]	[0.096]	[0.099]	[0.134]
ΣΔ Source Govt. Debt-to-GDP {t-1 to t-4}	0.811***	0.627***	0.583***	0.723***	0.814***	np	0.353***	0.856***
	[0.105]	[0.127]	[0.106]	[0.127]	[0.127]	np	[0.108]	[0.103]
Observations	66,275	66,275	66,275	66,275	66,275	66,275	66,275	66,275
Time FE	Yes	Yes	Yes	Yes	Yes	--	--	--
Source FE	No	Yes	No	--	--	--	No	No
Borrower FE	No	No	Yes	--	--	No	--	No
Source* Borrower FE	No	No	No	Yes	--	No	No	No
Source* Borrower* Currency FE	No	No	No	No	Yes	No	No	No
Source* Time FE	No	No	No	No	No	Yes	No	No
Borrower* Time FE	No	No	No	No	No	No	Yes	No
Currency* Time FE	No	No	No	No	No	No	No	Yes
Currency FE	No	No	No	No	No	No	No	--

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

"np" indicates that the variable is subsumed by the included set of fixed effects.

Table 3: Effect of monetary policy and government debt-to-GDP on cross-border lending flows by borrower sector

Panel B: Non-banks

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Dependent variable: Bilateral cross-border lending flows to non-banks								
Σ∆ Shadow Interest Rate {t-1 to t-4}	-1.104***	-1.143***	-1.036***	-1.210***	0.259	-1.177***	-0.982***	np
	[0.258]	[0.260]	[0.263]	[0.267]	[0.284]	[0.263]	[0.291]	np
Σ[∆Shadow Interest Rate * ∆ Source Govt. Debt-to-GDP] {t-1 to t-4}	0.294***	0.336***	0.314***	0.380***	0.018	0.203***	0.393***	-0.298***
	[0.056]	[0.058]	[0.058]	[0.060]	[0.064]	[0.064]	[0.061]	[0.081]
Σ∆ Source Govt. Debt-to-GDP {t-1 to t-4}	0.762***	0.468***	0.634***	0.614***	0.660***	np	0.783***	0.767***
	[0.065]	[0.076]	[0.066]	[0.077]	[0.077]	np	[0.067]	[0.064]
Observations	113,165	113,165	113,165	113,165	113,165	113,165	113,165	113,165
Time FE	Yes	Yes	Yes	Yes	Yes	--	--	--
Source FE	No	Yes	No	--	--	--	No	No
Borrower FE	No	No	Yes	--	--	No	--	No
Source* Borrower FE	No	No	No	Yes	--	No	No	No
Source* Borrower* Currency FE	No	No	No	No	Yes	No	No	No
Source* Time FE	No	No	No	No	No	Yes	No	No
Borrower* Time FE	No	No	No	No	No	No	Yes	No
Currency* Time FE	No	No	No	No	No	No	No	Yes
Currency FE	No	No	No	No	No	No	No	--

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

"np" indicates that the variable is subsumed by the included set of fixed effects.

Table 4: Effect of monetary policy and government debt-to-GDP on cross-border lending flows to the non-bank sector

Panel A: Non-bank financial institutions

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Dependent variable: Bilateral cross-border lending flows to non-bank financial institutions (NBFIs)								
Σ∆ Shadow Interest Rate {t-1 to t-4}	-4.675***	-4.949***	-4.452***	-5.317***	-4.490***	-4.992***	-4.459***	np
	[0.643]	[0.646]	[0.653]	[0.663]	[0.695]	[0.645]	[0.746]	np
Σ[∆Shadow Interest Rate * ∆ Source Govt. Debt-to-GDP] {t-1 to t-4}	0.792***	0.808***	0.720***	0.804***	0.606***	0.656***	0.890***	-0.362*
	[0.123]	[0.127]	[0.127]	[0.132]	[0.141]	[0.137]	[0.138]	[0.191]
Σ∆ Source Govt. Debt-to-GDP {t-1 to t-4}	0.659***	0.657***	0.594***	0.785***	0.722***	np	0.803***	0.744***
	[0.156]	[0.187]	[0.161]	[0.188]	[0.189]	np	[0.170]	[0.158]
Observations	32,427	32,427	32,427	32,427	32,427	32,427	32,427	32,427
Time FE	Yes	Yes	Yes	Yes	Yes	--	--	--
Source FE	No	Yes	No	--	--	--	No	No
Borrower FE	No	No	Yes	--	--	No	--	No
Source* Borrower FE	No	No	No	Yes	--	No	No	No
Source* Borrower* Currency FE	No	No	No	No	Yes	No	No	No
Source* Time FE	No	No	No	No	No	Yes	No	No
Borrower* Time FE	No	No	No	No	No	No	Yes	No
Currency* Time FE	No	No	No	No	No	No	No	Yes
Currency FE	No	No	No	No	No	No	No	--

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

"np" indicates that the variable is subsumed by the included set of fixed effects.

Table 4: Effect of monetary policy and government debt-to-GDP on cross-border lending flows to the non-bank sector

Panel B: Non-financial sector

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Dependent variable: Bilateral cross-border lending flows to the non-financial sector (NFS)								
Σ∆ Shadow Interest Rate {t-1 to t-4}	1.955***	1.923***	2.200***	2.376***	3.970***	1.362***	0.944**	np
	[0.348]	[0.349]	[0.354]	[0.356]	[0.366]	[0.356]	[0.411]	np
Σ[∆Shadow Interest Rate * ∆ Source Govt. Debt-to-GDP] {t-1 to t-4}	0.130*	0.156**	0.112	0.189**	-0.237***	0.345***	0.260***	-0.052
	[0.074]	[0.075]	[0.077]	[0.078]	[0.083]	[0.083]	[0.079]	[0.099]
Σ∆ Source Govt. Debt-to-GDP {t-1 to t-4}	0.532***	0.335***	0.598***	0.494***	0.460***	np	0.710***	0.484***
	[0.083]	[0.102]	[0.086]	[0.103]	[0.103]	np	[0.087]	[0.082]
Observations	87,399	87,399	87,399	87,399	87,399	87,399	87,399	87,399
Time FE	Yes	Yes	Yes	Yes	Yes	--	--	--
Source FE	No	Yes	No	--	--	--	No	No
Borrower FE	No	No	Yes	--	--	No	--	No
Source* Borrower FE	No	No	No	Yes	--	No	No	No
Source* Borrower* Currency FE	No	No	No	No	Yes	No	No	No
Source* Time FE	No	No	No	No	No	Yes	No	No
Borrower* Time FE	No	No	No	No	No	No	Yes	No
Currency* Time FE	No	No	No	No	No	No	No	Yes
Currency FE	No	No	No	No	No	No	No	--

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

"np" indicates that the variable is subsumed by the included set of fixed effects.

Table 5: Effect of monetary policy and government debt-to-GDP on cross-border lending flows - Extra effects due to Special Role of US monetary policy

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Dependent variable: Bilateral cross-border lending flows								
Σ[Δ Shadow Interest Rate * USD dummy] {t-1 to t-4}	-2.258***	-2.803***	-1.761***	-2.883***	-0.794**	-2.647***	-1.225***	np
	[0.339]	[0.340]	[0.346]	[0.351]	[0.384]	[0.340]	[0.383]	np
Σ[ΔShadow Interest Rate * Δ Source Govt. Debt-to-GDP * USD dummy] {t-1 to t-4}	0.924***	1.203***	0.894***	1.209***	0.835***	1.389***	0.455***	-0.031
	[0.113]	[0.115]	[0.114]	[0.118]	[0.126]	[0.125]	[0.117]	[0.163]
Σ[Δ Source Govt. Debt-to-GDP * USD dummy] {t-1 to t-4}	0.758***	0.740***	0.809***	0.667***	1.071***	0.666***	0.633***	0.524***
	[0.104]	[0.104]	[0.104]	[0.108]	[0.116]	[0.112]	[0.107]	[0.119]
Observations	179,440	179,440	179,440	179,440	179,440	179,440	179,440	179,440
Time FE	Yes	Yes	Yes	Yes	Yes	--	--	--
Source FE	No	Yes	No	--	--	--	No	No
Borrower FE	No	No	Yes	--	--	No	--	No
Source* Borrower FE	No	No	No	Yes	--	No	No	No
Source* Borrower* Currency FE	No	No	No	No	Yes	No	No	No
Source* Time FE	No	No	No	No	No	Yes	No	No
Borrower* Time FE	No	No	No	No	No	No	Yes	No
Currency* Time FE	No	No	No	No	No	No	No	Yes
Currency FE	No	No	No	No	No	No	No	--

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

The coefficients in this table show the extra effects of the explanatory variables measured in the case of US monetary policy's effects on USD lending.

"np" indicates that the variable is subsumed by the included set of fixed effects.

Table 6: Effect of monetary policy and government debt-to-GDP on cross-border lending flows - Extra effects due to exisiting level of debt

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Dependent variable: Bilateral cross-border lending flows								
Σ[Δ Shadow Interest Rate * Source Govt. Debt-to-GDP] {t-1 to t-4}	-0.045***	-0.053***	-0.046***	-0.052***	-0.052***	-0.058***	-0.049***	np
	[0.005]	[0.006]	[0.005]	[0.006]	[0.006]	[0.009]	[0.005]	np
Σ[ΔShadow Interest Rate * Δ Source Govt. Debt-to-GDP* Source Govt. Debt-to-GDP] {t-1 to t-4}	-0.014***	-0.010***	-0.011***	-0.008***	-0.006**	0.014***	-0.009***	-0.012***
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.003]	[0.002]	[0.002]
Σ[Δ Source Govt. Debt-to-GDP * Source Govt. Debt-to-GDP] {t-1 to t-4}	-0.007***	-0.005***	-0.007***	-0.006***	-0.008***	np	-0.004***	-0.004***
	[0.001]	[0.002]	[0.001]	[0.002]	[0.002]	np	[0.002]	[0.001]
Observations	179,440	179,440	179,440	179,440	179,440	179,440	179,440	179,440
Time FE	Yes	Yes	Yes	Yes	Yes	--	--	--
Source FE	No	Yes	No	--	--	--	No	No
Borrower FE	No	No	Yes	--	--	No	--	No
Source* Borrower FE	No	No	No	Yes	--	No	No	No
Source* Borrower* Currency FE	No	No	No	No	Yes	No	No	No
Source* Time FE	No	No	No	No	No	Yes	No	No
Borrower* Time FE	No	No	No	No	No	No	Yes	No
Currency* Time FE	No	No	No	No	No	No	No	Yes
Currency FE	No	No	No	No	No	No	No	--

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

"np" indicates that the variable is subsumed by the included set of fixed effects.

Table A1: Effect of government debt-to-GDP on country's banking system's government claims holdings

Model	[1]	[2]	[3]	[4]	[5]	[6]
Number of explanatory variable lags included:	*One lag*	*One lag*	*One lag*	*Four lags*	*Four lags*	*Four lags*
Dependent variable: Bilateral cross-border lending flows						
ΣΔ Source Govt. Debt-to-GDP {t-1 to t-4}	0.462***	0.548***	0.598***	0.467***	0.585***	0.672***
	[0.035]	[0.085]	[0.094]	[0.035]	[0.093]	[0.102]
Observations	647	647	647	594	594	594
Time FE	Yes	No	Yes	Yes	No	Yes
Source FE	No	Yes	Yes	No	Yes	Yes

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

This table shows the results of estimations in which changes in the government debt to GDP ratio at the country level are regressed on changes in the country's banking system's holdings of domestic sovereign debt, over time.

Table A2: Effect of monetary policy and government debt-to-GDP on cross-border lending flows - Central bank policy rates as alternative monetary policy measure

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Dependent variable: Bilateral cross-border lending flows								
ΣΔ Central Bank Policy Rate {t-1 to t-4}	-10.125***	-10.659***	-10.178***	-9.573***	-11.366***	-14.369***	-13.486***	np
	[2.180]	[2.177]	[2.180]	[2.180]	[2.188]	[2.186]	[2.588]	np
Σ[ΔCentral Bank Policy Rate * Δ Source Govt. Debt-to-GDP] {t-1 to t-4}	0.881***	0.802***	0.688***	0.633***	0.728***	4.012***	0.247	-0.284
	[0.226]	[0.231]	[0.227]	[0.232]	[0.233]	[0.629]	[0.238]	[0.237]
ΣΔ Source Govt. Debt-to-GDP {t-1 to t-4}	0.796***	0.513***	0.674***	0.557***	0.749***	np	0.673***	0.842***
	[0.058]	[0.070]	[0.059]	[0.070]	[0.070]	np	[0.061]	[0.058]
Observations	179,440	179,440	179,440	179,440	179,440	179,440	179,440	179,440
Time FE	Yes	Yes	Yes	Yes	Yes	--	--	--
Source FE	No	Yes	No	--	--	--	No	No
Borrower FE	No	No	Yes	--	--	No	--	No
Source* Borrower FE	No	No	No	Yes	--	No	No	No
Source* Borrower* Currency FE	No	No	No	No	Yes	No	No	No
Source* Time FE	No	No	No	No	No	Yes	No	No
Borrower* Time FE	No	No	No	No	No	No	Yes	No
Currency* Time FE	No	No	No	No	No	No	No	Yes
Currency FE	No	No	No	No	No	No	No	--

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

"np" indicates that the variable is subsumed by the included set of fixed effects.

Table A3: Effect of monetary policy and government debt-to-GDP on cross-border lending flows - Fiscal deficit to GDP ratio as alternative fiscal measure

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Dependent variable: Bilateral cross-border lending flows								
ΣΔ Shadow Interest Rate {t-1 to t-4}	-0.248	-0.31	0.252	0.066	0.903***	-0.752***	-1.093***	np
	[0.213]	[0.214]	[0.216]	[0.216]	[0.224]	[0.222]	[0.242]	np
Σ[ΔShadow Interest Rate * Δ Source Fiscal Deficit-to-GDP] {t-1 to t-4}	0.168***	0.222***	0.104**	0.173***	0.045	0.462***	0.059	0.023
	[0.040]	[0.041]	[0.041]	[0.041]	[0.042]	[0.057]	[0.041]	[0.044]
ΣΔ Source Fiscal Deficit-to-GDP {t-1 to t-4}	0.391***	0.423***	0.426***	0.433***	0.463***	np	0.276***	0.413***
	[0.084]	[0.084]	[0.084]	[0.084]	[0.084]	np	[0.088]	[0.083]
Observations	179,440	179,440	179,440	179,440	179,440	179,440	179,440	179,440
Time FE	Yes	Yes	Yes	Yes	Yes	--	--	--
Source FE	No	Yes	No	--	--	--	No	No
Borrower FE	No	No	Yes	--	--	No	--	No
Source* Borrower FE	No	No	No	Yes	--	No	No	No
Source* Borrower* Currency FE	No	No	No	No	Yes	No	No	No
Source* Time FE	No	No	No	No	No	Yes	No	No
Borrower* Time FE	No	No	No	No	No	No	Yes	No
Currency* Time FE	No	No	No	No	No	No	No	Yes
Currency FE	No	No	No	No	No	No	No	--

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

"np" indicates that the variable is subsumed by the included set of fixed effects.

Table A4: Effect of monetary policy and government debt-to-GDP on cross-border lending flows - Central bank policy rates as alternative monetary policy measure and Fiscal deficit to GDP ratio as alternative fiscal measure

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Dependent variable: Bilateral cross-border lending flows								
ΣΔ Shadow Interest Rate {t-1 to t-4}	-11.064***	-11.228***	-11.184***	-10.282***	-12.122***	-11.937***	-15.150***	np
	[2.175]	[2.172]	[2.175]	[2.174]	[2.183]	[2.153]	[2.579]	np
Σ[ΔShadow Interest Rate * Δ Source Fiscal Deficit-to-GDP] {t-1 to t-4}	-0.308**	-0.212	-0.268*	-0.191	-0.373**	3.846***	-0.704***	-0.549***
	[0.145]	[0.148]	[0.145]	[0.148]	[0.148]	[0.492]	[0.147]	[0.146]
ΣΔ Source Fiscal Deficit-to-GDP {t-1 to t-4}	0.405***	0.436***	0.435***	0.442***	0.464***	np	0.289***	0.412***
	[0.084]	[0.084]	[0.084]	[0.084]	[0.084]	np	[0.088]	[0.083]
Observations	179,440	179,440	179,440	179,440	179,440	179,440	179,440	179,440
Time FE	Yes	Yes	Yes	Yes	Yes	--	--	--
Source FE	No	Yes	No	--	--	--	No	No
Borrower FE	No	No	Yes	--	--	No	--	No
Source* Borrower FE	No	No	No	Yes	--	No	No	No
Source* Borrower* Currency FE	No	No	No	No	Yes	No	No	No
Source* Time FE	No	No	No	No	No	Yes	No	No
Borrower* Time FE	No	No	No	No	No	No	Yes	No
Currency* Time FE	No	No	No	No	No	No	No	Yes
Currency FE	No	No	No	No	No	No	No	--

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

"np" indicates that the variable is subsumed by the included set of fixed effects.

Table A5: Effect of monetary policy and government debt-to-GDP on cross-border lending flows - Arellano-Bond dynamic panel data estimations

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Dependent variable: Bilateral cross-border lending flows								
ΣΔ Central Bank Policy Rate {t-1 to t-4}	-1.597***	-1.597***	-1.597***	-1.597***	-1.597***	-0.643*	-0.977***	np
	[0.181]	[0.181]	[0.181]	[0.181]	[0.181]	[0.344]	[0.188]	np
Σ[ΔCentral Bank Policy Rate * Δ Source Govt. Debt-to-GDP] {t-1 to t-4}	0.010***	0.010***	0.010***	0.010***	0.010***	-0.001	-0.001	0.009***
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.004]	[0.002]	[0.002]
ΣΔ Source Govt. Debt-to-GDP {t-1 to t-4}	0.200***	0.200***	0.200***	0.200***	0.200***	np	-0.225***	0.052*
	[0.027]	[0.027]	[0.027]	[0.027]	[0.027]	np	[0.0278]	[0.027]
Observations	179,440	179,440	179,440	179,440	179,440	179,440	179,440	179,440
Time FE	Yes	Yes	Yes	Yes	Yes	--	--	--
Source FE	No	Yes	No	--	--	--	No	No
Borrower FE	No	No	Yes	--	--	No	--	No
Source* Borrower FE	No	No	No	Yes	--	No	No	No
Source* Borrower* Currency FE	No	No	No	No	Yes	No	No	No
Source* Time FE	No	No	No	No	No	Yes	No	No
Borrower* Time FE	No	No	No	No	No	No	Yes	No
Currency* Time FE	No	No	No	No	No	No	No	Yes
Currency FE	No	No	No	No	No	No	No	--

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

"np" indicates that the variable is subsumed by the included set of fixed effects.

Table A6: Effect of monetary policy and changes in sovereign CDS spreads on cross-border lending flows

Panel A: Replacing changes in debt to GDP ratios with change in source sovereign CDS spreads

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Dependent variable: Bilateral cross-border lending flows								
ΣΔ Shadow Interest Rate {t-1 to t-4}	-1.316***	-1.405***	-0.650***	-0.950***	0.008	-1.735***	-1.473***	np
	[0.235]	[0.236]	[0.240]	[0.241]	[0.259]	[0.238]	[0.265]	np
Σ[ΔShadow Interest Rate * Δ Source Sovereign CDS Spread] {t-1 to t-4}	0.694***	0.744***	0.551***	0.649***	0.466***	0.877***	0.372***	0.308***
	[0.050]	[0.051]	[0.052]	[0.053]	[0.056]	[0.055]	[0.055]	[0.075]
ΣΔ Source Sovereign CDS Spread {t-1 to t-4}	0.002	0	0.001	0	-0.001	np	0	0.002
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	np	[0.002]	[0.002]
Observations	173,947	173,947	173,947	173,947	173,947	173,947	173,947	173,947
Time FE	Yes	Yes	Yes	Yes	Yes	--	--	--
Source FE	No	Yes	No	--	--	--	No	No
Borrower FE	No	No	Yes	--	--	No	--	No
Source* Borrower FE	No	No	No	Yes	--	No	No	No
Source* Borrower* Currency F	No	No	No	No	Yes	No	No	No
Source* Time FE	No	No	No	No	No	Yes	No	No
Borrower* Time FE	No	No	No	No	No	No	Yes	No
Currency* Time FE	No	No	No	No	No	No	No	Yes
Currency FE	No	No	No	No	No	No	No	--

Standard errors in parenthese *** p<0.01, ** p<0.05, * p<0.1

"np" indicates that the variable is subsumed by the included set of fixed effects.

Table A6: Effect of monetary policy and changes in sovereign CDS spreads on cross-border lending flows

Panel B: Adding changes in source sovereign CDS spreads as additional control

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Dependent variable: Bilateral cross-border lending flows								
Σ∆ Shadow Interest Rate {t-1 to t-4}	-1.285***	-1.381***	-0.657***	-0.934***	-0.008	-1.735***	-1.468***	np
	[0.235]	[0.236]	[0.240]	[0.241]	[0.258]	[0.238]	[0.265]	np
Σ[∆Shadow Interest Rate * ∆ Source Govt. Debt-to-GDP] {t-1 to t-4}	0.744***	0.768***	0.599***	0.677***	0.510***	0.877***	0.436***	0.319***
	[0.051]	[0.051]	[0.052]	[0.053]	[0.057]	[0.055]	[0.056]	[0.075]
Σ∆ Source Govt. Debt-to-GDP {t-1 to t-4}	0.942***	0.612***	0.810***	0.654***	0.862***	np	0.808***	0.950***
	[0.060]	[0.073]	[0.061]	[0.073]	[0.073]	np	[0.063]	[0.060]
Observations	179,440	179,440	179,440	179,440	179,440	179,440	179,440	179,440
Time FE	Yes	Yes	Yes	Yes	Yes	--	--	--
Source FE	No	Yes	No	--	--	--	No	No
Borrower FE	No	No	Yes	--	--	No	--	No
Source* Borrower FE	No	No	No	Yes	--	No	No	No
Source* Borrower* Currency F	No	No	No	No	Yes	No	No	No
Source* Time FE	No	No	No	No	No	Yes	No	No
Borrower* Time FE	No	No	No	No	No	No	Yes	No
Currency* Time FE	No	No	No	No	No	No	No	Yes
Currency FE	No	No	No	No	No	No	No	--

Standard errors in parenthese *** p<0.01, ** p<0.05, * p<0.1

"np" indicates that the variable is subsumed by the included set of fixed effects.

Table A7: Residence-based data: Main specifications: Effect of monetary policy and government debt-to-GDP on cross-border lending flows

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Dependent variable: Bilateral cross-border lending flows								
ΣΔ Shadow Interest Rate {t-1 to t-4}	-0.415	-0.392	0.085	-0.134	0.307	-0.288	-0.636**	np
	[0.277]	[0.282]	[0.282]	[0.287]	[0.303]	[0.298]	[0.311]	np
Σ[ΔShadow Interest Rate * Δ Source Govt. Debt-to-GDP] {t-1 to t-4}	0.507***	0.443***	0.315***	0.324***	0.211***	0.228***	0.211***	0.394***
	[0.066]	[0.069]	[0.068]	[0.071]	[0.075]	[0.087]	[0.072]	[0.095]
ΣΔ Source Govt. Debt-to-GDP {t-1 to t-4}	0.936***	0.837***	0.866***	0.924***	1.072***	np	1.002***	0.790***
	[0.069]	[0.084]	[0.070]	[0.084]	[0.084]	np	[0.072]	[0.070]
Observations	141,401	141,401	141,401	141,401	141,401	141,401	141,401	141,401
Time FE	Yes	Yes	Yes	Yes	Yes	--	--	--
Source FE	No	Yes	No	--	--	--	No	No
Borrower FE	No	No	Yes	--	--	No	--	No
Source* Borrower FE	No	No	No	Yes	--	No	No	No
Source* Borrower* Currenc	No	No	No	No	Yes	No	No	No
Source* Time FE	No	No	No	No	No	Yes	No	No
Borrower* Time FE	No	No	No	No	No	No	Yes	No
Currency* Time FE	No	No	No	No	No	No	No	Yes
Currency FE	No	No	No	No	No	No	No	--

Standard errors in parenthe*** p<0.01, ** p<0.05, * p<0.1

"np" indicates that the variable is subsumed by the included set of fixed effects.

Table A8: Using monetary policy shocks (based on Jarocinski and Karadi (2020) methodology): Effect of monetary policy and government debt-to-GDP on cross-border lending flows

Model	[1]	[2]	[3]	[4]	[5]	[6]
Sample:	*2012-2016*		*2012-2024*			
MP shock measure:	*MP pm*		*PC MP*		*MP pm*	
Dependent variable: Bilateral cross-border lending flows						
ΣΔ Monetary Policy Shock {t-1 to t-4}	-50.030***	np	3.071	np	-11.921***	np
	[8.159]	np	[3.014]	np	[2.687]	np
Σ[ΔMonetary Policy Shock * Δ Source Govt. Debt-to-GDP] {t-1 to t-4}	7.417	23.444***	7.451***	7.448***	4.944***	2.125
	[5.620]	[5.347]	[1.674]	[2.009]	[1.505]	[1.813]
ΣΔ Source Govt. Debt-to-GDP {t-1 to t-4}	0.106	0.066	0.624***	0.770***	0.567***	0.778***
	[0.117]	[0.115]	[0.069]	[0.065]	[0.069]	[0.066]
Observations	47,288	47,288	135,173	135,173	135,173	135,173
Time FE	--	--	--	--	--	--
Source FE	No	No	No	No	No	No
Borrower FE	--	No	--	No	--	No
Source* Borrower FE	No	No	No	No	No	No
Source* Borrower* Currency FE	No	No	No	No	No	No
Source* Time FE	No	No	No	No	No	No
Borrower* Time FE	Yes	No	Yes	No	Yes	No
Currency* Time FE	No	Yes	No	Yes	No	Yes
Currency FE	No	--	No	--	No	--

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

"np" indicates that the variable is subsumed by the included set of fixed effects.

For definitions of the various types of monetary policy surprises shown in the column headings, please see Jarocinski and Karadi (2020).