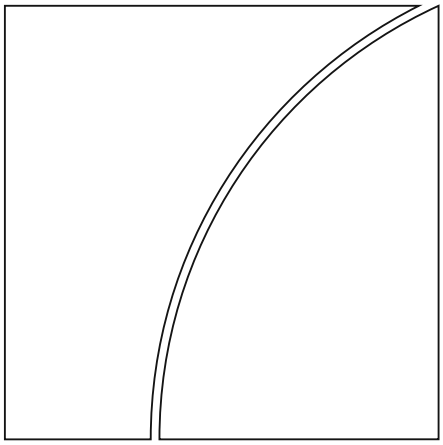

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by Stefan Avdjiev, Cathérine Koch, Patrick McGuire, and Goetz von Peter

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Transmission of monetary policy through global banks: whose policy matters?*

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ABSTRACT

This paper explores the basic question of *whose* monetary policy matters for banks' international lending. In the international context, monetary policies from several countries could come into play: the lender's, the borrower's, and that of a third country, the issuer of the currency in which cross-border lending is denominated. Using the rich dimensionality of the BIS international banking statistics, we find significant effects for all three policies. US monetary easing fuels cross-border lending in US dollars, as befits a global funding currency. At the same time, a tightening in the lender or the borrower country reinforces international dollar lending as global banks turn to the greenback for cheaper funding and toward borrowers abroad. Our results also show that stronger capitalization and better access to funding sources mitigate the frictions underpinning the transmission channels. Analogous results for euro-denominated lending confirm that global funding currencies play a key role in international monetary policy transmission.

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1 Introduction

Policy rates for the major currencies fell dramatically in the wake of the Global Financial Crisis of 2007-09. A number of studies make clear that economies around the world cannot perfectly insulate themselves from changes in policy stance elsewhere, certainly not from the monetary policies (MPs) of the major currencies. Yet the global nature of finance makes it difficult to capture the full range of monetary policy effects that might shape credit extended from one country to another.

The traditional approach to banking offers limited insights, since the focus is generally not on currencies. Monetary easing tends to fuel lending as banks take advantage of easier funding conditions ("bank-lending channel", e.g. Kashyap and Stein, 2000) and improved creditworthiness supports more debt ("balance-sheet channel", e.g. Bernanke and Gertler, 1995). Extending this logic to international banking would see cross-border lending rise after monetary easing in the lender or in the borrower country. However, what if the bulk of cross-border lending is denominated in a third, global, currency? Whose monetary policy matters then?

Post-crisis, the literature has moved in the opposite direction, toward a singular focus on currency and on the US dollar in particular. A growing body of evidence shows that US monetary easing and cheaper dollar funding fuels global liquidity [1]. McCauley et al. (2015) document the rapid rise in dollar-denominated credit to borrowers outside the United States and link this expansion to interest rate differentials with the US dollar. Bruno and Shin (2015) study how global banks, in particular, translate lower dollar funding costs into looser financial conditions elsewhere. This is mirrored in US banks' increased cross-border lending (Temesvary et al., 2018), and in more foreign bank credit to local firms (Morais et al. 2017). Avdjiev et al. (2017) and Cerutti et al. (2017) examine the role of US monetary policy for global liquidity conditions more generally. At the extreme, one can think of a global financial cycle that no longer aligns with countries' macroeconomic conditions (Rey, 2013).

But where does this leave the monetary policies of lender and borrower countries? Do they still matter? This paper bridges the gap between the above two strands of the literature to examine how various monetary policies shape international bank lending denominated in global currencies.

[1] See CGFS (2011) for definitions and measures of global liquidity.

This paper complements the broader initiative of the International Banking Research Network (IBRN) on the same topic. Buch et al. (2018) provide a meta-analysis of 19 coordinated, individual country studies based on their respective bank-level microdata. We extend the methodology to the international context, allowing for three distinct MPs to affect the universe of bilateral borrower-lender relationships at the country level.

Our main contribution is to run a horse race between three monetary policies to determine how cross-border dollar credit responds to the policies in the countries of the lenders and the borrowers, as well as that of the currency of denomination (US monetary policy).[2] We find significant effects for all three policies - while the denomination currency monetary policy has the expected effect, the policies of the countries where the lenders operate and where the borrowers reside also matter. US monetary easing typically leads to an expansion in cross-border bank lending denominated in dollars, even after controlling for other policies and developments affecting lenders and borrowers. Monetary easing in the lender or the borrower country of residence, by contrast, tends to curb cross-border lending as the relative attractiveness of dollar (or euro) funding and foreign borrowers declines. We also show that differences in bank capital and funding structures affect how each of the three MPs are transmitted. These results are not unique to the dollar as a denomination currency; we find analogous (but weaker) results for euro-denominated lending.

Our identification rests on three pillars. First, it draws on the rich dimensionality of the BIS international banking statistics (IBS). The locational data by residence feature credit flows between thousands of lender-borrower pairs on a quarterly basis.[3] Second, we also exploit cross-country heterogeneity to measure how lender and borrower countries' bank characteristics, such as capitalization and access to funding sources, mitigate or amplify the frictions underpinning the transmission channels. Third, to identify the effects of three MPs simultaneously, we drop all borrower and lender countries whose official currency coincides with the currency denomination of credit. The measures on monetary policy stance come from

[2]For instance, for dollar lending from banks located in the United Kingdom to borrowers in Italy, the lenders' policy rate is Bank Rate (on pound sterling), the borrower rate is the interest rate set by the ECB on the main refinancing operations, and the rate on the currency of denomination is the US federal funds rate since credit is denominated in dollars.

[3]The BIS locational statistics capture internationally active banks' international positions (both cross-border and local) booked in up to 46 countries vis-à-vis borrowers in more than 200 countries. We use counterparty information to control for monetary policy changes in those 55 countries for which reliable data exist.

the IBRN database on monetary instruments. We focus on short-term policy rates, which are comparable and available for 55 countries.

Two important precursors to our work also use the BIS IBS to examine international MP transmission through bank lending while focusing on the role of a single monetary policy. Correa et al (2018) find that monetary policy in lender countries is an important determinant of cross-border bank flows. Their evidence points to a cross-border portfolio channel whereby tighter monetary conditions erode the net worth and collateral of domestic borrowers and induce banks to reallocate more credit toward (safer) borrowers abroad. Takáts and Temesvary (2016) focus instead on the role of the currency of denomination in cross-border lending.[4] Using a post-crisis sample (2012-15), they show that easing in one of the major currency areas increases cross-border lending denominated in that currency, be it in dollars, euro or yen. This effect holds even when it is neither the lenders' nor the borrowers' domestic currency, and works mostly through lending to non-banks.

Our paper extends this line of research in several ways. It is the first to simultaneously examine the role of monetary policy changes *simultaneously* in three dimensions of the lending transaction: the countries of the lenders, the borrowers, and the currency in which credit is denominated. Moreover, we exploit the cross-country heterogeneity in bank characteristics in both the lender and borrower countries, and we interact them with changes in the three MPs to shed light on the frictions that dampen or amplify the channels at play.[5]

Second, as our data span the years 2000-16, the analysis comprises periods of normal and unconventional policy, with a large and balanced number of decreases and increases (reflecting rate cuts and hikes). This contrasts with Takáts and Temesvary's (2016) post-crisis analysis and their use of shadow interest rates. Their paper also groups banks according to their *nationality* (bank headquarters). We instead take the *residence* perspective, which affords a much longer time series.[6]

The residence perspective also has several conceptual advantages in the context of the main questions

[4]Their paper in turn broadens the focus of Temesvary et al. (2018), who study the effect of US monetary policy on US banks' cross-border lending.

[5]In what follows, we use "banks" with the understanding that the term refers to the group of internationally active banks operating in a particular lender country.

[6]Consequently, the bank characteristics we control for also follow the residence concept, i.e. use unconsolidated bank balance-sheet data. In addition to banks headquartered in the country, the bank characteristics relate to foreign subsidiaries operating in the same country.

that we examine. First, the conventional bank-lending channel relates to conditions and frictions in the location where banks fund themselves, book their lending and serve customers. These activities respond to monetary policy in that location (the "lender country"), not to monetary conditions in various home countries of the lending banks (the "lender nationality"). Second, the residence perspective is also more relevant when foreign affiliates are subject to host-country regulation or have access to local central bank liquidity facilities (e.g. Buch et al, 2016). Affiliates may well act in an autonomous manner, at least in banking groups running a decentralized model (McCauley et al, 2010). Furthermore, an advantage of locational data, as compared to the consolidated statistics, is that they reveal banks' internal capital markets. Banks that can draw on their foreign affiliates may be insulated from domestic liquidity shocks – but in so doing may propagate liquidity shocks abroad (Cetorelli and Goldberg, 2012).

The remainder of the paper proceeds as follows. Section 2 lays out the hypotheses and describes the methodological approach. Section 3 introduces the data on cross-border bank lending and bank balance-sheet characteristics. The results are presented and interpreted in light of the transmission channels and the underlying frictions in Section 4. Section 5 concludes. Tables and figures are found at the end of the paper, and the Annex Tables B1-B7 report full results and a series of robustness checks.

2 Empirical approach

2.1 Countries and currencies

In much of the literature on international banking, the monetary policies of two countries, at most, play a role: that of the lender and that of the borrower, alongside other factors shaping the supply of and demand for credit. This is based on the traditional view of an international bank extending cross-border credit (exporting domestic savings) to foreign borrowers out of its home country.

The rich dimensionality of the BIS international banking statistics allows for a more nuanced picture. Consider geography first. In a world with multinational groups, banks have offices in *many* countries. They raise funds and extend credit in various host countries and they book local claims or lend cross-border to borrowers in a third country (Fender and McGuire, 2010). In this view, "the lender country's monetary policy" could be either that of the bank's headquarters or the location where it operates. We focus on the residence perspective, which is conceptually better suited to the analysis of cross-border spillover effects.

As such, our study complements Takáts and Temesvary (2016), who are limited to the post-2012 period when the data by nationality started to feature the necessary breakdown for the location of the borrower.

The second nuance is that multinational banking groups will raise funding and extend credit in a *range of currencies*, most prominently in dollars and euros. This means that a third currency, typically neither the lenders' nor the borrowers' domestic currency, will also come into play. Why is the currency of denomination so important? Many global bank affiliates tap dollar and euro funding markets in addition to those in the local currency of the host country. Looking across the universe of BIS reporting banks, roughly half of their cross-border assets and liabilities are denominated in US dollars and about a third are in euros. In many locations, these are *foreign* currencies, and yet they still account for the bulk of cross-border lending (Figure 1, left-hand panel). For example, the Japanese yen and the pound Sterling constitute only relatively small shares of the cross-border positions reported by banks in Japan and the United Kingdom, respectively. In such cases, policy rates set elsewhere can have considerable effects on the evolution of these positions.

Looking across borrower countries, a similar picture emerges (Figure 1, right-hand panel). Cross-border lending denominated in euros and dollars to borrowers in the euro area and United States, respectively, is large. These are foreign currencies to most borrowers, and their cross-border borrowing in their respective domestic currencies is modest by comparison. Indeed, most countries outside the top-20 shown here will borrow almost exclusively in foreign currency. Hence, the monetary policies of these borrower countries relate to a correspondingly small part of the total cross-border lending into the country.

[Figure 1 goes here]

The main implication of Figure 1 is that attributing too much influence to domestic policies in the empirical design risks underestimating the scope of international spillovers via global currencies. A lender country's monetary policy can affect the lenders located there, especially their positions in domestic currency (gray bars in Figure 1, left-hand panel). Similarly, the borrower country's policy can affect borrowing by residents of that country, especially in the domestic currency (gray bars in Figure 1, right-hand panel). By contrast, the policies of the Federal Reserve and the ECB may affect cross-border positions between *virtually all* lender-borrower pairs since, for most pairs, dollar- and euro-denominated

positions are dominant.

2.2 Monetary policy effects: hypotheses

Our analysis considers *three* types of monetary policy to have an effect on cross-border bank lending: the monetary policies in the lender country and the borrower country, and that of the currency in which credit is denominated. There are primary responses as well as substitution effects to consider. Figure 2 illustrates in which direction the transmission channels are expected to operate in response to a *tightening* of monetary policies.

First consider the conventional effects: tighter monetary policy is generally intended to be contractionary in the country that raises the interest rate. The domestic part of these effects is standard in the literature. In the **lender country**, a tightening is expected to reduce credit growth: as local funding costs rise and banks extend less credit (Kashyap and Stein, 2000) – presumably in any currency. This is the bank-lending channel in Figure 2. Meanwhile, the effect of a tightening on borrower balance sheets in the same country likely weakens credit demand too (an unobserved local balance-sheet channel). Similarly, a tightening in the **borrower country** would also tend to slow credit there: as their financial strength deteriorates, credit extended to borrowers tends to fall (Bernanke and Gertler, 1995) – again, in any currency (balance-sheet channel in Figure 2). Meanwhile, local lenders also curb domestic credit due to the effect on their liquidity and funding costs (an unobserved local bank-lending channel).

[Figure 2 goes here]

These conventional responses are thus negative with respect to a domestic tightening, as captured in the shaded cells of columns 1-2 (Lender MP, Borrower MP). However, our focus is on *cross-border lending in dollars and euros*, where it is possible that the conventional responses may be weaker and overturned by what we collectively call *international substitution effects*. For concreteness, consider the effect on international dollar lending of the policies in countries other than the United States. If a policy tightening weakens supply and demand for dollar credit in the conventional way (shaded cells), international dollar lending slows in the same way as lending in domestic currency does. But there can be cross-currents from substitution effects (non-shaded cells). In column 1, tighter money in the lender country can conceivably *increase* dollar lending if banks, taking advantage of relatively cheaper dollar

funding, shift into dollar assets and/or substitute away from weaker domestic borrowers toward borrowers abroad (Correa et al, 2018). Likewise, a monetary tightening in the borrower country may allow lending from abroad to substitute for the retreat of weakened local banks there (de Haas and van Lelyveld, 2010). Indeed, demand among dollar borrowers may rise if tighter monetary policy induces an appreciation of the local currency (column 2).[7] Both forms of substitution into the dollar can have an *expansionary* effect on the observed international dollar lending from country *i* to country *j* (positive signs in columns 1-2).

When it comes to the **currency of denomination**, the conventional effects of monetary policy carry over from the domestic to the international context (Cetorelli and Goldberg, 2012). A tightening raises the cost of funding in dollars or euros, both to borrowers and to lenders who fund in (or swap into) these currencies; the bank-lending and balance-sheet channels operate in the same direction and reduce cross-border lending (shaded cells in column 3, Denomination MP). Therefore, dollar or euro lending is expected to decline in response to a tightening in the same currency (Takáts and Temesvary, 2016). Banks may seek to substitute into the dollar or euro as a rate hike widens the yield differential with domestic currencies – but borrowers have the opposite incentive and chose the cheaper funding currency. The latter effect may prevail as recent experience suggests, since US monetary easing translated into easier financial conditions for borrowers around the world (McCauley et al., 2015).

The strength of transmission through the above channels depends on the frictions banks and borrowers face. The bank-lending channel can be characterized as reflecting frictions in banks' ability to access alternative sources of funding (Buch et al., 2018). Banks with higher shares of short-term wholesale funding and intragroup funding can arguably tap more easily into funding sources. Conversely, banks that are more reliant on deposit funding are more exposed to a domestic tightening. For the balance-sheet channel, a tightening works through credit risk, asset substitution and borrower net worth (Bernanke and Gertler, 1995). Bank characteristics that mitigate the strength of this channel include capitalization levels, size and degree of internationalization.

To measure how frictions affect the strength of monetary transmission, we estimate specifications which include interactions of changes in the three MPs with the balance-sheet characteristics of banks in

[7] Bruno and Shin's (2015) model includes an exchange-rate channel that strengthens borrower balance sheets in a way equivalent to a decline in their credit risk.

lender and borrower countries. For the bank-lending channel, one expects better access to funding sources to have a positive effect on international lending following monetary policy shocks. With reference to Figure 2, short-term wholesale and intragroup funding could mitigate the negative effect of a tightening in a global currency (giving rise to positive coefficient on the interaction between those two variables and Denomination MP). Similarly, a tightening of Borrower MP may well contribute to more cross-border lending as banks there would respond to the increase in local funding cost by drawing funding from their international network of affiliates (suggesting a positive coefficient on the interaction between Borrower MP and intragroup funding). By contrast, the lack of alternative funding sources could hurt deposit-reliant banks, which would be more likely to scale back international lending when Lender MP tightens (implying a negative coefficient on the interaction between Lender MP and deposits).

The interactions for the balance-sheet channel are more subtle.[8] Higher capitalization should make banks' domestic response to an MP tightening (in both the lender and the borrower country) less negative, since well capitalized banks in these countries should be better placed to handle a decline in their borrowers' (or their own) net worth. But for cross-border lending this means that capitalization, interacted with an MP change, should be negative as the need for international substitution falls: well capitalized banks continue serving their domestic customers and lend less abroad. Similarly, well capitalized borrower-country banks should retrench less from their domestic borrowers when borrower MP tightens, leaving less room for foreign banks to push cross-border lending into the country. Thus both interactions of capitalization with Lender MP and Borrower MP are expected to be negative.

What Figure 2 makes clear is that a monetary policy tightening has negative effects on credit in any currency, but various substitution effects may attenuate or overturn these responses. It is for the currency of denomination that tighter policy most likely has the conventional, contractionary effects. By contrast, policy changes in other currencies – those of the lender and the borrower country – can induce substitution effects in and out of the global currency. In what follows, we let the data determine which effect dominates in response to various MP rate changes observed in the sample.

[8] We focus our discussion of this channel on capitalization, because all BIS reporting banks are internationally active (by definition), and bank size is less meaningful (and mostly insignificant) in our setting where banks are aggregated at the country level.

2.3 Specifications

Estimating the cross-border transmission of three monetary policies involves measuring how policy changes propagate across borders while controlling for other factors. We extend the specification of the IBRN initiative (Buch et al., 2018) accommodate three MPs simultaneously and reflect the effects discussed around Figure 2 – with due attention to the interaction terms reflecting frictions and channels relevant to international lending.

Every observation in a given quarter t is a triplet consisting of lenders in country i, borrowers in country j and credit denominated in a specific global currency (either the US dollar or euro). Our baseline specification examines how bank lending from country i to country j in a particular currency denomination reacts to *changes* in the monetary policy rate in either of the countries or currencies involved. The dependent variable is the quarterly growth rate (in percentage changes) of bilateral cross-border claims, representing credit in the form of loans and debt securities to all sectors.

The key variables of interest are the three monetary policies that are potentially at play. They are the respective changes in the policies of: the country of the borrower ($BorrMP_{jt}$), that of the lender ($LendMP_{it}$), and the issuer of the currency in which credit is denominated ($DenoMP_t$). Our approach extends the analysis of Takáts and Temesvary (2016) by incorporating the monetary policies of the countries of the lender and borrower in all combinations. We focus on *changes* in the stance of monetary policy, using the IBRN monetary policy database that includes measures of both conventional and unconventional policy. To allow for a time profile in the transmission of policy, all specifications include contemporaneous changes in monetary policy along with three lags.

The remaining regressors control for other influences. Risk aversion in financial markets, proxied by the VIX, is known to affect global liquidity conditions or the financial cycle (Rey, 2013; Bruno and Shin, 2015). We further control for the macroeconomic conditions of the lender and borrower countries by using the respective output gaps ($\Delta(LendBcycyle_{it-1})$ and $\Delta(BorrBcycyle_{jt-1})$). All time-invariant, structural demand and supply factors that shape a country's overall ability to borrow or lend are absorbed by fixed

effects (f_i and f_j). Our baseline specification is,

$$\Delta Y_{ijt} = \alpha + \sum_{k=0}^{3} \left(\beta_{Lk}\,\Delta LendMP_{it-k} + \beta_{Bk}\Delta BorrMP_{jt-k} + \beta_{Dk}\,\Delta DenoMP_{t-k}\right)$$
$$+\delta_0\, ln(VIX_{t-1}) + \delta_1\,\Delta(LendBcycyle_{it-1}) + \delta_2\,\Delta(BorrBcycyle_{jt-1}) + f_i + f_j + \varepsilon_{ijt} \quad (1)$$

where ΔY_{ijt} denotes the percentage change in cross-border claims denominated in a specific global currency (*Deno*) on all sectors.

Our empirical implementation starts with the US dollar as global currency, and later turns to the euro to ensure that the denomination effect we measure is not unique to the dollar. We assess the significance of monetary policy changes by a joint F-test capturing the contemporaneous effects and three lags ($K = 3$) for each of the countries whose policies may matter. If significant, the effect of policy changes in, say, the lender country is the sum over the estimated β_{Lk} coefficients. Our extended specification includes bank characteristics and their interactions with monetary policy in order to account for frictions related to the channels described in Figure 2. Characteristics of banks in the lender or in the borrower countries (*Bank*) enter on a standalone basis, and are interacted with policy changes ($Bank * \Delta MP$),

$$\Delta Y_{ijt} = \alpha + \sum_{k=0}^{3} \left(\beta_{Lk}\,\Delta LendMP_{it-k} + \beta_{Bk}\,\Delta BorrMP_{jt-k} + \beta_{Dk}\,\Delta DenoMP_{t-k}\right) + [Bank + Bank * \Delta MP]$$
$$+\delta_0\, ln(VIX_{t-1}) + \delta_1\,\Delta(LendBcycyle_{it-1}) + \delta_2\,\Delta(BorrBcycyle_{jt-1}) + f_i + f_j + \varepsilon_{ijt} \quad (2)$$

To capture frictions that might amplify or dampen the effects of monetary policy changes, we consider three variants of the term $[Bank + Bank * MP]$ – one for each monetary policy:[9]

(2a) Denomination MP: $\mu_D LendBank_{it-a} + \sum_{k=0}^{3} (\gamma_{Dk}\,\Delta DenoMP_{t-k} * LendBank_{it-a})$

(2b) Lender MP: $\mu_L LendBank_{it-a} + \sum_{k=0}^{3} (\gamma_{Lk}\,\Delta LendMP_{it-k} * LendBank_{it-a})$

(2c) Borrower MP: $\mu_B BorrBank_{jt-a} + \sum_{k=0}^{3} (\gamma_{Bk}\,\Delta BorrMP_{jt-k} * BorrBank_{jt-a})$.

[9] Since balance sheet characteristics are available on an annual basis, the notation $LendBank_{it-a}$ refers to the previous year-end data.

Again, we use joint F-tests to assess how the contemporaneous MP effect and its three lags interact with country-level characteristics (reflected in γ_{Dk}, γ_{Lk},or γ_{Bk}). For instance, a positive and significant sum over the estimates of γ_{Dk} says that a particular lender characteristic *attenuates* the effect $\Delta DenoMP$ if the estimated baseline effect was negative.

The BIS international banking statistics offer sufficient variation in the booking locations, borrower countries and denomination currencies (Section 3 describes the datasets used in regressions). The bilateral structure of the data with thousands of borrower-lender pairs grants econometric identification.[10] Still, several aspects also contribute to our proper identification strategy. We restrict our focus to cross-border credit in dollars or euros. To identify the distinct impact of a policy change on the currency of denomination (e.g. the US dollar), we *exclude* all claims on borrowers residing in the United States and claims reported by banks located in the United States. This ensures that a change in a country's monetary policy only triggers one policy indicator at a time for any triplet. We capture the monetary policy stance by official policy rates from the IBRN database.

A potential challenge related to the simultaneous inclusion of three monetary policy variables is the collinearity among those variables. It is possible that the monetary policies of major advanced economies could exhibit a high degree of correlation in the post-crisis period, as a result of the extraordinary monetary accommodation provided by the respective central banks in the aftermath of the global financial crisis. While the post-crisis correlations among the monetary policies of major advanced economies (AEs) are indeed positive (0.42), they are much weaker for all other country combinations which represent the bulk of the observations in our sample. This is especially true for EMEs - the median correlations for EMEs tend to be very low, both within all major EME country groups and between EMEs and AEs (including with the core AEs).

To alleviate concerns over multicollinearity, we also estimate regressions for one monetary policy at a time (rather than all three simultaneously) – at the risk of incurring an "omitted variables" problem instead. The conservative approach is to consider a range of specifications before reaching any conclusions: we first include all three monetary policies simultaneously, and then re-estimate each key specification for

[10] For a given borrower country, the dataset comprises many creditor countries whose responses differ according to their lender characteristics; likewise, banks in any given country extend credit to many borrower countries, where observed differences across pairs should relate to borrower (demand) characteristics.

one monetary policy at a time.

A related concern, one shared with much of the literature, is that monetary policy can be endogenous. Say the borrower country sees a boom fueled by funding from all sources (including from banks abroad), and the central bank tightens policy. Measures of exogenous policy shocks are available for too few economies for systematic use. That said, the dimensions of the dataset (32 lender countries, 55 borrower countries) should support our identification strategy, as does the use of multiple lags of each monetary policy variable in all specifications. Under reverse causality, it would be unlikely to see continued cross-border lending into a borrower country whose monetary policy has already acted to curb the boom.

Finally, we comment on the treatment of financial centers. Large shares of cross-border flows to/from financial centers reflect intermediation of funds channeled to other destinations. The headquarters of a German bank, for instance, might fund its subsidiary in London which on-lends to a company in Brazil. Those flows may be unrelated to UK monetary policy. In a way, this underscores the advantage of paying attention to the currency of denomination – in this example the dollar, which makes lending responsive to US monetary policy. On the other hand, the inclusion of financial centers in our the sample could also bias the results, distorting the impact of lender or borrower policies on cross-border lending. To address this concern, we complement our full-sample results with estimates from a sample that excludes nine financial centers.[11]

3 Data sources

We examine the transmission of monetary policy via bilateral flows of bank claims between pairs of lender and borrower countries. This section describes the data used in our analysis, drawing on the BIS locational banking statistics (LBS) and the IBRN monetary policy database. The IBRN collected quarterly data for different monetary policy instruments in 56 countries and different policy measures for the period 2000-17. We use the indicated policy rates as only those are available for the full set of borrower and lender countries.

[11] Most offshore centers are not part of our sample in the first place, mainly because they lack data on monetary policy.

3.1 The BIS international banking statistics

We construct a quarterly panel of cross-border bank claims, using the BIS locational banking statistics *by residence* (LBSR), which are compiled following balance-of-payments methodology. The statistics track the cross-border and local claims and liabilities of banking units located in a particular reporting country.[12] As such, the locational statistics are appropriate for analyzing the geography of international bank flows (Shin, 2012; Minoiu and Reyes, 2013; Brei and von Peter, 2018). Reported claims include loans, holdings of debt and equity securities, and derivatives positions with positive market value. Since loans and holdings of debt securities account for 93% of cross-border claims on average, we use the term "lending" for simplicity.

The final dataset based on the residence perspective includes up to 32 reporting lender countries for the 2000Q1-2016Q4 period. Banks have outstanding positions vis-à-vis counterparties in up to 55 countries for which we have data on monetary policies. Importantly, these statistics are broken down by currency denomination, allowing us to measure the effect on international bank credit of changes in the corresponding monetary policy rates.

3.2 Bank balance-sheet characteristics

Bank balance-sheet characteristics introduce cross-country heterogeneity and facilitate the identification of key frictions. In particular, we study how lender bank characteristics modify the impact of *DenoMP* and *LendMP* and then turn to borrower bank characteristics and examine how they alter the effect of *BorrMP* changes. Each of these variables is included in the regressions individually and also interacted with the respective MP measure. We use the same set of underlying bank characteristics in all specifications with interactions.

Our primary data source for the above bank balance-sheet characteristics is the Fitch database. To compute banking-system characteristics at the country level and align both datasets, we use the BIS banking list, which provides the names of all reporting banks that constitute the aggregate. As our analysis proceeds by residence, we retrieve data for each bank (domestic bank or foreign affiliates) that operates

[12] For example, the data reported by the United Kingdom to the BIS contain the positions of UK-headquartered banks' home offices as well as all foreign affiliates (branches and subsidiaries) of non-UK headquartered banks that operate in the United Kingdom.

in a given country. For the ratios of short-term wholesale funding, deposit funding and capital, we sum balance-sheet items across all resident banks before dividing the total by the sum of all resident banks' total balance sheet size. This procedure results in weighted averages. "Net due" is calculated as the difference between intragroup liabilities and intragroup assets at the country level, scaled by the balance sheet total – defined this way, a higher value reflects greater net borrowing from affiliates of the same banking group that are located in other jurisdictions.

The summary statistics for all variables used in the main empirical analyses are presented in Table 1. For a detailed description of the variables, see Table A1.

[Table 1 goes here]

4 Results

4.1 Benchmark results

Equation (1) sets out our benchmark specification. The results for the full sample (2000Q1-2016Q3) of US dollar-denominated cross-border claims are presented in Table 2. They indicate that a monetary policy tightening in the lender country or in the borrower country leads to *higher* growth in cross-border bank lending denominated in US dollars. By contrast, a tightening of US monetary policy is contractionary for cross-border dollar lending. The estimated impact is most significant and robust across specifications for the policies of the lender country and the denomination currency; the results for the policy of the borrower country are somewhat weaker.

[Table 2 goes here]

A tightening in US monetary policy leads to a contraction in US dollar-denominated cross-border lending. The negative and significant coefficients on the **denomination currency** monetary policy confirm our hypothesis that the combined effect of the channels in Figure 2 would result in slow-down or contraction of cross-border lending in the same currency. A rise in the cost of funding in a global funding currency naturally leads to a decline in the cross-border lending denominated in that currency.

By contrast, a monetary policy tightening in **lender country** triggers an *increase* in cross-border bank lending out of that country. Banks may take advantage of relatively cheaper dollar funding to lend abroad.

Tighter monetary policy at home may also reduce the creditworthiness of domestic borrowers and push lenders out of domestic lending into dollar-denominated cross-border lending to foreign borrowers. These substitution effects apparently outweigh the conventional contractionary effect of a tightening (column 1 in Figure 2).

A monetary tightening in the **borrower country** is also associated with increased dollar lending to that country. The positive coefficients on the borrower monetary policy suggest that international substitution effects can offset the contractionary effect on borrowers: internationally active banks may be drawn to the country that has just raised its risk-free rate relative to the rest of the world, either for the interest differential or for taking up the slack left by weaker local banks. That said, substitution effects may cut either way, and other specifications discussed in the next sub-section show that the results for borrower-country policy are the weakest among the three monetary policies we consider. Even so, the results suggest that the cross-currency spillovers may dominate the conventional contractionary effects, regardless of whether the lender or the borrower country tightens.

The benchmark results above are robust to alternative regression specifications. The key estimated coefficients retain their signs and significance when each monetary policy type enters the specification on its own (Table 2, columns 2-4). Furthermore, the main results remain intact when financial centers are excluded from the sample, both as lenders and borrowers.[13] The estimates remain in line with the full-sample results, both in the specification which simultaneously includes three monetary policies (Table 2, column 5), and in that with one policy at a time (Table 2, columns 6-8).

We next allow for monetary transmission to differ between periods of normal and unconventional monetary policy (Table 3).[14] The results suggest that our benchmark (full sample) results are primarily driven by periods of normal monetary policy. The estimated coefficients for those periods are highly significant and fully in line with the respective benchmark (full sample) coefficients (Table 3, top panel). In the meantime, the estimated coefficients for the unconventional MP periods, while broadly having the same signs as the respective ”normal MP periods” and ”full sample” coefficients, tend to be much

[13] We exclude Hong Kong SAR (China), Ireland, Luxembourg, Labuan (Malaysia), the Netherlands, Singapore, Switzerland, Chinese Taipei, and the United Kingdom. All nine jurisdictions appear in Lane and Milesi-Ferretti's (2017) list of financial centers based on external positions to GDP, and six of them are listed in the IMF (2008) report on offshore financial centers.

[14] We classify these periods according to the IBRN definition (see Buch et al., 2018).

less significant (Table 3, middle panel). The most likely explanation is related to two facts. First, the far smaller number of time-country pairs for which unconventional monetary policy is observed decreases the power of the statistical tests used to evaluate the significance of the estimated coefficients. Second, the lower volatility of policy rates during periods of unconventional monetary policy reduces the precision of the estimated coefficients.

[Table 3 goes here]

4.2 Identifying channels and capturing frictions

In the next step of our empirical exercise, we attempt to identify more precisely the transmission channels and capture the most important frictions associated with each of them. To do so, we augment our benchmark specification (equation (1)) with a number of bank balance-sheet characteristics, interacted with the three monetary policies separately (equation (2)). Due to space constraints, we have designed the tables in this sub-section so that they display only the key results (i.e. the estimated coefficients on the key interaction terms) from each regression. The full set of regression results for all coefficient estimates (plus robustness and subsample results) appear in the Annex Tables B1-B4 for dollar lending, and B5-B7 for the euro lending.

Table 4 reports the results for the specifications with interactions, while keeping all three monetary policies (see equations (2a)-(2c)). They provide evidence in support of the hypotheses we proposed in Section 2.2. The response of international bank lending to monetary policies reflects frictions that can be mitigated by better capitalization and access to alternative funding sources.

[Table 4 goes here]

The first set of frictions relates to the ease with which banks can access alternative funding sources. We capture those frictions through interactions of bank characteristics (the shares of short-term wholesale funding, deposit funding share, and net due from related offices) with each of the three monetary policy measures. Our results suggest that greater access to external funding provides banks with more flexibility in responding to monetary policy shocks.

The overall negative impact of a tightening in the denomination monetary policy is smaller for banks that are more reliant on short-term (ST) wholesale funding (Table 4, column 1) and banks with better

access to intragroup funding, as measured by the Net Due variable (Table 4, column 2). Such banks are more nimble, so when the denomination policy is tightened they may find it easier to switch to alternative sources of funding. As a consequence, their effective funding costs may rise by less, weakening the impact of the bank-lending channel (Kashyap and Stein, 2000). This result is in line with the finding of Takáts and Temesvary (2016), in that the reduction in cross-border lending following a policy tightening in the same currency is greater for liquidity-constrained banks.

The results from the interactions with lender and borrower policies provide further evidence of the importance of funding-related frictions. The overall positive impact of a tightening in banks' home-country monetary policy is smaller for banks that fund themselves primarily through deposits (Table 4, column 4). Such banks tend to have a currency funding mix tilted towards local currency (McCauley et al., 2010; Fender and McGuire, 2010), which exposed them to tighter domestic conditions. The expansionary effect of a tightening in the borrower monetary policy, on the other hand, is greater when banks in the borrower country rely more on intragroup funding (Table 3, column 7). Intuitively, an increase in local funding cost induces local banks to seek cross-border intragroup funding. Countries hosting banks with better access to such funding should see a greater increase in cross-border lending inflows in response to a borrower MP tightening.

Frictions related to the balance sheet channel are likely to depend on banks' capitalization. Interacting capitalization with each of the three monetary policy measures reveals that higher capitalization tends to insulate banks from monetary policy shocks. The expansionary impact of banks' home-country policy tends to be smaller for better capitalized banks (Table 4, column 3). Better capitalized banks have less binding Value-at-Risk and Economic Capital constraints (Vasicek, 2002; Bruno and Shin, 2015; Gambacorta and Shin, forthcoming). These banks should be less affected by the deterioration in the creditworthiness of their domestic borrowers that ensues from tighter monetary policy in the country of residence. Hence, the shift out of domestic lending into cross-border lending can be smaller for highly capitalized banks.

The positive impact that ensues from a tightening in the borrower country is also smaller if local banks are better capitalized (Table 4, column 6). A tightening of borrower MP increases the funding costs of banks in the borrower country. All else the same, this leads to a reduction in their lending, which in

turn creates a gap that could be filled by cross-border bank lending from abroad. But the reduction in local banks' lending (and the associated gap) should be smaller in countries with better capitalized banks (Gambacorta and Shin, forthcoming). As a result, there should be less room for cross-border lending to substitute for local lending in such countries.

Next, we examine the extent to which the above results are robust to alternative specifications, in which we include only *one* monetary policy at a time. We only use the monetary policy under study in the interaction term (Table 5). Our main results turn out to be robust to these modifications.

[Table 5 goes here]

Further, we re-estimate the benchmark specifications with interactions for a subsample that excludes financial centers (Table 6). The majority of the estimated coefficients on the key interaction terms retain their signs and statistical significance. Interestingly, the interaction terms that become insignificant all include the "net due" variable (Table 6, columns 2, 5 and 7). This is not surprising, given that a large share of positions with financial centers represent intragroup funding. A regression excluding financial centers may lose important information about internal capital markets (Cetorelli and Goldberg, 2012).

[Table 6 goes here]

Lastly, we test the robustness of our key results by estimating alternative specifications that simultaneously include bank characteristics for both lender and borrower countries. Table 7 shows that our previous findings remain intact. Just as in the benchmark estimates, the expansionary response to tightening in lender and borrower policies tends to be smaller for better capitalized banks and for deposit-reliant banks. Similarly, the alternative specifications confirm that the overall negative impact of a tightening in the denomination monetary policy is smaller for banks that are more reliant on ST wholesale funding.

[Table 7 goes here]

4.3 Results for euro-denominated lending

The empirical evidence for euro-denominated cross-border lending is more mixed than was the case for dollar lending. On the one hand, the baseline level effects of the three monetary policies on euro-denominated lending largely turn insignificant. One reason may be that the euro-related sample is much

smaller (less than 7,000 observations) than the dollar sample (more than 30,000 observations), because the specification excludes all observations for which the lender's or borrower's currency coincides with the currency of denomination. For the euro regression this excludes all euro area countries, along with all links among them and with other countries.

That said, the results from the euro regressions with interaction terms are very much in line with their dollar counterparts (comparing Table 4 for the US dollar and Table 8 for the euro). The interactions between monetary policy and bank balance-sheet characteristics point to the same frictions discussed above. Just as in the case of US dollar lending, a tightening in the **lender country** monetary policy has a smaller expansionary impact for better capitalized banks (Table 8, column 3) and for banks that fund themselves through deposits (Table 8, column 4). The opposite is true for banks that have better access to internal capital markets (Table 8, column 5).[15] Furthermore, the expansionary impact of a tightening in the **borrower country's** monetary policy is smaller for cross-border lending to countries with better capitalized banks (Table 8, column 6). Again, this euro-based result mirrors its dollar lending counterpart.

[Table 8 goes here]

The euro-related results can be interpreted as evidence that the notion of a "denomination effect" is more general than that of a "US dollar effect". It appears that the key frictions affecting the impact of monetary policy on US dollar-denominated cross-border bank lending also play a significant role when it comes to the impact of monetary policy on euro-denominated cross-border bank lending.

4.4 Further robustness checks

Annex Tables B1-B7 provides a series of robustness checks, including subsample results and additional interaction terms. Tables B1-B4 show our full results on US dollar lending, and Tables B5-B7 on euro lending. Tables B1-B4 also replicate regressions using the subsample without financial centers.

In Table B1, we also take the US zero lower bound (ZLB) into account, by interacting the indicator variable (ZLB) with the respective monetary policy variable. For the US dollar and the euro, respectively,

[15] However, the "net due" variable is not consistently significant, as was the case for the dollar regressions. It is insignificant when interacted with the denomination currency monetary policy (Table 8, column 2) and with the borrower country monetary policy (Table 8, column 7).

Tables B2 and B5 include interactions of denomination monetary policy (*DenoMP*) with lender bank characteristics (*LendBC*), such as short-term funding and intragroup funding.

Tables B3 (for dollar lending) and B6 (for euro lending) repeat the same pattern of robustness checks while using the monetary policy of the lender (*LendMP*) instead. Finally, Tables B4 (for dollar lending) and B7 (for euro lending) include interaction effects of borrower monetary policy changes (*BorrMP*) with bank characteristics of the borrowing country (*BorrBC*). None of the robustness check materially affect our earlier findings.

Conclusions

In this paper, we examine whose monetary policy matters for the international transmission of monetary policy through global banks. Our contribution is to run an econometric horse race among the monetary policies of three countries – that of the borrower, that of the lender, and that of the country issuing the currency in which international bank lending is denominated.

The findings suggest that the monetary policies of all countries involved can have a significant effect on cross-border bank lending. Monetary tightening in a global currency produces a contraction in cross-border bank lending denominated in that currency, in many ways a conventional effect of tightening. At the same time, tighter monetary policy in the lender country produces increased cross-border dollar lending, as expansionary spillovers outweigh contractionary domestic effects. We also find evidence, albeit less robust, for expansionary spillovers following a tightening in the borrower country's monetary policy.

The crossing of lender-borrower pairs with currencies gives rise to novel forms of substitution in the transmission channels and has important implications for monetary policy synchronization. If other central banks lower their policy rates in lockstep with the Federal Reserve, substitution effects could moderate the dollar expansion. If, instead, other central banks tighten their monetary policies when the Fed is easing, they would reinforce the US dollar lending expansion. Thus, our results suggest that there are significant monetary policy spillovers across countries as well as across currencies.

[Table A1 about here]

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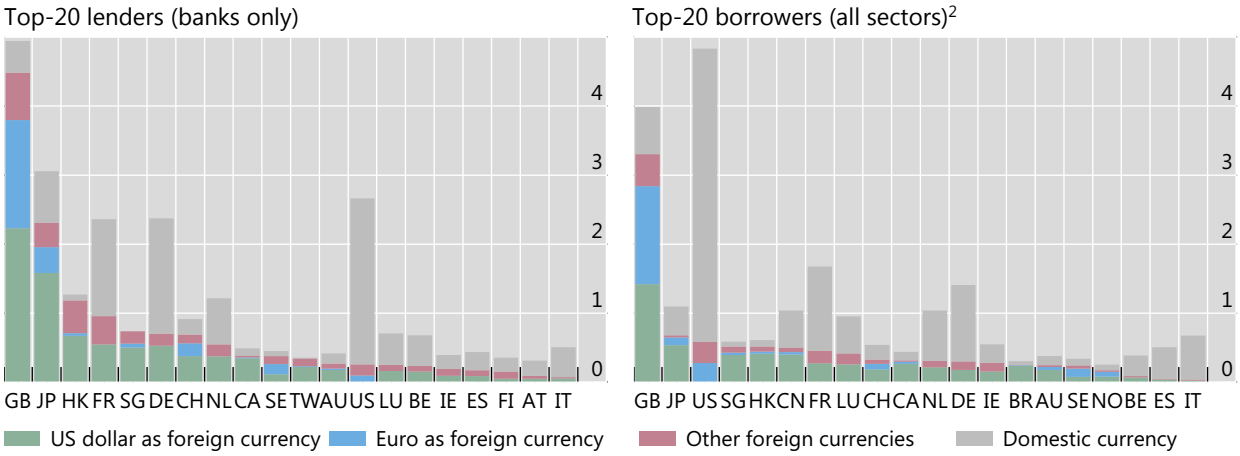
Geography vs currency denomination[1]

Cross-border claims at Q4 2014, in trillions of US dollars

Figure 1



Countries are sorted by foreign-currency cross-border positions in descending order. The domestic currency of the lender is defined with respect to the location of the reporting bank (left panel), and with respect to the borrower country (right panel). That is, for any bank (or any borrower) in the United States, cross-border dollar lending (funding) is in domestic currency, which shows as a grey (not a green) bar. [2] For AU, BR, CA, CN, HK, NO, SE and SG, domestic-currency amounts are approximated by borrowing *not* denominated in the currency of the lender nor in USD, EUR, JPY, CHF, GBP.

Source: BIS locational banking statistics.

Expected impact of monetary policies on cross-border bank lending

By channel and monetary policy type

Figure 2

Channel	**Lender MP**	**Borrower MP**	**Denomination MP**
Bank lending	-		-
Balance sheet		-	-
Substitution effects / yield differential	+	+	+

Summary statistics

Table 1

	Variables used in the US dollar regressions	Code	N	Mean	St. Dev.	Minimum	Maximum
Baseline	Cross-border claims, changes in %		36,986	5.01	33.60	-68.35	193.75
	Lender policy rate	*LendMP*	36,986	2.21	2.61	-0.25	59.00
	Borrower policy rate	*BorrMP*	36,986	3.98	5.03	-0.25	81.19
	Denomination's policy rate	*DenoMP*	36,340	1.49	1.81	0.07	5.61
	VIX, in logs	*ln_VIX*	36,986	2.95	0.36	2.43	3.79
	Lender business cycle	*Lend_bcycle*	36,340	-0.03	1.82	-11.81	6.92
	Borrower business cycle	*Borr_bcycle*	36,306	-0.02	1.92	-11.81	10.96
Lender country measures	Wholesale funding (short-term)		30,615	19.68	7.04	3.30	38.18
	Capital		30,615	5.60	1.86	2.57	14.26
	Net due		30,615	-0.63	4.23	-25.39	12.91
	Deposits		30,615	45.33	14.84	16.14	77.34
Borrower country measures	Wholesale funding (short-term)		21,727	19.27	7.09	3.30	38.18
	Capital		21,727	6.18	2.28	2.57	14.26
	Net due		21,727	-0.51	3.95	-25.39	12.91
	Deposits		21,727	45.20	15.30	16.14	77.34
	Variables used in the euro regressions	Code	N	Mean	St. Dev.	Minimum	Maximum
Baseline	Cross-border claims, changes in %		7,814	5.67	34.38	-64.02	177.41
	Lender policy rate	*LendMP*	7,814	2.15	2.78	-0.25	59.00
	Borrower policy rate	*BorrMP*	7,814	3.56	4.48	-0.25	81.19
	Denomination's policy rate	*DenoMP*	7,814	1.77	1.33	0.05	4.75
	VIX, in logs	*ln_VIX*	7,814	2.95	0.36	2.43	3.79
	Lender business cycle	*Lend_bcycle*	7,814	-0.04	1.91	-11.81	5.87
	Borrower business cycle	*Borr_bcycle*	7,803	-0.01	1.86	-11.81	10.59
Lender country measures	Wholesale funding (short-term)		6,734	17.58	6.27	3.30	32.25
	Capital		6,734	6.16	2.05	2.57	14.26
	Net due		6,734	-1.73	5.28	-25.39	5.10
	Deposits		6,734	47.53	16.58	16.14	77.34
Borrower country measures	Wholesale funding (short-term)		5,177	17.64	5.86	3.30	32.25
	Capital		5,177	6.67	2.30	2.57	14.26
	Net due		5,177	-0.91	3.96	-25.39	5.10
	Deposits		5,177	47.46	15.57	16.14	77.34

For the variable descriptions, see Appendix Table A1.

Impact of monetary policy on cross-border claims denominated in US dollars

Specifications excluding interactions of bank characteristics with monetary policy (MP) Table 2

	Full sample				Excluding financial centres			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A								
Σ DenoMP	-2.67***	-2.39***			-2.91***	-3.03***		
	(0.00)	(0.00)			(0.00)	(0.00)		
Σ LendMP	2.26***		2.36***		2.07**		2.40***	
	(0.00)		(0.00)		(0.02)		(0.01)	
Σ BorrMP	0.13			0.26***	0.22			0.34***
	(0.22)			(0.01)	(0.12)			(0.01)
Panel B								
D.DenoMP	-0.333	-0.053			-0.248	-0.356		
	(0.736)	(0.630)			(1.209)	(1.068)		
LD.DenoMP	0.560	1.029			-0.159	0.355		
	(0.787)	(0.701)			(1.242)	(1.149)		
LD2.DenoMP	-5.876***	-6.759***			-5.880***	-6.683***		
	(0.989)	(0.885)			(1.731)	(1.521)		
LD3.DenoMP	2.979***	3.397***			3.383***	3.656***		
	(0.570)	(0.522)			(0.915)	(0.857)		
D.LendMP	1.397**		1.760***		1.129		1.622	
	(0.629)		(0.553)		(1.111)		(1.007)	
LD.LendMP	1.254**		1.306**		1.604		1.766*	
	(0.581)		(0.509)		(1.004)		(0.913)	
LD2.LendMP	-0.357		-0.800*		-0.313		-0.707	
	(0.491)		(0.483)		(0.752)		(0.746)	
LD3.LendMP	-0.037		0.094		-0.349		-0.283	
	(0.269)		(0.265)		(0.366)		(0.364)	
D.BorrMP	0.075			0.153**	0.111			0.177*
	(0.072)			(0.070)	(0.098)			(0.097)
LD.BorrMP	-0.006			0.179**	0.042			0.208*
	(0.090)			(0.089)	(0.128)			(0.124)
LD2.BorrMP	0.076			-0.108	0.102			-0.066
	(0.095)			(0.093)	(0.140)			(0.137)
LD3.BorrMP	-0.019			0.040	-0.035			0.019
	(0.036)			(0.035)	(0.053)			(0.052)
L.ln_VIX	-1.294**	-1.859***	-1.562***	-2.629***	-1.310	-2.004**	-1.178	-2.224***
	(0.627)	(0.624)	(0.532)	(0.496)	(0.998)	(0.995)	(0.885)	(0.826)
LD.Lend_bcycle	0.410**	0.529***	0.383**	0.506***	0.405	0.603	0.282	0.527
	(0.171)	(0.170)	(0.168)	(0.166)	(0.362)	(0.369)	(0.357)	(0.358)
LD.Borr_bcycle	0.548***	0.695***	0.538***	0.645***	0.510**	0.728***	0.480**	0.613***
	(0.160)	(0.154)	(0.157)	(0.152)	(0.225)	(0.217)	(0.218)	(0.215)
Observations	36,340	36,340	36,986	36,986	14,620	14,620	14,885	14,885
R-squared	0.013	0.013	0.012	0.011	0.019	0.018	0.017	0.016
Adj R2	0.011	0.010	0.009	0.009	0.013	0.013	0.012	0.011

This table estimates equation (1). It shows the effects of changes in monetary policy on percentage changes in cross-border claims denominated in US dollars as reported in the LBS by residence. We simultaneously consider MP changes in the country of the denomination currency (DenoMP), the lender (LendMP) and borrower country (BorrMP). Short-term policy rates from the IBRN are used to measure monetary policy changes. In all specifications we control for lagged changes in the business cycles of the lender (Lend_bcycle) and borrower country (Borr_bcycle), respectively. Further, the lagged log VIX enters as a global factor and we include lender and borrower fixed effects. The quarterly data for up to 32 lender and 55 borrower countries range from 2000:Q1 to 2016:Q3. Panel A shows the sum of denomination (β_D), lender (β_L) and borrower (β_B) coefficient estimates (including contemporaneous MP changes "D" and three lags "LD-LD3"), respectively, with p-values of the F-tests in parentheses. Results excluding financial centres drop Chinese Taipei, Hong Kong SAR, Ireland, Luxembourg, Malaysia, Netherlands, Singapore, Switzerland and United Kingdom as lender and borrower countries. Panel B presents the underlying full regression output. We drop the US as borrower and lender country to grant proper identification of distinct MPs. For details on the variables, see Table 1; for the variable descriptions, see Appendix Table A1. Standard errors are clustered by lender-borrower pair. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Impact of monetary policy on cross-border claims denominated in US dollars

Including interactions of the zero lower bound (ZLB) with MP, full sample — Table 3

	(1)	(2)	(3)	(4)
Σ DenoMP	-2.11***	-1.90***		
	(0.01)	(0.01)		
Σ LendMP	2.28***		2.41***	
	(0.00)		(0.00)	
Σ BorrMP	0.16			0.26***
	(0.12)			(0.01)
Σ DenoMP*ZLB	-8.18	-9.08*		
	(0.16)	(0.08)		
Σ LendMP*ZLB	13.12***		9.67**	
	(0.01)		(0.04)	
Σ BorrMP*ZLB	-6.84			-7.60
	(0.44)			(0.34)
Observations	36,340	36,340	36,986	36,986
R-squared	0.014	0.013	0.012	0.012
Adj R2	0.011	0.011	0.009	0.009

This table estimates equation (1) while taking into account periods of unconventional monetary policy. We use a binary variable (ZLB) provided by the IBRN to indicate that the policy rate of the respective borrower, lender or denomination MP reaches the zero lower bound in period t. The ZLB indicator can switch to one only for short-term rates in the US, the UK, Japan and the euro area. For all other borrower and lender MPs, it indicates a zero. Different columns show our results for the simultaneous and separate inclusion of changes in MP. The first three rows show the sum of denomination (β_D), lender (β_L) and borrower (β_B) coefficient estimates (including contemporaneous MP changes "D" and three lags "LD-LD3"), respectively, with p-values of the F-tests in parentheses. The second set of rows refers to the sum of interaction coefficients (γ_D, γ_L and γ_B) of MP (including contemporaneous MP effects and three lags) with the zero lower bound indicator. The full set of regression results are available in Table B1 in the Working Paper version. Our results present the effects of changes in monetary policy on percentage changes in cross-border claims denominated in US dollars as reported in the LBS by residence. Short-term policy rates from the IBRN are used to measure monetary policy changes. In all specifications we control for lagged changes in the business cycles of the lender (Lend_bcycle) and borrower country (Borr_bcycle), respectively. Further, the lagged log VIX enters as a global factor and we include lender and borrower fixed effects. The quarterly data for up to 32 lender and 55 borrower countries range from 2000:Q1 to 2016:Q3. We drop the US as borrower and lender country to grant proper identification of distinct MPs. For details on the variables, see Table 1; for the variable descriptions, see Appendix Table A1. Standard errors are clustered by lender-borrower pair. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Impact of monetary policy on cross-border claims denominated in US dollars

Including interactions of bank characteristics with MP, full sample, all MP simultaneously Table 4

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Short funding	Net due	Capital	Deposits	Net due	Capital	Net due
Σ DenoMP*LendBC	0.12***	0.21**					
	(0.01)	(0.02)					
Σ LendMP*LendBC			-0.62***	-0.09**	0.14		
			(0.00)	(0.03)	(0.15)		
Σ BorrMP*BorrBC						-0.51***	0.38***
						(0.01)	(0.01)
Observations	30,615	30,615	30,615	30,615	30,615	21,727	21,727
R-squared	0.014	0.014	0.014	0.014	0.014	0.013	0.013
Adj R2	0.011	0.011	0.011	0.011	0.011	0.009	0.009

This table estimates equation (2), adding interaction terms of MP with balance-sheet characteristics to our baseline specification. Now, different columns refer to balance-sheet characteristics of the lender (LendBC) and borrower (BorrBC) banking systems, respectively. Each reported coefficient represents the sum of the estimated coefficients (γ_D, γ_L and γ_B) on the interaction terms of MP (including contemporaneous MP effects and three lags) with either LendBC or BorrBC. We provide p-values of the F-tests in parentheses. Balance-sheet characteristics refer to figures provided in the last annual report. Besides the interaction terms, all regressions control for these balance-sheet characteristics on a standalone basis. The full set of regression results are available in Tables B2 (DenoMP), B3 (LendMP) and B4 (BorrMP) in the Working Paper version. Like Table 2, Table 4 presents the effects of changes in monetary policy on percentage changes in cross-border claims denominated in US dollars as reported in the LBS by residence. We simultaneously consider MP changes in the country of the denomination currency (DenoMP), the lender (LendMP) and borrower country (BorrMP). Short-term policy rates from the IBRN are used to measure monetary policy changes. In all specifications, we control for lagged changes in the business cycles of the lender (Lend_bcycle) and borrower country (Borr_bcycle), respectively. Further, the lagged log VIX enters as a global factor and we include lender and borrower fixed effects. The quarterly data for up to 32 lender and 55 borrower countries range from 2000:Q1 to 2016:Q3. We drop the US as borrower and lender country to grant proper identification of distinct MPs. For details on the variables, see Table 1; for the variable descriptions, see Appendix Table A1. Standard errors are clustered by lender-borrower pair. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Impact of monetary policy on cross-border claims denominated in US dollars

Including interactions of bank characteristics with MP, full sample, one MP at a time — Table 5

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Short funding	Net due	Capital	Deposits	Net due	Capital	Net due
Σ DenoMP*LendBC	0.11**	0.15*					
	(0.02)	(0.09)					
Σ LendMP*LendBC			-0.93***	-0.14***	0.24***		
			(0.00)	(0.00)	(0.01)		
Σ BorrMP*BorrBC						-0.81***	0.44***
						(0.00)	(0.00)
Observations	30,615	30,615	31,219	31,219	31,219	22,222	22,222
R-squared	0.014	0.013	0.013	0.012	0.012	0.011	0.011
Adj R2	0.011	0.010	0.010	0.009	0.009	0.008	0.008

This table estimates equation (2), while considering changes in monetary policy separately. Different columns again refer to balance-sheet characteristics of the lender (LendBC) and borrower (BorrBC) banking systems, respectively. Each reported coefficient represents the sum of the estimated coefficients (γ_D, γ_L and γ_B) on the interaction terms of MP (including contemporaneous MP effects and three lags) with either LendBC or BorrBC. We provide p-values of the F-tests in parentheses. Balance-sheet characteristics refer to figures provided in the last annual report. Besides the interaction terms, all regressions control for these balance-sheet characteristics on a standalone basis. The full set of regression results are available in Tables B2 (DenoMP), B3 (LendMP) and B4 (BorrMP) in the Working Paper version. Like Table 2, Table 5 presents the effects of changes in monetary policy on percentage changes in cross-border claims denominated in US dollars as reported in the LBS by residence. As distinct from Tables 2 and 4, we now consider separately the MP changes in the country of the denomination currency (DenoMP), the lender (LendMP) and the borrower country (BorrMP). Short-term policy rates from the IBRN are used to measure monetary policy changes. In all specifications, we control for lagged changes in the business cycles of the lender (Lend_bcycle) and borrower country (Borr_bcycle), respectively. Further, the lagged log VIX enters as a global factor and we include lender and borrower fixed effects. The quarterly data for up to 32 lender and 55 borrower countries range from 2000:Q1 to 2016:Q3. We drop the US as borrower and lender country to grant proper identification of distinct MPs. For details on the variables, see Table 1; for the variable descriptions, see Appendix Table A1. Standard errors are clustered by lender-borrower pair. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Impact of monetary policy on cross-border claims denominated in US dollars

Including interactions of bank characteristics with MP, excluding financial centres Table 6

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Short funding	Net due	Capital	Deposits	Net due	Capital	Net due
All MP simultaneously							
Σ DenoMP*LendBC	0.16**	-0.07					
	(0.03)	(0.89)					
Σ LendMP*LendBC			-1.04***	-0.10	0.45		
			(0.00)	(0.22)	(0.47)		
Σ BorrMP*BorrBC						-0.52*	0.62
						(0.10)	(0.32)
Observations	13,448	13,448	13,448	13,448	13,448	8,122	8,122
R-squared	0.020	0.019	0.019	0.019	0.020	0.015	0.015
Adj R2	0.013	0.013	0.013	0.013	0.014	0.007	0.007
One MP at a time							
Σ DenoMP*LendBC	0.15**	-0.03					
	(0.05)	(0.95)					
Σ LendMP*LendBC			-1.34***	-0.16**	0.60		
			(0.00)	(0.03)	(0.32)		
Σ BorrMP*BorrBC						-0.75***	0.65
						(0.01)	(0.30)
Observations	13,448	13,448	13,704	13,704	13,704	8,312	8,312
R-squared	0.019	0.018	0.017	0.017	0.017	0.013	0.012
Adj R2	0.013	0.013	0.012	0.011	0.012	0.006	0.006

This table estimates equation (2). As distinct from Tables 4 and 5, it excludes financial centres as borrower and lender countries. Dropped financial centres include Chinese Taipei, Hong Kong SAR, Ireland, Luxembourg, Malaysia, Netherlands, Singapore, Switzerland and United Kingdom. In the upper panel, we simultaneously consider MP changes in the country of the denomination currency (DenoMP), the lender (LendMP) and the borrower country (BorrMP). In the lower panel, we now consider MP changes separately. Within each panel, different columns again refer to balance-sheet characteristics of the lender (LendBC) and borrower (BorrBC) banking systems, respectively. Each reported coefficient represents the sum of the estimated coefficients (γ_D, γ_L and γ_B) on the interaction terms of MP (including contemporaneous MP effects and three lags) with either LendBC or BorrBC. We provide p-values of the F-tests in parentheses. Balance-sheet characteristics refer to figures provided in the last annual report. Besides the interaction terms, all regressions control for these balance-sheet characteristics on a standalone basis. The full set of regression results are available in Tables B2 (DenoMP), B3 (LendMP) and B4 (BorrMP) in the Working Paper version. Our results present the effects of changes in monetary policy on percentage changes in cross-border claims denominated in US dollars as reported in the LBS by residence. Short-term policy rates from the IBRN are used to measure monetary policy changes. In all specifications we control for lagged changes in the business cycles of the lender (Lend_bcycle) and borrower country (Borr_bcycle), respectively. Further, the lagged log VIX enters as a global factor and we include lender and borrower fixed effects. The quarterly data for up to 32 lender and 55 borrower countries range from 2000:Q1 to 2016:Q3. We drop the US as borrower and lender country to grant proper identification of distinct MPs. For details on the variables, see Table 1; for the variable descriptions, see Appendix Table A1. Standard errors are clustered by lender-borrower pair. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Impact of monetary policy on cross-border claims denominated in US dollars

Bank characteristics of both lender and borrower countries, full sample — Table 7

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Short funding	Net due	Capital	Deposits	Net due	Capital	Net due
Σ DenoMP*LendBC	0.12**	0.14					
	(0.04)	(0.23)					
Σ DenoMP*BorrBC	-0.14*	0.27					
	(0.07)	(0.16)					
Σ LendMP*LendBC			-0.81***	-0.11*	0.06		
			(0.01)	(0.07)	(0.65)		
Σ LendMP*BorrBC			-0.30	-0.04	-0.10		
			(0.36)	(0.49)	(0.60)		
Σ BorrMP*LendBC						-0.15	-0.02
						(0.58)	(0.82)
Σ BorrMP*BorrBC						-0.46**	0.41**
						(0.03)	(0.02)
Observations	18,740	18,740	18,740	18,740	18,740	18,740	18,740
R-squared	0.014	0.013	0.013	0.013	0.013	0.013	0.013
Adj R2	0.009	0.009	0.009	0.009	0.009	0.008	0.008

This table estimates equation (2), adding interaction terms of MP with balance-sheet characteristics of *both* the lender and the borrower country. Different columns refer to the same balance-sheet characteristics of the lender (LendBC) and borrower (BorrBC) banking systems. Each reported coefficient represents the sum of the estimated coefficients (γ_D, γ_L and γ_B) on the interaction terms of MP (including contemporaneous MP effects and three lags) with both LendBC and BorrBC. We provide p-values of the F-tests in parentheses. Balance-sheet characteristics refer to figures provided in the last annual report. Besides the interaction terms, all regressions control for these balance-sheet characteristics on a standalone basis. Table 7 presents the effects of changes in monetary policy on percentage changes in cross-border claims denominated in US dollars as reported in the LBS by residence. We simultaneously consider MP changes in the country of the denomination currency (DenoMP), the lender (LendMP) and the borrower country (BorrMP). Short-term policy rates from the IBRN are used to measure monetary policy changes. In all specifications we control for lagged changes in the business cycles of the lender (Lend_bcycle) and borrower country (Borr_bcycle), respectively. Further, the lagged log VIX enters as a global factor and we include lender and borrower fixed effects. The quarterly data for up to 29 lender and 29 borrower countries range from 2000:Q1 to 2016:Q3. We drop the US as borrower and lender country to grant proper identification of distinct MPs. For details on the variables, see Table 1; for the variable descriptions, see Appendix Table A1. Standard errors are clustered by lender-borrower pair. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Impact of monetary policy on cross-border claims denominated in euro

Including interactions of bank characteristics with MP, full sample, all MP simultaneously — Table 8

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Short funding	Net due	Capital	Deposits	Net due	Capital	Net due
All MP simultaneously							
Σ DenoMP*LendBC	-0.23**	0.22					
	(0.04)	(0.25)					
Σ LendMP*LendBC			-0.86**	-0.21***	0.79***		
			(0.04)	(0.00)	(0.00)		
Σ BorrMP*BorrBC						-0.66**	0.03
						(0.02)	(0.92)
Observations	6,734	6,734	6,734	6,734	6,734	5,177	5,177
R-squared	0.016	0.017	0.016	0.017	0.022	0.016	0.018
Adj R2	0.005	0.006	0.005	0.006	0.011	0.005	0.007
One MP at a time							
Σ DenoMP*LendBC	-0.20*	0.19					
	(0.07)	(0.31)					
Σ LendMP*LendBC			-1.34***	-0.26***	0.75***		
			(0.00)	(0.00)	(0.00)		
Σ BorrMP*BorrBC						-1.05***	-0.02
						(0.00)	(0.93)
Observations	6,734	6,734	6,868	6,868	6,868	5,286	5,286
R-squared	0.015	0.016	0.013	0.014	0.018	0.013	0.012
Adj R2	0.005	0.006	0.003	0.004	0.008	0.003	0.003

This table estimates equation (2) for cross-border claims denominated in euro. In the upper panel, we simultaneously consider MP changes in the country of the denomination currency (DenoMP), the lender (LendMP) and the borrower country (BorrMP). In the lower panel, we now consider MP changes separately. Within each panel, different columns again refer to balance-sheet characteristics of the lender (LendBC) and borrower (BorrBC) banking systems, respectively. Each reported coefficient represents the sum of the estimated coefficients (γ_D, γ_L and γ_B) on the interaction terms of MP (including contemporaneous MP effects and three lags) with either LendBC or BorrBC. We provide p-values of the F-tests in parentheses. Balance-sheet characteristics refer to figures provided in the last annual report. Besides the interaction terms, all regressions control for these balance-sheet characteristics on a standalone basis. The full set of regression results are available in Tables B5 (DenoMP), B6 (LendMP) and B7 (BorrMP) in the Working Paper version. Like Table 2, Table 8 presents the effects of changes in monetary policy on percentage changes in cross-border claims denominated in euro as reported in the LBS by residence. Short-term policy rates from the IBRN are used to measure monetary policy changes. In all specifications we control for lagged changes in the business cycles of the lender (Lend_bcycle) and borrower country (Borr_bcycle), respectively. Further, the lagged log VIX enters as a global factor and we include lender and borrower fixed effects. The quarterly data for up to 20 lender and 37 borrower countries range from 2000:Q1 to 2016:Q3. We drop euro area countries as borrowers and lenders to grant proper identification of distinct MPs. For details on the variables, see Table 1; for the variable descriptions, see Appendix Table A1. Standard errors are clustered by lender-borrower pair. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Construction of variables used in the empirical analysis

Table A1

	Description	Data source
Dependent Variable		
Cross-border claims[1]	Cross-border claims (growth rate in %)	BIS international banking statistics[2]
Independent Variables		
Wholesale funding (short-term)	(Deposit from banks + Repos and cash collateral + other Deposits and Short-term Borrowings) /Total Assets (in %)	Fitch[3]
Capital ratio	Total equity/Total Assets (in %)	Fitch[3]
Liquidity ratio	Liquid Assets/Total Assets (in %)	Fitch[3]
Net due	(Intragroup XBL-XBC)/Total Assets (in %)	BIS locational banking statistics[2], Fitch[3]
Business cycle	Output gap	BIS[4]
VIX	Log of VIX	Bloomberg[3]

[1] Claims include both reporting banks' loans and holdings of securities. [2] Certain portions of the data are publicly available; others are marked as confidential by the respective reporting national authorities. The publicly available parts of the data can be accessed at: http://www.bis.org/statistics/consstats.htm?m=6%7C31%7C70. [3] Commercial dataset. [4] As defined in Borio (2014).

Impact of monetary policy on cross-border claims denominated in US dollars

Including interactions of the zero lower bound (ZLB) with MP

Table B1

	Full sample				Excluding financial centers			
Σ DenoMP	-2.11***	-1.90***			-3.27***	-3.12***		
	(0.01)	(0.01)			(0.01)	(0.01)		
Σ LendMP	2.28***		2.41***		2.00**		2.42***	
	(0.00)		(0.00)		(0.03)		(0.01)	
Σ BorrMP	0.16			0.26***	0.25*			0.34***
	(0.12)			(0.01)	(0.06)			(0.01)
Σ DenoMP*ZLB	-8.18	-9.08*			-10.08	-8.31		
	(0.16)	(0.08)			(0.31)	(0.34)		
Σ LendMP*ZLB	13.12***		9.67**		1.91		-0.99	
	(0.01)		(0.04)		(0.77)		(0.87)	
Σ BorrMP*ZLB	-6.84			-7.60	15.45			10.64
	(0.44)			(0.34)	(0.41)			(0.56)
Σ DenoMP*ZLB_Total	-10.29*	-10.98**			-13.36	-11.43		
	(0.08)	(0.04)			(0.19)	(0.21)		
Σ LendMP*ZLB_Total	15.40***		12.07***		3.91		1.44	
	(0.00)		(0.01)		(0.56)		(0.82)	
Σ BorrMP*ZLB_Total	-6.68			-7.35	15.70			10.98
	(0.45)			(0.35)	(0.40)			(0.54)
D.LendMP	0.994		1.762***		0.760		1.654	
	(0.679)		(0.554)		(1.221)		(1.011)	
LD.LendMP	1.891***		1.407***		2.259**		1.765*	
	(0.642)		(0.512)		(1.093)		(0.913)	
LD2.LendMP	-0.549		-0.855*		-0.588		-0.716	
	(0.494)		(0.489)		(0.758)		(0.746)	
LD3.LendMP	-0.051		0.094		-0.427		-0.281	
	(0.281)		(0.266)		(0.377)		(0.364)	
D.BorrMP	0.093			0.150**	0.129			0.175*
	(0.070)			(0.070)	(0.096)			(0.097)
LD.BorrMP	0.024			0.172*	0.070			0.206*
	(0.088)			(0.088)	(0.124)			(0.124)
LD2.BorrMP	0.050			-0.100	0.080			-0.064
	(0.094)			(0.093)	(0.139)			(0.136)
LD3.BorrMP	-0.011			0.038	-0.028			0.019
	(0.036)			(0.035)	(0.053)			(0.052)
D.DenoMP	-1.348*	-0.960			-1.134	-1.005		
	(0.786)	(0.760)			(1.197)	(1.164)		
LD.DenoMP	1.283	1.874**			-0.035	0.722		
	(0.796)	(0.735)			(1.270)	(1.210)		
LD2.DenoMP	-5.705***	-6.998***			-4.843***	-6.426***		
	(1.077)	(1.029)			(1.775)	(1.723)		
LD3.DenoMP	3.656***	4.180***			2.739**	3.588***		
	(0.755)	(0.743)			(1.151)	(1.146)		
D.LendMP_ZLB	8.409**		5.802*		1.856		-0.945	
	(3.942)		(3.489)		(5.399)		(5.181)	
LD.LendMP_ZLB	19.650***		13.401**		16.775**		11.271	
	(5.780)		(5.712)		(8.383)		(8.118)	
LD2.LendMP_ZLB	-19.695**		-10.544		-26.962**		-17.177	
	(7.740)		(7.394)		(11.890)		(11.125)	
LD3.LendMP_ZLB	4.757		1.007		10.238**		5.866	
	(3.316)		(3.154)		(5.057)		(4.787)	
D.BorrMP_ZLB	4.946			2.942	12.757			8.738
	(7.013)			(5.843)	(16.111)			(15.754)
LD.BorrMP_ZLB	-22.390**			-23.142**	-10.279			-10.160
	(9.588)			(9.672)	(25.289)			(25.244)
LD2.BorrMP_ZLB	25.468*			29.358**	29.249			28.223
	(14.750)			(14.485)	(37.139)			(36.891)
LD3.BorrMP_ZLB	-14.862**			-16.761***	-16.274			-16.160
	(6.353)			(6.233)	(15.535)			(15.443)
D.DenoMP_ZLB	-8.727**	-7.543**			-6.886	-5.088		
	(3.854)	(3.414)			(6.702)	(5.588)		
LD.DenoMP_ZLB	4.892	-2.022			5.418	-2.153		
	(6.956)	(6.723)			(11.968)	(11.876)		
LD2.DenoMP_ZLB	-9.149	-3.269			-12.954	-3.192		
	(7.159)	(6.850)			(12.174)	(12.070)		
LD3.DenoMP_ZLB	4.808**	3.756			4.340	2.121		
	(2.399)	(2.318)			(4.066)	(3.988)		
L.ln_VIX	-1.339**	-1.657***	-1.540***	-2.711***	-1.625	-2.023**	-1.061	-2.340***
	(0.639)	(0.632)	(0.533)	(0.490)	(1.043)	(1.017)	(0.887)	(0.804)
LD.Lend_bcycle	0.450***	0.491***	0.395**	0.496***	0.549	0.596	0.291	0.498
	(0.173)	(0.173)	(0.169)	(0.166)	(0.373)	(0.395)	(0.357)	(0.358)
LD.Borr_bcycle	0.567***	0.659***	0.544***	0.632***	0.577**	0.719***	0.492**	0.611***
	(0.166)	(0.162)	(0.157)	(0.152)	(0.240)	(0.232)	(0.218)	(0.215)
Observations	36,340	36,340	36,986	36,986	14,620	14,620	14,885	14,885
R-squared	0.014	0.013	0.012	0.012	0.020	0.018	0.017	0.016
Adj R2	0.011	0.011	0.009	0.009	0.013	0.013	0.012	0.012

See Table 3 for specification details.

Impact of monetary policy on cross-border claims denominated in US dollars

Including interactions of bank characteristics with *MP of currency of denomination* Table B2

	Short funding				Net due			
	Full sample		Excl. financial centers		Full sample		Excl. financial centers	
Σ DenoMP	-15.38***	-15.61***	-5.64	-6.71	-4.15***	-3.78***	-4.79***	-4.86***
	(0.00)	(0.00)	(0.39)	(0.30)	(0.00)	(0.00)	(0.00)	(0.00)
Σ LendMP	2.25***		1.70*		2.48***		1.93**	
	(0.00)		(0.07)		(0.00)		(0.04)	
Σ BorrMP	-0.33		-0.04		-0.32		0.04	
	(0.11)		(0.89)		(0.11)		(0.88)	
Σ DenoMP*LendBC	0.12***	0.11**	0.16**	0.15**	0.21**	0.15*	-0.07	-0.03
	(0.01)	(0.02)	(0.03)	(0.05)	(0.02)	(0.09)	(0.89)	(0.95)
D.LendMP	0.946		0.929		1.133		0.654	
	(0.692)		(1.175)		(0.697)		(1.155)	
LD.LendMP	1.408**		1.680		1.502**		1.829*	
	(0.643)		(1.038)		(0.645)		(1.032)	
LD2.LendMP	-0.016		-0.395		-0.133		-0.171	
	(0.513)		(0.782)		(0.508)		(0.761)	
LD3.LendMP	-0.088		-0.513		-0.027		-0.387	
	(0.280)		(0.365)		(0.279)		(0.366)	
D.BorrMP	-0.217		0.046		-0.211		0.113	
	(0.163)		(0.192)		(0.162)		(0.194)	
LD.BorrMP	-0.222		-0.307		-0.207		-0.272	
	(0.174)		(0.233)		(0.173)		(0.226)	
LD2.BorrMP	0.031		0.143		0.013		0.092	
	(0.129)		(0.178)		(0.129)		(0.174)	
LD3.BorrMP	0.082*		0.081		0.084*		0.108*	
	(0.047)		(0.058)		(0.048)		(0.058)	
D.DenoMP	-6.011	-6.746	-6.679	-6.566	-0.622	-0.472	-0.566	-0.804
	(4.252)	(4.136)	(6.323)	(6.277)	(0.874)	(0.748)	(1.307)	(1.171)
LD.DenoMP	-1.312	0.359	-4.523	-3.273	0.724	1.165	-0.146	0.391
	(4.307)	(4.231)	(6.432)	(6.456)	(0.954)	(0.839)	(1.365)	(1.241)
LD2.DenoMP	-20.741***	-23.713***	-10.279	-13.338	-8.469***	-9.159***	-8.442***	-9.044***
	(6.401)	(6.214)	(9.724)	(9.396)	(1.191)	(1.050)	(1.951)	(1.715)
LD3.DenoMP	12.686***	14.489***	15.841***	16.465***	4.220***	4.688***	4.368***	4.601***
	(3.581)	(3.468)	(5.272)	(5.143)	(0.646)	(0.581)	(1.009)	(0.925)
LendBC	0.035	0.031	-0.070	-0.086	0.087	0.095	0.508**	0.543**
	(0.034)	(0.034)	(0.055)	(0.055)	(0.061)	(0.061)	(0.227)	(0.227)
DenoMP*LendBC	0.082	0.095	0.096	0.093	0.182	0.121	1.015	1.046*
	(0.062)	(0.062)	(0.095)	(0.095)	(0.129)	(0.129)	(0.617)	(0.619)
L.DenoMP*LendBC	0.092	0.089	-0.078	-0.061	-0.279	-0.312	-0.616	-0.596
	(0.068)	(0.067)	(0.094)	(0.096)	(0.201)	(0.199)	(0.749)	(0.753)
L2.DenoMP*LendBC	0.072	0.078	0.329***	0.307***	0.091	0.126	-0.543	-0.489
	(0.065)	(0.064)	(0.104)	(0.104)	(0.177)	(0.176)	(0.611)	(0.616)
L3.DenoMP*LendBC	-0.130**	-0.152***	-0.186**	-0.194**	0.216*	0.212*	0.073	0.007
	(0.052)	(0.051)	(0.079)	(0.078)	(0.116)	(0.117)	(0.448)	(0.447)
L.ln_VIX	-1.342*	-1.769**	-1.935*	-2.550**	-1.319*	-1.808***	-1.816*	-2.397**
	(0.702)	(0.702)	(1.042)	(1.026)	(0.697)	(0.694)	(1.024)	(1.006)
LD.Lend_bcycle	0.463**	0.577***	0.178	0.319	0.516**	0.659***	0.203	0.367
	(0.212)	(0.213)	(0.385)	(0.392)	(0.214)	(0.215)	(0.390)	(0.396)
LD.Borr_bcycle	0.511***	0.632***	0.493**	0.695***	0.490***	0.618***	0.401*	0.610***
	(0.167)	(0.159)	(0.240)	(0.228)	(0.167)	(0.159)	(0.239)	(0.228)
Observations	30,615	30,615	13,448	13,448	30,615	30,615	13,448	13,448
R-squared	0.014	0.014	0.020	0.019	0.014	0.013	0.019	0.018
Adj R2	0.011	0.011	0.013	0.013	0.011	0.010	0.013	0.013

See Table 4 (full sample, all MP simultaneously), Table 5 (full sample, one MP at a time) and Table 6 (excluding financial centres, all MP simultaneously) for specification details.

Impact of monetary policy on cross-border claims denominated in US dollars

Including interactions of bank characteristics with *MP of lender* Table B3

	Capital				Deposits				Net due			
	Full sample		Excl. financial centers		Full sample		Excl. financial centers		Full Sample		Excl. financial centers	
Σ DenoMP	-3.89***		-4.53***		-3.67***		-4.22***		-4.16***		-5.02***	
	(0.00)		(0.00)		(0.00)		(0.00)		(0.00)		(0.00)	
Σ LendMP	5.62***	5.88***	8.74***	9.40***	3.47*	4.23**	4.29	5.52*	2.69***	2.94***	2.47***	2.86***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.08)	(0.03)	(0.19)	(0.08)	(0.00)	(0.00)	(0.01)	(0.00)
Σ BorrMP	-0.34*		-0.06		-0.33*		-0.03		-0.31		0.04	
	(0.09)		(0.81)		(0.10)		(0.91)		(0.12)		(0.89)	
Σ LendMP*LendBC	-0.62***	-0.93***	-1.04***	-1.34***	-0.09**	-0.14***	-0.10	-0.16**	0.14	0.24***	0.45	0.60
	(0.00)	(0.00)	(0.00)	(0.00)	(0.03)	(0.00)	(0.22)	(0.03)	(0.15)	(0.01)	(0.47)	(0.32)
D.LendMP	4.288***	5.719***	5.347**	7.131***	3.374**	5.207***	2.661	4.982*	1.374*	2.235***	0.821	1.749
	(1.493)	(1.351)	(2.404)	(2.152)	(1.698)	(1.653)	(2.707)	(2.681)	(0.746)	(0.648)	(1.202)	(1.087)
LD.LendMP	3.672**	5.617***	6.359**	8.192***	3.764*	4.992**	4.967	6.448*	1.419**	1.293**	1.938*	2.035**
	(1.815)	(1.603)	(3.198)	(2.840)	(2.240)	(2.100)	(4.114)	(3.763)	(0.665)	(0.571)	(1.084)	(0.967)
LD2.LendMP	-3.392*	-9.583***	-3.748	-9.517***	-6.999**	-10.923***	-7.258	-12.177***	-0.195	-0.765	-0.077	-0.888
	(1.944)	(1.571)	(3.360)	(2.574)	(2.748)	(2.532)	(5.108)	(4.410)	(0.534)	(0.521)	(0.921)	(0.897)
LD3.LendMP	1.053	4.122***	0.781	3.597**	3.324**	4.955***	3.921	6.266***	0.094	0.178	-0.217	-0.037
	(1.060)	(0.848)	(1.700)	(1.395)	(1.473)	(1.365)	(2.595)	(2.339)	(0.288)	(0.284)	(0.453)	(0.442)
D.BorrMP	-0.230		0.044		-0.221		0.064		-0.211		0.077	
	(0.162)		(0.191)		(0.162)		(0.191)		(0.162)		(0.191)	
LD.BorrMP	-0.205		-0.327		-0.231		-0.323		-0.191		-0.236	
	(0.174)		(0.235)		(0.176)		(0.236)		(0.174)		(0.228)	
LD2.BorrMP	0.002		0.107		0.036		0.126		0.008		0.094	
	(0.130)		(0.182)		(0.131)		(0.182)		(0.128)		(0.173)	
LD3.BorrMP	0.090*		0.111*		0.085*		0.103*		0.082*		0.103*	
	(0.048)		(0.060)		(0.048)		(0.059)		(0.048)		(0.058)	
D.DenoMP	-0.867		-0.858		-0.544		-0.368		-0.607		-0.677	
	(0.892)		(1.341)		(0.886)		(1.293)		(0.886)		(1.321)	
LD.DenoMP	0.324		-0.700		0.551		-0.549		0.730		-0.308	
	(0.996)		(1.474)		(0.976)		(1.399)		(0.961)		(1.397)	
LD2.DenoMP	-6.915***		-6.374***		-7.323***		-6.691***		-8.456***		-8.118***	
	(1.385)		(2.381)		(1.247)		(2.147)		(1.196)		(2.034)	
LD3.DenoMP	3.569***		3.398***		3.645***		3.384***		4.179***		4.086***	
	(0.773)		(1.240)		(0.671)		(1.122)		(0.647)		(1.040)	
LendBC	-0.751***	-0.617***	-0.673*	-0.404	-0.065	-0.072*	-0.132*	-0.117*	0.071	0.055	0.551**	0.433**
	(0.207)	(0.200)	(0.343)	(0.351)	(0.041)	(0.040)	(0.071)	(0.070)	(0.059)	(0.057)	(0.225)	(0.218)
L.ln_VIX	-1.282*	-0.812	-1.375	-0.325	-1.271*	-1.324**	-1.831*	-1.321	-1.281*	-1.491**	-1.796*	-1.477
	(0.706)	(0.615)	(1.052)	(0.926)	(0.702)	(0.604)	(1.041)	(0.918)	(0.699)	(0.608)	(1.035)	(0.940)
LD.Lend_bcycle	0.472**	0.450**	0.078	-0.082	0.487**	0.437**	0.237	0.036	0.452**	0.454**	0.327	0.126
	(0.218)	(0.216)	(0.416)	(0.410)	(0.217)	(0.215)	(0.413)	(0.412)	(0.211)	(0.207)	(0.382)	(0.378)
LD.Borr_bcycle	0.459***	0.468***	0.304	0.328	0.503***	0.469***	0.437*	0.433*	0.500***	0.442***	0.386	0.362
	(0.170)	(0.167)	(0.247)	(0.239)	(0.170)	(0.167)	(0.250)	(0.242)	(0.167)	(0.162)	(0.238)	(0.230)
LendMP*LendBC	-0.422**	-0.546***	-0.554**	-0.695***	-0.046	-0.069**	-0.039	-0.071	0.143*	0.204**	0.253	0.282
	(0.169)	(0.165)	(0.252)	(0.246)	(0.033)	(0.033)	(0.056)	(0.058)	(0.085)	(0.080)	(0.494)	(0.482)
L.LendMP*LendBC	0.020	0.124	-0.247	-0.159	0.027	0.040	-0.008	0.006	-0.048	-0.061	1.102**	0.984**
	(0.220)	(0.210)	(0.328)	(0.321)	(0.032)	(0.031)	(0.045)	(0.046)	(0.079)	(0.077)	(0.497)	(0.489)
L2.LendMP*LendBC	-0.127	-0.137	-0.137	-0.131	-0.001	-0.011	0.035	0.038	-0.139*	-0.021	-1.238**	-1.275**
	(0.154)	(0.140)	(0.185)	(0.165)	(0.033)	(0.031)	(0.047)	(0.045)	(0.083)	(0.077)	(0.579)	(0.578)
L3.LendMP*LendBC	-0.096	-0.369***	-0.099	-0.355***	-0.068**	-0.098***	-0.087*	-0.134***	0.185**	0.114	0.335	0.614
	(0.103)	(0.087)	(0.159)	(0.136)	(0.029)	(0.027)	(0.049)	(0.045)	(0.088)	(0.078)	(0.449)	(0.436)
Observations	30,615	31,219	13,448	13,704	30,615	31,219	13,448	13,704	30,615	31,219	13,448	13,704
R-squared	0.014	0.013	0.019	0.017	0.014	0.012	0.019	0.017	0.014	0.012	0.020	0.017
Adj R2	0.011	0.010	0.013	0.012	0.011	0.009	0.013	0.011	0.011	0.009	0.014	0.012

See Table 4 (full sample, all MP simultaneously), Table 5 (full sample, one MP at a time) and Table 6 (excluding financial centres, all MP simultaneously) for specification details.

Impact of monetary policy on cross-border claims denominated in US dollars

Including interactions of bank characteristics with *MP of borrower* Table B4

	Capital				Net due			
	Full sample		Excl. financial centers		Full sample		Excl. financial centers	
Σ DenoMP	-3.09***		-4.20***		-2.96***		-4.51***	
	(0.00)		(0.01)		(0.00)		(0.01)	
Σ LendMP	1.35		0.01		1.57*		0.25	
	(0.12)		(0.99)		(0.07)		(0.87)	
Σ BorrMP	3.28**	4.15***	3.35	3.24	0.11	0.37	0.75	0.83
	(0.04)	(0.01)	(0.23)	(0.25)	(0.74)	(0.30)	(0.12)	(0.11)
Σ BorrMP*BorrBC	-0.51***	-0.81***	-0.52*	-0.75***	0.38***	0.44***	0.62	0.65
	(0.01)	(0.00)	(0.10)	(0.01)	(0.01)	(0.00)	(0.32)	(0.30)
D.LendMP	1.153		0.399		1.256		0.535	
	(0.932)		(1.872)		(0.917)		(1.845)	
LD.LendMP	1.061		1.672		1.203		1.843	
	(0.858)		(1.626)		(0.839)		(1.587)	
LD2.LendMP	-1.116**		-1.994**		-1.138**		-2.077**	
	(0.463)		(0.822)		(0.461)		(0.835)	
LD3.LendMP	0.247		-0.064		0.245		-0.050	
	(0.192)		(0.255)		(0.192)		(0.246)	
D.BorrMP	2.008	3.689***	3.833	3.961*	0.191	0.699*	0.767*	0.911*
	(1.535)	(1.337)	(2.435)	(2.315)	(0.372)	(0.368)	(0.446)	(0.474)
LD.BorrMP	2.932*	4.703***	1.227	3.869	0.075	0.138	-0.787	-0.398
	(1.720)	(1.569)	(2.779)	(2.809)	(0.339)	(0.322)	(0.532)	(0.527)
LD2.BorrMP	-2.265	-6.787***	-4.592	-8.797***	-0.174	-0.469*	0.471	0.029
	(2.175)	(1.867)	(3.211)	(3.098)	(0.221)	(0.244)	(0.483)	(0.515)
LD3.BorrMP	0.600	2.541**	2.877*	4.208**	0.015	0.001	0.295	0.284
	(1.145)	(1.025)	(1.610)	(1.627)	(0.073)	(0.074)	(0.214)	(0.210)
D.DenoMP	-0.196		-1.600		-0.012		-1.512	
	(1.157)		(2.104)		(1.131)		(2.119)	
LD.DenoMP	-0.835		-1.865		-0.430		-1.537	
	(1.299)		(2.266)		(1.279)		(2.295)	
LD2.DenoMP	-4.497**		-2.757		-5.247***		-4.388	
	(1.771)		(3.342)		(1.549)		(3.219)	
LD3.DenoMP	2.433***		2.027		2.733***		2.923*	
	(0.937)		(1.664)		(0.837)		(1.688)	
L.ln_VIX	-1.991**	-1.962***	-3.134**	-1.646	-1.998**	-2.809***	-3.124**	-2.312**
	(0.868)	(0.705)	(1.421)	(1.186)	(0.860)	(0.667)	(1.423)	(1.159)
LD.Lend_bcycle	0.294	0.290	0.506	0.334	0.329	0.329	0.496	0.326
	(0.241)	(0.236)	(0.564)	(0.561)	(0.237)	(0.231)	(0.561)	(0.556)
LD.Borr_bcycle	0.841***	0.870***	0.496	0.500	0.936***	0.976***	0.558	0.581
	(0.265)	(0.250)	(0.429)	(0.383)	(0.271)	(0.248)	(0.444)	(0.396)
BorrBC	-0.621***	-0.474**	-0.449	-0.252	-0.002	-0.021	0.364	0.304
	(0.225)	(0.230)	(0.461)	(0.460)	(0.105)	(0.105)	(0.374)	(0.364)
BorrMP*BorrBC	-0.205	-0.347***	-0.345	-0.347	0.173*	0.193**	0.765	0.757
	(0.140)	(0.124)	(0.226)	(0.215)	(0.098)	(0.098)	(0.523)	(0.519)
L.BorrMP*BorrBC	-0.139	-0.067	0.052	0.075	0.063	0.076	0.096	0.043
	(0.123)	(0.118)	(0.210)	(0.214)	(0.097)	(0.101)	(0.607)	(0.609)
L2.BorrMP*BorrBC	-0.120	-0.176	0.020	-0.108	0.194*	0.232**	-0.409	-0.471
	(0.116)	(0.116)	(0.199)	(0.218)	(0.105)	(0.094)	(0.592)	(0.578)
L3.BorrMP*BorrBC	-0.044	-0.219**	-0.241*	-0.365**	-0.050	-0.059	0.169	0.323
	(0.102)	(0.092)	(0.145)	(0.146)	(0.079)	(0.073)	(0.442)	(0.429)
Observations	21,727	22,222	8,122	8,312	21,727	22,222	8,122	8,312
R-squared	0.013	0.011	0.015	0.013	0.013	0.011	0.015	0.012
Adj R2	0.009	0.008	0.007	0.006	0.009	0.008	0.007	0.006

See Table 4 (full sample, all MP simultaneously), Table 5 (full sample, one MP at a time) and Table 6 (excluding financial centres, all MP simultaneously) for specification details.

Impact of monetary policy on cross-border claims denominated in euro

Including interactions of bank characteristics with *MP of currency of denomination* Table B5

	Short funding		Net due	
	all MP simultaneously	one MP at a time	all MP simultaneously	one MP at a time
Σ DenoMP	26.30***	27.22***	6.19**	8.75***
	(0.01)	(0.01)	(0.03)	(0.00)
Σ LendMP	0.44		1.37	
	(0.68)		(0.21)	
Σ BorrMP	0.00		0.03	
	(1.00)		(0.96)	
Σ DenoMP*LendBC	-0.23**	-0.20*	0.22	0.19
	(0.04)	(0.07)	(0.25)	(0.31)
D.LendMP	-1.386		-1.110	
	(1.383)		(1.306)	
LD.LendMP	0.715		1.492	
	(1.491)		(1.617)	
LD2.LendMP	0.764		0.701	
	(0.591)		(0.595)	
LD3.LendMP	0.344		0.283	
	(0.246)		(0.246)	
D.BorrMP	-1.090		-1.034	
	(0.783)		(0.772)	
LD.BorrMP	0.648		0.610	
	(0.801)		(0.771)	
LD2.BorrMP	0.236		0.281	
	(0.365)		(0.357)	
LD3.BorrMP	0.205		0.175	
	(0.147)		(0.143)	
D.DenoMP	13.048	10.985	1.906	0.825
	(9.318)	(8.943)	(3.064)	(2.620)
LD.DenoMP	10.480	11.274	6.900**	8.748***
	(10.331)	(9.898)	(2.904)	(2.326)
LD2.DenoMP	-0.335	0.706	-3.418	-3.240
	(9.960)	(9.715)	(2.605)	(2.536)
LD3.DenoMP	3.109	4.253	0.797	2.415
	(8.206)	(8.381)	(2.021)	(1.902)
LendBC	0.032	0.039	0.019	0.018
	(0.080)	(0.078)	(0.105)	(0.103)
DenoMP*LendBC	-0.199	-0.190	1.209***	1.204***
	(0.147)	(0.146)	(0.382)	(0.380)
L.DenoMP*LendBC	-0.124	-0.119	-0.537	-0.612
	(0.231)	(0.234)	(0.526)	(0.526)
L2.DenoMP*LendBC	0.127	0.125	-0.198	-0.066
	(0.218)	(0.225)	(0.472)	(0.471)
L3.DenoMP*LendBC	-0.029	-0.019	-0.259	-0.337
	(0.134)	(0.136)	(0.281)	(0.282)
L.ln_VIX	2.477	2.929*	2.660*	2.955*
	(1.522)	(1.509)	(1.543)	(1.522)
LD.Lend_bcycle	-0.388	-0.404	-0.233	-0.233
	(0.544)	(0.542)	(0.547)	(0.543)
LD.Borr_bcycle	-0.532	-0.566	-0.514	-0.530
	(0.499)	(0.491)	(0.497)	(0.488)
Observations	6,734	6,734	6,734	6,734
R-squared	0.016	0.015	0.017	0.016
Adj R2	0.005	0.005	0.006	0.006

See Table 8 for specification details.

Impact of monetary policy on cross-border claims denominated in euro

Including interactions of bank characteristics with *MP of lender* Table B6

	Capital		Deposits		Net due	
	all MP	one MP	all MP	one MP	all MP	one MP
Σ DenoMP	3.73		3.75		4.51	
	(0.18)		(0.19)		(0.12)	
Σ LendMP	8.39***	8.35***	13.10***	13.37***	3.79***	3.85***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)
Σ BorrMP	-0.01		0.05		0.19	
	(0.99)		(0.94)		(0.79)	
Σ LendMP*LendBC	-0.86**	-1.34***	-0.21***	-0.26***	0.79***	0.75***
	(0.04)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
D.LendMP	2.589	0.687	6.279*	4.625	2.026	0.534
	(3.174)	(3.149)	(3.287)	(3.513)	(1.292)	(1.145)
LD.LendMP	4.087	11.945***	4.193	9.590**	0.812	3.516*
	(4.167)	(3.770)	(3.495)	(3.848)	(1.797)	(1.844)
LD2.LendMP	2.960	-6.313**	4.087	-1.373	0.772	-0.315
	(4.374)	(3.108)	(3.799)	(3.911)	(0.684)	(0.746)
LD3.LendMP	-1.246	2.032	-1.456	0.528	0.181	0.110
	(2.108)	(1.642)	(2.175)	(1.926)	(0.274)	(0.230)
D.BorrMP	-1.078		-1.064		-0.939	
	(0.776)		(0.777)		(0.770)	
LD.BorrMP	0.598		0.665		0.681	
	(0.785)		(0.795)		(0.772)	
LD2.BorrMP	0.294		0.265		0.270	
	(0.361)		(0.363)		(0.357)	
LD3.BorrMP	0.174		0.187		0.175	
	(0.147)		(0.147)		(0.143)	
D.DenoMP	-1.575		-1.506		-2.501	
	(3.056)		(3.063)		(2.838)	
LD.DenoMP	9.426***		8.682***		9.036***	
	(3.122)		(2.890)		(2.799)	
LD2.DenoMP	-5.702*		-4.768*		-3.368	
	(2.963)		(2.487)		(2.379)	
LD3.DenoMP	1.580		1.340		1.341	
	(2.114)		(2.025)		(1.949)	
LendBC	-0.531	-0.380	-0.029	-0.080	0.088	0.101
	(0.477)	(0.479)	(0.090)	(0.093)	(0.105)	(0.114)
L.ln_VIX	2.460	2.001	2.399	1.459	2.110	1.265
	(1.518)	(1.350)	(1.501)	(1.333)	(1.532)	(1.408)
LD.Lend_bcycle	-0.462	-0.327	-0.379	-0.244	-0.310	-0.241
	(0.543)	(0.520)	(0.556)	(0.529)	(0.566)	(0.530)
LD.Borr_bcycle	-0.555	-0.476	-0.541	-0.468	-0.539	-0.406
	(0.497)	(0.471)	(0.495)	(0.470)	(0.499)	(0.474)
LendMP*LendBC	-0.459	-0.339	-0.150*	-0.136	0.882***	0.824***
	(0.480)	(0.514)	(0.079)	(0.088)	(0.107)	(0.105)
L.LendMP*LendBC	-0.445	-0.592	-0.095**	-0.117**	0.130	0.214**
	(0.381)	(0.392)	(0.048)	(0.050)	(0.095)	(0.093)
L2.LendMP*LendBC	-0.105	-0.244	-0.001	0.004	0.014	-0.143
	(0.354)	(0.377)	(0.052)	(0.055)	(0.127)	(0.101)
L3.LendMP*LendBC	0.149	-0.164	0.035	-0.008	-0.234**	-0.147*
	(0.197)	(0.164)	(0.042)	(0.038)	(0.095)	(0.082)
Observations	6,734	6,868	6,734	6,868	6,734	6,868
R-squared	0.016	0.013	0.017	0.014	0.022	0.018
Adj R2	0.005	0.003	0.006	0.004	0.011	0.008

See Table 8 for specification details.

Impact of monetary policy on cross-border claims denominated in euro

Including interactions of bank characteristics with *MP of borrower* Table B7

	Short funding		Net due	
	all MP simultaneously	one MP at a time	all MP simultaneously	one MP at a time
Σ DenoMP	5.34*		7.35***	
	(0.06)		(0.01)	
Σ LendMP	0.95		1.02	
	(0.39)		(0.34)	
Σ BorrMP	6.27**	6.93***	-0.11	0.50
	(0.04)	(0.01)	(0.92)	(0.62)
Σ BorrMP*BorrBC	-0.66**	-1.05***	0.03	-0.02
	(0.02)	(0.00)	(0.92)	(0.93)
D.LendMP	-0.837		-0.839	
	(1.304)		(1.310)	
LD.LendMP	0.965		1.063	
	(1.628)		(1.621)	
LD2.LendMP	0.644		0.628	
	(0.617)		(0.621)	
LD3.LendMP	0.175		0.166	
	(0.309)		(0.314)	
D.BorrMP	1.398	-1.314	0.257	-0.708
	(2.252)	(2.051)	(0.683)	(0.645)
LD.BorrMP	4.664	12.470***	-0.340	1.890*
	(3.066)	(2.504)	(0.802)	(0.984)
LD2.BorrMP	1.150	-5.656*	0.279	-0.347
	(4.108)	(3.153)	(0.525)	(0.534)
LD3.BorrMP	-0.939	1.431	-0.302	-0.340*
	(2.105)	(1.690)	(0.218)	(0.199)
D.DenoMP	-3.119		-2.403	
	(2.900)		(2.825)	
LD.DenoMP	9.947***		10.156***	
	(3.166)		(2.908)	
LD2.DenoMP	-2.982		-1.975	
	(2.917)		(2.617)	
LD3.DenoMP	1.493		1.574	
	(1.991)		(1.956)	
L.ln_VIX	1.792	1.359	2.120	0.697
	(1.718)	(1.439)	(1.704)	(1.359)
LD.Lend_bcycle	-0.387	-0.329	-0.365	-0.217
	(0.450)	(0.453)	(0.438)	(0.445)
LD.Borr_bcycle	-0.891	-0.379	-0.577	0.047
	(0.688)	(0.689)	(0.604)	(0.625)
BorrBC	-0.530	-0.409	0.436**	0.396**
	(0.382)	(0.409)	(0.193)	(0.189)
BorrMP*BorrBC	-0.117	0.095	0.206	0.135
	(0.213)	(0.198)	(0.277)	(0.240)
L.BorrMP*BorrBC	-0.527**	-0.772***	-0.081	-0.013
	(0.236)	(0.228)	(0.297)	(0.299)
L2.BorrMP*BorrBC	-0.114	-0.257	0.486	0.265
	(0.223)	(0.218)	(0.344)	(0.318)
L3.BorrMP*BorrBC	0.101	-0.120	-0.583*	-0.409
	(0.186)	(0.148)	(0.334)	(0.280)
Observations	5,177	5,286	5,177	5,286
R-squared	0.016	0.013	0.018	0.012
Adj R2	0.005	0.003	0.007	0.003

See Table 8 for specification details.

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