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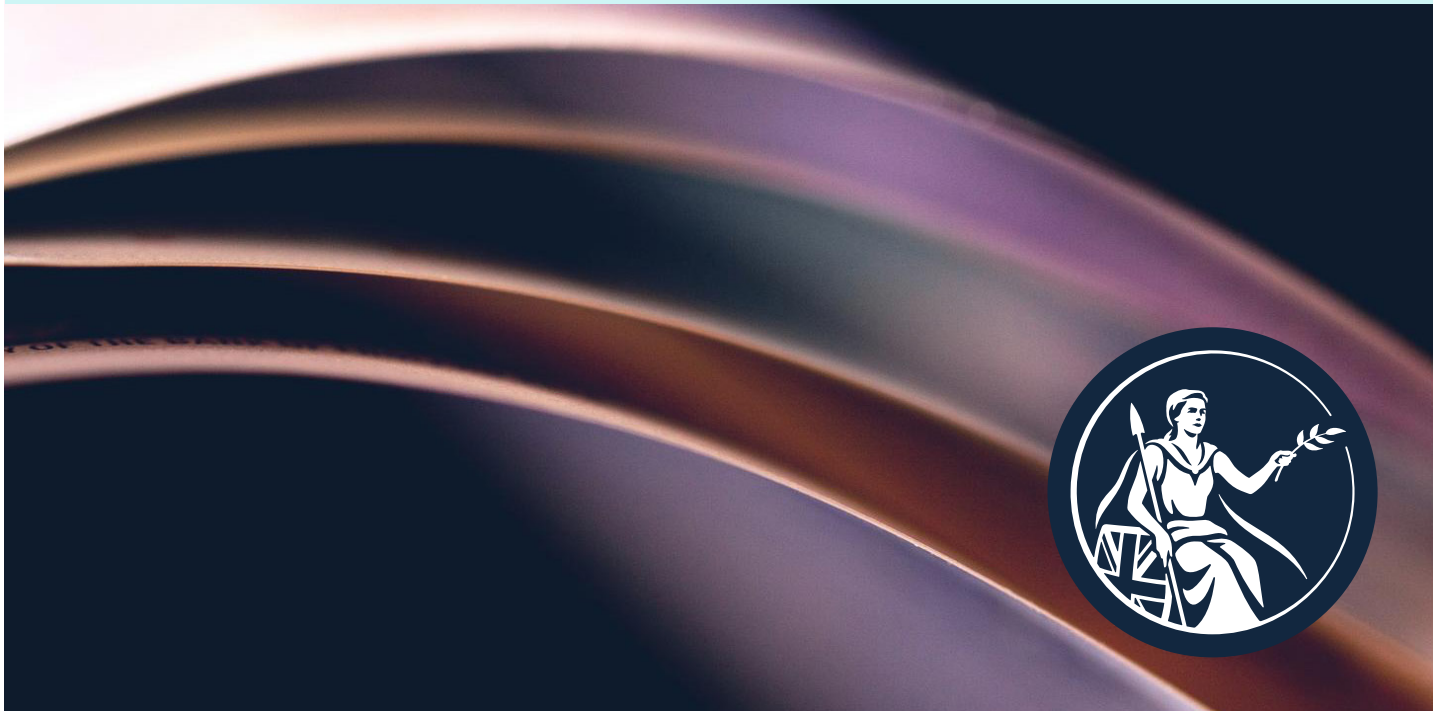

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Nonbank lenders as global shock absorbers: evidence from US monetary policy spillovers

David Elliott,[1] Ralf R Meisenzahl[2] and José-Luis Peydró[3]

Abstract

We show that nonbank lenders act as global shock absorbers from US monetary policy spillovers. For identification, we exploit loan-level data from the global syndicated lending market and US monetary policy surprises. We find that when US monetary policy tightens, nonbanks increase dollar credit supply to non-US firms (relative to banks), mitigating the reduction in dollar credit. This increase is stronger for riskier firms, proxied by emerging market firms, high-yield firms, or firms in countries with stronger capital inflow restrictions. However, these results are not driven by firm-lender matching, zombie lending, fragile-nonbank lending, or periods of low versus higher local GDP growth. Furthermore, the substitution from bank to nonbank credit has firm-level real effects. In sum, despite increased risk-taking by less regulated and more fragile nonbanks (relative to banks), access to nonbank credit reduces the volatility in capital flows – and associated economic activity – stemming from US monetary policy spillovers, with important implications for theory and policy.

Key words: Nonbank lending, international monetary policy spillovers, global financial cycle, banks, US dollar funding for non-US firms.

JEL classification: E5, F34, F42, G21, G23, G28.

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banking, the Banca d'Italia and Bocconi conference on financial stability and regulation, the Bank of Finland workshop on banking and institutions, the Royal Economic Society annual conference, the Federal Reserve conference on international roles of the dollar, and the BoE-BIS-IMF-ECB conference on international spillovers. Wharton Research Data Services (WRDS) and DealScan and Compustat data were used in preparing this paper.

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1 Introduction

Capital flows and credit growth are strongly correlated across countries (Calvo et al., 1996; Rey, 2013). Macroeconomic evidence suggests that this "global financial cycle" is largely driven by US monetary policy (Miranda-Agrippino and Rey, 2020): expansionary Federal Reserve monetary policy drives increases in lending and risky asset prices globally, while contractionary policy leads to a tightening of global financial conditions. Rapid credit growth—often driven by capital inflows—is also the best predictor of financial crises (Jorda et al., 2011; Schularick and Taylor, 2012). The potential for US monetary policy to affect credit conditions elsewhere has therefore been a source of significant concern for policymakers—especially those in emerging markets, where the spillover effects are most pronounced (Kalemli-Ozcan, 2019). Indeed, BIS General Manager Caruana (2012), Reserve Bank of India Governor Rajan (2014) and the IMF (2022) have highlighted the potential for US monetary policy spillovers to lead to financial stability risks and macroeconomic volatility globally.[1]

Existing literature has highlighted the role of the banking sector in propagating these spillovers. When US monetary policy tightens, international bank lending declines (Bruno and Shin, 2015a)—that is, there is an international bank lending channel of monetary policy. The effect is stronger for lending to riskier borrowers and emerging market borrowers (Morais et al., 2019; Bräuning and Ivashina, 2020), suggesting an international risk-taking channel.

However, *nonbank* financial intermediaries have grown in importance in recent decades, accounting for half of global financial assets as of 2021 (FSB, 2022). Despite this growth, there is scant evidence on how international lending by nonbanks responds to US monetary policy, and whether nonbanks propagate or absorb US monetary policy shocks.

In this paper, we fill this gap by studying how US monetary policy affects lending to non-US corporates by nonbanks, relative to banks (depository institutions). This is ultimately an empirical question, as different theories offer contrasting predictions. On the one hand, Bruno and Shin (2015a,b) argue that tighter US monetary policy weakens the balance sheets

[1]Federal Reserve policymakers have also debated the implications of US monetary policy spillovers: see, for example, Bernanke (2012), Powell (2013), and Fischer (2015).

of non-US firms with dollar liabilities. This could affect lending by banks and nonbanks in a similar way, suggesting that nonbanks could reinforce US monetary policy spillovers. On the other hand, evidence from the US shows that tighter monetary policy causes deposit funding to flow from banks to nonbanks via money market funds (Drechsler et al., 2017; Xiao, 2020), resulting in more nonbank lending (Drechsler et al., 2022; Elliott et al., 2022). In addition, tighter regulation implies that banks typically have lower risk tolerance than nonbanks (Buchak et al., 2018a; Irani et al., 2021), suggesting that nonbank lending could be less sensitive to changes in risk induced by US monetary policy. These factors suggest that nonbanks could attenuate the international bank lending and international risk-taking channels.

Empirically distinguishing between these predictions is challenging because US monetary policy might affect the credit *demand* of bank and nonbank borrowers differently. To identify credit *supply* effects, we therefore study the global syndicated lending market—a setting in which corporates borrow from multiple lenders (both banks and nonbanks) at the same time. This allows us to compare how banks and nonbanks lend to the same firm in the same period (even in the same loan), and how this varies with US monetary policy. Specifically, we use borrower-quarter fixed effects to control for time-varying borrower characteristics, including borrower-level credit demand (Khwaja and Mian, 2008; Chodorow-Reich, 2014). Our main sample covers 30 years (1990–2019) and borrowers in 121 countries.

A second challenge is that US monetary policy is not exogenous, but is affected by domestic and global economic conditions, which might themselves affect bank and nonbank credit supply. We address this challenge by instrumenting US monetary policy using the series of monetary policy *surprises* constructed by Jarociński and Karadi (2020).[2] We also control for local and global macroeconomic and financial conditions, which ensures that our results are not driven by local or global crises (Aldasoro et al., 2023).

We find that when US monetary policy tightens, nonbanks increase the supply of syndicated dollar credit to non-US corporates, relative to banks. The economic effect is large:

[2]We also use the uninstrumented Fed Funds rate and Wu and Xia (2016) shadow rate in robustness tests.

a 25 basis point monetary tightening is associated with a relative increase in nonbank loan size of around 5%. In other words, nonbank lenders attenuate the international transmission of US monetary policy. The relative increase in lending holds for both of the main types of nonbank lender in this market (investment banks and finance companies), US and non-US lenders, and within-border and cross-border dollar loans. The effect is driven by dollar loans specifically, with no significant increase in the supply of non-dollar loans, consistent with US monetary policy transmitting internationally via dollar funding markets.[3]

If the substitution is driven in part by higher risk tolerance of nonbanks relative to banks (Buchak et al., 2018a; Irani et al., 2021; Aldasoro et al., 2022), then we would expect it to be stronger for lending to riskier borrowers. Consistent with this idea, we find that the relative increase in nonbank lending is larger for borrowers from emerging markets and borrowers paying higher yields on their loans. Hence nonbank lenders also attenuate the international risk-taking channel of US monetary policy. However, the relative expansion of nonbank credit is not driven by particularly destabilising forms of lending: the increase is no larger for nonbank lenders with more fragile funding structures or for loans with shorter maturities, and is equally sustained during periods of low local GDP growth. The relative increase in nonbank credit is also no larger for loans to borrowers with lower ex-ante or ex-post profitability, suggesting that it is not driven by zombie lending.

One way in which countries can respond to volatility in capital flows is to implement capital inflow restrictions (IMF, 2022). These restrictions also create risk in lending for banks and nonbanks, so can be viewed as another proxy for borrower risk. Using the capital controls dataset of Fernández, Klein, Rebucci, Schindler, and Uribe (2016), we find that the reduction in bank credit supply following a US monetary tightening is larger for borrowers in countries with stronger capital inflow restrictions, and that the substitution from bank to nonbank credit is stronger for these borrowers. Like the previous results on emerging market borrowers and high-yield borrowers, these results are consistent with the idea that, in response to a US monetary tightening, banks retrench more from loans that involve greater

[3]When we expand the sample to include US borrowers in addition to non-US borrowers, we find that the strength of the substitution from bank to nonbank credit is equal across US and non-US borrowers.

frictions, while nonbanks are better able to continue providing these loans.

We next aggregate the loan-level dataset to the borrower-quarter level in order to study the overall strength of substitution from bank to nonbank credit. In line with our loan-level results, we find that when US monetary policy tightens, total bank lending to a given borrower falls, while total nonbank lending increases (both in absolute terms and as a share of total credit). However, total borrower-level credit falls, implying that the substitution from bank to nonbank credit is incomplete.

This incomplete substitution could reflect reduced credit demand. However it could also reflect informational frictions: the syndicated loan market relies on soft information (Sufi, 2007), and nonbank lenders make up a relatively small proportion of the primary market. They are therefore likely to focus their increased credit supply on borrowers about whom they have better information. To test this idea, we study whether credit supply increases more for firms that already have existing relationships with nonbank lenders. We find that when US monetary policy tightens, non-US firms that have previously borrowed from nonbanks are more likely to obtain a new dollar syndicated loan.[4] Matching the syndicated lending data to firm-level financial statements from Compustat Global, we find that firms with existing nonbank relationships also experience a relative increase in total balance sheet debt, suggesting that for firms without such relationships, it is more difficult to substitute for a reduction in syndicated credit supply from banks. Finally, the relative increase in credit supply has real economic effects, as firms with nonbank relationships relatively increase fixed assets and employment after a US monetary contraction.

Our findings are consistent with the funding-based mechanism proposed by Drechsler et al. (2017) and Xiao (2020), whereby tighter monetary policy causes deposit funding to flow from banks to nonbanks via money market funds. While those papers focus on the US, we provide indicative evidence that a similar mechanism operates at the international level. Specifically,

[4]In our loan-level regressions, adding borrower-quarter fixed effects does not change the estimated coefficient compared to regressions with borrower fixed effects only. This implies that unobserved time-varying borrower fundamentals (such as credit demand) are orthogonal to our main variable (the interaction between nonbank lenders and monetary policy). This suggests that—in our firm-level regressions where we cannot control for borrower-quarter fixed effects but only borrower fixed effects—our results reflect a credit supply mechanism.

using the BIS International Debt Securities dataset, we show that when US monetary policy tightens, nonbank financial intermediaries headquartered outside of the US increase short-term dollar debt issuance relative to banks, consistent with a relative improvement in dollar funding conditions for nonbanks.

Our results have important implications for theory and policy. Recent literature finds that nonbank credit supply in the syndicated loan market is more sensitive to funding market stress (Fleckenstein et al., 2021; Irani et al., 2021) and local economic shocks (Aldasoro et al., 2023). In contrast, we show that international nonbank credit supply is more stable than bank credit supply in response to US monetary policy tightening shocks. These findings suggest that US monetary policy spillovers are weaker once nonbank lenders are taken into account, and that firms and countries with better access to nonbank credit are less exposed to the capital flow volatility associated with the global financial cycle; hence nonbanks act as global shock absorbers. However, there may be an important financial stability trade-off between better access to credit during times of US monetary policy tightening, versus higher risk-taking in lending by less regulated and more fragile nonbanks (compared to banks).

Contributions to existing literature

Our paper contributes to the large recent literature on US monetary spillovers and the "global financial cycle" (Rey, 2013; McCauley et al., 2015; Bruno and Shin, 2015a,b; Bernanke, 2017; Kalemli-Ozcan, 2019; Avdjiev and Hale, 2019; Iacoviello and Navarro, 2019; Miranda-Agrippino and Rey, 2020). We complement these more macro-focused studies by providing micro evidence on the channels through which these spillovers occur. Our micro perspective allows us to show crucial heterogeneity in the response of different financial intermediaries—nonbank lenders vs. banks—to international spillovers from US monetary policy.

We also add to empirical literature studying the international transmission of shocks to financial intermediaries (Peek and Rosengren, 1997; Giannetti and Laeven, 2012; De Haas and Van Horen, 2013; Ongena et al., 2015; Doerr and Schaz, 2021), in particular monetary policy shocks (Cetorelli and Goldberg, 2012; Morais et al., 2019; Avdjiev et al., 2020; Bräuning and

Ivashina, 2020). Our finding that nonbanks increase international lending relative to banks in response to contractionary US monetary policy reflects recent evidence in the domestic US context (Drechsler et al., 2022; Elliott et al., 2022). This suggests that the mechanisms underlying the bank and nonbank lending channels of monetary policy identified in the US (Drechsler et al., 2017; Xiao, 2020) could also operate at the international level. Our results on risk-taking by banks and nonbanks are also related to the literature on the bank risk-taking channel of monetary policy, e.g. Rajan (2005); Allen and Rogoff (2011); Maddaloni and Peydró (2011); Borio and Zhu (2012); Jiménez et al. (2012, 2014); Dell'Ariccia et al. (2017).

Our paper also adds to a growing literature exploring the drivers and implications of the recent growth of nonbank credit intermediation (Pozsar et al., 2013; Moreira and Savov, 2017; Buchak et al., 2018a,b; Chen et al., 2018; Nelson et al., 2018; Fuster et al., 2019; Fleckenstein et al., 2021; Irani et al., 2021; Aldasoro et al., 2023). We extend this mostly US-focused literature by providing cross-country evidence, which highlights important differences in nonbank vs. bank lending across developed and emerging market economies, as well as differences in countries subject to stronger capital controls. Moreover, we highlight a setting where nonbank credit supply is more stable than bank credit supply.

The rest of the paper is structured as follows. Section 2 describes the international syndicated lending market and the datasets that we use, and discusses key differences between banks and nonbanks in this setting. Section 3 provides loan-level evidence on the differential response to US monetary policy by bank and nonbank lenders. Section 4 provides evidence on the impact of nonbank lending on firm-level credit and real outcomes. Section 5 provides suggestive evidence for the mechanism underlying our results. Section 6 concludes.

2 Empirical setting and data sources

2.1 The international syndicated lending market

To compare how international bank and nonbank lending responds to US monetary policy, we study the global syndicated lending market. Syndicated loans are loans extended to one borrower (primarily non-financial corporates) by multiple lenders (including both banks and nonbanks), making this an ideal setting to study how lending by different financial intermediaries responds to monetary policy. This market is a very significant source of cross-border credit: according to BIS data, syndicated loans comprised 30% of total global cross-border debt issuance in 2012:Q4, and 46% for emerging markets.[5]

We obtain loan-level data on global syndicated loan originations from Refinitiv LPC's DealScan dataset for the period 1990–2019. In a typical syndicated loan, the borrower takes out a "package" that includes several loan "facilities". The group of lenders is known as the syndicate, and includes at least one lead arranger, who negotiates the terms of the loan and recruits other lenders (known as participants) via a book-building process. DealScan provides detailed information on individual loan facilities, including the identity of the borrower, the identities of the lenders in the syndicate (including lead arrangers and participants), the type of facility (typically term loan or credit line), loan amount, maturity, currency, and interest rate. Following Roberts (2015), we drop observations that we identify as likely to be amendments to existing loans, because these do not necessarily involve new credit. We then collapse the dataset to the borrower-lender-currency-quarter level. In order to study firm-level outcomes, we collapse the dataset again to the borrower-quarter or borrower-year level. We convert all monetary variables to 2012 US dollars to avoid capturing any effects from inflation.

Since we are interested in international spillovers from US monetary policy, our main sample is dollar-denominated loans to borrowers headquartered outside of the US.[6] As shown in

[5] Following Gadanecz (2004) and De Haas and Van Horen (2013), we define total cross-border debt issuance as the sum of international syndicated lending (BIS Table 10), international money market instruments (Table 14A), and international bonds and notes (Table 14B).

[6] We drop borrowers in offshore centres, based on the BIS country classification.

Table 1, 65% of loans to non-US borrowers are denominated in the borrower's local currency. However foreign-currency loans are predominantly denominated in US dollars, reflecting the dominant position of the dollar in international trade and finance (Gopinath and Stein, 2021): 74% of foreign-currency loans to non-US borrowers are denominated in dollars, with this share rising to 84% for emerging market borrowers. Over our sample period, annual dollar-denominated loan issuance to non-US borrowers averages around $400bn, with fluctuations in aggregate issuance following a broadly pro-cyclical pattern (Figure 1, Panel A).

Classifying banks and nonbanks DealScan includes a lender classification, which allows us to classify most lenders as banks (depository institutions) or nonbanks. We classify the following DealScan lender types as banks: African bank, Asia-Pacific bank, Eastern European / Russian bank, foreign bank, Middle Eastern bank, mortgage bank, thrift / S&L, US bank, Western European bank, and unclassified lenders with the word "bank" in the name. All other types of lender are classified as nonbanks.[7] We manually reclassify a small number of important lenders that appear to be misclassified in DealScan. We drop international financial institutions (e.g. the World Bank) and development banks. In our main sample (dollar-denominated loans to non-US borrowers), of the lenders that we classify as banks and for which DealScan also provides an SIC code, 96% have two-digit SIC code 60 (depository institution) and 2% have four-digit SIC code 6712 (bank holding company).

In our main sample, nonbanks account for around 7% of loan originations (Figure 1, Panel B). But there is substantial variation in this share over time, with the nonbank share increasing to 13% in developed economies in 2004, and rising to 10% in emerging economies in 2018. While DealScan only provides information on the primary syndicated lending market, there is also an active secondary market, where nonbanks play a much larger role (Bord and Santos, 2012; Irani et al., 2021). Nonbanks lend to borrowers in all regions and industries, and participate in both of the main types of loan (term loans and credit lines). On average, they lend to riskier borrowers than banks (Aldasoro et al., 2022). We observe nonbank lenders headquartered in all regions of the world; most are based in developed economies (Table 2).

[7] We drop any remaining lenders for which DealScan does not provide a classification.

The large majority of nonbanks in the primary market are investment banks and finance companies, which account for around one-half and one-third of nonbank loan originations, respectively. Investment banks include securities underwriting firms and broker-dealers.[8] Finance companies are wholesale financial institutions that specialise in industrial lending, including the financial services arms of some large industrial conglomerates (e.g. General Electric Capital Corp and Siemens Financial Services). We also observe a small number of loan originations by institutional investors and other funds, but these investors are usually only active in the secondary market.

Key differences between banks and nonbanks Banks and nonbanks differ in important ways that could affect their responsiveness to monetary policy. First, banks typically receive much of their funding from retail depositors, whereas investment banks and finance companies are entirely reliant on wholesale funding. This difference in funding structure implies that relative funding conditions for banks and nonbanks are likely to be sensitive to monetary policy. In particular, focusing on the US, Drechsler et al. (2017) show that an increase in the Fed Funds rate causes deposits to flow out of banks, as banks' market power allows them to raise deposit rates by less than the Fed Funds rate and hence benefit from higher net interest margins. These deposits flow to shadow banks such as money market funds, which in turn provide funding to 'downstream' nonbank lenders via wholesale money markets (Xiao, 2020), resulting in an improvement in funding conditions for nonbank lenders relative to banks.

In addition, tighter regulation implies that banks typically have lower risk tolerance than nonbanks (Buchak et al., 2018a; Irani et al., 2021), suggesting that nonbank lending could be less sensitive to increases in risk when US monetary policy tightens.

Identifying credit supply effects An important challenge to identifying the differential credit *supply* response of banks and nonbanks to US monetary policy is that banks and nonbanks might lend to borrowers with different characteristics, and US monetary policy

[8] We classify lenders at the entity/subsidiary level, rather than the parent/group level. So the major US broker-dealers are classified as investment banks throughout, even though their parent companies became bank holding companies during our sample period.

might affect the credit *demand* of these borrowers differently. Two features of the syndicated lending market allow us to cleanly isolate the credit supply response.

First, syndicated loans are extended by multiple lenders to one borrower. This allows us to exploit within-borrower variation by comparing how different lenders lend to the same firm at the same time. Specifically, we use borrower-quarter fixed effects to control for time-varying borrower characteristics, including credit demand (Khwaja and Mian, 2008; Chodorow-Reich, 2014; Gao and Jang, 2021).[9]

Second, while the borrower chooses the lead arranger, the other lenders in the syndicate (participants) are selected in a book-building process run by the lead arranger, and are therefore not chosen by the borrower (Bruche et al., 2020). This ensures that the composition of the syndicate is supply-driven, and alleviates concerns that borrowers might vary their credit demand asymmetrically across lenders in response to credit demand shocks (Paravisini et al., 2015).

2.2 Other data sources

We match the DealScan syndicated lending dataset to several other data sources. Summary statistics for the variables used in the regressions are presented in Table 3.

Monetary policy measures We measure the stance of US monetary policy using the Federal Funds rate. The Fed Funds rate is not exogenous, because it is affected by domestic and global economic conditions which might themselves affect credit supply. We therefore instrument the Fed Funds rate using the series of US monetary policy shocks constructed by Jarociński and Karadi (2020). Jarocinski and Karadi use high-frequency changes in short-term interest rate derivatives prices around FOMC policy announcements to isolate unexpected shocks to monetary policy, and then use information from equity prices to purge these shocks from the effects of information about the economic outlook that is released alongside the policy announcements.

[9]Firms very rarely take out more than one loan package in the same quarter, so these borrower-quarter fixed effects are essentially loan package fixed effects.

The dependent variable in our loan-level regressions is based on the level of new loan issuance, which cannot easily be converted into changes because individual firms take out loans infrequently. We therefore use the level of the Fed Funds rate in our regressions, and to convert the Jarocinski-Karadi shock series into a level series we take the cumulative sum, in line with recent macro literature (Coibion, 2012; Ramey, 2016; Cloyne and Hürtgen, 2016; Bu et al., 2021; Döttling and Ratnovski, 2023).

In robustness tests, we run OLS regressions using the raw (uninstrumented) Fed Funds rate, as well as the shadow rate of Wu and Xia (2016), which adjusts the Fed Funds rate to incorporate the effects of unconventional monetary policy at the zero lower bound.

Macroeconomic control variables To control for local economic conditions in the borrower country and lender country, we collect quarterly country-level macroeconomic variables from the IMF's International Financial Statistics dataset: real GDP growth, CPI inflation, the monetary policy rate,[10] and quarterly exchange rate appreciation or depreciation against the dollar. We also collect data on other global factors typically associated with the global financial cycle (Bruno and Shin, 2015a,b; Rey, 2013; Miranda-Agrippino and Rey, 2020): the Federal Reserve dollar index, and the VIX (a measure of equity market volatility).

Capital controls To consider the impact of capital controls, we use the dataset of Fernández et al. (2016). This provides annual country-level measures of a range of capital flow restrictions for the period 1995–2019, based on the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).

Compustat In order to study firm-level real effects, we match DealScan to borrower-level financial statements from Compustat North America and Compustat Global using the updated link provided by Chava and Roberts (2008). We extend this link using a matching algorithm based on firm names, countries, and SIC codes, following an approach similar to Cohen et al. (2021).

[10] We use the central bank policy rate where available, and the money market rate, central bank discount rate, or short-term government bond rate otherwise.

Bank and nonbank funding flows To investigate changes in the liabilities side of bank and nonbank balance sheets, we collect country-level data on short-term dollar funding of non-US banks and nonbanks. For banks, we use the dataset on dollar deposits at non-US banks constructed by Levy Yeyati (2006), which provides annual country-level data for 1991–2009. For nonbanks, we use the BIS International Debt Securities dataset, which provides quarterly country-level data on international debt instruments issued by nonbank financial intermediaries for the period 1993–2019.

3 Loan-level results

In this section we use the loan-level syndicated lending data to estimate the differential response of international bank and nonbank credit supply to US monetary policy.

3.1 International bank lending

We start by estimating the response of international bank lending to US monetary policy. We drop nonbank lenders from the sample and estimate the following regression:

$$\text{Log(New credit)}_{b,l,t} = \alpha_b + \delta_l + \beta \text{Fed Funds}_{t-1} + \gamma \text{Macro controls}_{b,l,t-1} + \varepsilon_{b,l,t} \qquad (1)$$

where $\text{Log(New credit)}_{b,l,t}$ is the log of the total amount of new dollar syndicated credit extended by lender l to borrower b in quarter t. We measure US monetary policy using the lagged Fed Funds rate. We control for time-invariant borrower and lender characteristics using borrower fixed effects α_b and lender fixed effects δ_l. And we control for local macroeconomic conditions (one-quarter lags of GDP growth, inflation, monetary policy rate, and exchange rate appreciation) in both the borrower country and lender country; among other things, these variables control for local economic and financial crises. The sample consists of dollar-denominated loans from banks (in any country) to non-US borrowers from 1990 to 2019. We cluster standard errors by borrower, lender, and quarter.

First stage The Fed Funds rate is not exogenous, because it responds to economic conditions that are likely to also affect credit supply. We therefore instrument the Fed Funds rate using the cumulative sum of the US monetary policy shocks constructed by Jarociński and Karadi (2020). The first-stage regression corresponding to equation (1) is:

$$\text{Fed Funds}_{t-1} = \kappa_b + \eta_l + \phi \text{JK}_{t-1} + \lambda \text{Macro controls}_{b,l,t-1} + \omega_{b,l,t} \tag{2}$$

where JK_{t-1} is the cumulative sum of the Jarocinski-Karadi shocks. Regression results for several versions of this first-stage regression are reported in Table A1 in the Appendix. The cumulative Jarocinski-Karadi shocks are very highly predictive of the level of the Fed Funds rate, resulting in large Kleibergen and Paap (2006) F-statistics and implying that our setup does not suffer from a weak instruments problem (Stock and Yogo, 2005).

Main results Our main instrumental variable regression results for equation (1) are shown in Table 4. Consistent with existing evidence (Morais et al., 2019; Bräuning and Ivashina, 2020), we find that banks cut international lending in response to contractionary US monetary policy. This result holds across different sets of fixed effects and control variables (columns 1–4).[11] In our baseline regression including the full set of controls (column 4), we find that a 100 basis point monetary tightening is associated with a reduction in bank lending of around 12%.[12] Also consistent with existing studies, we find that the reduction in lending is larger for borrowers in emerging markets (column 5).[13]

In columns 6 and 7, we find that the estimated response to monetary policy is robust to controlling for other factors typically associated with the global financial cycle (with the coefficient estimate remaining very stable across specifications): the strength of the dollar (Bruno and Shin, 2015b), and financial market volatility (Bruno and Shin, 2015a; Rey, 2013). This suggests a direct transmission channel from US monetary policy to international bank

[11] The sample size drops considerably in column 4 because the full set of local macroeconomic control variables is not available for all countries in all time periods.

[12] In these regressions we do not yet include borrower-quarter fixed effects, so some of this reduction could reflect reduced credit demand. We introduce borrower-quarter fixed effects when we compare nonbank to bank lending below.

[13] In column 5, Fed Funds_{t-1} and $\text{Fed Funds}_{t-1} \times \text{EME}_b$ are instrumented with JK_{t-1} and $\text{JK}_{t-1} \times \text{EME}_b$.

lending.[14]

Overall these results suggest that banks transmit the effects of US monetary policy globally, and particularly to emerging markets. That is, there is an international bank lending channel and international risk-taking channel of US monetary policy.

3.2 International nonbank lending

We now add nonbank lenders to the sample to estimate how nonbanks respond to US monetary policy relative to banks. In Section 3.1 above, where we only include bank lenders, we control for borrower characteristics using borrower fixed effects. These fixed effects do not fully control for demand, because the credit demand of different borrowers is likely to change differently over time. However, once we add nonbank lenders to the sample, we observe both banks and nonbanks lending to the same borrower at the same time, meaning that we can now include borrower-quarter fixed effects to control for credit demand. That is, we can isolate differential credit supply effects by comparing how bank and nonbank credit provision to the same borrower varies with US monetary policy.

Our baseline regression specification is:

$$\text{Log(New credit)}_{b,l,t} = \alpha_{b,t} + \delta_l + \beta\,(\text{Nonbank}_l \times \text{Fed Funds}_{t-1}) + \gamma\text{Controls}_{b,l,t-1} + \varepsilon_{b,l,t} \quad (3)$$

where $\text{Log(New credit)}_{b,l,t}$ is the log of the total amount of new dollar syndicated credit extended by lender l to borrower b in quarter t. Nonbank_l is an indicator variable equal to one for nonbank lenders and zero for banks. The coefficient β therefore provides an estimate of how nonbank lending changes relative to bank lending when US monetary policy tightens. Borrower-quarter fixed effects $\alpha_{b,t}$ control for observed and unobserved time-varying borrower characteristics, including credit demand. Lender fixed effects δ_l control for time-invariant lender characteristics, such as business model. We also include lender country-quarter fixed effects to control for economic conditions in the lender country. Finally, we include interac-

[14]The result is also robust to controlling for the risk aversion and uncertainty indices of Bekaert et al. (2022).

tions between the nonbank lender indicator and a vector of lagged macroeconomic controls (GDP growth, inflation, monetary policy rate, exchange rate appreciation) for both the borrower country and lender country. The sample consists of dollar loans to non-US borrowers over 1990–2019. Standard errors are clustered by borrower, lender, and quarter.

First stage As before, we instrument the Fed Funds rate with the cumulative sum of Jarociński and Karadi (2020) monetary policy shocks. Specifically, the first-stage regression corresponding to equation (3) is:

$$\text{Nonbank}_l \times \text{Fed Funds}_{t-1} = \kappa_{b,t} + \eta_l + \phi\,(\text{Nonbank}_l \times \text{JK}_{t-1}) + \lambda \text{Controls}_{b,l,t-1} + \omega_{b,l,t} \quad (4)$$

where JK_{t-1} is the cumulative sum of the Jarocinski-Karadi shocks. Regression results for several versions of this first-stage regression are reported in Table A2 in the Appendix. Again, the first-stage regressions exhibit very high predictive power.

Main results Table 5 presents instrumental variable regression results for equation (3). We find that when US monetary policy tightens, nonbanks increase international lending relative to banks. In other words, nonbank lenders attenuate the international transmission of US monetary policy. This result is robust to including different sets of fixed effects and macroeconomic control variables (columns 1–4). And the effect is large: the coefficient estimate in our baseline specification including borrower-quarter fixed effects (column 4) suggests that a 100 basis point monetary policy tightening increases nonbank lending by nearly 20% relative to banks. Columns 5 and 6 show that the result is robust to controlling for the strength of the dollar and the VIX, which are other factors often associated with the global financial cycle.[15] The result is also robust to only including the 1990–2006 sample period (column 7). This implies that the result is not driven by the global financial crisis, nor by post-crisis regulatory changes such as the Volcker Rule or Basel III.

In column 8, we drop time fixed effects so that we can also include the uninteracted level

[15]The result is also robust to controlling for the risk aversion and uncertainty indices of Bekaert et al. (2022).

of the Fed Funds rate, which is again instrumented with the cumulative Jarocinski-Karadi shocks.[16] In this regression, the coefficient on Fed Funds$_{t-1}$ provides an estimate of the impact of a monetary tightening on lending by banks, while the coefficient on Nonbank$_l$ × Fed Funds$_{t-1}$ provides an estimate of the impact of a monetary tightening on lending by nonbanks relative to banks. Consistent with the results in Table 4, we find that a 100 basis point tightening leads to a reduction in bank lending of around 13%; column 8 suggests that nonbank lending is, in contrast, almost completely unaffected by the monetary tightening. That is, international nonbank lending is much more stable than bank lending in response to US monetary policy.[17]

3.3 Further robustness tests

We next disaggregate the data to understand whether our results are driven by a specific type of nonbank lender, a specific type of loan, or whether the lender is the syndicate lead. Table 6 shows the results of these robustness tests. In column 1, we keep only the two main types of nonbank lender—investment banks and finance companies, which account for around one-half and one-third of nonbank loan originations, respectively—and estimate separate coefficients for these two types. We find that the relative increase in credit supply holds for both types, and is of a very similar magnitude.[18] In column 2, we estimate separate coefficients for the two main types of loan facility—credit lines and term loans—and again find that the relative increase in nonbank credit supply holds for both types.[19] In column 3, we estimate separate coefficients for lenders that are lead arrangers in the loan versus lenders that are merely participants.[20] The relative increase in nonbank credit supply holds for both lead arrangers

[16] That is, Fed Funds$_{t-1}$ and Nonbank$_l$ × Fed Funds$_{t-1}$ are instrumented with JK$_{t-1}$ and Nonbank$_l$ × JK$_{t-1}$.

[17] We find some evidence that banks increase lending to nonbank lenders when US monetary policy tightens (results available on request). However this is a rare occurrence in our sample, so cannot be an important driver of our results.

[18] In particular, this suggests that our finding is unlikely to be related to non-loan aspects of the borrower-lender relationship. For example, if a lender also underwrites the borrower's bonds, then this could lead to conflicts of interest, informational economies of scope, or cross-selling. However, this situation would be much more likely for investment banks than finance companies. The fact that we find very similar results for both lender types therefore suggests that these factors are not driving our results.

[19] While nonbanks active in the secondary market (such as CLOs and mutual funds) typically specialise in term loans (Bord and Santos, 2012), the main nonbanks in the primary market are active in both loan types (Aldasoro et al., 2022).

[20] We identify lead arrangers following the classification in Bharath et al. (2011).

and participants, with a somewhat larger impact for lead arrangers. Taken together, these results suggest that our main finding is robust across lender and loan types.

Data on the quantity of credit provided by individual lenders is often missing in DealScan. In column 4, we therefore impute missing values of the dependent variable using an allocation algorithm proposed by De Haas and Van Horen (2013): for loans with missing lender quantities, we allocate half of the total loan quantity to the lead arrangers and half to the participants. This reflects the stylised fact that lead arrangers typically provide a larger quantity of credit than participants (Ivashina, 2009). We again find that nonbanks increase lending relative to banks when US monetary policy tightens.

All of the regressions presented so far measure US monetary policy using the Fed Funds rate instrumented by the cumulative Jarociński and Karadi (2020) shocks. In Table A3 in the Appendix, we consider alternative measures of US monetary policy. In columns 1 and 2, we estimate the OLS version of our baseline regression, i.e. we use the uninstrumented Fed Funds rate. We again observe a relative increase in nonbank lending when US monetary policy tightens. The estimated effect size is smaller when using OLS rather than IV; this could reflect the fact that the (uninstrumented) Fed Funds rate also reflects economic conditions, and so provides a noisier measure of the causal effects of monetary policy than the Jarocinski-Karadi shocks. In columns 3 and 4, we measure US monetary policy using the shadow rate of Wu and Xia (2016) (again using OLS), which incorporates the effects of unconventional monetary policy at the zero lower bound. Again, we find that a monetary tightening is associated with a relative increase in nonbank lending.

Finally, in columns 5 and 6, we return to our IV specification, but estimate separate coefficients for periods of Fed monetary tightening and loosening. Specifically, we define an indicator variable equal to one during periods when the Fed Funds target rate was being increased ("tightening cycles"), and another indicator variable equal to one during periods when the Fed Funds target rate was being reduced ("loosening cycles"), and interact our main variable of interest ($\text{Nonbank}_l \times \text{Fed Funds}_{t-1}$) with each of these indicators.[21] We find

[21] We drop periods when the target rate was held constant for a sustained period of time.

that the positive relationship between the Fed Funds rate and nonbank lending holds during both tightening and loosening cycles, although when we include our full set of controls, we observe a larger effect during tightening cycles (column 6).

3.4 Heterogeneity by currency and nationality

The sample considered so far consists of dollar-denominated loans to non-US borrowers. In Table 7, we explore how the relative response of banks and nonbanks to US monetary policy varies across currencies and borrower and lender nationalities.

If the relative increase in nonbank credit supply is driven by conditions in dollar funding markets, then we would expect it to primarily apply to dollar-denominated lending, rather than lending in other currencies. In column 1, we therefore expand the sample to include loans in all currencies to non-US borrowers.[22] Consistent with a mechanism involving dollar funding markets, the relative expansion in nonbank credit is driven by dollar lending specifically: we do not observe a statistically significant increase in lending in other currencies. The difference between the estimated coefficients for dollar and non-dollar loans is significant at the 5% level.

Meanwhile, columns 2–4 demonstrate that within dollar lending, our main result is very robust across borrower and lender nationalities. In column 2, the sample consists of dollar-denominated loans to borrowers in all countries, i.e. including US borrowers. We find that the relative increase in nonbank lending is very similar for international borrowers and domestic US borrowers. In columns 3 and 4, we return to our main sample of dollar loans to non-US borrowers. In column 3, we find that the relative increase in nonbank lending holds for both US and non-US lenders, with a somewhat larger effect for US lenders. In response to a 100 basis point US monetary tightening, US nonbanks increase lending by around 24% relative to US banks, while non-US nonbanks increase lending by around 15% relative to non-US banks. Finally, in column 4, we find that the effect is similar for within-border loans (defined as loans where the borrower and lender are headquartered in the same country) and cross-border loans, with relative increases in nonbank lending of around 15% and 20%,

[22] As for all monetary variables in our dataset, we convert non-dollar loans to 2012 dollar values.

respectively.[23]

3.5 Heterogeneity by borrower risk

The results above establish that nonbank credit substitutes for bank credit when US monetary policy tightens. One mechanism that could contribute to this substitution is differences in risk tolerance between banks and nonbanks. Tighter regulation implies that banks typically have lower risk tolerance than nonbanks (Buchak et al., 2018a; Irani et al., 2021), and nonbanks in this market lend to riskier borrowers on average (Aldasoro et al., 2022). This suggests that bank lending is likely to be more sensitive to increases in risk caused by US monetary policy tightening. Indeed, existing literature on the risk-taking channel of monetary policy demonstrates that banks reduce lending to riskier borrowers more when monetary policy tightens, both domestically (Jiménez et al., 2014; Dell'Ariccia et al., 2017) and internationally (Morais et al., 2019; Bräuning and Ivashina, 2020). If this mechanism is playing a role in driving our results, then we would expect the substitution from bank to nonbank credit to be stronger for riskier borrowers.

To test this hypothesis, we start by measuring risk at the country level. Specifically, in columns 1–3 of Table 8, we interact our main variable of interest ($\text{Nonbank}_l \times \text{Fed Funds}_{t-1}$) with an indicator variable for borrowers in emerging markets—which are those typically seen as most vulnerable to US monetary policy spillovers (Calvo et al., 1996; Kalemli-Ozcan, 2019).[24] We find that the relative increase in nonbank credit supply is substantially larger for emerging market borrowers. The coefficient estimates in column 3 suggest that when US monetary policy tightens by 100 basis points, nonbanks increase lending by around 15% for developed market borrowers and 23% for emerging market borrowers, relative to banks.

We next consider a borrower-level measure of risk that can vary within countries. Each year, we compute the median syndicated loan spread, and we define borrowers whose average loan spread is greater than the median as 'high yield.'[25] We find some evidence that the

[23] Around 80% of loans in our main sample (dollar loans to non-US borrower) are cross-border.

[24] We classify countries using the BIS Locational Banking Statistics classification.

[25] We use DealScan's all-in drawn spread, which includes fees and the spread over Libor paid on each dollar drawn.

relative increase in nonbank lending is larger for these high yield borrowers, although this result is sensitive to control variables (columns 4–6).

In short, the results in Table 8 suggest that the relative increase in nonbank credit supply is stronger for riskier borrowers, consistent with differences in risk tolerance between banks and nonbanks. That is, nonbanks attenuate the international risk-taking channel of US monetary policy.

An important question from a policy perspective is whether this increased risk-taking by nonbanks is likely to increase borrower vulnerabilities, and/or sustain 'zombie' firms. Table 9 presents suggestive evidence that this is not the case. In column 1, we include an interaction variable for nonbank lenders that typically have more fragile funding structures, i.e. a heavy reliance on short-term or runnable funding.[26] Such lenders might be less able to fulfil their commitments or roll-over funding in the event of stress. We find no evidence that the increase in lending is stronger for these more fragile nonbank lenders. In column 2, we test whether the increase in nonbank lending varies with the maturity of the loan: an increased reliance on short-term funding might make borrowers more vulnerable if capital flows dry up in the future. Again, we find no relationship between the expansion of nonbank lending and loan maturity.

In column 3, we test whether the relative increase in nonbank credit supply is sustained during periods of low local GDP growth: increased use of nonbank credit could be destabilising if the funding dries up when the economy is weak. Specifically, we add a triple interaction with an indicator variable equal to one for borrowers in countries whose GDP growth in the previous quarter is in the lowest quartile (we define GDP growth quartiles using the full sample). The estimated coefficient on this triple interaction term is very small and insignificant, suggesting that the relative increase in nonbank credit is similar during periods of weak versus higher local GDP growth.[27]

[26] Following Irani et al. (2021), these are defined as investment banks, hedge funds, and mutual funds. In our sample, this group is dominated by investment banks, because very few hedge funds and mutual funds appear in the primary market.

[27] We also estimate a positive coefficient on the double interaction between 'Nonbank lender' and 'Low GDP growth', implying that nonbanks lend more than banks when the borrower's country experiences low GDP growth, regardless of US monetary policy. However this positive coefficient estimate is not always robust to

Finally, in columns 4 and 5, we interact our main variable with measures of the borrower's ex-ante and ex-post profitability, specifically return-on-assets in the year before (column 4) and after (column 5) the loan. We find no evidence that the increase in nonbank credit supply is stronger for less profitable firms, suggesting that nonbanks are not increasingly engaging in zombie lending.[28]

3.6 Impact of capital controls

One way in which countries can respond to volatility in capital flows is to implement capital flow restrictions (IMF, 2022). The impact of capital controls on the responsiveness of international bank and nonbank lending to US monetary policy is conceptually uncertain. On the one hand, capital controls could dampen capital flows in general (Qureshi et al., 2011; Klein, 2012; Rey, 2013; Pasricha et al., 2018), and hence reduce the sensitivity of all financial intermediaries to US monetary policy. On the other hand, frictions introduced by capital controls could amplify the effects of changes in bank and nonbank funding conditions on lending.

To explore this question, we measure capital controls using the dataset of Fernández et al. (2016). Based on the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER), this dataset provides annual country-level measures of a range of capital flow restrictions for the period 1995–2019. We focus on financial credit inflow (fci) restrictions in the borrower country, which restrict the ability of corporates to obtain cross-border credit.

Specifically, we augment our baseline regressions for banks (equation (1)) and nonbanks (equation (3)) by adding interactions with an indicator variable for borrowers in countries that have financial credit inflow restrictions. Table 10 presents the results. The reduction in bank credit supply following a US monetary tightening is larger for borrowers subject to inflow restrictions (columns 1 and 2), and the relative increase in nonbank credit supply is

alternative definitions of low GDP growth, whereas the insignificant triple interaction is robust.

[28] We also find no relationship with an indicator variable for borrowers that are ex-ante or ex-post loss-making.

also larger for these borrowers (columns 3 and 4). These results are consistent with the idea that, faced with more challenging funding conditions following a US monetary tightening, banks retrench more from loans that involve greater frictions. Meanwhile, nonbanks—who experience an improvement in funding conditions relative to banks (see Section 5)—are better able to continue providing these loans.

In summary, our loan-level evidence suggests that nonbank lenders mitigate the reduction in international dollar credit supply when US monetary policy tightens. The relative increase in nonbank credit supply is stronger for riskier borrowers. But we find no evidence that it is associated with an increase in destabilising lending or zombie lending. Moreover, the substitution from bank to nonbank credit is stronger for borrowers in countries with capital inflow restrictions.

4 Firm-level results

The previous section establishes that when US monetary policy tightens, nonbanks increase the supply of dollar credit to non-US borrowers, relative to banks. In this section we first aggregate the loan-level dataset to the borrower-quarter level in order to study the overall strength of substitution from bank to nonbank credit. We then estimate firm-level real effects of the relative expansion of nonbank credit.

4.1 Firm-level credit

In order to estimate the overall strength of substitution from bank to nonbank credit, we aggregate to the borrower-quarter level by summing over total dollar credit, total dollar credit from banks, and total dollar credit from nonbanks. We estimate regressions of the form:

$$\text{Outcome}_{b,t} = \alpha_b + \beta \text{Fed Funds}_{t-1} + \gamma \text{Macro controls}_{b,t-1} + \varepsilon_{b,t}, \tag{5}$$

where $\text{Outcome}_{b,t}$ is a measure of total dollar credit at the borrower-quarter level; α_b is a borrower fixed effect; Fed Funds_{t-1} is the lagged Fed Funds rate (instrumented with the lagged

cumulative sum of Jarocinski-Karadi US monetary policy shocks); and Macro controls$_{b,t-1}$ is a vector of lagged macroeconomic variables for the borrower's country: GDP growth, inflation, the monetary policy rate, and exchange rate appreciation. The sample consists of non-US borrowers from 1990 to 2019. We cluster standard errors by borrower and quarter.

Estimated regression results for equation (5) are shown in Table 11. We find that when US monetary policy tightens, total dollar bank lending to a given borrower falls (columns 1 and 2), while total nonbank lending increases (columns 3 and 4), leading to an increase in the nonbank share of total dollar lending (columns 5 and 6). Column 6 suggests that a 100 basis point monetary tightening is associated with an increase in the nonbank share of 0.7 percentage points (this is a substantial increase, given that the mean nonbank share is 7.6%). That is, in line with our loan-level results, there is substitution from bank to nonbank credit at the borrower level. However, total borrower-level credit falls (columns 7 and 8), meaning that the substitution is incomplete.[29]

4.2 Nonbank relationships and firm-level outcomes

The incomplete substitution from banks to nonbanks documented above could reflect demand, since borrowers might reduce dollar credit demand when US monetary policy tightens. However it could also reflect informational frictions. Relationships are important in the syndicated lending market (Sufi, 2007). Lead arrangers monitor borrowers over time and share the information with other syndicate members, meaning that lenders accumulate soft information about their borrowers (Gustafson et al., 2021). Borrowers are therefore more likely to benefit from the relatively increased credit supply after a US monetary contraction if they already have relationships with nonbank lenders.

To test this idea, we measure past nonbank relationships by constructing an indicator variable equal to one for firms that have borrowed from nonbank lenders in a previous syndicated loan. We then match this firm-level variable to annual financial statements data from

[29]The dependent variables in columns 1–6 are only observed for loans where the individual lender quantities are observed, whereas the dependent variable in columns 7 and 8 is observed for all loans. This explains why the sample size is larger in columns 7 and 8.

Compustat Global, and estimate regressions of the following form at the firm-year level:[30]

$$\begin{aligned}\text{Outcome}_{b,t} = \alpha_b + \delta_{c,t} + \beta\,(\text{Nonbank relation}_{b,t} \times \text{Fed Funds}_{t-1}) \\ + \gamma_1\,(\text{Nonbank relation}_{b,t} \times \text{Macro controls}_{b,t-1}) + \gamma_2 \text{Firm controls}_{b,t-1} + \varepsilon_{b,t},\end{aligned} \tag{6}$$

where $\text{Nonbank relation}_{b,t}$ is our indicator variable for past nonbank lending relationships. We interact this variable both with the lagged Fed Funds rate and with a vector of lagged macroeconomic control variables for the firm's country. We instrument the interaction term $\text{Nonbank relation}_{b,t} \times \text{Fed Funds}_{t-1}$ with $\text{Nonbank relation}_{b,t} \times \text{JK}_{t-1}$, where JK_{t-1} is the lagged cumulative sum of Jarocinski-Karadi shocks. We control for local economic shocks with country-year fixed effects $\delta_{c,t}$. To control for firm characteristics, we include firm fixed effects α_b and lagged values of log(total assets), return-on-assets, and nonbank relation. The sample consists of non-US firms from 1991 to 2019. We only include firms that appear as borrowers in DealScan at least once: this is to ensure that we are comparing firms with or without nonbank relationships, rather than with or without access to the syndicated credit market in general. We drop financial services firms and utilities. Standard errors are clustered by firm and year.

Table 12 shows estimated regression results for equation (6) across a range of dependent variables. The dependent variable in column 1 is an indicator variable equal to one if the firm obtains a new dollar syndicated loan. We find that when US monetary policy tightens, non-US firms that have previously borrowed from nonbanks are more likely to obtain a new loan. A 100 basis point tightening is associated with a 2.1 percentage point increase in the probability of obtaining a new loan (mean = 6.8%). We do not, however find any significant effect on loan size conditional on obtaining a loan (column 2). That is, the relative increase in syndicated credit supply mainly occurs on the extensive margin, rather than the intensive margin.[31]

[30] We use annual rather than quarterly data because Compustat has better firm coverage at annual frequency, and only provides employment data at annual frequency.

[31] This implies that the total increase in credit supply via nonbanks is likely to be much larger than suggested by the results in Table 11, which only incorporate the intensive margin (i.e. lending quantities conditional on obtaining a loan).

The dependent variables in columns 3–7 are from Compustat Global. We find that a 100 basis point increase in US monetary policy is associated with a 4.6% increase in total balance sheet debt (column 3) and a 0.6 percentage point increase in leverage (column 4) for firms with nonbank relationships relative to firms without such relationships. This suggests that firms without nonbank relationships are unable to use other debt markets (such as bonds) to fully substitute for a reduction in syndicated credit supply.

This differential access to credit results in a relative expansion of total assets for firms with nonbank relationships (column 5). Finally, we find evidence that the relative increase in nonbank credit supply has significant real economic effects, as firms with existing nonbank lending relationships increase fixed assets (column 6) and employment (column 7) relative to firms without nonbank relationships.

In summary, the results in this section suggest that firms with existing relationships with nonbank lenders are better able to obtain new dollar syndicated loans when US monetary policy tightens, and that this improved access to credit is associated with relative growth in total assets, fixed assets, and employment.

5 Bank and nonbank funding flows

The sections above show that when US monetary policy tightens, the provision of dollar credit to non-US borrowers shifts from banks to nonbank lenders. This result holds for lenders headquartered both inside and outside of the US (Table 7, column 3). In Section 3.5, we show that the substitution is larger for loans to riskier borrowers, consistent with a role for differences in risk tolerance between banks and nonbanks in explaining our results. In this section, we provide suggestive evidence for an additional mechanism that could contribute to the substitution.

Conceptually, our results are consistent with the funding-based mechanism of Drechsler et al. (2017) and Xiao (2020). Following a monetary tightening, banks use their deposit market power to raise deposit rates by less than the Fed Funds rate and hence benefit from higher net interest margins. Meanwhile, shadow banks such as money market funds (MMFs),

who face a more yield-sensitive clientele, pass on the rate rise more fully. As a result, MMF yields increase relative to bank deposit rates, which causes deposits to flow from banks to MMFs. These MMFs in turn provide short-term funding to 'downstream' nonbank lenders via instruments such as commercial paper and repo, which enables nonbanks to increase real economy lending relative to banks. Drechsler et al. (2017) and Xiao (2020) provide granular evidence consistent with this mechanism in the domestic US context.

In Table 13, we provide indicative evidence that a similar mechanism operates at the international (non-US) level. We estimate country-level panel regressions of the form:

$$\Delta\text{Log(Funding)}_{c,t} = \alpha_c + \beta\Delta\text{Fed Funds}_t + \gamma\text{Macro controls}_{c,t-1} + \varepsilon_{c,t}, \tag{7}$$

where the dependent variable is the growth rate of a country-level measure of bank or nonbank funding (i.e. based on the liabilities side of financial intermediaries); α_c is a country fixed effect; $\Delta\text{Fed Funds}_t$ is the change in the Fed Funds rate (instrumented with the Jarocinski-Karadi monetary policy shocks); and $\text{Macro controls}_{c,t-1}$ is a vector of lagged country-level macroeconomic control variables: GDP growth, inflation, the monetary policy rate, and exchange rate appreciation. The sample consists of non-US countries (the sample period varies depending on data availability). We cluster standard errors by country and time (year or quarter).

In columns 1 and 2, the dependent variable is the annual growth rate of dollar deposits at non-US banks for the sample period 1991–2009, from the dataset of Levy Yeyati (2006). In columns 3–6, the dependent variable is the quarterly growth rate of short-term (up to one-year maturity) debt instruments issued by non-US nonbank financial intermediaries for the period 1993-2019, from the BIS International Debt Securities dataset. Columns 3 and 4 consider dollar debt instruments, whereas columns 5 and 6 consider non-dollar debt instruments.

We find that a US monetary tightening is associated with a small reduction in dollar deposit growth at non-US banks, although this effect is statistically insignificant (columns 1 and 2). Meanwhile, there is a significant increase in short-term dollar debt issued by non-US nonbanks (columns 3 and 4): a 100 basis point tightening is associated with an increase

in nonbank dollar debt issuance of around 11%. That is, in response to a US monetary tightening, short-term dollar funding of nonbanks increases relative to banks, consistent with the domestic US patterns documented by Drechsler et al. (2017) and Xiao (2020).

The increase in nonbank dollar debt issuance could be demand-driven (nonbanks seek more funding because they have improved investment opportunities) or supply-driven (dollar funding conditions improve for nonbanks). However, in columns 5 and 6, we find that there is no change in short-term *non-dollar* debt issuance by nonbanks. That is, the increase in nonbank debt issuance is specific to dollar debt, consistent with a supply-driven mechanism working through dollar funding markets.

6 Conclusions

Growing evidence that US monetary policy has important effects on financial conditions and economy activity globally (Rey, 2013; Bruno and Shin, 2015a; Miranda-Agrippino and Rey, 2020), and especially in emerging markets (Calvo et al., 1996; Kalemli-Ozcan, 2019), has inspired significant debate among policymakers—both in the "core" country (the US) from which the most significant monetary shocks emanate (Bernanke, 2012; Powell, 2013; Fischer, 2015) and in the emerging economies to which they flow (Rajan, 2014). Recent research has highlighted the role of an international *bank* lending channel and an international risk-taking channel in propagating these spillovers. We show that nonbank financial intermediaries attenuate both of these channels, implying that US monetary policy spillovers are weaker once nonbank lenders are taken into account. These findings suggest that firms and countries with better access to nonbank credit are less exposed to the capital flow volatility stemming from US monetary policy spillovers.

Our results have important implications for theory and policy, and suggest several areas for future research. First, in an international setting, we show that nonbank credit supply is more stable than bank credit supply in response to US monetary policy tightening, especially for riskier firms, emerging market firms, and firms in countries with stronger capital inflow restrictions. Policy and research should take this into account.

Second, several recent papers have found that nonbanks are more fragile in financial crises (Fleckenstein et al., 2021; Irani et al., 2021; Aldasoro et al., 2023). These papers and our results on increased nonbank risk-taking suggest the potential for important financial stability trade-offs. For example, when accessing nonbank credit, there may be a trade-off between improved access to credit during times of US monetary policy tightening, versus more fragility during financial crises, particularly given our finding that nonbanks (which are less regulated and more fragile than banks) focus their higher credit supply on riskier borrowers. Assessing the optimal mix of bank and nonbank credit is beyond the scope of this paper, but is a crucial area for future research to aid policy evaluation. Relatedly, further research is also required to understand the industrial organisation of nonbank lenders in international credit markets, including the implications of different capital and funding models.

Third, our results raise questions about the role and design of public interventions in credit markets where both banks and nonbanks are present, including restrictions on capital flows (Adrian, Gopinath, Gourinchas, Pazarbasioglu, and Weeks-Brown, 2022).

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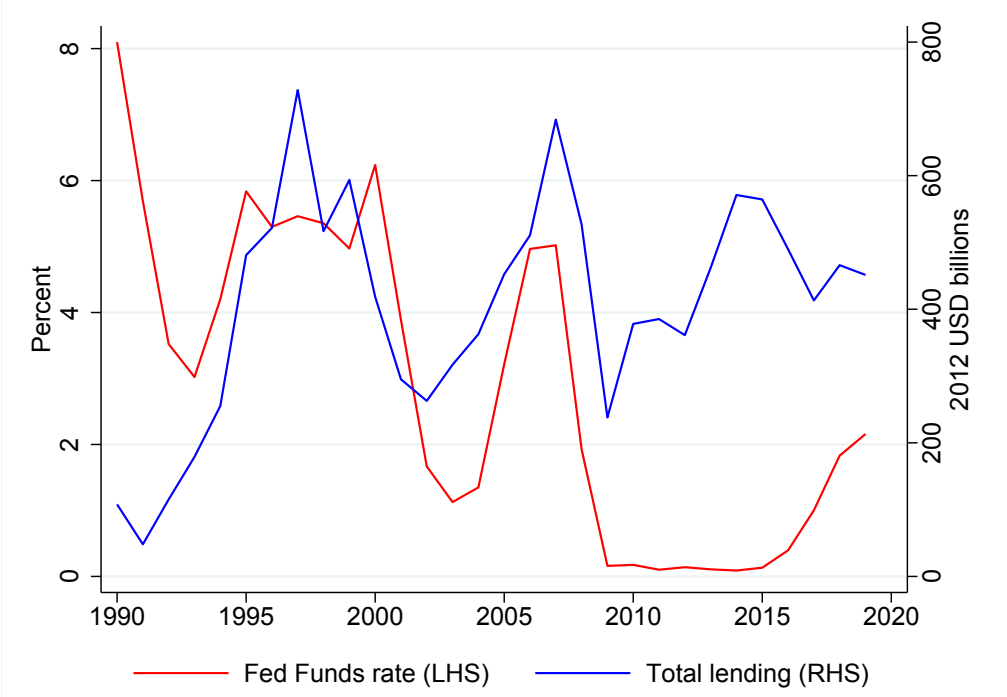
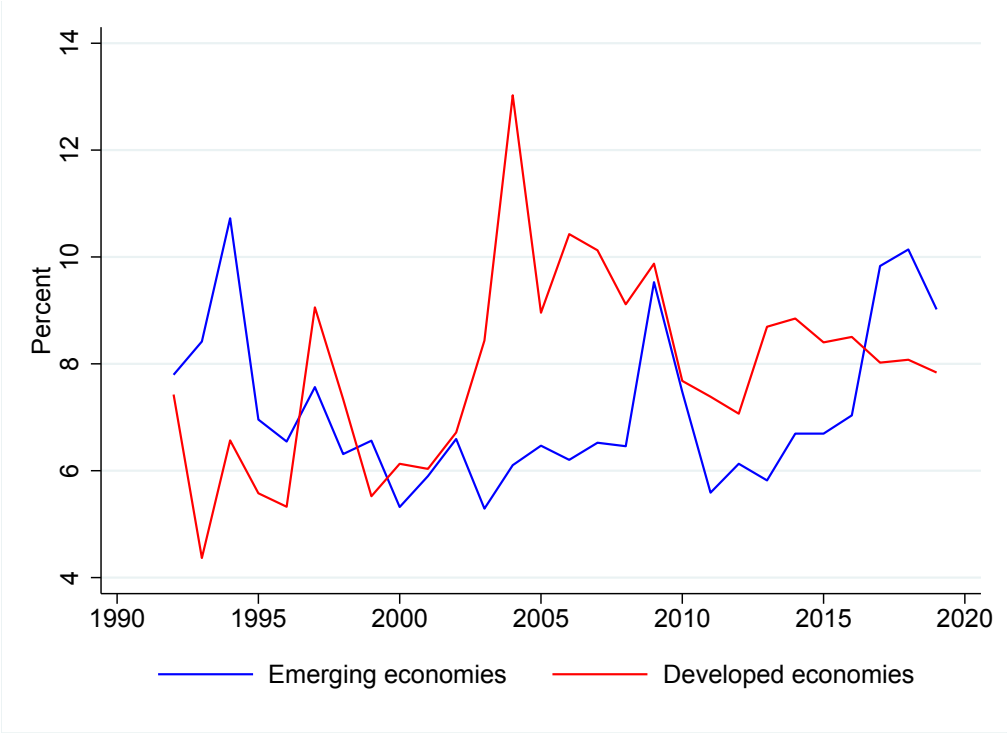
Figure 1: International dollar syndicated lending

(a) Total international dollar syndicated loan issuance



(b) Nonbank share of lending



Notes: Panel A shows annual total dollar-denominated syndicated lending to non-US borrowers. Panel B shows the nonbank share of lending (based on number of loan originations). The country classifications (emerging and developed) refer to the borrower country, and are based on the BIS Locational Banking Statistics classification. Offshore centres and observations identified as likely to be amendments to existing loans are dropped.
Source: DealScan.

Table 1: Borrowers and loans by borrower region

Region	# Borrowers	# Loans	Percent of loans in		
			Dollar	Local	Other
Developed economies					
Asia and Pacific	12,079	37,888	6	87	7
Europe	16,036	54,952	18	70	12
North America	2,851	8,787	40	57	3
TOTAL:	30,966	101,627	15	75	10
Emerging economies					
Africa and Middle East	1,741	4,628	69	18	13
Asia and Pacific	12,057	29,173	36	58	6
Europe	1,630	5,058	56	11	32
Latin America and Caribbean	2,272	4,980	88	11	2
TOTAL:	17,700	43,839	48	43	9
GLOBAL TOTAL:	48,666	145,466	25	65	9

Notes: The table shows the number of borrowers and loan facilities by borrower region, and the percentage of loan facilities denominated in US dollars, local currency (i.e. the currency of the borrower), and other currencies. The sample consists of loans to non-US borrowers over 1990–2019. The country classifications are based on the BIS Locational Banking Statistics classification. Offshore centres and observations identified as likely to be amendments to existing loans are dropped. Currency shares are based on number of loan facilities.
Source: DealScan.

Table 2: Lenders and loans by lender region

Region	Number of lenders		Number of loans	
	Bank	Nonbank	Bank	Nonbank
Developed economies				
Asia and Pacific	538	108	24,744	1,235
Europe	1,695	316	106,561	4,286
North America	870	693	37,583	8,902
TOTAL:	3,103	1,117	168,888	14,423
Emerging economies				
Africa and Middle East	350	65	10,004	617
Asia and Pacific	1,407	170	28,822	1,119
Europe	268	22	2,645	78
Latin America and Caribbean	232	34	2,694	291
TOTAL:	2,257	291	44,165	2,105
GLOBAL TOTAL:	5,360	1,408	213,053	16,528

Notes: The table shows the number of lenders and loan originations by lender region, split by lender type (bank or nonbank). The sample consists of dollar loans to non-US borrowers over 1990–2019. The country classifications are based on the BIS Locational Banking Statistics classification. Offshore centres and observations identified as likely to be amendments to existing loans are dropped.
Source: DealScan.

Table 3: Regression summary statistics

Statistic:	Obs	Mean	Std dev	p25	p50	p75
Macroeconomic variables						
Fed Funds effective rate	120	2.90	2.37	0.39	2.44	5.25
Jarocinski-Karadi shocks (cumulative sum)	118	-1.43	0.56	-1.82	-1.49	-0.98
Wu-Xia shadow rate	120	2.51	2.75	0.47	2.43	5.10
Dollar index	120	87.45	9.58	81.42	87.92	93.08
VIX	120	19.16	7.11	13.82	17.18	22.57
Loan-level variables						
Log(New credit amount)	60886	2.786	1.319	1.9	2.7	3.7
Log(New credit imputed amount)	182236	3.092	1.378	2.1	3.0	4.0
Nonbank lender	182535	0.069	0.254	0.0	0.0	0.0
Investment bank lender	182535	0.033	0.178	0.0	0.0	0.0
Finance company lender	182535	0.023	0.151	0.0	0.0	0.0
Unstable nonbank lender	182535	0.033	0.178	0.0	0.0	0.0
Lead arranger	182535	0.437	0.496	0.0	0.0	1.0
Participant	182535	0.563	0.496	0.0	1.0	1.0
Tightening cycle	182535	0.303	0.460	0.0	0.0	1.0
Loosening cycle	182535	0.220	0.414	0.0	0.0	0.0
US lender	182535	0.145	0.352	0.0	0.0	0.0
Within-border loan	182535	0.206	0.404	0.0	0.0	0.0
Cross-border loan	182535	0.794	0.404	1.0	1.0	1.0
EME borrower	182535	0.572	0.495	0.0	1.0	1.0
High yield borrower	126932	0.489	0.500	0.0	0.0	1.0
Log(Maturity)	171268	1.168	0.842	0.4	1.4	1.6
RoA_{t-1} (%)	73266	10.567	7.255	5.5	9.5	14.5
RoA_{t+1} (%)	74841	9.914	7.037	5.1	9.1	13.5
Capital inflow restrictions	146667	0.359	0.480	0.0	0.0	1.0
Quarterly borrower-level variables						
Log(Total borrowing)	27291	5.112	1.345	4.23	5.09	5.96
Log(Bank borrowing)	8367	4.552	1.497	3.62	4.56	5.49
Log(Nonbank borrowing)	8367	1.054	1.708	0.00	0.00	2.17
Nonbank share	8367	0.076	0.180	0.00	0.00	0.07
Annual borrower-level variables						
Past nonbank relationship	138934	0.251	0.434	0.00	0.00	1.00
New loan indicator	138934	0.068	0.251	0.00	0.00	0.00
Log(New credit)	9372	5.347	1.431	4.44	5.31	6.25
Log(Total debt)	128608	5.191	2.206	3.90	5.25	6.63
Leverage	134238	0.280	0.191	0.14	0.26	0.40
Log(Total assets)	134243	6.687	1.842	5.49	6.62	7.87
Log(PP&E)	133622	5.312	2.178	4.02	5.37	6.73
Log(Employment)	86590	1.062	1.867	-0.12	1.06	2.30
Country-level variables						
Log(Bank dollar deposits)	1,767	7.52	3.95	5.17	7.32	9.20
Log(Nonbank dollar debt)	1,872	6.49	2.21	5.03	6.67	8.08
Log(Nonbank non-dollar debt)	1,476	7.21	2.20	5.81	7.21	9.14

Notes: The table shows summary statistics for the variables used in the regressions. The sample consists of dollar loans to non-US borrowers over 1990–2019.

Table 4: Impact of US monetary policy on global lending by banks

Dependent variable:	Log(New credit amount)						
	(1)	(2)	(3)	(4)	(5)	(6)	7)
Fed Funds	-0.141***	-0.119***	-0.130***	-0.124***	-0.088***	-0.128***	-0.124***
	(0.014)	(0.010)	(0.016)	(0.022)	(0.032)	(0.023)	(0.022)
Fed Funds × EME borrower					-0.062*		
					(0.037)		
Dollar index						-0.004	
						(0.003)	
VIX							-0.001
							(0.004)
Lender fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower country fixed effects	No	Yes	-	-	-	-	-
Borrower industry fixed effects	No	Yes	-	-	-	-	-
Borrower fixed effects	No	No	Yes	Yes	Yes	Yes	Yes
Lender macro controls	No	No	No	Yes	Yes	Yes	Yes
Borrower macro controls	No	No	No	Yes	Yes	Yes	Yes
Observations	55,798	53,055	54,924	35,723	35,723	35,723	35,723
Number of borrowers	5,872	5,383	5,025	3,775	3,775	3,775	3,775
Number of lenders	2,475	2,414	2,446	1,921	1,921	1,921	1,921
Kleibergen-Paap F-statistic	3,989.0	3,706.4	1,213.0	735.3	348.1	818.3	793.1

Notes: The table shows instrumental variable regression results for equation (1) estimated at the borrower-lender-quarter level. The sample consists of dollar-denominated loans from banks (in any country) to non-US borrowers from 1990 to 2019. The dependent variable is the log of the total amount of new dollar syndicated credit extended by a lender to a borrower in a quarter. 'Fed Funds' is the lagged Fed Funds rate. 'EME borrower' is an indicator variable for borrowers headquartered in emerging markets, based on the BIS classification. 'Fed Funds' is instrumented with the lagged cumulative sum of Jarociński and Karadi (2020) US monetary policy shocks. 'Fed Funds × EME borrower' is instrumented with the interaction between 'EME borrower' and the lagged cumulative Jarocinski-Karadi shocks. 'Dollar index' is the lagged Federal Reserve US dollar index. 'VIX' is the lagged CBOE Volatility Index. Lender macro controls are one-quarter lags of the following variables for the country of the lender, obtained from the IMF: GDP growth, inflation, monetary policy rate, and exchange rate appreciation against the dollar. Similarly for borrower macro controls. Borrower industry is defined by four-digit SIC code. Standard errors are clustered by borrower, lender, and quarter, and shown in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

Table 5: Impact of US monetary policy on global lending by nonbanks relative to banks

Dependent variable:	Log(New credit amount)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Nonbank lender × Fed Funds	0.066***	0.105***	0.104***	0.188***	0.185***	0.182***	0.115**	0.114**
	(0.024)	(0.020)	(0.019)	(0.057)	(0.055)	(0.055)	(0.051)	(0.054)
Nonbank lender × Dollar index					-0.003			
					(0.003)			
Nonbank lender × VIX						0.004		
						(0.003)		
Fed Funds								-0.126***
								(0.022)
Lender fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower country fixed effects	Yes	-	-	-	-	-	-	-
Borrower industry fixed effects	Yes	-	-	-	-	-	-	-
Quarter fixed effects	Yes	Yes	-	-	-	-	-	No
Borrower fixed effects	No	Yes	-	-	-	-	-	Yes
Borrower × Quarter fixed effects	No	No	Yes	Yes	Yes	Yes	Yes	No
Lender country × Quarter fixed effects	No	No	No	Yes	Yes	Yes	Yes	No
Lender macro controls	No	No	No	-	-	-	-	Yes
Borrower macro controls	No	No	-	-	-	-	-	Yes
Lender macro controls × Nonbank	No	No	No	Yes	Yes	Yes	Yes	Yes
Borrower macro controls × Nonbank	No	No	No	Yes	Yes	Yes	Yes	Yes
Sample end	2019	2019	2019	2019	2019	2019	2006	2019
Observations	55,949	57,990	57,495	36,954	36,954	36,954	24,102	38,226
Number of borrowers	5,499	5,159	5,106	3,806	3,806	3,806	2,148	3,902
Number of lenders	2,661	2,692	2,675	2,047	2,047	2,047	1,498	2,140
Kleibergen-Paap F-statistic	230.2	256.0	248.1	36.4	51.3	40.0	84.2	12.4

Notes: The table shows instrumental variable regression results for equation (3) estimated at the borrower-lender-quarter level. The sample consists of dollar-denominated loans from banks and nonbank lenders (in any country) to non-US borrowers from 1990 to 2019 (1990 to 2006 in column 7). The dependent variable is the log of the total amount of new dollar syndicated credit extended by a lender to a borrower in a quarter. 'Nonbank lender' is an indicator variable equal to one for nonbank lenders and zero for banks. 'Fed Funds' is the lagged Fed Funds rate. 'Fed Funds' is instrumented with the lagged cumulative sum of Jarociński and Karadi (2020) US monetary policy shocks. 'Nonbank lender × Fed Funds' is instrumented with the interaction between 'Nonbank lender' and the lagged cumulative Jarocinski-Karadi shocks. 'Dollar index' is the lagged Federal Reserve US dollar index. 'VIX' is the lagged CBOE Volatility Index. Lender macro controls are one-quarter lags of the following variables for the country of the lender, obtained from the IMF: GDP growth, inflation, monetary policy rate, and exchange rate appreciation against the dollar. Similarly for borrower macro controls. Borrower industry is defined by four-digit SIC code. Standard errors are clustered by borrower, lender, and quarter, and shown in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

Table 6: Global lending by nonbanks relative to banks – further robustness tests

Dependent variable:	Log(New credit amount)			
Loan share:	Actual	Actual	Actual	Imputed
	(1)	(2)	(3)	(4)
Investment bank lender × Fed Funds	0.208**			
	(0.083)			
Finance company lender × Fed Funds	0.185***			
	(0.069)			
Nonbank lender × Fed Funds × Credit line		0.124**		
		(0.057)		
Nonbank lender × Fed Funds × Term loan		0.100*		
		(0.055)		
Nonbank lender × Fed Funds × Lead arranger			0.217***	
			(0.065)	
Nonbank lender × Fed Funds × Participant			0.147***	
			(0.057)	
Nonbank lender × Fed Funds				0.083**
				(0.033)
Lender fixed effects	Yes	Yes	Yes	Yes
Borrower × Quarter fixed effects	Yes	Yes	Yes	Yes
Lender country × Quarter fixed effects	Yes	Yes	Yes	Yes
Lender macro controls × Nonbank lender	Yes	Yes	Yes	Yes
Borrower macro controls × Nonbank lender	Yes	Yes	Yes	Yes
Lower-order interactions	-	Yes	Yes	-
Observations	36,615	31,301	36,954	128,722
Number of borrowers	3,780	3,280	3,806	10,252
Number of lenders	1,975	1,880	2,047	3,498
Kleibergen-Paap F-statistic	9.8	8.2	17.4	29.6

Notes: The table shows instrumental variable regression results for equation (3) estimated at the borrower-lender-quarter level. The sample consists of dollar-denominated loans from banks and nonbank lenders (in any country) to non-US borrowers from 1990 to 2019. In column 1, nonbank lenders that are neither investment banks nor finance companies are dropped. In column 2, loan facilities that are neither credit lines nor term loans are dropped. The dependent variable is the log of the total amount of new dollar syndicated credit extended by a lender to a borrower in a quarter. In column 4, missing values of the dependent variable are imputed using the approach of De Haas and Van Horen (2013). 'Nonbank lender' is an indicator variable equal to one for nonbank lenders and zero for banks. 'Investment bank lender' and 'finance company lender' are indicator variables for investment bank lenders and finance company lenders, respectively. 'Credit line' and 'term loan' are indicator variables for credit lines and term loans, respectively. 'Lead arranger' and 'participant' are indicator variables for lead arrangers and participant lenders, respectively. 'Fed Funds' is the lagged Fed Funds rate. All interactions involving the Fed Funds rate are instrumented with the corresponding interactions involving the lagged cumulative sum of Jarociński and Karadi (2020) US monetary policy shocks. Lender macro controls are one-quarter lags of the following variables for the country of the lender, obtained from the IMF: GDP growth, inflation, monetary policy rate, and exchange rate appreciation against the dollar. Similarly for borrower macro controls. Standard errors are clustered by borrower, lender, and quarter, and shown in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

Table 7: Global lending by nonbanks relative to banks – by currency and nationality

Dependent variable:	Log(New credit amount)			
	(1)	(2)	(3)	(4)
Nonbank lender × Fed Funds × Dollar loan	0.086***			
	(0.030)			
Nonbank lender × Fed Funds × Non-dollar loan	0.039			
	(0.029)			
Nonbank lender × Fed Funds × US borrower		0.344***		
		(0.086)		
Nonbank lender × Fed Funds × Non-US borrower		0.334***		
		(0.085)		
Nonbank lender × Fed Funds × US lender			0.239***	
			(0.062)	
Nonbank lender × Fed Funds × Non-US lender			0.153***	
			(0.058)	
Nonbank lender × Fed Funds × Within-border loan				0.145***
				(0.054)
Nonbank lender × Fed Funds × Cross-border loan				0.201***
				(0.057)
Lender fixed effects	Yes	Yes	Yes	Yes
Borrower × Quarter fixed effects	Yes	Yes	Yes	Yes
Lender country × Quarter fixed effects	Yes	Yes	Yes	Yes
Lender macro controls × Nonbank lender	Yes	Yes	Yes	Yes
Borrower macro controls × Nonbank lender	Yes	Yes	Yes	Yes
Lower-order interactions	Yes	Yes	Yes	Yes
Observations	124,171	140,999	36,954	36,954
Number of borrowers	15,848	11,430	3,806	3,806
Number of lenders	4,028	3,652	2,047	2,047
Kleibergen-Paap F-statistic	21.5	13.0	17.0	18.5

Notes: The table shows instrumental variable regression results for equation (3) estimated at the borrower-lender-quarter level, with additional interaction terms. The sample consists of loans in all currencies to non-US borrowers (column 1), dollar-denominated loans to borrowers in all countries (column 2), and dollar-denominated loans to non-US borrowers (columns 3 and 4). The sample period is 1990 to 2019. The dependent variable is the log of the total amount of new syndicated credit extended by a lender to a borrower in a quarter. 'Nonbank lender' is an indicator variable equal to one for nonbank lenders and zero for banks. 'Dollar loan' is an indicator variable for loans denominated in US-dollars. 'US borrower' is an indicator variable for borrowers headquartered in the US. 'US lender' is an indicator variable for lenders headquartered in the US. 'Within-border loan' is an indicator variable for loans where the borrower and lender are headquartered in the same country. 'Fed Funds' is the lagged Fed Funds rate. All interactions involving the Fed Funds rate are instrumented with the corresponding interactions involving the lagged cumulative sum of Jarociński and Karadi (2020) US monetary policy shocks. Lender macro controls are one-quarter lags of the following variables for the country of the lender, obtained from the IMF: GDP growth, inflation, monetary policy rate, and exchange rate appreciation against the dollar. Similarly for borrower macro controls. Standard errors are clustered by borrower, lender, and quarter, and shown in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

Table 8: Global lending by nonbanks relative to banks – by borrower risk

Dependent variable:	Log(New credit amount)					
	(1)	(2)	(3)	(4)	(5)	(6)
Nonbank lender × Fed Funds	0.078***	0.165***	0.146***	0.081***	0.187***	0.181***
	(0.021)	(0.061)	(0.052)	(0.018)	(0.062)	(0.059)
Nonbank lender × Fed Funds × EME borrower	0.040*	0.079***	0.086***			
	(0.022)	(0.029)	(0.027)			
Nonbank lender × Fed Funds × High yield borrower				0.039**	0.039*	0.020
				(0.018)	(0.023)	(0.023)
Lender fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Borrower × Quarter fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Lender country × Quarter fixed effects	No	No	Yes	No	No	Yes
Lender macro controls	No	Yes	-	No	Yes	-
Lender macro controls × Nonbank lender	No	Yes	Yes	No	Yes	Yes
Borrower macro controls × Nonbank lender	No	Yes	Yes	No	Yes	Yes
Lower-order interactions	Yes	Yes	Yes	Yes	Yes	Yes
Observations	57,495	37,753	36,954	47,845	30,331	29,597
Number of borrowers	5,106	3,857	3,806	3,822	2,772	2,743
Number of lenders	2,675	2,120	2,047	2,361	1,856	1,791
Kleibergen-Paap F-statistic	165.6	14.5	19.4	143.4	15.2	20.8

Notes: The table shows instrumental variable regression results for equation (3) estimated at the borrower-lender-quarter level, with additional interaction terms. The sample consists of dollar-denominated loans from banks and nonbank lenders (in any country) to non-US borrowers from 1990 to 2019. The dependent variable is the log of the total amount of new dollar syndicated credit extended by a lender to a borrower in a quarter. 'Nonbank lender' is an indicator variable equal to one for nonbank lenders and zero for banks. 'EME borrower' is an indicator variable for borrowers in emerging markets, based on the BIS classification. 'High yield borrower' is an indicator variable for borrowers whose average loan spread in the quarter is greater than the median. 'Fed Funds' is the lagged Fed Funds rate. All interactions involving the Fed Funds rate are instrumented with the corresponding interactions involving the lagged cumulative sum of Jarociński and Karadi (2020) US monetary policy shocks. Lender macro controls are one-quarter lags of the following variables for the country of the lender, obtained from the IMF: GDP growth, inflation, monetary policy rate, and exchange rate appreciation against the dollar. Similarly for borrower macro controls. Standard errors are clustered by borrower, lender, and quarter, and shown in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

Table 9: Global lending by nonbanks – no evidence of destabilising or zombie lending

Dependent variable:	Log(New credit amount)				
	(1)	(2)	(3)	(4)	(5)
Nonbank lender × Fed Funds	0.178***	0.162***	0.184***	0.166**	0.156**
	(0.055)	(0.050)	(0.057)	(0.069)	(0.068)
Nonbank lender × Fed Funds × Fragile nonbank lender	0.020				
	(0.044)				
Nonbank lender × Fed Funds × Log(Maturity)		0.021			
		(0.014)			
Nonbank lender × Fed Funds × Low GDP growth			0.012		
			(0.033)		
Nonbank lender × Low GDP growth			0.106*		
			(0.060)		
Nonbank lender × Fed Funds × RoA_{t-1}				-0.002	
				(0.002)	
Nonbank lender × Fed Funds × RoA_{t+1}					-0.002
					(0.003)
Lender fixed effects	Yes	Yes	Yes	Yes	Yes
Borrower × Quarter fixed effects	Yes	Yes	Yes	Yes	Yes
Lender country × Quarter fixed effects	Yes	Yes	Yes	Yes	Yes
Lender macro controls × Nonbank lender	Yes	Yes	Yes	Yes	Yes
Borrower macro controls × Nonbank lender	Yes	Yes	Yes	Yes	Yes
Lower-order interactions	Yes	Yes	-	Yes	Yes
Observations	36,954	36,300	36,954	14,924	15,570
Number of borrowers	3,806	3,715	3,806	1,358	1,376
Number of lenders	2,047	2,027	2,047	1,107	1,147
Kleibergen-Paap F-statistic	14.1	17.9	18.2	7.8	10.9

Notes: The table shows instrumental variable regression results for equation (3) estimated at the borrower-lender-quarter level, with additional interaction terms. The sample consists of dollar-denominated loans from banks and nonbank lenders (in any country) to non-US borrowers from 1990 to 2019. The dependent variable is the log of the total amount of new dollar syndicated credit extended by a lender to a borrower in a quarter. 'Nonbank lender' is an indicator variable equal to one for nonbank lenders and zero for banks. 'Fragile nonbank lender' is an indicator variable equal to one for investment banks, hedge funds, and mutual funds. 'Log(Maturity)' is the log of the loan maturity. 'Low GDP growth' is an indicator variable equal to one for borrowers in countries whose GDP growth in the previous quarter is in the lowest quartile (GDP growth quartiles are defined using the full sample). RoA_{t-1} and RoA_{t+1} are the borrower's return-on-assets in the year before and after the loan, respectively. 'Fed Funds' is the lagged Fed Funds rate. All interactions involving the Fed Funds rate are instrumented with the corresponding interactions involving the lagged cumulative sum of Jarociński and Karadi (2020) US monetary policy shocks. Lender macro controls are one-quarter lags of the following variables for the country of the lender, obtained from the IMF: GDP growth, inflation, monetary policy rate, and exchange rate appreciation against the dollar. Similarly for borrower macro controls. Standard errors are clustered by borrower, lender, and quarter, and shown in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

Table 10: Impact of capital controls on global bank and nonbank lending

Sample:	Bank lenders only		Bank and nonbank lenders	
Dependent variable:	Log(New credit amount)			
	(1)	(2)	(3)	(4)
Fed Funds	-0.066**	-0.076**		
	(0.030)	(0.034)		
Fed Funds × Capital inflow restrictions	-0.102***	-0.085**		
	(0.035)	(0.036)		
Nonbank lender × Fed Funds			0.060***	0.126**
			(0.016)	(0.057)
Nonbank lender × Fed Funds × Capital inflow restrictions			0.068***	0.094***
			(0.024)	(0.028)
Lender fixed effects	Yes	Yes	Yes	Yes
Borrower fixed effects	Yes	Yes	-	-
Borrower × Quarter fixed effects	No	No	Yes	Yes
Lender country × Quarter fixed effects	No	No	Yes	Yes
Lender macro controls	No	Yes	-	-
Borrower macro controls	No	Yes	-	-
Lender macro controls × Nonbank lender	No	No	No	Yes
Borrower macro controls × Nonbank lender	No	No	No	Yes
Lower-order interactions	Yes	Yes	Yes	Yes
Observations	41,127	31,071	42,289	32,035
Number of borrowers	3,983	3,348	4,003	3,370
Number of lenders	2,126	1,759	2,250	1,868
Kleibergen-Paap F-statistic	380.2	359.0	116.1	11.9

Notes: Columns 1 and 2 show instrumental variable regression results for equation (1), with additional interaction terms. Columns 3 and 4 show instrumental variable regression results for equation (3), with additional interaction terms. The regressions are estimated at the borrower-lender-quarter level. The sample consists of dollar-denominated loans from lenders (in any country) to non-US borrowers from 1990 to 2019. In columns 1 and 2 only bank lenders are included; in columns 3 and 4 both bank and nonbank lenders are included. The dependent variable is the log of the total amount of new dollar syndicated credit extended by a lender to a borrower in a quarter. 'Nonbank lender' is an indicator variable equal to one for nonbank lenders and zero for banks. 'Capital inflow restrictions' is an indicator variable for borrowers in countries that have financial credit inflow restrictions, using the measure of Fernández et al. (2016). 'Fed Funds' is the lagged Fed Funds rate. 'Fed Funds' is instrumented with the lagged cumulative sum of Jarociński and Karadi (2020) US monetary policy shocks. All interactions involving the Fed Funds rate are instrumented with the corresponding interactions involving the lagged cumulative Jarocinski-Karadi shocks. Lender macro controls are one-quarter lags of the following variables for the country of the lender, obtained from the IMF: GDP growth, inflation, monetary policy rate, and exchange rate appreciation against the dollar. Similarly for borrower macro controls. Standard errors are clustered by borrower, lender, and quarter, and shown in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

Table 11: Impact of US monetary policy on firm-level syndicated credit

Dependent variable:	Bank borrowing		Nonbank borrowing		Nonbank share		Total borrowing	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fed Funds	-0.109***	-0.066**	0.031*	0.070^{+}	0.003*	0.007**	-0.022**	-0.052***
	(0.018)	(0.026)	(0.018)	(0.043)	(0.002)	(0.003)	(0.010)	(0.013)
Country fixed effects	Yes	-	Yes	-	Yes	-	Yes	-
Borrower fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,578	2,891	6,578	2,891	6,578	2,891	22,543	13,672
Number of borrowers	4,681	994	4,681	994	4,681	994	12,850	3,979
Kleibergen-Paap F-statistic	225.0	302.9	225.0	302.9	225.0	302.9	206.5	250.4

Notes: The table shows instrumental variable regression results for equation (5) estimated at the borrower-quarter level. The sample consists of non-US firms from 1990 to 2019. The dependent variable is the log of the total amount of new dollar syndicated credit from banks (columns 1 and 2), the log of the total amount of new dollar syndicated credit from nonbanks (column 3 and 4), the nonbank share of new dollar syndicated credit (column 5 and 6), and the log of the total amount of new dollar syndicated credit (column 7 and 8). The dependent variable in columns 7 and 8 is based on all loans, whereas the dependent variables in columns 1–6 are based only on loans where individual lender quantities are observed. 'Fed Funds' is the lagged Fed Funds rate. This is instrumented with the lagged cumulative sum of Jarociński and Karadi (2020) US monetary policy shocks. Macro controls are one-quarter lags of the following variables for the country of the borrower, obtained from the IMF: GDP growth, inflation, monetary policy rate, and exchange rate appreciation against the dollar. Standard errors are clustered by borrower and quarter, and shown in parentheses. $^{+}$, *, **, and *** indicate significance at 11%, 10%, 5% and 1%, respectively.

Table 12: Impact of past nonbank relationships on firm-level outcomes

Dependent variable:	Loan indicator	Loan size	Total debt	Leverage	Total assets	PP&E	Employment
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Nonbank relation × Fed Funds	0.021***	0.017	0.046***	0.006**	0.008**	0.014*	0.014*
	(0.007)	(0.029)	(0.015)	(0.002)	(0.004)	(0.008)	(0.008)
Borrower fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country × Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls × Nonbank relation	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	110,347	4,854	104,608	109,305	109,310	108,864	79,954
Number of borrowers	6,834	1,274	6,741	6,787	6,787	6,780	6,184
Kleibergen-Paap F-statistic	16.8	239.8	17.1	16.7	16.7	16.8	14.2

Notes: The table shows instrumental variable regression results for equation (6) estimated at the borrower-year level. The sample consists of non-US firms from 1991 to 2019, excluding financial services, utilities, and firms that never appear as borrowers in DealScan. The dependent variables in columns 1 and 2 are from DealScan: indicator variable equal to one if the firm obtains a new dollar syndicated loan (column 1); and log of the total amount of new dollar syndicated credit, conditional on obtaining a new loan (column 2). The dependent variables in columns 3–7 are from Compustat Global: log of total debt (column 3); leverage (column 4); log of total assets (column 5); log of property, plant, and equipment (column 6); and log of employment (column 7). 'Nonbank relation' is an indicator variable equal to one for firms that have borrowed from nonbank lenders in the syndicated credit market in a previous year. 'Fed Funds' is the lagged Fed Funds rate. 'Nonbank relation × Fed Funds' is instrumented with the interaction between 'Nonbank relation' and the lagged cumulative sum of Jarociński and Karadi (2020) US monetary policy shocks. Borrower controls are lags of log(total assets), return-on-assets, and nonbank relation. Macro controls are lags of the following variables for the country of the borrower, obtained from the IMF: GDP growth, inflation, monetary policy rate, and exchange rate appreciation against the dollar. Standard errors are clustered by borrower and year, and shown in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

Table 13: Impact of US monetary policy on dollar funding of non-US banks and nonbanks

Dependent variable:	ΔLog(Bank dollar deposits)		ΔLog(Nonbank dollar debt)		ΔLog(Nonbank non-dollar debt)	
	(1)	(2)	(3)	(4)	(5)	(6)
ΔFed Funds	-0.010	-0.011	0.114***	0.110***	0.000	-0.015
	(0.009)	(0.009)	(0.029)	(0.036)	(0.117)	(0.125)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country macro controls	No	Yes	No	Yes	No	Yes
Observations	1,627	1,080	1,747	1,636	1,377	1,330
Kleibergen-Paap F-statistic	168.2	178.5	21.9	20.8	18.7	23.2

Notes: The table shows instrumental variable regression results for equation (7) estimated at the country-year level (columns 1 and 2) or country-quarter level (columns 3–6). The sample consists of non-US countries from 1991 to 2009 (columns 1 and 2) or 1993 to 2019 (columns 3–6). The dependent variable is the growth rate of dollar deposits at non-US banks (columns 1 and 2), growth rate of short-term dollar debt instruments issued by non-US nonbank financial intermediaries (columns 3 and 4), or growth rate of short-term non-dollar debt instruments issued by non-US nonbank financial intermediaries (column 5 and 6). 'ΔFed Funds' is the change in the Fed Funds rate. This is instrumented with the Jarociński and Karadi (2020) US monetary policy shocks. Macro controls are lags of the following country-level variables, obtained from the IMF: GDP growth, inflation, monetary policy rate, and exchange rate appreciation against the dollar. Standard errors are clustered by country and year (columns 1 and 2) or country and quarter (columns 3–6), and shown in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

APPENDIX

Table A1: Selected first-stage regressions for banks

Dependent variable:	Fed Funds			
	(1)	(2)	(3)	(4)
JK monetary policy shocks	3.980***	4.002***	4.340***	4.295***
	(0.219)	(0.216)	(0.211)	(0.244)
Lender fixed effects	Yes	Yes	Yes	Yes
Borrower country fixed effects	No	Yes	-	-
Borrower industry fixed effects	No	Yes	-	-
Borrower fixed effects	No	No	Yes	Yes
Lender macro controls	No	No	No	Yes
Borrower macro controls	No	No	No	Yes
Observations	55,798	53,055	54,924	35,723
Number of borrowers	5,872	5,383	5,025	3,775
Number of lenders	2,475	2,414	2,446	1,921
R^2	0.750	0.780	0.919	0.930
Kleibergen-Paap F-statistic	3,989.0	3,706.4	1,213.0	735.3

Notes: The table shows regression results for equation (2). These are the first-stage regressions corresponding to columns 1–4 of Table 4. The regressions are estimated at the borrower-lender-quarter level. The sample consists of dollar-denominated loans from banks (in any country) to non-US borrowers from 1990 to 2019. 'Fed Funds' is the Fed Funds rate. 'JK' is the cumulative sum of Jarociński and Karadi (2020) US monetary policy shocks. Lender macro controls are one-quarter lags of the following variables for the country of the lender, obtained from the IMF: GDP growth, inflation, monetary policy rate, and exchange rate appreciation against the dollar. Similarly for borrower macro controls. Borrower industry is defined by four-digit SIC code. Standard errors are clustered by borrower, lender, and quarter, and shown in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

Table A2: Selected first-stage regressions for nonbanks

Dependent variable:	Nonbank lender × Fed Funds			
	(1)	(2)	(3)	(4)
Nonbank lender × JK monetary policy shocks	3.862***	3.990***	3.993***	2.214***
	(0.339)	(0.336)	(0.344)	(0.443)
Lender fixed effects	Yes	Yes	Yes	Yes
Borrower country fixed effects	Yes	-	-	-
Borrower industry fixed effects	Yes	-	-	-
Quarter fixed effects	Yes	Yes	-	-
Borrower fixed effects	No	Yes	-	-
Borrower × Quarter fixed effects	No	No	Yes	Yes
Lender country × Quarter fixed effects	No	No	No	Yes
Lender macro controls × Nonbank lender	No	No	No	Yes
Borrower macro controls × Nonbank lender	No	No	No	Yes
Observations	55,949	57,990	57,495	36,954
Number of borrowers	5,499	5,159	5,106	3,806
Number of lenders	2,661	2,692	2,675	2,047
R^2	0.764	0.795	0.809	0.902
Kleibergen-Paap F-statistic	230.2	256.0	248.1	36.4

Notes: The table shows regression results for equation (4). These are the first-stage regressions corresponding to columns 1–4 of Table 5. The regressions are estimated at the borrower-lender-quarter level. The sample consists of dollar-denominated loans from banks and nonbank lenders (in any country) to non-US borrowers from 1990 to 2019. 'Fed Funds' is the Fed Funds rate. 'JK' is the cumulative sum of Jarociński and Karadi (2020) US monetary policy shocks. 'Nonbank lender' is an indicator variable equal to one for nonbank lenders and zero for banks. Lender macro controls are one-quarter lags of the following variables for the country of the lender, obtained from the IMF: GDP growth, inflation, monetary policy rate, and exchange rate appreciation against the dollar. Similarly for borrower macro controls. Borrower industry is defined by four-digit SIC code. Standard errors are clustered by borrower, lender, and quarter, and shown in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

Table A3: Alternative monetary policy measures

Dependent variable:	Log(New credit amount)					
Estimation:	OLS	OLS	OLS	OLS	IV	IV
	(1)	(2)	(3)	(4)	(5)	(6)
Nonbank lender × Fed Funds	0.049***	0.037**				
	(0.014)	(0.017)				
Nonbank lender × Wu-Xia			0.046***	0.035***		
			(0.011)	(0.013)		
Nonbank lender × Fed Funds × Tightening					0.130***	0.210***
					(0.041)	(0.079)
Nonbank lender × Fed Funds × Loosening					0.132***	0.132*
					(0.042)	(0.070)
Lender fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Borrower × Quarter fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Lender country × Quarter fixed effects	No	Yes	No	Yes	No	Yes
Lender macro controls × Nonbank lender	No	Yes	No	Yes	No	Yes
Borrower macro controls × Nonbank lender	No	Yes	No	Yes	No	Yes
Lower-order interactions	-	-	-	-	Yes	Yes
Observations	57,872	37,129	57,856	37,123	27,349	17,639
Number of borrowers	5,140	3,819	5,139	3,818	2,610	1,940
Number of lenders	2,687	2,054	2,687	2,054	1,824	1,376
R^2	0.878	0.892	0.878	0.892	-	-
Kleibergen-Paap F-statistic	-	-	-	-	171.5	24.2

Notes: The table shows regression results for equation (3) estimated at the borrower-lender-quarter level. The sample consists of dollar-denominated loans from banks and nonbank lenders (in any country) to non-US borrowers from 1990 to 2019. The dependent variable is the log of the total amount of new dollar syndicated credit extended by a lender to a borrower in a quarter. 'Nonbank lender' is an indicator variable equal to one for nonbank lenders and zero for banks. 'Fed Funds' is the lagged Fed Funds rate. 'Wu-Xia' is the lagged US shadow rate of Wu and Xia (2016). In columns 1–4, the regressions are estimated by OLS. In columns 5 and 6, interactions involving the Fed Funds rate are instrumented with the corresponding interactions involving the lagged cumulative sum of Jarociński and Karadi (2020) US monetary policy shocks. 'Tightening' and 'loosening' are indicator variables for quarters when the Federal Reserve was raising or lowering the Federal Funds target rate, respectively. Lender macro controls are one-quarter lags of the following variables for the country of the lender, obtained from the IMF: GDP growth, inflation, monetary policy rate, and exchange rate appreciation against the dollar. Similarly for borrower macro controls. Standard errors are clustered by borrower, lender, and quarter, and shown in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.