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A Global Lending Channel Unplugged?

Does U.S. Monetary Policy Affect Cross-border and Affiliate Lending by Global U.S. Banks?

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A Global Lending Channel Unplugged?

Does U.S. Monetary Policy Affect Cross-border and Affiliate Lending by Global U.S. Banks?

Abstract: We examine how U.S. monetary policy affects the international activities of U.S. Banks. We access a rarely studied U.S. bank-level regulatory dataset to assess at a quarterly frequency how changes in the U.S. Federal funds rate (before the crisis) and quantitative easing (after the onset of the crisis) affects changes in cross-border claims by U.S. banks across countries, maturities and sectors, and also affects changes in claims by their foreign affiliates. We find robust evidence consistent with the existence of a potent global bank lending channel. In response to changes in U.S. monetary conditions, U.S. banks strongly adjust their cross-border claims in both the pre and post-crisis period. However, we also find that U.S. bank affiliate claims respond mainly to host country monetary conditions. (124 words)

Keywords: bank lending channel; monetary transmission; global banking; cross-country analysis

JEL classification: E44; E52; F42; G15; G21

1. Introduction

In today's globally interconnected financial system, the effects of a central bank's actions reach far beyond national borders. Monetary policy, in particular, can affect local and international financial markets in numerous ways: via interest rates, asset prices, and the availability of credit. These monetary effects can then feed into the real side of the economy.

While the impact of monetary policy on the supply of credit in the domestic economy has been widely analyzed (Bernanke and Blinder (1992), Kashyap and Stein (2000), Jiménez et al. (2012)), recent attention has turned to the impact of monetary policy on the supply of credit to borrowers located abroad. The rise of global banks, i.e., banks which lend to borrowers cross-border or maintain foreign affiliates in many other countries, over the past two decades has added a sense of urgency to the study of potential "global" bank lending channels. Following monetary easing at home, global banks can both increase cross-border flows to other countries via the external capital market and send funds to their foreign affiliates via the internal capital market.

Recent empirical work (*à la* Peek and Rosengren (1997)) has shown that globally active U.S. banks have relied on both these channels in response to domestic financial (Cetorelli and Goldberg (2011), Cetorelli and Goldberg (2012b)) and monetary policy shocks (Cetorelli and Goldberg (2012a)). The utilization of both the external and internal capital markets implies that U.S. banks actively reallocate claims between the U.S. and other countries.[1] As such, the global banks' reliance on these channels not only reduces the domestic impact of the bank lending channel of monetary policy, but also spreads U.S. monetary policy effects abroad. In light of the well-established benefits of developed-country banks' lending in emerging markets (Goldberg (2007)), the expansion of U.S. bank claims abroad in times of U.S. monetary easing can have beneficial effects on recipient economies.

[1] The majority of U.S. banks' cross-border claims is made up of loans and leases and deposits with foreign banks. These claims also include repurchase agreements, guarantees and Treasury securities.

In the absence of capital controls, profit-maximizing global banks can reallocate funds across borders to their most efficient use. With the globalization of banking, global U.S. banks now have the ability to optimize their portfolio by channeling domestic funds to their subsidiaries or unaffiliated borrowers in foreign countries. Doing so, they can enjoy investment prospects, diversification and risk management benefits beyond the opportunities available within the U.S.. This reallocation of funds following changes in domestic monetary conditions has been documented within global banks and between the banking systems of various countries. In this paper, we add to the literature by examining the transmission of U.S. domestic monetary policy to a broad range of other countries, through changes in cross-border and affiliate bank exposures at the host country-bank level.[2]

We are first to utilize the full dimensionality of the bank-level Country Exposure reports, a unique regulatory dataset on individual U.S. banks' foreign claims, to study the cross-border bank lending

[2] Closest related to our paper in this respect are Cetorelli and Goldberg (2012a) and Correa et al. (2015). Cetorelli and Goldberg (2012a) use U.S. bank-level data to examine the impact of U.S. monetary policy on global U.S. banks' foreign lending. While we study the external capital markets in detail, they focus on the specifics of banks' internal capital markets. Accordingly, they look at how U.S. monetary policy affects flows between the U.S. parent bank and foreign offices via internal capital markets, and how these internal flows impact total foreign lending by U.S. banks' affiliates abroad. Correa et al. (2015) study at the bank level the role of various funding constraints in mitigating the impact of liquidity risk on U.S. banks domestic and foreign lending. Focusing on external capital markets, our study differs by looking at *bilateral* bank flows of various types at the bank-host country level, controlling for not only U.S. but host country macro and monetary conditions as well. Cerutti et al. (2014), on the other hand, use country-to-country level data on cross-border bank flows to study the non-price determinants of the cross-border supply of credit. They find that global liquidity is driven primarily by uncertainty (VIX), U.S. monetary policy (term premia but not federal funds rate per se), and UK and Euro Area bank conditions (proxied by leverage and TED spreads). Dinger and te Kaat (2015) study the impact of country-level current account balances on individual bank risk-taking. See also He and McCauley (2013), Lo Duca et al. (2014), Bruno and Shin (2015), Cerutti et al. (2015) and McCauley et al. (2015). And focusing on individual "recipient" countries, Ioannidou et al. (2015) assess if changes in the U.S. federal funds rate have compositional effects on the supply of U.S. Dollar denominated credit granted in Bolivia (an almost entirely dollarized country), Coleman et al. (2014) study the flows of non-U.S. affiliate private banks in Brazil, Morais et al. (2017) assess the impact of foreign monetary policies on lending by foreign versus domestic banks in Mexico, and Ongena et al. (2015) study the differential impact of domestic and foreign monetary policy on the local supply of bank credit in domestic and foreign currencies in Hungary. However these papers do not assess – as we do – the impact of a domestic monetary policy on the supply of cross-border and affiliate credit abroad by many individual banks across many different countries (see recently Jung Lee et al. (2015) on risk-taking in cross-border syndicated lending).

channel in the bilateral lending of U.S. banks.[3] Although the regulatory data is confidential, and is therefore not widely available, it is more granular and broader in scope than any publicly available data. We construct a dataset on globally active U.S. financial institutions' domestic and foreign activities between 2003 and 2016, and study how changes in the stance of U.S. monetary policy (as measured by changes in the Federal funds rate in the pre-crisis, and in quantitative easing in the post-crisis period) affect U.S. banks' bilateral cross-border and foreign affiliate flows. We define cross-border flows as changes in direct claims by the bank's headquarters located in the home country on the foreign country, while affiliate (local) flows are changes in claims acquired by the subsidiaries or representatives of U.S. banks located in foreign countries. *A la* Kashyap and Stein (2000), our identification strategy is based on the hypothesis that deposit-funding constrained or less capitalized global U.S. banks (henceforth shorthanded as "[funding-] constrained" banks) exhibit a stronger response to changes in monetary conditions at home than their funding-abundant or better capitalized counterparts.[4]

We find strong evidence that U.S. monetary easing (tightening), as measured by changes in the Federal funds rate, is associated with meaningful increases (decreases) in the bilateral cross-border flows of U.S. banks in the pre-crisis period. This effect is substantially stronger for constrained than for unconstrained banks. Following an increase in the US federal funds rate by 100 bps for example, cross-border lending by the more constrained banks (at the 75 percentile) declines by 2 to 6 percentage points more than lending by the less constrained banks (at the 25 percentile). This differential is larger than the mean growth rate of cross-border lending and around 10 percent of its standard deviation. We also find some evidence that unconventional monetary policy (quantitative easing) in the post-crisis period, as measured by the short-term shadow U.S. interest rate, significantly increases bilateral cross-border flows

[3] The confidential regulatory FFIEC 009 dataset contains detailed information on all U.S. banks' cross-border and foreign affiliate exposures (at the bank-host country-year:quarter level) which have at least 30 million U.S. dollars in total foreign claims. Correa et al. (2015) also use the 009 data but at the bank – time level.

[4] Kashyap and Stein (2000) focus on bank liquidity and size, but the ensuing literature has shown that the (core) deposit to assets ratio and the capital ratio are good proxies for access to stable sources of financing for banks (Cornett et al. (2011); Correa et al. (2015)).

by U.S. banks. The monetary transmission into the flows of constrained banks is significantly greater in the post-crisis period as well (by 2 percentage points, for a 100 bps easing). These results on the cross-border expansionary effect of quantitative easing are also present when studying maturity or target sector-specific credit flows. Finally, we show that cross-border flows to lower income countries fluctuate more in response to changes in U.S. monetary policy in the pre-crisis period.[5] Our results also suggest that U.S. banks' foreign affiliate flows are significantly affected by the bank lending channel of *host country* monetary policy in the pre-crisis period. Host country monetary shocks affected global U.S. banks' foreign subsidiaries significantly more than U.S. branches abroad.[6] However, the stance of U.S. monetary policy has no significant impact on these affiliate flows. We also benchmark our specifications to those of Kashyap and Stein (2000) by studying monetary transmission into U.S. banks' domestic lending flows. Our results suggest that the domestic bank lending channel has intensified over time. Finally, in auxiliary estimations we find that U.S monetary policy may also affect U.S. banks' decision to enter new host markets in the pre-crisis period.

Our four main contributions to this literature are as follows.[7] First, using our unique bank-level data on bilateral foreign exposures we document the significant impact of U.S. monetary policy on U.S. banks' *cross-border* flows via *external* capital markets, i.e., to non-affiliated parties abroad. These results complement previous results on the existence of the bank lending channel in U.S. banks' *internal* capital markets abroad (Cetorelli and Goldberg (2012a)) and U.S. banks' *foreign affiliate* lending abroad (Cetorelli and Goldberg (2012a); Morais et al. (2017)). Distinguishing these various channels is important,

[5] These results on the strength of a cross-border bank lending channel are economically relevant, since our sample of host countries are substantially more bank-based than the U.S.: The median bank loans to GDP ratio in a subsample of our host countries is 0.8, compared to a ratio of 0.4 in the U.S. over the past five years.

[6] We combine our bank-level foreign affiliate claims data from the 009 reports with data from the quarterly FR Y-10 regulatory report on U.S. banks' organizational structure in individual host countries.

[7] Inspired by Correa and Murry (2009), and in addition to these four contributions, we further differ from their study in our: (1) focus on bank funding constraints proxied in our study by the bank deposits or capital to assets ratios (they focus on the bank liquidity ratio defined as the banks' securities, trading assets, federal funds sold, and securities purchased under agreement to resell to total assets); (2) two-stage modelling of cross-border lending and affiliate presence; (3) empirical differentiation across loan, bank and country characteristics.

since the diversification benefits (the return-risk tradeoffs) that global banks might incur from reallocating funds to cross-border flows are significantly different from the tradeoffs associated with internal or affiliate flows. Cross-border flows tend to go to informationally transparent lower-risk outlets abroad, such as banks or sovereigns. As these flows originate from the U.S., the country and transfer risks associated with cross-border flows are minimal. The projects that banks finance via foreign affiliate flows (funded by internal capital transfers), on the other hand, tend to be informationally opaque with greater monitoring requirement, country risk and transfer risk. Given these differences, we expect that the transmission of monetary policy-induced funding shocks into cross-border flows differs from how internal transfers or foreign affiliate flows are affected by such shocks. Our results confirm our hypothesis.

Second, our bilateral financial flows data at the bank-host country-maturity and bank-host country-sector level allows us to directly control for changes in conditions that are likely to affect the *demand* for investment by U.S. banks abroad. Since our goal is to identify U.S. monetary policy effects on the supply of bank credit to foreign countries, our use of a broad set of fixed effects to control for demand-side changes allows for a clearer identification of the bank lending channel (Bernanke and Gertler (1995)).

Third, our data extends to the fourth quarter of 2016, providing us with a substantially longer time horizon to examine the post-crisis impact of U.S. quantitative easing on the international bank lending channel than previous work. Comparing the pre- versus post-crisis periods using a difference-in-difference approach, Cetorelli and Goldberg (2012a) for example document that the crisis caused a more severe lending contraction by liquidity-constrained banks. Morais et al. (2017) show the expansionary effect of U.S. quantitative easing on the lending of U.S. banks through foreign affiliates. We study the impact of quantitative easing on cross-border flows while carefully controlling for changes in time-varying demand-side conditions throughout and in the aftermath of the financial crisis. We find some

evidence of a post-crisis bank lending channel, i.e., that quantitative easing (measured by decreases in the U.S. shadow short-term rate and the Fed's sale of U.S. Treasury securities) increases the bilateral cross-border flows of funding-constrained U.S. banks significantly more than their unconstrained counterparts after the onset of the crisis.

Finally, we refine our results on the strength of monetary transmission across several bank and host country characteristics. To our knowledge, we are first to examine the roles of the scope of foreign exposure of banks, and the income level and dollarization of host countries in this context. While significant across all these sub-groups, we find that our cross-border monetary transmission results are the strongest for geographically well-diversified global U.S. banks. In addition, local monetary transmission into U.S. banks' affiliate lending is stronger in host countries where a higher share of U.S. bank lending is denominated in the local currency.

The remainder of the paper proceeds as follows. Section 2 describes the empirical methodology in detail, and presents the model specifications. Section 3 describes the data, and Section 4 presents the results of the estimation. Section 5 examines the period after the onset of the financial crisis when the Federal Reserve heavily relied on non-traditional monetary instruments. Section 6 offers some concluding thoughts.

2. Hypotheses and Empirical Methodology

Based on the aforementioned papers the following testable hypotheses can be formulated:

1. A tightening (loosing) in U.S. monetary conditions, captured by an increase (decrease) in the federal funds rate − or equivalent shadow rate −, reduces (expands) cross-border lending by U.S. banks, especially by constrained banks with low deposit to assets or capital to assets ratios. The strength of this effect depends on:

a. The maturity of cross-border flows, as short-term flows are easier to adjust in response to changes in monetary conditions, relative to longer-term investments.

b. The target sector of lending and the income level of host countries, as the financial and private sector and low-income countries offer a wider range of return-risk opportunities (compared to lending to the public sector or high-income countries, respectively).

2. A tightening (loosing) in the host domestic monetary conditions, captured by an increase (decrease) in the host short term interest rate, reduces (expands) local lending by U.S. banks` affiliates, especially by constrained banks with low deposit to assets or capital to assets ratios. The effect is particularly strong for lending:

   a. By banks` subsidiaries in the host country, which have more direct access to local financial markets.

Our main specification describes U.S. banks' quarterly cross-border flows as follows. Let $Y_{j,t}^{i,n}$ denote bank *j*'s holdings of cross-border claims in host country *i* at time *t.* The superscript *n* denotes either target sector (financial, private non-financial, or public) or maturity of the claim, depending on the breakdown of the data for a specific estimation. Then $\Delta \ln(Y)_{j,t}^{i,n}$ captures the quarterly change (from time *t-1* to time *t*) of the natural logarithm of the cross-border bank flow of maturity or sector *n* of bank *j* into host country *i.* Our specification is as follows:

$$(1)\ \Delta \ln(Y)_{j,t}^{i,n} = \alpha + \sum_{k=1}^{4}\beta_k MP_{t-k}^{us} + \sum_{k=1}^{4}\gamma_k MP_{t-k}^{us} \times C_{j,t-k} + \sum_{k=1}^{4}\delta_k C_{j,t-k} + \zeta \begin{pmatrix} Bank \\ Controls \end{pmatrix}_{j,t-1} + \eta \begin{pmatrix} Demand \\ Controls \end{pmatrix}_{t-1}^{i,n} + \varepsilon_{j,t}^{i,n}$$

In Equation (1), $\Delta \ln(Y)_{j,t}^{i,n}$ denotes the quarter-to-quarter cross-border flow at the bank-country level as described above. The monetary policy variable *MP* is the quarterly change in the Federal ("Fed") funds rate from time *t-1* to *t.* Furthermore, *C* denotes the bank's deposit to assets ratio, later replaced by the

capital to assets ratio.[8] As in Kashyap and Stein (2000) and Cetorelli and Goldberg (2012a), we focus on the cumulative impact of monetary policy changes over the four preceding quarters.[9] Therefore, four lags of the monetary shock measure, the funding measure, and their interactions are included.[10] For the maturity-specific specifications, *n* characterizes remaining maturity: Short-term (less than 1 year) or long term (over 1 year). For the target sector-specific specifications, *n* characterizes: Financial sector, non-financial private sector or public sector. *Bank Controls* contains a vector of supply-side variables: Lagged values of bank total assets, capital-asset ratio, return on equity and the ratio of interest plus non-interest expenses to total assets ("expense ratio"). In addition, *Bank Controls* contains a Selection Correction term to control for the sample selection bias due to the fact that the dependent variable $\Delta \ln(Y)$ is observed for only a select group of globally active U.S. banks, as further explained in the Data section below. Lastly, *Demand Controls* contains various combinations of bank, host country, time and sector or maturity fixed effects to control for changes in demand-side conditions.

We also examine financial flows of U.S. banks' foreign affiliates, i.e., these also can be considered "local" bank flows because the affiliate has a local presence in the foreign country. Let $X_{j,t}^{i}$ denote bank *j*'s holdings of local claims in host country *i* at time *t.* Then $\Delta \ln(X)_{j,t}^{i}$ captures the quarterly (from time *t-1* to time *t*) bank flows of bank *j*'s foreign affiliate in host country *i.* Equation (2) describes our empirical specification.

[8] U.S. monetary policy shocks are independent of credit conditions abroad, eliminating concerns about a feedback effect from foreign credit conditions to monetary policy changes. Given our identification strategy we are not concerned about potential domestic macroeconomic feedback effects into monetary policy (Acharya et al. (2016)). Indeed, we identify monetary transmission from the *differential* response of funding-constrained versus funding-abundant banks to monetary shocks. Even if macro shocks simultaneously impact all banks' flows through monetary policy, the cross-bank *differences* in the strength of transmission should not be impacted.

[9] Our use of lagged values of the bank funding ratios ensures that these ratios may at most reflect *past* strategic choices of banks. The inclusion of four lags of the quarterly interest rate changes ensures that we capture the cumulative effect of monetary policy shocks throughout the previous year. While the use of four lags has become standard in the literature, we also repeat the analysis using three and five lags of the monetary policy shocks, and find that our results are robust to changes in the number of lags used.

[10] Since a bank can choose its funding ratio strategically, the inclusion of lags of the funding ratio that are in time similar to those of the monetary policy shocks (in their levels and interactions) ensures that the funding ratio is not endogenous to the interest rate changes.

(2) $$\Delta \ln(X)^{i}_{j,t} = \iota + \sum_{k=1}^{4}(\theta_k MP^{us}_{t-k} + \psi_k MP^{i}_{t-k}) + \sum_{k=1}^{4}(\kappa_k MP^{us}_{t-k} + \varphi_k MP^{i}_{t-k}) \times C_{j,t-k}$$

$$+\sum_{k=1}^{4}\chi_k C_{j,t-k} + \psi\begin{pmatrix} Bank \\ Controls \end{pmatrix}_{j,t-1} + \omega\begin{pmatrix} Demand \\ Controls \end{pmatrix}^{i}_{t-1} + \mu^{i}_{j,t}$$

In addition to the variables described for Equation (1) above, Equation (2) also contains the host country *i* monetary policy measure MP^{i}_{t} and its interaction with the funding ratio $C_{j,t-k}$.[11] This monetary measure is defined as the quarterly change in the host country *i* short-term base interest rate (the local equivalent of the Fed funds rate). The vector *Demand Controls* contains various combinations of bank, host country[12] and time fixed effects, as well as host country macro controls in some specifications.[13] We also include a Selection Correction term to control for the sample selection bias due to the fact that the dependent variable $\Delta \ln(X)$ is observed for only those U.S. banks who actively maintain an affiliate in host country *i*, as further explained in the Data section below.

In both Equations (1) and (2), we expect that the direct effect of the U.S. monetary policy shock on bank flows is negative: $\sum_{k=1}^{4}\beta_k < 0$ and $\sum_{k=1}^{4}\theta_k < 0$. Our strategy for identifying an international bank lending channel of U.S. monetary policy focuses on the sign of the cumulative coefficients on the interaction term of the bank's funding ratio and the U.S. monetary policy shock: $\sum_{k=1}^{4}\gamma_k$ and $\sum_{k=1}^{4}\kappa_k$. If U.S. banks that are rich in deposits or capital change their global financial flows *less* in response to a U.S. monetary policy shock than the banks that have a lower capital ratio or less access to funding through deposits, we expect to find $\sum_{k=1}^{4}\gamma_k > 0$ and $\sum_{k=1}^{4}\kappa_k > 0$. If U.S. banks' local (affiliate) flows in foreign countries exhibit a host country lending channel, we would expect to find $\sum_{k=1}^{4}\psi_k < 0$ and $\sum_{k=1}^{4}\varphi_k > 0$.

[11] The inclusion of four lags of both the U.S. and host country monetary policy shocks ensures that the cumulative effects of the monetary policy shocks of both countries are captured, even if the timing of the transmission of the U.S. and host country monetary policy effects may differ to some extent.

[12] The inclusion of host country fixed effects allows us to control for time-invariant country-specific institutional traits (such as monetary policy and currency regimes) and geographical characteristics (such as distance) that may impact bilateral lending flows.

[13] The inclusion of bank fixed effects also controls for time-invariant bank traits (such as a bank ownership structure or business model) that may impact global lending flows. The inclusion of time fixed effects controls for cyclicality and seasonality.

Lastly, based on the findings of Temesvary (2014), we expect that all else equal, funding-constrained banks maintain higher foreign flows: $\sum_{k=1}^{4}\delta_k < 0$ and $\sum_{k=1}^{4}\chi_k < 0$.

3. Data

a. Data on U.S. Banks' foreign claims

Our main dependent variables are the bilateral cross-border and foreign affiliate bank flows described above. These variables are derived from quarterly bank-level data on U.S. banks' cross-border and foreign affiliate claims from the Federal Financial Institutions Examination Council (FFIEC)'s 009 Data Report form. Banks' responses on this supervisory form are kept strictly confidential. Respondents consist of U.S. banks, savings associations, bank holding companies, savings and loan holding companies, and intermediate holding companies which hold 30 million USD or more in claims on residents of foreign countries.[14] Using this dataset, our sample is an unbalanced panel of 138 FFIEC-reporting banks' foreign claims in near 120 host countries and territories, with quarterly frequency over the 2003 Q1-2016 Q4 period. Cross-border claims and foreign affiliate claims are reported separately for each host country-bank-time (i.e., year:quarter) combination.[15] For each bilateral bank-host country pair, we use cross-border claims data delineated by remaining maturity (short-term with maturity less than one year and long-term with maturity over one year) and by target sector of investment (financial sector, non-financial private sector and public sector).

We use foreign exposure data that is reported on an *ultimate risk* basis, i.e., after mandated adjustments for transfer of risk exposure.[16] Furthermore, we use data on U.S. banks' cross-border and foreign affiliate

[14] For more information on this regulatory reporting form, see https://www.ffiec.gov/forms009_009a.htm.
[15] Using data from the FFIEC 009 form, we define cross-border claims as: Total Cross-border Claims on an ultimate risk basis. Foreign affiliate claims are defined as (Gross) Local Country Claims on Local Residents.
[16] The risk transfer adjustment implies that the reported amount may differ from the actual (direct, or immediate counterparty) amount extended to the host country. The ultimate risk claims reflect the amount of claims for the repayment of which the given host country is responsible. For instance, if Country A issues guarantees for the loans that the U.S. banks made to Country B, then Country A's ultimate risk exposure would exceed the actual direct

claims on a *gross* basis. In addition, as mentioned above the FFIEC 009a reports data on *claims* which, in addition to loans, also include bonds, stocks, guarantees, etc.

While a breakdown by asset type is not available on a bilateral basis, we can use Call Reports data aggregated across all U.S. global banks to examine the composition of claims over time. In 2004, total loans and leases made up 36 percent of U.S. banks' foreign claims (28 percent to private sector, 2 percent to banks, remainder to governments); this share was 35 percent in 2008 (sectoral composition as before). The share of loans dropped to 27 percent in 2010 and rose back up to 31 percent in 2012 (20 percent to private sector, 7 percent to banks, rest to governments) and 33 percent in 2015 (16 percent to private sector, 6 percent to banks, rest to governments). Deposits with foreign banks made up 13 percent in 2004, remained at this level through 2008, and rose to 15 percent in 2010 and to 18 percent by 2012 and remained at that level through 2015. The share of repurchase agreements rose from 7 percent in 2004 to 13 percent 2008, and stayed near that level through 2015. The rest of foreign claims is made up of net due from foreign offices, Treasury and asset-backed securities and guarantees.

Of the U.S. financial institutions which report their foreign exposures on the FFIEC 009 form, 63 percent are commercial banks, 32 percent are bank holding companies, and the remaining 5 percent consist of savings banks and other non-depository institutions. There is some regional variation in the allocation of U.S. bank affiliates around the world. While the average Western European country hosts affiliates of 10 U.S. banks, South American countries host 8 U.S. bank affiliates on average. The average number of U.S. bank affiliates in Asian countries is 8, while this number is smaller in Eastern Europe (5 U.S. banks). Overall, about 50 percent of our sample pertains to host countries which can be classified as low or

investment in that country. Similarly, Country B's reported ultimate risk claims would be less than the actual claims the bank acquired there.

lower-middle income countries, and half our or sample covers higher-middle and high income countries.[17]

Looking at cross-border claims by target sector, 41 percent of such claims are invested in the financial sector, 47 percent in the non-financial private sector and 12 percent in the public sector.

The share of foreign claims in global U.S. banks' portfolio has varied somewhat over our sample period. While on average cross-border claims made up around 11 percent of U.S. banks' total assets at the beginning of our sample, this number ticked down to a mean of 10 percent right before the crisis, 10 percent in 2013, and 6 percent in 2015. Claims held through local representation, on the other hand, have been stable over time, constituting a 6 percent share of assets at the beginning of our sample, and 7 percent in 2013 and beyond. At the bilateral bank-host country level, affiliate claims have become more prevalent relative to cross-border claims. At the country level, on average banks held one-fourth as much in local claims as in cross-border claims in the early 2000s. However, by 2015 the ratio of affiliate to cross-border claims per country has reached 1.2. Merging our dataset with data from the Federal Reserve's Y-10 form on the organizational structure of global U.S. banks abroad, we can identify around 7 percent of our foreign affiliate flows observations as coming from subsidiaries at the beginning of our sample. This share increased sharply to 17 percent in 2008, and declined to around 5 percent in the post-crisis period. The remaining fraction of our affiliate flows observations comes from branches or representative offices of U.S. banks in foreign countries.

Global U.S. banks are well-diversified across foreign countries: any one host country sees an average of 1 percent of a U.S. bank's cross-border portfolio, but this share reaches as high as 70 percent for some bank-country pairs. The number of foreign countries a U.S. bank holds cross-border claims in ranges from 1 to over a hundred, with a median of 32 countries. About one-eighth of our observations come from

[17] Using the classification of the World Bank, available at: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups.

'specialized' banks, i.e., those with 4 or fewer target host countries.[18] In about half of the bilateral U.S. foreign exposures we observe, global U.S. banks also hold local (affiliate) claims in the host countries they maintain a cross-border banking relationship with. For these U.S. banks, the number of affiliate-active countries ranges from 1 to over 90, with a median of 19 countries. About three-fourths of U.S. banks' foreign affiliate claims are denominated in host countries' local currencies in the pre-crisis period. We find that 40 countries can be categorized as "low dollarized" hosts for at least a quarter or more before the crisis, that is, receiving U.S. bank affiliate flows that are at least 60 percent local currency-denominated.

b. Data on U.S. banks' balance sheet and financial conditions

Our bank-level (supply-side) control variables come from the quarterly balance sheet and financial database collected from the Report of Condition and Income (Call Reports).[19] We include the following bank-specific variables in our regressions: total assets, total equity capital to asset ratio, deposit to asset ratio, return on equity and the expense ratio. In order to control for reporting biases, we also calculate a Selection Correction statistic from probit regressions of a bank's globally active/non-active status (for Equation 1), and foreign affiliate presence status (for Equation 2). In doing so, we follow the methodology proposed by Heckman (1976). The details of the probit specifications are presented in the Appendix.[20]

[18]After we delete those banks which have four or fewer host countries in their portfolio at a given time, we have 89 banks left in our sample. Moreover, there are 26 global banks in our sample which maintain 5 or more host countries in their portfolio *at all times* throughout our sample. As will become clear below, we demonstrate that our results are robust to removing the "specialized" banks from our sample.

[19] Call Reports data are reported on the FFIEC Central Data Repository's Public Data Distribution site (for commercials banks), on the FR Y-9C forms on the Chicago Fed's website (for bank holding companies) and on the FR 2886b and FFIEC 002 forms (for Edge and Agreement Corporations).

[20] We control for selection bias in cross-border flows since we observe these values only for those banks whose foreign exposure exceeds 30 million USD (the reporting threshold for the FFIEC 009 form). Therefore, a potential concern is that there are unobservable factors which simultaneously affect the likelihood that a U.S. bank maintains a high enough foreign exposure to have to report on the FFIEC 009 form on the one hand, and the magnitude of this bank's cross-border flows, on the other. This may lead us to overestimate the monetary transmission effects in Equation (1). We correct for this bias by calculating the selection error correction statistic from the globally

c. Data on U.S. and host country monetary and macro characteristics

In some specifications of our estimation of local (affiliate) bank flows and foreign affiliate presence, we also include a set of host country macroeconomic characteristics to control for host country-specific time-variant changes in credit demand conditions. We focus on the following set of controls: Quarterly changes in the host country's short-term interest rate, in the local currency-USD exchange rate, and the host country's real GDP.[21] We collect data on these variables from the EIU's Country Data, the IMF's International Financial Statistics, and OECD's Statistics. Data on the U.S. Fed funds rate and the Fed's holdings of U.S. Treasury securities comes from the website of the Federal Reserve. The dataset on post-crisis shadow short term interest rates is constructed, documented and provided by Krippner (2016). Figure 1 plots the evolution of the U.S. Fed funds rate and the Krippner's short-term shadow rate over the sample period. As expected, the shadow interest rate moves closely together with the U.S. Fed funds rate in the first part of the sample: The rates increase until 2006, plateau at 5.25 percent until September 2007 and go into a steep decline afterwards. Krippner's shadow rate dipped into negative territory when the Fed funds rate hit the "zero bound" at the end of 2008. The shadow interest rate continued to fall and reached its lowest point at the end of 2012, while the Fed Funds rate remained near the zero lower bound as expansionary monetary policy continued. From then on, the shadow interest rate increased and turned positive again at the time of the Federal Reserve's lift-off at end-2015.

active/non-active probit regression, and including this statistic in our estimation of Equation (1). Similarly, there is a selection bias in the estimation of Equation (2) in that we only observe foreign affiliate flows for those host country-bank pairs in which the bank has incurred the fixed cost of setting up a local presence. We control for this bias by estimating a probit regression of banks' foreign affiliate presence choices, then including the calculated selection correction statistic in the estimation of Equation (2).

[21] While we know the relative prevalence of local currencies in affiliate flows, the affiliate claims volumes are reported in U.S. dollars. In the affiliate lending flows regressions, the inclusion of exchange rate changes and Host Country – Time Fixed Effects controls for currency valuation effects in lending flows that may result from the effect of U.S. monetary policy shocks on exchange rates. We do not directly address currency valuation effects in cross-border lending, since these flows are more likely denominated in U.S. dollars.

The *crisis* indicator variable, included in some post-crisis specifications, is defined to equal 1 from the first quarter of 2008 through the end of 2009, and to equal 0 otherwise. Table 1 provides detailed data descriptions, sources, and summary statistics.

4. Estimation Results

a. Introduction

We present our estimation results in Tables 2 through 9. In Table 2, we estimate Equation (1) using the maturity-specific cross-border bank flows dataset, identifying the role of U.S. monetary policy shocks using the deposit to assets ratio as the bank funding measure. We then repeat the same exercise, using the capital to asset ratio as our funding constraint measure in Table 3.[22] We next benchmark the potency of this newly documented cross-border bank lending channel in Table 4 by studying for the same set of banks the equivalent potency of the domestic transmission mechanism. We further examine the robustness of the cross-border channel in Table 5 by using the sector-specific version of our cross-border bank flows dataset (using both the deposit to asset and capital ratios as measures of bank funding constraints).

While in Tables 2 through 5 we focus our attention on the pre-crisis period, in Table 6 we examine the role of the Fed's unconventional monetary policy actions after the onset of the crisis in determining U.S. banks' cross-border flows. In Table 7, we explore how the impact of U.S. monetary policy differs between the higher and lower income host countries in our sample. Lastly, in Tables 8 and 9 we study the role of U.S. and host country monetary policy shocks in driving U.S. banks' local (affiliate) flows in foreign countries.

[22] Consistent with the literature, in all our specifications we include four lags of both the levels of monetary policy shocks and their interactions with banks' funding constraint measure. We also repeat Column 1 of each table including four lags of the level of monetary shocks only, and find that the significance of the cumulative coefficient on this variable remains closely comparable to those obtained with the inclusion of the interaction terms.

b. Cross-border flows

Table 2 shows that there is strong evidence of a global bank lending channel in U.S. banks' cross-border flows in the 2003-2007 period.[23] As we move from Column 1 to 4, we include an increasingly exhaustive set of fixed effects to control for non-monetary shocks and unobservable factors. While Table 2 shows that our results are robust to the inclusion of the most extensive set of fixed effects at the time – host country – maturity level (Column 11), we gradually build up our set of fixed effects so that we can examine the role of a broader set of explanatory variables.[24]

Importantly, the coefficients on the interaction of the U.S. Fed funds rate change and the bank's deposit to asset ratio are highly significant throughout.[25] Therefore, the bilateral cross-border flows of more funding-constrained U.S. banks are affected by U.S. monetary policy significantly *more* than the flows of their funding-abundant counterparts, suggesting a causal role for U.S. monetary policy. For funding-constrained banks (with a deposit to assets ratio of 40 percent, at the 25th percentile of the distribution), the results in Table 2 indicate that a 100 basis points increase in the U.S. Fed funds rate causes a cumulative 3 to 4 percentage points decline in bilateral cross-border flows.[26]

In most specifications, we include host country – bank and host country – bank – credit maturity fixed effects. Doing so allows us to control for historical ties between host country – bank pairs, and identify

[23] Standard errors on the cumulative coefficients across the four lags of included monetary policy shocks are calculated using the delta method. We cluster standard errors at the host country – bank level in Table 2. The significance levels of the coefficients are robust to clustering at the bank level.

[24] For instance, including time – host country – maturity fixed effects in all specifications would prevent us from including the levels of the U.S. monetary policy shocks or host country macro controls throughout.

[25] These results are robust to replacing the deposit to asset ratio with banks' commitments ratio (Correa et al. (2015)). In additional regressions, we also repeat the Table 2 specifications including four lags of the dependent variable. We find that the cumulative effects of the four lags of the monetary policy shocks and their interactions with the bank funding ratios remain highly significant throughout.

[26] For instance, this cumulative effect in column 1 is obtained as: -12.85 + (0.22)*40= -4 percent. A 100 basis points change in the Fed Funds rate corresponds to a two standard deviation change. While the Fed generally changes interest rates in 25 basis points increments, a particular monetary policy goal (tightening or easing) is often achieved in several steps. Since we are examining the cumulative effects of monetary policy actions over four quarters, we present results in response to a 100 basis points change in the interest rate. The pre-crisis average change in cross-border flows (pooled across maturities) was around 8 percent.

transmission effects from variation within such pairs over time. Table 2 shows that the percentage decline in U.S. cross-border lending flows across countries and credit maturities following a 100 basis points increase in the U.S. Fed funds rate is 2.7 to 4.4 percentage points *higher* for funding-constrained banks (at the 25th percentile of the funding ratio distribution) than funding-abundant banks (at the 75th percentile).[27] These results remains significant even when we include time fixed effects.

As mentioned above, about one-eighth of observations in the sample come from U.S. banks that are specialized lenders, i.e., hold cross-border claims in 4 or fewer countries. We take further steps to exclude the possibility that these banks in the sample may bias our results, since the bilateral cross-border flows of these specialized banks may be strongly affected by historical, cultural or ownership ties (Paravisini et al. (2014)). Therefore, in Columns 5 through 11 we focus our attention on multi-country lenders with 5 or more bilateral cross-border relationships. We find that the coefficient on the interaction of bank funding ratio and U.S. monetary shocks remains highly significant, even when we include time-host country-credit maturity fixed effects to fully control for unobservable demand side shocks (Column 11). Even in this most complete specification, funding-constrained U.S. banks lower their bilateral cross-border flows by 2.9 percentage points *more* than their funding-abundant counterparts in response to a 100 basis points increase in the Fed funds rate. There is also some evidence that funding-constrained banks add more cross-border claims, all else equal (third row of Table 2), consistent with the findings of Temesvary (2014).

In Columns 12 and 13, we examine how our results on the presence of an active international bank lending channel may vary depending on the maturity of cross-border flows. We expect that quarterly

[27] Cross-border lending flows are generated out of the funds of banks' domestic (U.S.) offices, which are exposed to U.S. monetary policy-induced funding shocks. Therefore, host country interest rate changes are not included in the cross-border specifications. The choice to do so is validated by the finding that our U.S. monetary transmission results are robust to the inclusion of Host Country – Time Fixed Effects (which would pick up any impact that host country interest rate changes may have on cross-border lending flows). When we repeat Models 4 and 9 of Table 2 including host country interest rate changes in a robustness check, we find that these variables enter the regressions insignificantly while the U.S. monetary policy effects remain significant.

monetary policy shocks have a stronger impact on short-term claims than long-term flows, as the former are easier to adjust depending on funding conditions. Indeed, the coefficient on the funding ratio and monetary shock interaction is significant at the 5 percent level in short-term flows. Furthermore, funding-constrained banks' short-term cross-border flows respond 4.3 percentage points more to a 100 basis points dip in the Fed funds rate than the flows of their funding-abundant counterparts. This result is robust to the inclusion of time – host country fixed effects to control for unobservable credit demand shocks. The coefficient on long-term flows, however, is insignificant and very small in magnitude. The significant monetary tightening-induced reduction in short-term cross-border flows before the crisis may reflect a pattern of "retreating to home" in response to contractionary U.S. monetary policy on the external margin, parallel to the internal margin "retreating to home" pattern which Cetorelli and Goldberg (2012b) document. Indeed, in line with this explanation, in auxiliary regressions we find that pre-crisis contractionary U.S. monetary policy lead U.S. banks to *increase* the relative share of short-term *domestic* loans while they *reduced* the relative prevalence of short maturities in their cross-border flows.[28]

In Table 3, we repeat the same specifications as in Table 2 using the capital ratio as our measure of a bank's ability to obtain outside funding.[29] These results also show convincing evidence of an international bank lending channel in cross-border flows. On average, the monetary policy effects are somewhat greater in magnitude than those we obtained using the deposit to asset ratio as the funding constraint measure. While the full-sample specifications in Columns 1 through 4 also show consistently significant monetary transmission effects, the monetary policy coefficients increase in magnitude and significance when we eliminate specialized lender banks from our sample in Columns 5 through 11.

[28] Our result on the increasing share of short-term maturity flows (relative to longer-term flows) in response to tightening U.S. monetary policy are in line with the findings of Black and Rosen (2008) and Morais et al. (2017).

[29] We also estimate the Table 2 specifications using bank size (total assets) as a measure of a bank's access to alternate sources of funding, and find our results on the strength of the bank lending channel are robust to this measure of funding constraint.

These results indicate that a 100 basis points rise in the U.S. Fed funds rate significantly reduces bilateral cross-border lending flows, and this impact is significantly *higher* for less-capitalized U.S. banks. Depending on the specification, a 100 basis points hike in the Fed funds rate causes a 3 to 4 percentage points greater drop in cross-border flows by low-capitalized banks than high-capitalized ones in Columns 5 through 11. These results are robust to the inclusion of host country – bank, time and credit maturity fixed effects, and remain highly significant even in our most complete specification (including time – host country – maturity fixed effects, in Column 11). Looking by maturity in Columns 12 and 13, we observe a similar result as in Table 2, further corroborating the external-margin substitution story we outlined above: Short-term flows exhibit a much stronger response to monetary shocks than do long-term investments. The coefficient on the interaction of the monetary shock and the capital ratio is positive and significant at the 1 percent level: Low-capitalized U.S. banks exhibit a 2.45 percentage points greater response to U.S. monetary policy shocks than high-capitalized ones. This result remains robust to the inclusion of time – host country fixed effects to control for unobservable credit demand side shocks.

To benchmark the potency of the cross-border bank lending channel, we estimate the transmission of changes in the Fed funds rate through the domestic bank lending channel. We report a set of representative specifications in Table 4. The dependent variable is now the quarterly change in domestic U.S. bank lending across maturities during the 2003:Q1-2008:Q3 period and we again assess the impact of changes in the Fed funds rate on the lending of banks with different deposit to asset or capital ratios. In Columns 1 through 4 we include only the globally active banks (that is, banks which report foreign exposures), and in Columns 5 and 6 we examine all U.S. banks (many of which are only lending in the U.S.).

The Table 4 specifications allow us to compare our estimates on the strength of the domestic bank lending channel with those obtained by previous authors. Looking at all U.S. banks in Columns 5 and 6,

the point estimate of the average cumulative coefficient on the interaction of the funding ratio with the monetary shock is 0.07. This monetary transmission effect is within close range of the average result of near 0.05 obtained by Kashyap and Stein (2000) for all U.S. banks over the 1986-1993 period. In additional specifications, we estimate the Column 5 and 6 specifications for the subsample of large U.S. banks.[30] Doing so, we obtain an average coefficient of 0.15, which is similar in magnitude to the 0.112 estimate that Kashyap and Stein (2000) obtained for the largest banks in their earlier sample.

Focusing on monetary transmission into the domestic lending of *global* U.S. banks, we obtain an average domestic transmission effect of 0.21 (Columns 3 and 4), which is greater in magnitude than the transmission effects for all U.S. banks, described above. When we restrict our sample to *large* global U.S. banks[31], as expected our monetary transmission results remain significant but smaller in magnitude with an average effect of 0.17. With an average coefficient of 0.15, we document that monetary pass-through effects are somewhat smaller into the domestic lending of large *domestic* (non-global) banks. Overall, comparing our results to those of Kashyap and Stein (2000) and Cetorelli and Goldberg (2012a), we conclude that the strength of the bank lending channel appears to have increased from the 1980s and 1990s into the 2000s.

It is also interesting to compare the strength of monetary transmission into global U.S. banks' cross-border flows (as shown in Table 2) with the transmission into their domestic flows in Columns 1 through 4 in Table 4. The domestic monetary effects in Table 4 appear much smaller than what we found for cross-border flows. These relative magnitudes are in line with earlier results on the higher potency of cross-border monetary transmission, as in Aramonte et al. (2015) and Célérier et al. (2016).

[30] Detailed results of these alternative specifications are available from the authors upon request.
[31] Following Cetorelli and Goldberg (2012a), we define large banks as those above the 95th percentile of total assets in the cross-section of U.S. banks in a given time period.

However, it is difficult to compare these coefficients with those in the previous tables, since the magnitudes of domestic claims are substantially greater than cross-border claims. Therefore, even a large absolute change in domestic claims from one quarter to the next may appear smaller in percentage terms, and the base of cross-border lending is often small such that a few additional units of lending may result in large proportional changes. In fact, comparing the cross-border flows of globally active U.S. banks with their domestic (U.S.) flows reveals that the standard deviation of cross-border flows is nearly three times as big as that of their domestic flows (Table 1).[32] Adjusting the Table 2 results for these scale differences reveals that the differential impact of a U.S. monetary policy shock on funding constrained vs. funding abundant global banks' cross-border flows is about 0.11 standard deviations. The comparable differential impact of these global banks' domestic flows in Table 4 is a bit smaller at 0.07 standard deviations. There is evidence that banks recurrently treat their cross-border and foreign lending as residual compared to their domestic activities (as in, e.g., Cetorelli and Goldberg (2011) and Cetorelli and Goldberg (2012b)), providing an explanation for the larger elasticities.

In Table 5, we now use the sector-specific breakdown of cross-border lending flows (to the financial, private and the public sectors of host countries) to repeat specifications 1 through 4 from both Tables 2 and 3. Examining monetary transmission into cross-border flows at the host country – bank – sector level is useful for several reasons. First, doing so allows us to fully control for unobservable host country – sector-specific demand shocks, allowing for the possibility that the various sectors experience shocks to their demand for U.S. bank credit differentially. Second, using sector-specific data allows us to refrain from restricting the strength and magnitude of monetary transmission to be the same across various sectors. In fact, there can be substantial differences in the risk-return tradeoffs that banks face in their decision to expand flows into the financial, private or public sectors of host countries after a monetary policy shock (Alper et al. (2017)). As a result, we expect to find differences in the strength and magnitude

[32] The standard deviation of the growth in global banks' cross-border flows across maturities equals 36 percent in the estimation sample, while this value for global banks' domestic flows is 12 percent.

of monetary transmission across the various sectors, with flows to the public sector likely exhibiting the weakest monetary transmission effects.

In our results covering all global U.S. banks and target sectors, we continue to see strong evidence of an international bank lending channel, using either the deposit to asset ratio in Columns 1 through 4 or the capital ratio in Columns 5 through 8 as our funding measure. Looking at the results using the deposit to assets ratio, the coefficients on the interaction terms of bank funding ratio and monetary shocks are positive and significant in all specifications. This corresponds to a 2.1 to 3 percentage points bigger decline in cross-border flows by funding-constrained banks than funding-abundant ones, in response to a 100 basis points rise in the Fed funds rate.

Using the capital ratio as our measure of bank funding constraints in Columns 5 through 8, the effect of a 100 basis points hike in the Fed funds rate is significantly *higher* for low-capitalized banks: A bank at the 25th percentile of the capital ratio distribution responds by 2 to 2.8 percentage points *more* than does a funding-abundant bank. This monetary policy effect remains significant at the 1 percent level even when we saturate the model with host country – bank – sector and time fixed effects in Column 8. The breakdown of the results by sector (Columns 9 through 11) illustrates that the monetary transmission results are the strongest (both in terms of magnitude and significance) in lending to the financial sector, followed by lending to the non-financial private sector. As expected, the monetary transmission effects are negligible in lending to the public (sovereign) sectors of foreign countries. Overall, the results in Tables 2 through 5 demonstrate a robust relationship between U.S. monetary policy and cross-border flows. The stronger impact for funding constrained banks is consistent with a causal role for U.S. monetary policy.

c. Post-2007 period

Our analysis thus far has focused on the time period before the onset of the financial crisis and the pursuant recession. In Table 6, we examine the presence of the international bank lending channel in the post-2007 period.[33] Due to the low number of post-crisis observations and the confounding effects of aggregate shocks during the crisis, previous work on the international bank lending channel was limited to simple pre vs post-crisis-onset comparative analysis regarding the post-2007 period. However, our dataset extends through 2016 – including a sufficient number of time periods in the aftermath of the onset of the crisis to allow for a study of global monetary transmission comparable to the pre-crisis analysis. We define 2008:Q4 as the onset of the crisis episode in international banking. This quarter is a natural split in our sample, as this is the first quarter in the immediate aftermath of the Lehman crisis (September 2008). In addition, 2008:Q4 is also the first quarter when the Fed funds rate hit the zero lower bound.

Two important complications in studying the post-2007 period in U.S. banks' global activities are the presence of aggregate shocks which simultaneously affected the demand and supply sides of international financial flows, and the increasing irrelevance of the Fed funds rate as a measure of the stance of U.S. monetary policy. First, the quick contagion of the financial crisis across institutions and borders caused leftward shifts in the supply of credit. Soon thereafter, the real economic effects brought on by the drying-up of liquidity led to leftward shifts of the world-wide demand for credit as well, while central banks around the world engaged in aggressive expansionary policy to fend off these negative economic effects. To sum up: Substantial interest rate declines coincided with large decreases in the volume of bank credit.

[33] In addition to splitting the data into pre-crisis and post-2007 subsamples, we also repeat the Table 2 specifications using the full sample, replacing the Fed Funds Rate with the Krippner (2016)'s Shadow Short-term Rate as the measure of U.S. monetary policy stance throughout (we discuss this shadow interest rate in a few paragraphs), and find that our results are robust to this alternative pooled specification.

In our Table 6 analysis of the post-2007 period, we rely on an extensive set of fixed effects to separate these aggregate shocks from changes in flows brought on by monetary easing. In all our specifications, we include bank controls, host country – bank – maturity or host country – bank – sector fixed effects and time fixed effects. Furthermore, as before, we include four lagged values of our monetary measures and present cumulative marginal effects in Table 6.

The second issue to tackle is the irrelevance of the Fed funds rate as a monetary measure after the onset of the crisis. At end-2008, the Fed's aggressive expansionary efforts sent the effective Fed funds rate below 25 basis points. This policy rate remained at near-zero levels until the liftoff at the end of 2015, while in the meantime the Fed's active monetary expansion continued. As a result, quarterly changes in the Fed funds rate were not informative as measures of the stance of U.S. monetary policy over the 2008-2015 period. Therefore, we examine two alternate measures of the stance of U.S. monetary policy for our post-2007 analysis.

First, we employ Krippner (2016)'s shadow short-term interest rate in place of the Fed funds rate (Columns 1 through 4).[34] Our second proxy for unconventional monetary policy is the Fed's sales of Treasury Securities (Columns 5 through 8).[35] In Columns 1, 2, 5 and 6, we use the maturity-breakdown version of the cross-border flows data, while in Columns 3, 4, 7 and 8 we use the sectoral-breakdown data. For both versions of data and monetary policy measures, we examine both the deposit to asset ratio and the capital ratio as measures of bank funding constraints.

Using Krippner (2016)'s shadow short-term rate as our measure of monetary policy in the first four columns of Table 6, we find significant monetary policy effects in our analysis of the maturity-specific cross-border lending data (Columns 1 and 2). In these specifications, funding-constrained U.S. banks (at

[34] The construction of this shadow short term rate is carefully documented and explained in Krippner (2016).

[35] We use the Fed's *sale,* as opposed to purchases, of securities to ensure that increases in the monetary measure correspond to contractionary policy, while decreases are indicative of expansionary policy. This makes our measure of unconventional monetary policy consistent with the use of the Fed funds rate in the pre-crisis period.

the 25th percentile of the funding ratio distribution) raise their cross-border flows 1.5 to 2.3 percentage points more than their funding-abundant counterparts, in response to a 100 basis points decrease in Krippner's short-term shadow rate in the post-2007 period.[36] As the average cross-border flows (across maturities) were 2.7 percent in the post-2007 period (with a standard deviation of 34), our post-crisis results are also economically relevant and hold up to the inclusion of bank balance sheet controls, as well as host country – bank – credit maturity and time fixed effects. However, as expected the post-2007 results are smaller in magnitude than the pre-crisis monetary transmission effects, and less robust than our pre-crisis effects.[37]

In Columns 5 through 8, we repeat the specifications of Columns 1 through 4, now using the Fed's sale of Treasury securities as our measure of monetary policy. Previously, our unit of measurement was a 100 basis points change in the base interest rate – which corresponds to an approximately 1.5 standard deviations change in the case of the Krippner short-term shadow rate. For consistency, we define a unit change in the Fed's sale of securities as a 1.5 standard deviations change in this measure as well. This corresponds to an approximately 15 percentage points change in this variable. While there is no evidence of substantial monetary transmission in the maturity-breakdown data (Columns 5 and 6), we find some evidence of monetary transmission in the sector-specific data (Column 7). Using the deposit to asset ratio as our measure of bank funding, we find that funding-constrained banks increase their bilateral cross-border flows in response to a 15 percentage points increase in the Fed's purchases of Treasury securities (quantitative easing) by 0.9 percentage points *more* than funding-abundant banks. This result is significant at the 1 percent level, even after saturating the model with bank balance sheet

[36] A 100 basis points change in the short-term shadow rate corresponds to approximately 1.5 standard deviations.

[37] An important characteristic of the post-2007 period was the rapid build-up of excess reserves on banks' balance sheets. The implication of this phenomenon is that banks only turned a fraction of the liquidity provided by the Fed into loans in the post-2007 period. Therefore, the buildup of excess reserves actually makes our results on the strength of the bank lending channel seem conservative.

controls, as well as host country – bank – sector and time fixed effects.[38] However, similar to using the Krippner shadow rate, using the Fed's sale of Treasure securities as a measure of monetary expansion we also conclude that transmission into cross-border lending has been weaker and less robust in the post-2007 era than in the pre-crisis period.

d. Higher vs. lower income host countries

Our results so far have shown that U.S. monetary policy is associated with changes in cross-border flows, especially for funding constrained banks. While we have controlled for a large number of bank, host country characteristics, and fixed effects, there still may be additional variation in our host country characteristics that explains the U.S. bank response. An interesting dimension along which we expect to see potential heterogeneity in monetary transmission is the income level of host countries, for several reasons. From banks' perspective, lower income countries contribute a different return – risk tradeoff to the investment portfolio than higher income (developed) recipient states. Insofar as risk-adjusted returns to banks' cross-border investment differ across high and low income countries, an episode of U.S. monetary tightening (easing) would influence U.S. banks' cross-border lending to lower vs. higher income countries differently. For this reason, the systemic risk exposure that global U.S. banks might undertake through increased lending to lower-income host countries makes income-specific differences in monetary transmission important from U.S. regulators' perspective as well. From host countries' perspectives, the documented growth impact of foreign bank inflows (Goldberg (2007)) may provide needed capital in developing countries, and volatility of these inflows induced by U.S. monetary policy could provide a particular challenge for policy makers in those low-income countries. Furthermore, the inflows from foreign banks may induce lower-income countries to offer particularly hospitable regulatory treatment to banks providing such inflows (Temesvary (2017)).

[38] We also repeat the Table 6 specifications excluding the 2008-2009 crisis period, and find that the significance of our monetary transmission results are robust to this exclusion.

In Table 7, we report results from several specifications in which we interact our dummy variable for lower income countries (below the median income per capita in the given time period)[39] with U.S. monetary policy measures. Columns 1 and 2 replicate the specifications in Column 4 from Tables 2 and 3 with the addition of a lower income dummy variable and its interaction with the key monetary policy variables. Columns 3 and 4 in Table 7 replicate Columns 4 and 8 of Table 5, while Columns 5 through 8 in Table 7 replicate the post-crisis specifications in Columns 1 through 4 of Table 6 in a similar way.

Table 7 reveals that in the pre-crisis period the strength of the transmission of U.S. monetary policy into U.S. banks' cross-border lending to lower income countries is significantly *stronger* than into higher income countries. In Columns 1 through 4, the (direct) effects of a U.S. monetary tightening are significantly more negative in lending to lower income countries (first row). Furthermore, Columns 2 and 4 show that in the pre-crisis period, a 100 percentage point tightening in the U.S. Fed funds rate reduced the cross-border lending of low-capitalized U.S. banks to lower income countries by 3.5 to 7.3 percentage points more than the lending of higher-capitalized banks.

Our hypothesis is that cross-border flows to low-income countries would be impacted more strongly because of a different risk-return tradeoff in those countries. To examine this explanation, we also calculate country-risk adjusted market returns for each host country in our sample.[40] Doing so, we find that risk-adjusted returns are not only smaller in lower income host countries (with mean of 1.72 percent vs. 2.21 in higher income countries), but they are also more volatile (variance of 27.25 in lower income countries, vs. 9.91 in higher income countries) in the pre-crisis period. Interpreted in conjunction with the results in the first four columns of Table 7, this less attractive return-risk tradeoff in lower

[39] The cross-sectional median GDP per capita which we use for our categorization is around $4,100 per capita in 2015, which closely corresponds to the national income per capita which the World Bank uses as an upper threshold for low and lower-middle income countries (https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups).

[40] We calculate this risk-adjusted return measure as each host country's average "money market return" (collected from the Economist Intelligence Unit) minus that country's "country risk premium" (developed by A. Damodaran, available at http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html).

income countries, suggests that the period of U.S. monetary tightening that prevailed in our pre-crisis sample contributed to a reduction in U.S. bank lending flows to lower income host countries *more* than to higher income host countries.

Looking at the post-2007 period (columns 5 through 8 of Table 7), we do not find significant differences in the strength of transmission into lower vs. higher income host countries. Studying post-2007 risk-adjusted returns, we see that lower income countries on average offered higher risk-adjusted returns than higher income countries, albeit at somewhat higher volatility as well. As the post-2007 return-risk tradeoff in lower income countries is less clear-cut, we indeed expect to see a weaker pattern between the strength of transmission post-crisis, and the income level of recipient countries.

e. Affiliate flows

In Table 8, we study the impact of U.S. monetary policy on the local (affiliate) flows of U.S. banks in foreign countries. Understanding the strength of this transmission mechanism is important for several reasons. Flows through foreign affiliates expose U.S. banks to country risk and transfer risk more than cross-border flows, and can transmit host country financial shocks back to the U.S. through the financial connections of the affiliates to their U.S. parents. Previous papers found a strong positive impact of U.S. monetary easing on the foreign affiliate flows of U.S. banks in both the pre-crisis (Cetorelli and Goldberg (2012a)) and post-crisis (Morais et al. (2017)) periods. Theory would predict that due to their lower fixed setup costs, cross-border flows are easier and quicker to adjust in response to funding shocks which affect parent banks. Therefore, we expect that U.S. monetary transmission into foreign affiliate flows is weaker and smaller in magnitude than transmission into cross-border flows. Furthermore, because our local flows data incorporates claims by affiliates who operate as fully chartered subsidiaries in foreign countries, we also expect that provision of liquidity by the host country's monetary authority (as measured by quarterly changes in the host's short-term base rate) would also significantly impact U.S.

banks' local flows there.[41] Related to this point, we hypothesize that the extent of host country monetary influence is directly related to the prevalence of the local (host country) currency in U.S. banks' investments there. In Columns 1 through 4 of Table 8, we study the role of U.S. *and* host country monetary conditions on U.S. banks' local flows via affiliates. In Columns 5 through 8, we then focus on the subset of the local flows of multi-country (non-specialized) U.S. banks in low-dollarized countries (i.e., where the share of dollar-denominated claims is below the 40th percentile across all countries). Throughout Table 8, we control for changes in host country macro traits, the bias inherent in selective reporting, and an increasingly exhaustive set of demand and supply-side fixed effects.

In our full sample specifications in Columns 1 through 4, we find evidence that host country monetary policy matters, but no support for a role for U.S. monetary policy in determining U.S. banks' foreign affiliate flows. The direct impact of an increase in host country short-term interest rates on local flows is negative (first row), and significantly more so for low-capitalized U.S. banks. In Columns 1 and 2, the negative impact of a 100 basis points increase in the host country interest rate on U.S. banks' local flows is 3.7 to 4 percentage points *greater* for low-capitalized U.S. banks' affiliates than for those of high-capitalized U.S. banks.[42] These effects are economically relevant given that the average affiliate flows were equal to 1.4 percent during the pre-crisis period (with a standard deviation of 11.5). The significance and magnitude of the difference between the funding-constrained vs. unconstrained banks` monetary effects remains high even after we saturate our model with host country – bank and time fixed effects. The coefficients on both the levels and interactions of U.S. monetary policy changes are insignificant in all our Table 8 specifications.

We expect that the host country monetary policy effects are particularly strong in those foreign countries where a higher share of U.S. banks' local claims are denominated in the country's currency

[41] We explore the role of subsidiary vs. branch presence in detail in Table 9 below.
[42] A 100 basis points change in host country interest rates corresponds to a 1.25 standard deviation change.

(i.e., the currency in which the monetary authority provides liquidity to banks). In line with expectations, our results on the role of host country monetary policy increase in magnitude and significance once we restrict our attention to the subset of multiple-country U.S. banks in low-dollarized countries (while the U.S. monetary effects remain insignificant).[43] In Columns 5 through 8, the negative monetary impact is a significant 2.1 to 7.3 percentage points *higher* for low-capitalized U.S. banks than for high-capitalized ones. Notably, the significance of our monetary results prevails even when we fully control for demand-side conditions in Column 8.[44] In additional specifications, we also explore the role that U.S. and host country monetary policy may play in shaping the patterns of internal funds flows between a U.S. bank's affiliates in individual host countries, and own related offices in other countries.[45] Repeating the Table 8 specifications using a bank's host country-specific *net due to* shares, we find no systematic relationship between such internal flows and monetary policy conditions.

The mode of a global U.S. bank's entry into a host country can also have important effects on the strength of monetary transmission. Subsidiaries of U.S. banks in foreign countries are locally chartered and able to draw on local funding sources (deposits and central bank liquidity in the host country). Branches, on the other hand, constitute a weaker form of host country presence in that these offices are dependent on parent bank funding and have limited access to local liquidity sources. Therefore, we expect that the transmission of host country monetary policy is substantially stronger into the lending flows of U.S. bank affiliates that are organized as subsidiaries. Since the 009 data includes both subsidiaries and branches' claims under "local claims", we rely on an additional data source from the regulatory FR Y-10 form to identify the organizational form of each U.S. bank's affiliate per host country.

[43] The host country monetary transmission result remains significant even when host country monetary shocks are included without U.S. monetary shocks in the regression (Column 8) – alleviating concerns about the extent to which the results may be driven by the correlation of host country interest rates with U.S. interest rates.

[44] The strength of host country monetary transmission remains significant even when we replace the four lagged values of each of the host country macro demand controls with one, two, three and four-quarter-ahead forecasts of these variables (from Consensus Economics).

[45] We define *net due to* as affiliate-specific net due to own related offices (fcex 8595 in the 009 data), over assets.

We define a subsidiary dummy variable with value 1 if the Y-10 data indicates that a given U.S. bank has a subsidiary in the given host country at a given time, and 0 otherwise. In order to examine the role of affiliate organizational type in the strength of monetary transmission, in Table 9 we interact our monetary variables with the subsidiary indicator dummy.

Our results in Table 9 confirm our hypothesis: the transmission of host country monetary policy is stronger into the lending flows of U.S. banks' subsidiaries than branches. The Table 9 results reveal that the triple interaction of host country monetary policy shocks, funding ratios and the subsidiary indicator is significant in six specifications, with coefficients in the 5.45 to 9.45 range. These results suggest that the differential impact of host country monetary policy on funding constrained versus funding abundant U.S. subsidiaries is significantly greater than the differential impact of U.S. branches in host countries.[46] Notably, we find no evidence on the existence of a bank lending channel of U.S. monetary policy in banks' foreign subsidiary flows. At first blush, this result appears to be at odds with the findings of recent papers on the topic. Morais et al. (2017) find a strong bank lending channel of U.S. monetary policy in the local flows of U.S. banks in Mexico, while Coleman et al. (2014) find that even the flows of non-U.S. affiliate private banks in Brazil are affected by U.S. monetary policy. We can point to three potential sources as to the discrepancy of our results. First, we saturate our specifications with increasingly exhaustive sets of fixed effects to control for demand-side conditions over time. If previous findings of a bank lending channel in local flows were due to rightward shifts in the demand for U.S. bank claims in host countries that coincided with U.S. monetary policy easing, then our explicit controls for demand-side shifts would negate these findings.[47] Our results are also based on a large cross-section of host countries, and may therefore indicate that the authors' findings (specific to lending in Mexico and Brazil)

[46] In order to explore the role that internal funds transfers (between the foreign affiliate and other related offices) may play in the strength of monetary transmission into affiliate lending flows, in additional specifications, we repeat the Table 9 regressions interacting the U.S. and host country monetary policy measures with a *net due to* variable (as described above). We do not find that such internal transfers impact the strength of monetary transmission into U.S. banks' affiliate lending.

[47] However, Coleman et al. (2014) 's findings are robust to controlling for demand-side changes.

cannot be generalized. Second, we include in our specifications changes in the host country's monetary policy rate, both in its level and interaction with the bank funding ratio. To the extent that foreign monetary policy rates move together with U.S. policy rates, previous work's findings on the significant impact of U.S. monetary policy on local flows might have been due to an omitted variable problem. The third possible explanation is that our identification is based on the use of the *headquarters`* (U.S.) capitalization of the bank – we do not have data on the capitalizations and funding positions of individual subsidiaries.

5. Summary and Conclusion

In this paper, we studied the functioning of the bank lending channel through the foreign financial flows of U.S. banks via external capital markets between 2003 and 2016. Specifically, we examined how changes in the stance of U.S. monetary policy (measured as changes in the Fed funds rate up to 2008, and quantitative easing beyond) affected U.S. banks' bilateral cross-border and foreign affiliate flows. Using the identification strategy that funding-constrained banks exhibit a stronger response to changes in liquidity conditions than their unconstrained peers, we find strong evidence that U.S. monetary easing significantly increased the bilateral cross-border flows of U.S. banks in the pre-crisis period, and this effect was substantially stronger for constrained banks. We also find some evidence that easing in U.S. liquidity conditions in the post-2007 period was significantly and positively related to bilateral cross-border flows by U.S. banks. Furthermore, the impact of U.S. monetary policy was substantially stronger on U.S. banks' lending to lower income countries before the crisis. Estimating the bank lending channel in U.S. banks domestic lending, we find that domestic monetary transmission has intensified since the work of Kashyap and Stein (2000). We find that U.S. banks' foreign affiliate flows respond to host country monetary policy, and these local monetary effects are stronger on subsidiaries than on branches. Our findings are robust to various data specifications, funding constraint measures (i.e., deposit or capital to assets ratios) and the inclusion of exhaustive sets of relevant fixed effects. Some results suggest that U.S.

monetary policy may have also affected U.S. banks' decision to "go global" and to establish local presence in foreign countries.

Our contributions to the literature are three-fold. First, to our knowledge we are first to utilize the full dimensionality of the detailed regulatory Country Exposure dataset on U.S. banks' foreign claims, which allows us to explicitly control for changing conditions in the *demand* for investment by U.S. banks abroad, thereby providing a clearer identification of the bank lending channel (Bernanke and Gertler (1995)). Second, to our knowledge our work is the first to document the working of the bank lending channel through U.S. banks' *cross-border* flows in *external* capital markets, i.e., to non-affiliated parties abroad. By doing so, our results complement the findings of Cetorelli and Goldberg (2012a) on the bank lending channel in U.S. banks' *internal* capital markets abroad and Morais et al. (2017)'s work on the lending channel in U.S. banks' *foreign affiliate* lending abroad. Third, we are able to rely on the Country Exposure dataset's longer time series to study the periods before and after the onset of the financial crisis using comparable empirical models, and document the impact of post-crisis U.S. liquidity conditions on U.S. banks' foreign flows.

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Table 1
Summary statistics

Variable Names	Definition	Unit	N	Mean	SD	Min.	10%	25%	50%	75%	90%	Max.
Dependent Variables												
Quarterly Change in Cross-border US Bank Lending												
Aggregate (Pre-crisis)	the change in the natural logarithm of the bank's stock of total cross-border claims[a] in the host country in quarter t pre-crisis	%	25,470	-0.40	53.08	-277.26	-49.55	-10.57	0	11.31	51.08	219.72
Aggregate (Post-2007)	the change in the natural logarithm of the bank's stock of total cross-border claims in the host country in quarter t post-2007	%	9,313	-1.48	30.11	-265.21	-21.06	-2.64	0	1.73	18.82	200.37
≤ 1 Year (Pre-crisis)	the change in the natural logarithm of the bank's stock of total cross-border claims with a remaining maturity below one year[b] in the host country in quarter t pre-crisis	%	24,780	10.66	42.46	-153.97	-27.28	0	0	22.99	60.99	164.90
≤ 1 Year (Post-2007)	the change in the natural logarithm of the bank's stock of total cross-border claims with a remaining maturity below one year in the host country in quarter t post-2007	%	44,213	2.98	40.70	-154.55	-37.92	-2.42	0	11.32	46.45	164.85
> 1 Year (Pre-crisis)	the change in the natural logarithm of the bank's stock of total cross-border claims with a remaining maturity equal to and above one year in the host country in quarter t pre-crisis	%	16,775	5.41	29.83	-152.48	0.00	0	0	9.59	26.42	164.79
> 1 Year (Post-2007)	the change in the natural logarithm of the bank's stock of total cross-border claims with a remaining maturity equal to and above one year in the host country in quarter t post-2007	%	8,904	2.34	27.33	-148.42	-6.46	0	0	2.35	17.78	163.69
To Banks (Pre-crisis)	the change in the natural logarithm of the bank's stock of total cross-border claims on the host country`s financial sector[c] in quarter t pre-crisis	%	43,872	7.37	46.97	-194.59	-29.95	0	0	16.84	61.60	185.98
To Banks (Post-2007)	the change in the natural logarithm of the bank's stock of total cross-border claims on the host country`s financial sector in quarter t post-2007	%	78,291	1.03	44.51	-194.59	-40.21	0	0	5.75	44.50	186.02
To Non-financial Private Sector (Pre-crisis)	the change in the natural logarithm of the bank's stock of total cross-border claims on the host country`s non-financial private sector in quarter t pre-crisis	%	45,022	8.38	39.21	-194.59	-8.07	0	0	17.42	45.06	185.82
To Non-financial Private Sector (Post-2007)	the change in the natural logarithm of the bank's stock of total cross-border claims on the host country`s non-financial private sector in quarter t post-2007	%	54,139	4.19	38.46	-194.59	-22.91	0	0	8.94	38.65	186.02
To Public Sector (Pre-crisis)	the change in the natural logarithm of the bank's stock of total cross-border claims on the host country`s public sector in quarter t pre-crisis	%	45,612	2.69	27.65	-194.59	0.00	0	0	0	17.19	185.92
To Public Sector (Post-2007)	the change in the natural logarithm of the bank's stock of total cross-border claims on the host country`s public sector in quarter t post-2007	%	71,689	0.44	35.23	-10.03	0	0	0	0	15.26	186.02
Quarterly Change in Global US Bank Domestic Lending in the U.S. (Pre-crisis)												
Global U.S. Banks	the change in the natural logarithm of the global U.S. bank's stock of domestic (U.S.) claims in quarter t pre-crisis	%	1,940	1.39	11.52	-42.91	-11.21	-3.05	1.39	6.16	13.58	44.93
Domestic U.S. Banks	the change in the natural logarithm of the domestic U.S. bank's stock of domestic (U.S.) claims in quarter t pre-crisis	%	355,374	2.27	10.12	-44.97	-7.85	-2.18	1.66	6.54	13.43	45.00
Quarterly Change in US Bank Affiliate Lending in Other Countries (Pre-crisis)	the change in the natural logarithm of the bank's stock of net foreign affiliate claims[d] in the host country in quarter t pre-crisis	%	7,897	0.08	47.71	-386.00	-24.00	-2.00	0	4.00	22.00	387.00
US Bank Maintains Affiliate in Host Country (Pre-crisis)	indicator variable that equals 1 if the US bank maintains an affiliate in the host country at time t, and equals 0 otherwise	0/1	19,641	0.12	0.33	0	0	0	0	0	1.00	1.00
Independent Variables												
Monetary Variables												
US Federal Funds Rate (Pre-crisis)	quarterly change in the US federal funds rate pre-crisis	%	25,768	0.09	0.50	-1.63	-0.31	-0.03	0.03	0.47	0.58	0.58
Δ Host Country Short-Term Interest Rate (pre-crisis)	quarterly change in the host country's short-term base interest rate pre-crisis	%	18,976	-0.03	0.82	-5.04	-0.55	-0.09	0	0.17	0.55	4.00

Δ US Krippner`s Shadow Short Rate (Post-2007)	quarterly change in the Krippner (2013) US shadow federal funds rate post-2007	%	44,167	-0.07	0.71	-1.74	-0.90	-0.31	-0.05	0.13	0.72	2.09
Δ US Federal Reserve`s Sale of Securities (Post-2007)	quarterly change in the Federal Reserve`s sale of securities post-2007	%	44,609	-5.09	10.67	-37.59	-21.27	-7.12	-0.52	-0.01	0.43	21.80
Bank Variables												
Bank Deposits to Assets Ratio	bank deposits divided by total assets	%	64,862	49.86	19.14	0.45	21.12	40.27	52.58	63.53	71.75	82.42
Bank Capital Ratio	bank total equity capital divided by total assets	%	61,222	9.50	2.90	0.27	6.66	7.68	9.09	10.91	13.19	18.88
Bank Total Assets	the natural logarithm of total bank assets	mln. USD	66,847	11.08	2.48	1.65	7.21	8.99	11.55	12.97	14.24	14.80
Bank Return On Equity	bank net income divided by total equity	%	66,787	1.65	5.17	-84.14	-0.10	0.67	2.08	3.34	4.70	42.00
Bank Cost Ratio	bank expenses divided by total assets	%	66,774	1.18	0.74	0.00	0.60	0.78	1.00	1.32	1.78	7.25
Other Variables												
US and Host Country GDP Growth	quarterly growth rate of Gross Domestic Product	%	7,562	2.13	6.01	-32.67	-4.14	-0.61	2.88	5.74	8.02	18.20
US CPI Inflation	quarterly change in the Consumer Price Index	%	13,203	0.54	0.45	-1.43	0.08	0.40	0.61	0.78	1.00	1.10
Exchange Rate	quarterly change in the nominal exchange rate (expressed as the host country currency per US dollar)	%	9,577	-0.33	4.28	-11.84	-5.81	-2.75	0.00	1.42	4.98	18.46
Predicted Probability that US Bank Lends Across Borders	predicted probability that the US bank lends across borders (i.e., reports on the FFIEC 009 form), derived from the probit regression in Appendix Table 1	%	139,260	2.44	15.21	0	0.01	0.01	0.02	0.03	0.07	100.00
Predicted Probability that US Bank Maintains Affiliate in Host Country	predicted probability that the US bank maintains an affiliate in the host country (i.e., reports non-zero affiliate claims), derived from the probit regression in Appendix Table 2	%	19,641	12.15	30.69	0	0	0	0.07	0.92	86.90	100.00
Selection Bias Correction for Observing US Banks Lending Across Borders	Selection Bias Correction statistic derived from the probit regression in Appendix Table 1	-	139,260	3.74	0.64	0	3.47	3.68	3.85	3.99	4.11	7.02
Selection Bias Correction for Observing US Banks Affiliate Presence in Host Country	Selection Bias Correction statistic derived from the probit regression in Appendix Table 2	-	19,641	3.25	1.49	0	0.24	2.70	3.46	4.17	4.87	7.83
Share of US Dollar-denominated Foreign Affiliate Claims in Total	ratio of all US banks' US Dollar-denominated foreign affiliate claims to total foreign affiliate claims in the host country	%	6,305	28.29	32.65	0	0	0	14.00	45.00	97.00	100.00
Subsidiary Indicator	indicator variable that equals 1 if the foreign affiliate flows observation comes from a subsidiary of a global US bank in the host country, and equals 0 otherwise	0/1	5,449	0.06	0.23	0	0	0	0	0	0	1.00
Lower Income	indicator variable that equals 1 if the host country is below the median GDP per capita across all host countries in that time period, and equals 0 otherwise	0/1	59,842	0.39	0.49	0	0	0	0	1.00	1.00	1.00

Note. -- [a]Total Cross-border Claims on an ultimate risk basis are defined as: Total Cross-border claims (fcex8580) –[outward risk transfer on banks (fcex8586) + outward risk transfer on public entities (fcex8587) + outward risk transfer on other borrowers (fcex8588)] + [inward risk transfer to banks (fcex8590) + inward risk transfer to public entities (fcex8591) + inward risk transfer to other sectors (fcex8592)]. [b]The sectoral breakdown of cross-border claims consists of risk transfer-adjusted cross-border claims on banks (fcex8577-fcex8586+fcex8590), public entities (fcex8578-fcex8587 +fcex8591) and other borrowers (fcex8579-fcex8588 +fcex8592). [c]The maturity breakdown of cross-border claims consists of cross-border claims with remaining maturity of one year or less (cexa5221 for FFIEC 009a reporters; risk-transfer adjusted fcex8581 (before Q4 2005) and fcexc921 (post- Q4 2005) for 009a-non-reporters), and with remaining maturity over one year (cexa5222) for FFIEC 009a reporters; risk-transfer adjusted (fcex8670+fcex8584) (before Q4 2005) and (fcexc915+fcexc916+fcexc917+fcexc918+fcexc919+fcexc920)-fcexc921) (post- Q4 2005) for 009a-non-reporters). [d]Foreign affiliate claims are defined as Local Country Claims on Local Residents (fcex8593 and fcexa339).

Table 2

Quarterly change in cross-border US bank lending across countries and credit maturities for banks with different deposit ratios during the 2003:Q1-2008:Q3 period

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
Sample of Banks	*All*	*All*	*All*	*All*	*Multiple Countries*	*Multiple Countries*	*Multiple Countries*	*Multiple Countries*	*Multiple Countries*	*Multiple Countries*	*Multiple Countries*	*Multiple Countries*	*Multiple Countries*
Included Maturities	*All*	*All*	*All*	*All*	*All*	*All*	*All*	*All*	*All*	*All*	*All*	*≤ 1 Year*	*> 1 Year*
ΣΔ US Federal Funds Rate{t-1 to t-4}	-12.850	-12.610	-11.340		-11.630	-9.176	-11.330						
	[4.457]***	[4.47]***	[4.669]**		[4.694]***	[3.967]**	[4.930]**						
ΣΔ US Federal Funds Rate{t-1 to t-4} * Bank Deposits to Assets Ratio{t-1 to t-4}	0.219	0.218	0.207	0.228	0.201	0.144	0.208	0.174	0.236	0.235	0.158	0.229	0.007
	[0.084]***	[0.084]***	[0.088]**	[0.090]***	[0.088]**	[0.076]*	[0.093]**	[0.076]**	[0.096]***	[0.090]***	[0.081]**	[0.107]**	[0.132]
Σ Bank Deposits to Assets Ratio{t-1 to t-4}	-0.053	-0.055	-0.015	-0.028	-0.039	-0.039	-0.026	-0.052	-0.048	-0.071	-0.054	-0.068	-0.019
	[0.090]	[0.090]	[0.101]	[0.102]	[0.092]	[0.026]	[0.104]	[0.027]**	[0.106]	[0.094]	[0.028]*	[0.040]*	[0.053]
Constant	-5.734	-1.369	53.180	25.460	15.020	1.033	51.500	5.190	22.770	-19.910	-2.410	-10.720	11.380
	[33.870]	[34.090]	[37.290]	[42.130]	[34.670]	[3.383]	[38.070]	[3.826]	[42.600]	[38.450]	[3.571]	[5.172]**	[5.221]**
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Host Country - Bank Fixed Effects	Yes	Yes	--	--	Yes	No	--	No	--	Yes	No	No	No
Credit Maturity Fixed Effects	No	No	--	--	Yes	--	--	--	--	Yes	--	--	--
Host Country - Credit Maturity Fixed Effects	No	No	--	--	No	Yes	--	Yes	--	No	--	--	--
Host Country - Bank - Credit Maturity Fixed Effects	No	No	Yes	Yes	No	No	Yes	No	Yes	No	No	No	No
Time Fixed Effects	No	No	No	Yes	No	No	No	Yes	Yes	Yes	--	--	--
Time - Host Country Fixed Effects	No	No	No	No	No	No	No	No	No	No	--	Yes	Yes
Time - Host Country - Credit Maturity Fixed Effects	No	No	No	No	No	No	No	No	No	No	Yes	n/p	n/p
Selection Bias Correction for Observing US Banks Lending Across Borders	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.08	0.08	0.13	0.13	0.08	0.03	0.13	0.03	0.13	0.08	0.11	0.10	0.14
Number of Observations	20,782	20,779	20,779	20,779	20,329	20,329	20,329	20,329	20,329	20,329	20,329	12,915	7,414
Percentage point change in cross-border US bank lending across countries and credit maturities following a decrease in the US federal funds rate by 100 bps by lower (25%) versus higher (75%) deposit-ratio banks:	*4.08*	*4.06*	*3.86*	*4.26*	*3.75*	*2.69*	*3.89*	*3.24*	*4.40*	*4.38*	*2.94*	*4.27*	*0.13*
Percentage point change in cross-border US bank lending across countries and credit maturities following a decrease in the US federal funds rate by 100 bps by lower (25%) deposit-ratio banks:	*-3.95*	*-3.75*	*-2.93*		*-3.39*	*-3.28*	*-2.80*						

Note. -- The table reports estimates from ordinary least squares regressions. The dependent variable is the quarterly change in cross-border US bank lending across countries and credit maturities (i.e., credit granted with a maturity less than one year and credit granted with a maturity over one year). Table 1 contains the definition of all variables and the summary statistics for each included variable. Bank Controls include the lagged values of Bank Total Assets, Capital-Asset Ratio, Return On Equity and the Cost Ratio. The Selection Bias Correction for Observing US Banks Lending Across Borders comes from a probit regression explaining the bank's lending across borders (Appendix Table 1 Model [1]). The Multiple Countries sample includes banks active in five countries or more. Coefficients are listed in the first row, robust standard errors that are corrected for clustering by host country-bank are reported in the row below, and the corresponding significance levels are placed adjacently. Σ indicates that the sum of the four coefficients on the indicated lag terms (and corresponding standard errors and significance level) is reported. "Yes" indicates that the set of characteristics or fixed effects is included. "No" indicates that the set of characteristics or fixed effects is not included. "--" indicates that the indicated set of characteristics or fixed effects are comprised in the wider included set of fixed effects. "n/p" indicates that the set of fixed effects cannot be included. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 3

Quarterly change in cross-border US bank lending across countries and credit maturities for banks with different capital ratios during the 2003:Q1-2008:Q3 period

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
Sample of Banks	*All*	*All*	*All*	*All*	*Multiple Countries*	*Multiple Countries*	*Multiple Countries*	*Multiple Countries*	*Multiple Countries*	*Multiple Countries*	*Multiple Countries*	*Multiple Countries*	*Multiple Countries*
Included Maturities	*All*	*All*	*All*	*All*	*All*	*All*	*All*	*All*	*All*	*All*	*All*	*≤ 1 Year*	*> 1 Year*
ΣΔ US Federal Funds Rate{t-1 to t-4}	-12.990	-12.540	-10.840		-12.460	-14.810	-11.280						
	[5.685]**	[5.684]**	[5.927]*		[5.785]**	[4.760]***	[6.102]*						
ΣΔ US Federal Funds Rate{t-1 to t-4} * Bank Capital Ratio{t-1 to t-4}	1.295	1.263	1.116	0.913	1.268	1.518	1.208	1.491	1.276	1.293	1.618	2.450	-0.937
	[0.655]**	[0.654]**	[0.679]*	[0.488]*	[0.669]*	[0.552]***	[0.706]*	[0.549]***	[0.730]*	[0.681]*	[0.569]***	[0.776]***	[1.014]
Σ Bank Capital Ratio{t-1 to t-4}	0.103	0.112	0.350	0.490	-0.038	-0.708	0.221	-0.660	0.254	0.023	-0.669	-0.709	-0.080
	[0.501]	[0.500]	[0.519]	[0.533]	[0.497]	[0.203]***	[0.538]	[0.204]***	[0.548]	[0.502]	[0.215]***	[0.286]***	[0.423]
Constant	-1.567	3.073	59.360	46.550	19.280	5.947	58.230	10.160	24.400	-5.967	0.970	-6.038	11.940
	[33.710]	[33.930]	[38.340]	[32.010]	[34.560]	[3.574]*	[37.980]	[4.032]***	[42.710]	[38.740]	[3.676]	[5.264]	[5.308]**
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Host Country - Bank Fixed Effects	Yes	Yes	--	--	Yes	No	--	No	--	Yes	No	No	No
Credit Maturity Fixed Effects	No	No	--	--	Yes	--	--	--	--	Yes	--	--	--
Host Country - Credit Maturity Fixed Effects	No	No	--	--	No	Yes	--	Yes	--	No	--	--	--
Host Country - Bank - Credit Maturity Fixed Effects	No	No	Yes	Yes	No	No	Yes	No	Yes	No	No	No	No
Time Fixed Effects	No	No	No	Yes	No	No	No	Yes	Yes	Yes	--	--	--
Time - Host Country Fixed Effects	No	No	No	No	No	No	No	No	No	No	--	Yes	Yes
Time - Host Country - Credit Maturity Fixed Effects	No	No	No	No	No	No	No	No	No	No	Yes	n/p	n/p
Selection Bias Correction for Observing US Banks Lending Across Borders	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.07	0.07	0.13	0.13	0.08	0.02	0.13	0.03	0.13	0.08	0.10	0.09	0.14
Number of Observations	20,782	20,779	20,779	20,779	20,329	20,329	20,329	20,329	20,329	20,329	20,329	12,915	7,414
Percentage point change in cross-border US bank lending across countries and credit maturities following a decrease in the US federal funds rate by 100 bps by lower (25%) versus higher (75%) capital-ratio banks:	*3.23*	*3.15*	*2.79*	*2.28*	*3.16*	*3.79*	*3.01*	*3.72*	*3.18*	*3.23*	*4.04*	*6.11*	*-2.34*
Percentage point change in cross-border US bank lending across countries and credit maturities following a decrease in the US federal funds rate by 100 bps by lower (25%) capital-ratio banks:	*-3.81*	*-3.59*	*-2.97*		*-3.50*	*-4.10*	*-2.74*						

Note. -- The table reports estimates from ordinary least squares regressions. The dependent variable is the quarterly change in cross-border US bank lending across countries and credit maturities (i.e., credit granted with a maturity less than one year and credit granted with a maturity over one year). Table 1 contains the definition of all variables and the summary statistics for each included variable. Bank Controls include the lagged values of Bank Total Assets, Return On Equity and the Cost Ratio. The Selection Bias Correction for Observing US Banks Lending Across Borders comes from a probit regression explaining the bank's lending across borders (Appendix Table 1 Model [1]). The Multiple Countries sample includes banks active in five countries or more. Coefficients are listed in the first row, robust standard errors that are corrected for clustering by host country-bank are reported in the row below, and the corresponding significance levels are placed adjacently. Σ indicates that the sum of the four coefficients on the indicated lag terms (and corresponding standard errors and significance level) is reported. "Yes" indicates that the set of characteristics or fixed effects is included. "No" indicates that the set of characteristics or fixed effects is not included. "--" indicates that the indicated set of characteristics or fixed effects are comprised in the wider included set of fixed effects. "n/p" indicates that the set of fixed effects cannot be included. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 4

Quarterly change in domestic US bank lending across maturities for banks with different deposit or capital ratios during the 2003:Q1-2008:Q3 period

Model	[1]	[2]	[3]	[4]	[5]	[6]
Bank Ratio	*Deposits to Assets*	*Deposits to Assets*	*Capital*	*Capital*	*Capital*	*Capital*
Sample of Banks	*Globally Active*	*Globally Active*	*Globally Active*	*Globally Active*	*All US*	*All US*
ΣΔ US Federal Funds Rate{t-1 to t-4}	2.045		-1.171		0.448	
	[3.799]		[1.501]		[0.219]**	
ΣΔ US Federal Funds Rate{t-1 to t-4} * *Bank Ratio* {t-1 to t-4}	-0.024	-0.012	0.235	0.187	0.069	0.074
	[0.068]	[0.060]	[0.080]***	[0.083]**	[0.021]***	[0.021]***
Σ *Bank Ratio* {t-1 to t-4}	0.021	0.019	-0.005	-0.001	0.020	0.023
	[0.089]	[0.084]	[0.066]	[0.065]	[0.007]***	[0.007]***
Constant	48.260	72.060	47.620	70.950	22.550	23.580
	[22.940]**	[25.760]***	[18.570]***	[20.980]***	[1.360]***	[1.403]***
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Maturity Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	Yes	No	Yes	No	Yes
Globally Active Bank 1/0	n/p	n/p	n/p	n/p	Yes	Yes
R-squared	0.07	0.09	0.06	0.08	0.08	0.09
Number of Observations	1,599	1,599	1,780	1,780	255,426	255,426
Percentage point change in domestic US bank lending across maturities following a decrease in the US federal funds rate by 100 bps by lower (25%) versus higher (75%) deposit- or capital-ratio banks:	*-0.44*	*-0.23*	*0.96*	*0.76*	*0.28*	*0.30*
Percentage point change in domestic US bank lending across maturities following a decrease in the US federal funds rate by 100 bps by lower (25%) deposit- or capital-ratio banks:	*0.98*	*-0.57*	*0.58*		*1.00*	

Note. -- The table reports estimates from ordinary least squares regressions. The dependent variable is the quarterly change in domestic US bank lending across maturities (i.e., credit granted with a maturity less than one year and credit granted with a maturity over one year). Table 1 contains the definition of all variables and the summary statistics for each included variable. Bank Controls include the lagged values of Bank Total Assets, Return On Equity and the Cost Ratio. The Globally Active Bank dummy is defined as 1 if the bank maintains cross-border operations in addition to operating in the US, and 0 otherwise. Coefficients are listed in the first row, robust standard errors that are corrected for clustering by bank are reported in the row below, and the corresponding significance levels are placed adjacently. Σ indicates that the sum of the four coefficients on the indicated lag terms (and corresponding standard errors and significance level) is reported. "Yes" indicates that the set of characteristics or fixed effects is included. "No" indicates that the set of characteristics or fixed effects is not included. "--" indicates that the indicated set of characteristics or fixed effects are comprised in the wider included set of fixed effects. "n/p" indicates that the set of fixed effects cannot be included. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 5

Quarterly change in cross-border US bank lending across countries and sectors for banks with different deposit or capital ratios during the 2003:Q1-2008:Q3 period

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
Bank Ratio	*Deposits to Assets*	*Deposits to Assets*	*Deposits to Assets*	*Deposits to Assets*	*Capital*	*Capital*	*Capital*	*Capital*	*Capital*	*Capital*	*Capital*
Sample of Banks	*All*	*All*	*All*	*All*	*All*	*All*	*All*	*All*	*Multiple Countries*	*Multiple Countries*	*Multiple Countries*
Included Sectors	*All*	*All*	*All*	*All*	*All*	*All*	*All*	*All*	*Financial Private*	*Non-financial Private*	*Public*
ΣΔ US Federal Funds Rate{t-1 to t-4}	-7.208	-7.341	-7.154		-9.341	-9.720	-9.537				
	[2.746]***	[2.757]***	[2.888]***		[3.551]***	[3.591]***	[3.751]***				
ΣΔ US Federal Funds Rate{t-1 to t-4} * *Bank Ratio* {t-1 to t-4}	0.104	0.104	0.102	0.146	0.778	0.808	0.800	1.104	2.894	0.728	0.107
	[0.051]**	[0.051]**	[0.053]*	[0.053]***	[0.405]**	[0.407]**	[0.425]*	[0.417]***	[0.970]***	[0.429]*	[0.184]
Σ *Bank Ratio* {t-1 to t-4}	-0.024	-0.021	-0.023	-0.067	0.058	0.056	0.048	0.027	-0.158	0.702	-0.613
	[0.049]	[0.049]	[0.052]	[0.052]	[0.268]	[0.268]	[0.278]	[0.270]	[0.609]	[0.418]*	[0.274]**
Constant	55.060	51.230	55.540	13.370	66.750	63.100	67.190	26.340	16.350	-57.410	92.390
	[20.500]***	[20.650]***	[21.530]***	[23.020]	[20.160]***	[20.230]***	[21.090]***	[22.700]	[48.120]	[41.570]	[26.170]***
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Host Country - Bank Fixed Effects	Yes	Yes	--	--	Yes	Yes	--	--	Yes	Yes	Yes
Sector Fixed Effects	No	No	--	--	No	No	--	--	n/p	n/p	n/p
Host Country - Sector Fixed Effects	No	No	--	--	No	No	--	--	n/p	n/p	n/p
Host Country - Bank - Sector Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes	n/p	n/p	n/p
Time Fixed Effects	No	No	No	Yes	No	No	No	Yes	Yes	Yes	Yes
Selection Bias Correction for Observing US Banks Lending Across Borders	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.04	0.04	0.12	0.12	0.04	0.04	0.11	0.11	0.10	0.12	0.13
Number of Observations	59,568	59,559	59,559	59,559	60,840	60,831	60,831	60,831	19,578	20,599	20,759
Percentage point change in cross-border US bank lending across countries and sectors following a decrease in the US federal funds rate by 100 bps by lower (25%) versus higher (75%) deposit- or capital-ratio banks:	*2.12*	*2.12*	*2.09*	*2.98*	*1.98*	*2.05*	*2.03*	*2.81*	*7.35*	*1.85*	*0.27*
Percentage point change in cross-border US bank lending across countries and sectors following a decrease in the US federal funds rate by 100 bps by lower (25%) deposit- or capital-ratio banks:	*-3.36*	*-3.48*	*-3.35*		*-3.88*	*4.03*	*-3.91*				

Note. -- The table reports estimates from ordinary least squares regressions. The dependent variable is the quarterly change in cross-border US bank lending across countries and sectors (i.e., the non-financial private sector, the financial private sector and the public sector). Table 1 contains the definition of all variables and the summary statistics for each included variable. Bank Controls include the lagged values of Bank Total Assets, Return On Equity and the Cost Ratio. The Selection Bias Correction for Observing US Banks Lending Across Borders comes from a probit regression explaining the bank's lending across borders (Appendix Table 1 Model [1]). Coefficients are listed in the first row, robust standard errors that are corrected for clustering by host country-bank are reported in the row below, and the corresponding significance levels are placed adjacently. Σ indicates that the sum of the four coefficients on the indicated lag terms (and corresponding standard errors and significance level) is reported. "Yes" indicates that the set of characteristics or fixed effects is included. "No" indicates that the set of characteristics or fixed effects is not included. "--" indicates that the indicated set of characteristics or fixed effects are comprised in the wider included set of fixed effects. "n/p" indicates that the set of fixed effects cannot be included. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 6

Quarterly change in cross-border US bank lending across countries, credit maturities and sectors for banks with different deposit or capital ratios during the 2008:Q4-2016:Q4 period

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Bank Ratio	*Deposits to Assets*	*Capital*	*Deposits to Assets*	*Capital*	*Deposits to Assets*	*Capital*	*Deposits to Assets*	*Capital*
ΣΔ US Krippner`s Shadow Short Rate{t-1 to t-4} * *Bank Ratio* {t-1 to t-4}	0.097	0.484	-0.010	-0.827				
	[0.034]***	[0.283]*	[0.031]	[0.210]***				
ΣΔ US Federal Reserve`s Sale of Securities{t-1 to t-4} * *Bank Ratio* {t-1 to t-4}					0.028	-0.001	0.035	-0.081
					[0.0288]	[0.192]	[0.0139]***	[0.0867]
Σ *Bank Ratio* {t-1 to t-4}	0.116	0.031	0.003	-0.266	1.113	1.611	-0.124	-1.673
	[0.060]**	[0.245]	[0.038]	[0.160]*	[0.825]	[3.333]	[0.516]	[1.968]
Constant	52.520	23.340	48.660	48.340	25.220	12.840	29.760	41.030
	[24.320]**	[20.400]	[12.580]***	[11.560]***	[24.840]	[21.200]	[12.740]**	[11.110]***
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Host Country - Bank - Credit Maturity Fixed Effects	Yes	Yes	No	No	Yes	Yes	No	No
Host Country - Bank - Sector Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Selection Bias Correction for Observing US Banks Lending Across Borders	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.06	0.06	0.05	0.05	0.06	0.06	0.05	0.05
Number of Observations	29,989	31,552	96,372	96,372	29,104	30,660	92,324	96,812
Percentage point change in cross-border US bank lending across countries, credit maturities and sectors following a decrease in the US Krippner`s Shadow Short Rate by 100 bps or a 13 pp decrease in the Fed's holdings of secturities (this change corresponds to approximately 1.5 standard deviations for these variables) by lower (25%) versus higher (75%) deposit- or capital-ratio banks:	*2.32*	*1.54*	*-0.25*	*-2.55*	*-1.09*	*0.00*	*0.85*	*-0.25*

Note. -- The table reports estimates from ordinary least squares regressions. The dependent variable is the quarterly change in cross-border US bank lending across countries and credit maturities (i.e., credit granted with a maturity less than one year and credit granted with a maturity over one year) in Models [1], [2], [5] and [6] or sectors (i.e., the non-financial private sector, the financial private sector and the public sector) in Models [3], [4], [7] and [8]. Table 1 contains the definition of all variables and the summary statistics for each included variable. Bank Controls include the lagged values of Bank Total Assets, Return On Equity and the Cost Ratio. The Selection Bias Correction for Observing US Banks Lending Across Borders comes from a probit regression explaining the bank's lending across borders (Appendix Table 1 Model [1]). Coefficients are listed in the first row, robust standard errors that are corrected for clustering by host country-bank are reported in the row below, and the corresponding significance levels are placed adjacently. Σ indicates that the sum of the four coefficients on the indicated lag terms (and corresponding standard errors and significance level) is reported. "Yes" indicates that the set of characteristics or fixed effects is included. "No" indicates that the set of characteristics or fixed effects is not included. "--" indicates that the indicated set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 7

Quarterly change in cross-border US bank lending in lower vs. higher income countries, across credit maturities and sectors for banks with different deposit or capital ratios

	Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Bank Ratio	*Deposits to Assets*	*Capital*	*Deposits to Assets*	*Capital*	*Deposits to Assets*	*Capital*	*Deposits to Assets*	*Capital*
	Time period	*2003:Q1-2008:Q3*	*2003:Q1-2008:Q3*	*2003:Q1-2008:Q3*	*2003:Q1-2008:Q3*	*2008:Q4-2016:Q4*	*2008:Q4-2016:Q4*	*2008:Q4-2016:Q4*	*2008:Q4-2016:Q4*
ΣΔ US Federal Funds Rate{t-1 to t-4} * Lower Income{t-1 to t-4}		-15.830	-36.210	-2.134	-9.570				
		[9.477]*	[12.55]***	[6.518]	[5.288]*				
ΣΔ US Federal Funds Rate{t-1 to t-4} * *Bank Ratio* {t-1 to t-4}		0.043	-0.928	0.123	0.300				
		[0.111]	[0.896]	[0.0678]*	[0.258]				
ΣΔ US Federal Funds Rate{t-1 to t-4} * *Bank Ratio* * Lower Income{t-1 to t-4}		0.294	3.906	0.037	1.034				
		[0.181]*	[1.433]***	[0.115]	[0.551]*				
ΣΔ US Krippner's Shadow Short Rate{t-1 to t-4} * Lower Income{t-1 to t-4}						5.617	1.071	2.357	-1.535
						[4.039]	[6.282]	[3.652]	[4.328]
ΣΔ US Krippner's Shadow Short Rate{t-1 to t-4} * *Bank Ratio* {t-1 to t-4}						0.130	0.573	0.025	-0.734
						[0.0433]***	[0.336]*	[0.0449]	[0.26]***
ΣΔ US Krippner's Shadow Short Rate{t-1 to t-4} * *Bank Ratio* * Lower Income{t-1 to t-4}						-0.111	-0.178	-0.040	0.062
						[0.0712]	[0.603]	[0.062]	[0.424]
Σ *Bank Ratio* {t-1 to t-4}		-0.024	0.824	-0.081	0.223	0.166	0.120	0.044	-0.411
		[0.103]	[0.763]	[0.0696]	[0.28]	[0.0717]**	[0.303]	[0.048]	[0.207]**
Σ *Bank Ratio* {t-1 to t-4} * Lower Income{t-1 to t-4}		0.041	-0.429	0.031	-0.438	-0.209	-0.292	-0.088	0.237
		[0.157]	[1.125]	[0.0953]	[0.452]	[0.0977]**	[0.474]	[0.062]	[0.319]
Constant		16.270	64.910	27.940	31.710	54.640	17.290	49.350	50.130
		[39.36]	[46.8]	[30.14]	[25.45]	[26.62]**	[21.91]	[14.33]***	[12.01]***
Bank Controls		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Host Country - Bank - Credit Maturity Fixed Effects		Yes	Yes	No	No	Yes	Yes	No	No
Host Country - Bank - Sector Fixed Effects		No	No	Yes	Yes	No	No	Yes	Yes
Time Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Selection Bias Correction for Observing US Banks Lending Across Borders		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared		0.13	0.13	0.12	0.11	0.06	0.06	0.05	0.05
Number of Observations		20,641	19,522	51,804	54,237	28,355	29,864	83,672	87,754
Percentage point change in cross-border US bank lending in low income countries and credit maturities following a decrease in the US federal funds rate by 100 bps by lower (25%) versus higher (75%) deposit- or capital-ratio banks:		*6.51*	*7.33*	*3.28*	*3.46*	*0.46*	*1.27*	*-0.37*	*-2.11*
Percentage point change in cross-border US bank lending in high income countries and credit maturities following a decrease in the US federal funds rate by 100 bps by lower (25%) versus higher (75%) deposit- or capital-ratio banks:		*0.84*	*-2.28*	*2.53*	*0.78*	*3.14*	*1.84*	*0.59*	*-2.30*

Note. -- The table reports estimates from ordinary least squares regressions. The dependent variable is the quarterly change in cross-border US bank lending across countries and credit maturities (i.e., credit granted with a maturity less than one year and credit granted with a maturity over one year) in Models [1], [2], [5] and [6], and sectors ((i.e., the non-financial private sector, the financial private sector and the public sector) in Models [3], [4], [7] and [8]. Table 1 contains the definition of all variables and the summary statistics for each included variable. Bank Controls include the lagged values of Bank Total Assets, Return On Equity and the Cost Ratio. The Selection Bias Correction for Observing US Banks Lending Across Borders comes from a probit regression explaining the bank's lending across borders (Appendix Table 1 Model [1]). The Lower Income dummy variable included in its level and interactions indicates countries below the median GDP per capita across host countries in the given time period. Coefficients are listed in the first row, robust standard errors that are corrected for clustering by host country-bank are reported in the row below, and the corresponding significance levels are placed adjacently. Σ indicates that the sum of the four coefficients on the indicated lag terms (and corresponding standard errors and significance level) is reported. "Yes" indicates that the set of characteristics or fixed effects is included. "No" indicates that the set of characteristics or fixed effects is not included. "--" indicates that the indicated set of characteristics or fixed effects are comprised in the wider included set of fixed effects. "n/p" indicates that the set of fixed effects is impossible to include. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Table 8

Quarterly change in US bank affiliate lending in other countries for banks with different capital ratios during the 2003:Q1-2008:Q3 period

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Sample of Host Countries	*All*	*All*	*All*	*All*	*Multiple Lowly-Dollarized*	*Multiple Lowly-Dollarized*	*Multiple Lowly-Dollarized*	*Multiple Lowly-Dollarized*
ΣΔ Host Country Short-Term Interest Rate{t-1 to t-4}	-20.820	-15.740			-42.220	-35.320		
	[7.985]***	[8.196]*			[20.78]**	[17.98]**		
ΣΔ Host Country Short-Term Interest Rate{t-1 to t-4} * Bank Capital Ratio{t-1 to t-4}	1.990	1.835	0.348	0.307	4.784	4.625	1.695	2.118
	[0.959]**	[1.036]*	[0.76]	[0.763]	[2.547]*	[2.305]**	[1.341]	[1.302]*
ΣΔ US Federal Funds Rate{t-1 to t-4}	-8.459				-17.520			
	[18.95]				[26.44]			
ΣΔ US Federal Funds Rate{t-1 to t-4} * Bank Capital Ratio{t-1 to t-4}	-0.369	-0.486	0.578		0.984	1.530	5.347	
	[1.745]	[1.953]	[1.427]		[2.438]	[2.635]	[3.713]	
Σ Bank Capital Ratio{t-1 to t-4}	-4.091	-3.931	-0.279	-0.030	-3.381	-3.226	-1.030	-0.669
	[1.847]**	[1.887]**	[0.526]	[0.538]	[2.14]	[2.667]	[1.238]	[1.082]
Constant	113.200	-283.400	-44.810	-41.250	212.800	-596.900	-34.660	-32.460
	[212]	[266]	[26.44]*	[25.11]*	[316.1]	[410.8]	[30.39]	[30.59]
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Host Country Macro Controls	Yes	Yes	--	--	Yes	Yes	--	--
Host Country - Bank Fixed Effects	Yes	Yes	No	No	Yes	Yes	No	No
Time Fixed Effects	No	Yes	--	--	No	Yes	--	--
Time - Host Country Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes
Bank Fixed Effects	--	--	Yes	Yes	--	--	Yes	Yes
Selection Correction for Observing US Banks Affiliate Presence in Host Country	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.18	0.31	0.52	0.52	0.17	0.32	0.64	0.64
Number of Observations	2,916	2,916	3,616	3,616	1,301	1,301	1,477	1,477
Percentage point change in US bank affiliate lending in other countries following a decrease in the host country short-term interest rate by 100 bps by lower (25%) versus higher (75%) capital-ratio banks:	*3.98*	*3.67*	*0.73*	*0.64*	*7.31*	*7.06*	*2.12*	*2.65*
Percentage point change in US bank affiliate lending in other countries following a decrease in the host country short-term interest rate by 100 bps by lower (25%) capital-ratio banks:	*-7.08*	*-3.04*			*-8.06*	*-2.83*		
Percentage point change in US bank affiliate lending in other countries following a decrease in the US federal funds rate by 100 bps by lower (25%) versus higher (75%) capital-ratio banks:	*-0.74*	*-0.97*	*1.20*		*1.50*	*2.34*	*6.69*	

Note. -- The table reports estimates from ordinary least squares regressions. The dependent variable is the quarterly change in US bank affiliate lending in the host country. Table 1 contains the definition of all variables and the summary statistics for each included variable. Bank Controls include the lagged values of Bank Total Assets, Return On Equity and the Cost Ratio; the Host Country Macro Controls include the lagged quarterly changes in the host country's short term interest rate, the exchange rate and the host country's GDP. The Selection Bias Correction for Observing US Banks Affiliate Presence in Host Country comes from a probit regression explaining the bank's presence in the host country (Appendix Table 2 Model 1). The Multiple Countries sample includes banks active in five countries or more. The Lowly-Dollarized Countries sample includes host countries for which the share of non-local currency to total US bank lending is below the 40 percentile across all countries that US banks lend to. Coefficients are listed in the first row, robust standard errors that are corrected for clustering by host country-bank are reported in the row below, and the corresponding significance levels are placed adjacently. Σ indicates that the sum of the four coefficients on the indicated lag terms (and corresponding standard errors and significance level) is reported. "Yes" indicates that the set of characteristics or fixed effects is included. "No" indicates that the set of characteristics or fixed effects is not included. "--" indicates that the indicated set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** significant at 5%, * significant at 10%.

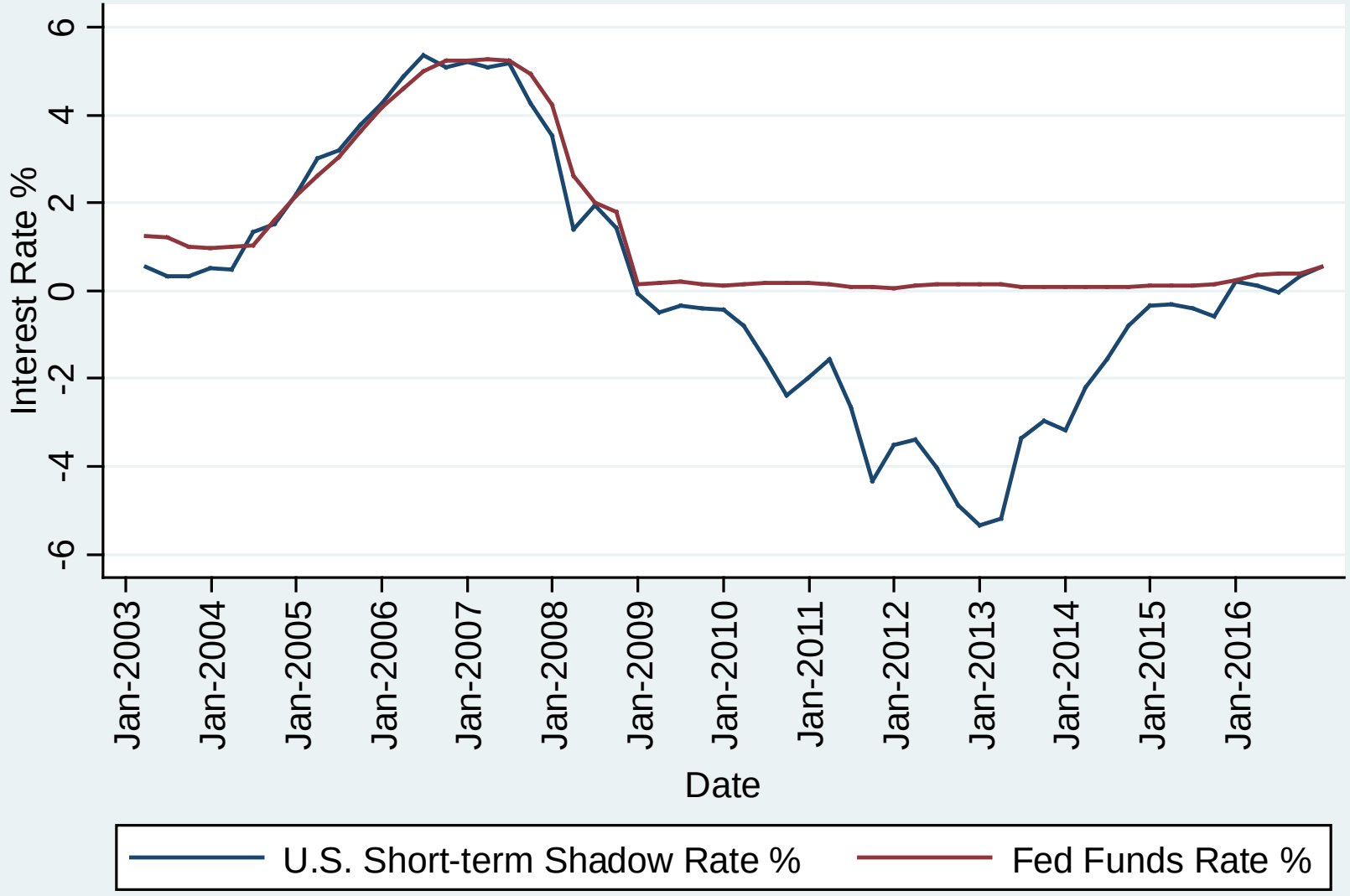
Table 9

Quarterly change in US bank subsidiary vs. branch lending in other countries for banks with different capital ratios during the 2003:Q1-2008:Q3 period

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Sample of Banks	*All*	*All*	*All*	*All*	*Multiple Countries*	*Multiple Countries*	*Multiple Countries*	*Multiple Countries*
ΣΔ Host Country Short-Term Interest Rate{t-1 to t-4}	-13.570	-8.800			-13.130	-8.510		
	[4.503]***	[3.888]**			[4.364]***	[3.788]**		
ΣΔ Host Country Short-Term Interest Rate{t-1 to t-4} * Subsidiary{t-1 to t-4}	-65.470	-83.570	-53.080	-43.570	-62.300	-79.510	-52.930	-42.680
	[42.71]	[44.64]*	[36.59]	[25.8]*	[41.81]	[44.62]*	[35.86]	[24.85]*
ΣΔ Host Country Short-Term Interest Rate{t-1 to t-4} * Bank Capital Ratio{t-1 to t-4}	0.911	0.794	0.047	0.112	0.817	0.722	0.006	0.065
	[0.444]**	[0.457]*	[0.449]	[0.498]	[0.411]**	[0.44]*	[0.429]	[0.471]
ΣΔ Host Country Short-Term Interest Rate{t-1 to t-4} * Bank Capital Ratio{t-1 to t-4} * Subsidiary{t-1 to t-4}	7.409	9.453	5.595	3.734	7.004	8.942	5.449	3.510
	[4.454]*	[4.795]**	[3.406]*	[2.756]	[4.323]*	[4.784]*	[3.279]*	[2.668]
ΣΔ US Federal Funds Rate{t-1 to t-4}	-3.961				-12.600			
	[18.29]				[16.77]			
ΣΔ US Federal Funds Rate{t-1 to t-4} * Subsidiary{t-1 to t-4}	-0.193	12.410	-42.130		1.696	15.080	-39.150	
	[20.7]	[18.58]	[20.47]**		[20.88]	[18.94]	[18.78]**	
ΣΔ US Federal Funds Rate{t-1 to t-4} * Bank Capital Ratio{t-1 to t-4}	-0.837	-1.014	-1.888		0.007	0.138	-0.728	
	[1.597]	[1.985]	[2.075]		[1.507]	[1.722]	[1.791]	
ΣΔ US Federal Funds Rate{t-1 to t-4} * Bank Capital Ratio{t-1 to t-4} * Subsidiary{t-1 to t-4}	2.921	0.389	3.054		2.490	-0.189	2.491	
	[6.12]	[4.928]	[2.841]		[6.156]	[4.967]	[2.457]	
Σ Bank Capital Ratio{t-1 to t-4}	-3.589	-2.864	-2.838	-3.586	-3.654	-2.987	-2.943	-3.524
	[2.688]	[1.979]	[2.115]	[1.882]*	[2.484]	[1.923]	[2.232]	[1.94]*
Σ Bank Capital Ratio{t-1 to t-4} * Subsidiary{t-1 to t-4}	-0.278	-0.554	-0.211	-0.525	-0.250	-0.513	-0.151	-0.516
	[1.073]	[1.172]	[0.892]	[0.835]	[1.096]	[1.198]	[0.942]	[0.868]
Constant	85.040	-326.400	7.958	-112.200	-56.780	-505.400	-134.700	-186.500
	[203.9]	[220.5]	[248.6]	[222.7]	[198]	[167]***	[232.4]	[217.7]
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Host Country Macro Controls	Yes	Yes	--	--	Yes	Yes	--	--
Host Country Fixed Effects	Yes	Yes	--	--	Yes	Yes	--	--
Time Fixed Effects	No	Yes	--	--	No	Yes	--	--
Time - Host Country Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Selection Correction for Observing US Banks Affiliate Presence in Host Country	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.10	0.23	0.55	0.55	0.11	0.24	0.56	0.56
Number of Observations	2,841	2,841	3,526	3,526	2,794	2,794	3,479	3,479
Percentage point change in US bank branch lending in other countries								
following a decrease in the host country short-term interest rate by 100 bps by lower (25%) versus higher (75%) capital-ratio banks:	*1.85*	*1.61*	*0.09*	*0.22*	*1.47*	*1.30*	*0.01*	*0.12*
following a decrease in the host country short-term interest rate by 100 bps by lower (25%) capital-ratio banks:	*-7.89*	*-4.10*			*-8.09*	*-4.29*		
following a decrease in the US federal funds rate by 100 bps by lower (25%) versus higher (75%) capital-ratio banks:	*-1.70*	*-2.06*	*-3.66*		*0.01*	*0.25*	*-1.38*	
Percentage point change in US bank subsidiary lending in other countries								
following a decrease in the host country short-term interest rate by 100 bps by lower (25%) versus higher (75%) capital-ratio banks:	*16.90*	*20.82*	*10.93*	*7.45*	*14.09*	*17.40*	*10.30*	*6.75*
following a decrease in the host country short-term interest rate by 100 bps by lower (25%) capital-ratio banks:	*-18.73*	*-18.83*			*-18.44*	*-18.33*		
following a decrease in the US federal funds rate by 100 bps by lower (25%) versus higher (75%) capital-ratio banks:	*4.23*	*-1.27*	*2.26*		*4.50*	*-0.09*	*3.33*	

Note. -- The table reports estimates from ordinary least squares regressions. The dependent variable is the quarterly change in US bank affiliate lending in the host country. Table 1 contains the definition of all variables and the summary statistics for each included variable. Bank Controls include the lagged values of Bank Total Assets, Return On Equity and the Cost Ratio; the Host Country Macro Controls include the lagged quarterly changes in the host country's short term interest rate, the exchange rate and the host country's GDP. The Selection Bias Correction for Observing US Banks Affiliate Presence in Host Country comes from a probit regression explaining the bank's presence in the host country (Appendix Table 2 Model 1). The Multiple Countries sample includes banks active in five countries or more. The Subsidiary dummy variable included in its level and interactions indicates indicates that the US bank maintains a local presence in the host country via a subsidiary (as opposed to a branch). Coefficients are listed in the first row, robust standard errors that are corrected for clustering by host country-bank are reported in the row below, and the corresponding significance levels are placed adjacently. Σ indicates that the sum of the four coefficients on the indicated lag terms (and corresponding standard errors and significance level) is reported. "Yes" indicates that the set of characteristics or fixed effects is included. "No" indicates that the set of characteristics or fixed effects is not included. "--" indicates that the indicated set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** significant at 5%, * significant at 10%.

Figure 1: U.S. Interest Rates: 2003-2016



Appendix

Appendix A: Probit estimation of global activity status and foreign market presence

In the following analysis, we examine the role of U.S. monetary policy on the *extensive* margin: How changes in the U.S. Fed funds rate affected U.S. banks' choice to become globally active and to establish local presence in a given foreign country in the pre-crisis period. It is these estimations that we used in the tables of the main text to control for selection into the set of globally active banks and affiliate-active host countries.

A.1. Empirical Methodology

In our examination of how banks' globally active vs. non-active status depends on the stance of U.S. monetary policy, the dependent variable of interest is an indicator that takes on a value of 1 if the bank operates beyond U.S. borders in the given period, and 0 otherwise. Equation (A.1) describes the probit formulation[48] of the bank's globally active status.

(A.1) $$G_{j,t} = \Lambda[\xi + \tau G_{t-1} + \sum_{k=1}^{4} o_k MP_{t-k}^{us} + \sum_{k=1}^{4} \pi_k MP_{t-k}^{us} \times C_{j,t-k}$$

$$+\sum_{k=1}^{4} \chi_k C_{j,t-k} + \varsigma \begin{pmatrix} Bank \\ Controls \end{pmatrix}_{j,t-1} + \sigma \begin{pmatrix} Macro \\ Controls \end{pmatrix}_{t-1} + \upsilon_{j,t}]$$

In this expression, the indicator variable $G_{j,t}$ takes on a value of 1 if bank *j* is globally active at time *t* in the 009 data, and $\Lambda[\bullet]$ denotes the cumulative density function of the normal distribution. The explanatory variables are as defined in the text. *Bank Controls* includes total assets, return on equity and the cost to asset ratio and bank fixed effects. *Macro Controls* include U.S. GDP growth and U.S. CPI inflation. Various combinations of bank, bank home state and time fixed effects are also included, depending on the specification. If tightening in liquidity conditions induced by contractionary U.S.

[48] In the presence of a large number of fixed effects, the use of a logistic formulation is much more suitable as compared to a probit specification.

monetary policy reduces the probability that a U.S. bank would extend claims beyond the domestic market, i.e. if the bank lending channel operates on the *extensive* margin as well, we expect to find $\sum_{k=1}^{4} o_k < 0$ and $\sum_{k=1}^{4} \pi_k > 0$. A potential explanation for the existence of such an external bank lending channel is that the tightening of liquidity conditions that banks experience after contractionary monetary policy might lead them to revise and re-optimize their portfolio with more focus on domestic investments. We calculate a Selection Correction statistic from the estimation of Equation (A.1) and use this variable as a regressor in Equation (1). We do so in order to control for the selection bias resulting from the fact that we only observe cross-border flows from a select group of 009 reporting banks who have chosen to maintain global (non-domestic) operations. The results of the Equation (A.1) estimations are discussed in the main text.[49]

Next, we present our specification for examining any impact that the stance of U.S. monetary policy might have had on U.S. banks' choice to maintain local operations in a given host country in the pre-crisis period. We do so by focusing again on the subset of globally active U.S. banks as in Tables 2 through 7 of the main text. We formulate the probit estimation of bank *j*'s decision to maintain a local presence in host country *i* at time *t* as follows. Let $P_{j,t}^{i}$ denote an indicator variable that takes on a value of 1 if bank *j* has an affiliate presence in host country *i* at time *t*, and 0 otherwise.

(A.2) $P_{j,t}^{i} = \Lambda[\, \beta + \vartheta P_{j,t-1}^{i} + \sum_{k=1}^{4} \Upsilon_k MP_{t-k}^{us} + \sum_{k=1}^{4} \phi_k MP_{t-k}^{us} \times C_{j,t-k}$

$$+\sum_{k=1}^{4} \varpi_k C_{j,t-k} + \kappa \left(\begin{matrix} Bank \\ Controls \end{matrix} \right)_{j,t-1} + \digamma \left(\begin{matrix} Macro \\ Controls \end{matrix} \right)_{t-1}^{i} + \epsilon_{j,t}^{i}]$$

[49] The exclusion restrictions (i.e., variables which are included in the logit estimation but not in the cross-border flows regressions) are the lagged values of the dependent variable, the U.S. macro controls (GDP Growth and CPI Inflation) and the bank type and home state fixed effects.

Where Λ is the normal CDF, and $P_{j,t-1}^{i}$ is the one-quarter lagged value of the foreign market presence indicator variable. The explanatory variables are as defined in the main text. The *Bank Controls* included in Equation (A.2) are total assets, return on equity and the cost-to-asset ratio. The *Macro Controls,* included in some specifications, contain the quarterly changes in the host country's short-term interest rate, GDP and the host-U.S. exchange rate. All specifications contain host country fixed effects, and we also add bank fixed effects as we saturate our model. If tighter liquidity conditions resulting from contractionary U.S. monetary policy reduces the probability that a U.S. bank would establish local presence in a foreign country that it already sends cross-border investments to, then we expect to find $\sum_{k=1}^{4}\Upsilon_k < 0$ and $\sum_{k=1}^{4}\phi_k > 0$. These findings would be indicative of the existence of an *extensive* margin bank lending channel. A potential explanation for why U.S. banks' choice to establish local presence abroad might be affected by the stance of monetary policy in the U.S. is that doing so enables the bank to extend *local flows* in the host market. Therefore, operating an affiliate represents an additional channel for bilateral foreign investment in that market. The relative attractiveness of such additional channels might vary with the liquidity conditions that U.S. banks experience at home. We calculate a Selection Correction statistic from the estimation of Equation (A.2) and use this variable as a regressor in Equation (2). We do so in order to control for the selection bias resulting from the fact that we only observe local flows for a select group of foreign countries whose lucrative investment prospects have led U.S. banks to establish local presence there. Results of the estimation of Equation (A.2) are discussed in the main text.[50]

A.2. Data

[50] The exclusion restrictions (i.e., variables which are included in the logit estimation but not in the affiliate flows regressions) are the lagged values of the dependent variable, and (depending on the specification in Tables 8 and 9) the level of U.S. Fed Funds rate changes or host country macro controls.

The dataset used in the estimation of banks' globally active status in Equation (A.1) incorporates all U.S. financial institutions that report on the Call Reports. We use a large dataset including the balance sheet and financial data of all U.S. financial institutions over the 2003-2007 period, including commercial banks, bank holding companies, and edge and agreement corporations. In order to identify those banks with significant foreign exposures, the dependent variable is an indicator that takes on a value of 1 if the bank reports its foreign exposure on the FFIEC 009 form, and 0 otherwise.

A.3. Estimation Results

In Table A.1 below, we find that a 100 basis points increase in the U.S. Fed funds rate in the pre-crisis period would have corresponded to a minimal decline in the probability of a U.S. bank maintaining global operations in the pre-crisis period (the sample probability is 2.4 percent). There is no significant difference between low vs. high-capitalized banks in this impact of U.S. monetary policy. Table A.1 reveals that whether the bank was globally active in the previous period is a very strong predictor of its current globally active status. Bigger and less profitable banks were more likely to be active abroad.

In Table A.2, the level effect of a U.S. monetary policy shock is significant in two of the four specifications. The interaction of monetary policy changes with bank capitalization is significant in one specification. Therefore, there is some limited evidence that increases in the U.S. Fed funds rate reduces the probability that a U.S. bank would be present in a given host country through local operations. These effects remain even after controlling for host country macro controls and host country and bank fixed effects. However, the strongest predictors of this decision appear to be bank size and whether the bank already maintained local presence in the country in the previous period. Both these variables have positive and strongly significant effects on the probability of a bank's affiliate presence.

Appendix B: Alternative specifications and robustness checks

Lending to a host market via multiple channels. Since serving a host market via an affiliate is a strategic choice from the bank's perspective, it is possible that the strength of monetary transmission into a bank's lending on the intensive margin is dependent on whether the bank also maintains an affiliate in the host market that it lends via cross-border flows. This is because the presence of an affiliate enables the bank to respond to the U.S. monetary policy-induced scarcity of liquidity in cross-border lending by choosing to serve the host market via affiliate flows instead. In additional cross-border flows specifications (available from the authors upon request), we interact the U.S. monetary policy shock and its interaction with the bank funding ratio with an indicator of whether the bank also maintains an affiliate in the given host country in that time period. We find that our monetary transmission results are not significantly different in host countries where lending occurs via cross-border flows only, relative to countries where the lending bank maintains an affiliate as well.

Using alternative balance sheet measures of funding constraints. In our main specifications, we use the deposit to asset ratio and capital ratio as proxies for banks' funding constraints, which previous literature has shown to be valid proxies of banks' stable funding sources (Cornett et al. (2011); Jiménez et al. (2012); Correa et al. (2015); Ongena et al. (2015)). In alternative specifications, we also repeat our Table 2 and 3 specifications using banks' *illiquid assets ratio* (defined as the sum of "loans and leases held for sale", "net total loans and leases", "amortized cost of held-to-maturity securities" and "fair value of available-for-sale securities", divided by total assets) and banks' *commitments ratio* (defined as "loan commitments", over the sum of "loan commitments" and total assets) as our measures of funding constraints ((Cornett et al. (2011); Correa et al. (2015)). We find that using the commitments ratio as our proxy of funding constraint yields highly significant monetary transmission results into U.S. banks' cross-border lending.

Examining the role of internal net transfers. We also explore the role of U.S. and host country monetary conditions in shaping the patterns of internal funds transfers in and out of U.S. banks' foreign affiliates. We define a host country-specific *Net Due* variable as the bank's host country-specific net amount owed to own related offices in other countries (fcex 8595 from the 009 data), divided by total assets (Correa et al. (2015)), and repeat our Table 8 specifications using this measure as our dependent variable. We do not find a systematic relationship between U.S. and host country monetary policy changes, and foreign affiliates' *net due to* shares. Hence treating *net due to* as exogenous to monetary conditions, we also repeat the Table 9 specifications, interacting the *net due to* variable with the monetary policy measures and their interactions with the capital ratio. We find no evidence that *net due to* shares impact the strength of monetary transmission into the lending of U.S. banks' foreign affiliates.

Delineation of by bank size. When we restrict our sample to *large* global U.S. banks in our Table 4 specifications, as expected our domestic (U.S.) monetary transmission results remain significant but somewhat smaller in magnitude with an average effect of 0.17. Separately, when we examine monetary pass-through effects into the domestic lending of large *domestic* (non-global) banks, we find that they are somewhat smaller, with an average coefficient of 0.15. While we find that there is significant monetary transmission into the foreign lending of large global U.S. banks as well, our size-delineated findings on the role of bank size point in the same direction as Kashyap and Stein (2000) and Cetorelli and Goldberg (2012a).

Replacing the host country macro variables with forecast values. We examine the possibility that our host country macroeconomic demand controls (quarterly changes in the local currency-USD exchange rate, and the host country's real GDP) may be endogenous to the host country's monetary policy. We do so by replacing these host country macro variables with one, two, three and four-quarter forecast values

collected from Consensus Economics. We repeat the Table 8 estimations including four leads of these forecast values, and find that our monetary transmission results remain significant.

Using affiliate organizational information from Accuity. While the FR Y-10 form is the most reliable available source on U.S. banks' foreign organizational structure, we also re-estimate our Table 9 specifications using subsidiary information from Accuity. Doing so, we find that our Table 9 results continue to hold: host country monetary transmission is stronger into the affiliate lending of U.S. banks' subsidiaries, compared to affiliates organized as branches.

Examining the role of carry trade. A potential explanation for why lower income countries might see stronger transmission is carry trade, as these lower income countries offer higher interest rates. So a lowering of the US fed funds rate might make these lower income (higher rate) countries appear to be a more profitable target for carry trade (and the US more attractive as a carry source).

To see if this is the case, we ran additional regressions looking at the potential role of carry trade in several ways: First we separate higher vs. lower interest rate countries by replacing the "low income" dummy in Table 7 with a "high rate" dummy, which takes a value of one if a host country has money market rates above the median at a given time, and zero otherwise. These results show that there is no significant difference in the strength of the transmission between high rate vs. low rate countries: carry trade does not appear to be driving the low vs. high income results. Second, we separate "target" vs. "source" countries, using two additional variables from the 009 dataset: the total borrowing of all foreign offices of a given bank from a host country ("carry source" = total amount borrowed from a country by the bank), and the total claims of all foreign offices of a given bank on a host country ("carry target" = total amount invested in a country by the bank). We categorize countries as "carry target" if the ratio of carry inflows is high relative to carry outflows, and interact this "carry target" dummy with the monetary

transmission measures. We do not see any significant difference in the strength of monetary transmission based on whether the country is a “carry trade target” or not.

Appendix Table 1

US banks lending across borders during the 2003:Q1-2008:Q3 period

Model	[1]	[2]	[3]	[4]
US Banks Lending across Borders{t-1}	1.012	1.026	1.012	1.005
	[0.104]***	[0.106]***	[0.104]***	[0.103]***
ΣΔ US Federal Funds Rate{t-1 to t-4}	-0.088	-0.085	-0.088	
	[0.0479]*	[0.0478]*	[0.0479]*	
ΣΔ US Federal Funds Rate{t-1 to t-4} * Bank Capital Ratio{t-1 to t-4}	0.005	0.004	0.005	0.005
	[0.004]	[0.004]	[0.004]	[0.004]
Σ Bank Capital Ratio{t-1 to t-4}	-0.001	-0.001	-0.001	0.000
	[0.002]	[0.002]	[0.002]	[0.002]
Bank Total Assets{t-1}	0.032	0.033	0.033	0.033
	[0.006]***	[0.005]***	[0.006]***	[0.005]***
Bank Return on Equity{t-1}	-0.003	-0.003	-0.003	-0.002
	[0.001]***	[0.001]***	[0.001]***	[0.001]**
Bank Cost Ratio{t-1}	0.006	0.008	0.006	0.003
	[0.004]	[0.004]**	[0.004]	[0.006]
US GDP Growth{t-1}	0.039	0.041	0.039	
	[0.021]*	[0.021]*	[0.021]*	
US CPI Inflation{t-1}	0.052	0.052	0.052	
	[0.024]**	[0.024]**	[0.024]**	
Constant	-4.922	-5.028	-4.922	-4.638
	[0.202]***	[0.204]***	[0.202]***	[0.253]***
Bank Type Fixed Effects	Yes	No	Yes	Yes
Home State Fixed Effects	No	Yes	Yes	Yes
Time Fixed Effects	No	No	No	Yes
Number of Observations	139,260	141,647	139,172	139,172

Note. -- The table reports estimates of marginal effects (in percent) from probit regressions. The dependent variable is a dummy that equals 1 if a US bank lends across border in t (year:quarter) and is 0 otherwise. Table 1 contains the definition of all variables and the summary statistics for each included variable. Marginal effects are listed in the first row, robust standard errors clustered by bank are reported in the row below, and the corresponding significance levels are placed adjacently. Σ indicates that the sum of the four coefficients on the indicated lag terms (and corresponding standard errors and significance level) is reported. "Yes" indicates that the set of characteristics or fixed effects is included. "No" indicates that the set of characteristics or fixed effects is not included. *** Significant at 1%, ** significant at 5%, * significant at

Appendix Table 2

US banks affiliate presence in host countries during the 2003:Q1-2008:Q3 period

Model	[1]	[2]	[3]	[4]
US Banks Affiliate Presence in Host Country{t-1}	10.970	10.360	12.800	13.490
	[0.392]***	[0.446]***	[0.377]***	[0.489]***
ΣΔ US Federal Funds Rate{t-1 to t-4}	-6.549	-4.273	-0.461	0.415
	[1.142]***	[1.176]***	[1.985]	[2.160]
ΣΔ US Federal Funds Rate{t-1 to t-4} * Bank Capital Ratio{t-1 to t-4}	0.178	0.211	-0.108	0.026
	[0.118]	[0.116]*	[0.214]	[0.238]
Σ Bank Capital Ratio{t-1 to t-4}	-0.144	-0.151	-1.545	-1.615
	[0.042]***	[0.044]***	[0.316]***	[0.370]***
Bank Total Assets{t-1}	0.728	0.755	-15.200	-16.010
	[0.086]***	[0.088]***	[2.368]***	[2.726]***
Bank Return on Equity{t-1}	0.504	0.454	-0.761	-0.463
	[0.073]***	[0.071]***	[0.228]***	[0.250]*
Bank Cost Ratio{t-1}	0.049	0.077	-8.732	-7.239
	[0.165]	[0.155]	[1.460]***	[1.702]***
Constant	-6.585	-7.199	50.740	51.540
	[0.457]***	[0.506]***	[7.130]***	[7.911]***
Bank Fixed Effects	No	No	Yes	Yes
Host Country Macro Controls	No	Yes	No	Yes
Host Country Fixed Effects	Yes	Yes	Yes	Yes
Number of Observations	16,912	13,867	10,250	7,420

Note. -- The table reports estimates of marginal effects (in percent) from probit regressions. The dependent variable is a dummy that equals 1 if a US bank has an affiliate in the host country at time t (year:quarter) and is 0 otherwise. The Host Country Macro Controls include the lagged quarterly changes in the host country's short-term interest rate, the host country's GDP and the exchange rate. Table 1 contains the definition of all variables and the summary statistics for each included variable. Marginal effects are listed in the first row, robust standard errors clustered by host country-bank are reported in the row below, and the corresponding significance levels are placed adjacently. Σ indicates that the sum of the four coefficients on the indicated lag terms (and corresponding standard errors and significance level) is reported. "Yes" indicates that the set of characteristics or fixed effects is included. "No" indicates that the set of characteristics or fixed effects is not included. *** Significant at 1%, ** significant at 5%, * significant at 10%.