P R W P 7216

Abstract

is paper identi es the international credit channel of monetary policy by analyzing the universe of corporate loans in Mexico, matched with rm and bank balance-sheet data, and by exploiting foreign monetary policy shocks, given the large presence of European and U.S. banks in Mexico. e paper nds that a softening of foreign monetary policy increases the supply of credit of foreign banks to Mexican rms. Each regional policy shock a ects supply via their respective banks (for example, U.K. monetary policy a ects credit supply in Mexico via U.K. banks), in turn implying strong real e ects, with substantially larger elasticities from monetary rates than quantitative easing. Moreover, low foreign monetary policy rates and expansive quantitative easing increase disproportionally more the supply of credit to borrowers with higher ex ante loan rates—reach-for-yield—and with substantially higher ex post loan defaults, thus suggesting an international risk-taking channel of monetary policy. All in all, the results suggest that foreign quantitative easing increases risk-taking in emerging markets more than it improves the real outcomes of rms.

---

is paper is a product of the Finance and Private Sector Development Team, Development Research Group. It is part of a larger e ort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org.
e authors may be contacted at cruizortega@worldbank.org.

The International Bank Lending Channel of Monetary Policy Rates and Quantitative Easing: Credit Supply, Reach-for-Yield, and Real Effects

Bernardo Morais José-Luis Peydró Claudia Ruiz*

JEL codes: E44, E52, E58, G01, G21, G28.
Keywords: credit channel of monetary policy, financial globalization, quantitative easing (QE), credit supply, risk-taking, foreign banks.

* This draft is from March 2015. Bernardo Morais: Federal Reserve Board, bernardo.c.morais@frb.gov; José-Luis Peydró: ICREA-Universitat Pompeu Fabra, Cass Business School, CREI, Barcelona GSE, CEPR, jose.peydro@upf.edu; Claudia Ruiz: DECFP, World Bank, cruizortega@worldbank.org. Peydró acknowledges financial support from project ECO2012-32434 of the Spanish Ministry of Economics and Competitiveness. We thank Mark Gertler, Fabrizio Lopez-Gallo Dey, Soledad Martinez-Peria, Pascual O'Dogherty, Hélène Rey, Andrei Shleifer, Jeremy Stein and the seminar participants at Bank of Mexico and the Federal Reserve Board for helpful comments. The views expressed in the paper are solely those of the authors and do not necessarily represent the views of the Federal Reserve Board, the World Bank, Mexican Banking and Securities Commission (CNBV) or Bank of Mexico.

1. Introduction

The recent global financial crisis, as well as previous crises, have shown that bank credit cycles have a strong impact on the economy, that financial globalization can increase financial fragility, and that monetary policy may be a key public policy tool (Bernanke, 1983; Reinhart and Rogoff, 2009; Schularick and Taylor, 2012). As Rey (2013) argued in the Federal Reserve's annual conference in Jackson Hole, monetary policy by the Fed may have substantial spillovers in emerging markets' credit cycles, including excessive bank risk-taking. Furthermore, the Fed's Vice Chairman, Stanley Fischer (2014), also argued that both the interest rate and quantitative easing (QE) may affect international spillovers and pointed out that European monetary policy also plays an important role, as European banks are also strongly globalized. Similarly, some central bankers in emerging markets, like Raghuram Rajan (2014) from the Reserve Bank of India, complained about the negative spillovers of the United States and Europe's monetary policy on emerging markets' financial stability.

In this paper, we study the previous issues. In particular, we study the international bank lending channel of monetary policy, both through the interest rate and QE. We analyze: (a) whether foreign monetary policy affects the supply of credit from foreign banks to local firms; (b) whether there are real effects associated with foreign monetary policy shocks, or are local firms able to neutralize the international shocks by substituting credit with local banks or other sources of finance; (c) whether an expansive foreign monetary policy creates an international risk-taking channel by affecting banks' reach-for-yield incentives; (d) and finally, whether these effects depend on the type of monetary policy used, i.e., policy interest rates versus QE.

Despite the importance of these questions for policy and macro-finance, the identification of foreign monetary policies on the credit channel by foreign banks has been elusive. This has been due to the lack of exploitation of comprehensive credit registry data, matched with firm and bank information, with enough years to analyze monetary policy. We overcome this hurdle by using the proprietary data set of the Mexican bank supervisor containing all business loans, matched with firm and bank balance-sheet information. Importantly, the data set, which starts in January 2002, includes *all* new and outstanding commercial loans at a monthly frequency for all banks in Mexico, as well as the relevant loan terms, including loan rates (that are absent in most credit registers around the world).

The importance of foreign banks in Mexico (notably US, Eurozone and UK) in conjunction with the exhaustive credit data (matched to firm and bank level data) makes Mexico an excellent empirical laboratory to identify the transmission of foreign monetary policy shocks – both interest rates and QE – through the credit supply of foreign banks, as well as the associated real effects on borrowers and reach-for-yield incentives of banks. In particular, the credit extended to Mexican firms by banks in Mexico owned by US and European banks represents 56 percent of all the bank credit in Mexico. Furthermore, unlike most credit registries, the Mexican one does not have a minimum loan size for inclusion in the data set.[1] Overall, our data set includes 6,942,806 loans by 38 banks to 149,940 firms.

To identify the credit supply and risk-taking channels of monetary policy (Bernanke and Gertler, 1995; Kashyap and Stein, 2000; Adrian and Shin, 2011), we analyze loan-level data at the monthly frequency with borrower (or borrower*period) fixed effects. This allows us to control for unobserved (time-variant) firm fundamentals (such as risk or investment opportunities) that proxy for credit demand, since foreign banks may lend to a different type of firms, such as larger firms (Khwaja and Mian, 2008). Since firms that borrow from multiple banks only represent 18 percent of all firms, and 56 percent of total bank credit, we also include in some specifications firms that borrow from only one bank using firm*bank and state*industry*period fixed effects to control for unobservables. Furthermore, given that period fixed effects control for unobserved global shocks, identification also comes in a given period (month) from the differential of monetary policies between Mexico, US, UK, and the Eurozone. Since our identification compares lending from different foreign banks (themselves shocked by their home monetary policy), borrower selection is less of an issue since, as we show, borrowers within US, UK and Eurozone banks are not (statistically) different. Moreover, to identify the risk-taking channel of monetary policy, we analyze compositional changes of credit supply depending on borrowers' ex-ante loan rates and also analyze ex-post loan defaults.

For the identification of the associated real effects, we analyze total (bank and non-bank) firm-level credit availability as well as the dynamics of firm assets. This is relevant since firms could potentially neutralize the international monetary policy shocks by substituting their current credit suppliers with credit from other banks or from other sources. Furthermore, and different from

[1] For example, in Germany the threshold is 1.5 million euros while in Italy it is 75,000 euros. This implies that loans to small and even medium firms may not be included in those credit registers.

papers that analyze local monetary policy on local credit conditions, we examine European (Eurozone and UK) and US monetary policies, which are determined exogenously to the Mexican economy.[2] Finally, and as a measure of monetary policy, for monetary rates we use the overnight rate, while for monetary QE we use the change in the balance sheets of US, UK, and Eurozone central banks' as a share of GDP.[3]

We find the following robust results. A foreign policy rate shock only affects the supply of credit to Mexican firms via their respective foreign banks in Mexico: US, UK and Eurozone monetary policy impacts the supply of credit to Mexican firms only through US, UK and Eurozone banks, respectively.[4] Furthermore, all loan terms are significantly affected, reinforcing the supply driven channel; interestingly, though, the effects are substantially weaker for loan rates. In particular, a 1 standard deviation reduction in foreign monetary policy rates: increases the volume supplied by foreign banks in Mexico by around 3.7 percent, lengthens the loan maturity by 8.7 percent, and increases the probability of future default over the next year by 8.6 percent.[5] Moreover, a softening of foreign monetary policy raises the collateral requirements by 6.3 percent, probably to compensate for the softening in the other lending margins, including default.

We also find that foreign QE has an expansionary effect on credit supply to Mexican firms. QE originated in the US and in the Eurozone works respectively through US and Eurozone banks in Mexico (mainly on credit volume and maturity). Moreover, a softening in foreign QE is related with a rise in loan defaults from Mexican firms over the following year. However, we find that even though these non-standard monetary policies have an expansionary effect, their economic magnitude tends to be lower than that of changes in policy rates. For instance, whereas a one standard deviation decrease in the Fed Funds rate expands the credit volume of US banks by 7.2

[2] To account for further potential concerns of endogeneity of foreign monetary policy rates, while controlling for foreign economic activity, we either take the nominal rate, or the residual of the regression of the policy rate of a country on its GDP and price changes (thus proxying a Taylor-rate shock). We also control for foreign economic activity, as this could be a separate channel of influence.

[3] While the Fed and the Bank of England pursued explicitly QE as a key non-standard monetary policy, the ECB main non-standard monetary policy was until 2015 the full provision of liquidity to banks at a given price against a very wide set of collateral, the so-called credit enhancement (Trichet (2009), ECB (2009 and 2011), Fisher (2014)).

[4] Instead, a loosening of domestic monetary policy rate softens bank lending conditions regardless of bank nationality; for example, a 1 standard deviation reduction in the Mexican policy rate raises the lending volume on average by 1.6 percent for the loans supplied by all banks (national and foreign).

[5] These effects, however, are an average of the impact of US, UK and the Eurozone, and for some credit margins the quantitative effects vary substantially across regions. For example, the effects on loan rates are only significant for US monetary policy.

percent and maturity by 10.8 percent, a one standard deviation increase in our measure of QE increases volume by only 0.5 percent and maturity by 2.2 percent

We also analyze the implications of the changes in monetary policy at the firm level. While loan-level analysis is needed to identify the credit supply, firm level data are necessary to analyze credit and debt substitution effects and the associated real effects.[6] We find that the international monetary policy channel has significant real effects, with substantial stronger elasticities from monetary rates than quantitative easing. In particular, a tightening by one standard deviation of foreign monetary rates leads to a reduction of 3.4 percent of firm-level total bank credit volume, a reduction of 1 percent in all firm liabilities and a reduction of 0.6 percent in total firm assets. Instead, a contraction of one standard deviation in quantitative easing decreases total bank credit at the firm-level by 0.8 percent but without significant overall real effects.

Finally, an expansive monetary policy leads to higher supply of credit in general, but with important heterogeneous effects. Quantitative effects are strongest to corporate borrowers with higher ex-ante loan rates – proxying for reach-for-yield – with foreign banks engaging more in this risk-taking. This finding is present along all the credit dimensions. For borrowers with higher ex-ante loan rates, the ex-post default probability associated with a reduction of 1 standard deviation in foreign monetary policy increases by 10.3 percent, whereas for the remaining borrowers there is no effect. Likewise, a 1 standard deviation expansion of QE leads to a 10.9 percent increase in the future default rate of firms with higher ex-ante loan rates, and has a much smaller impact on firms with lower ex-ante loan rates. Therefore, the greater risk-taking is associated with ex-ante observable variables (previous high loan rates) and higher ex-post defaults. All in all, this evidence suggests an international risk-taking channel of monetary policy, both through foreign monetary policy rates and QE.

Our paper contributes to the literature in three main ways. First, it contributes to the literature analyzing the international channel of monetary policy. Cetorelli and Goldberg (2012) provide direct evidence that global banks manage liquidity on a global scale, actively using cross-border internal funding in response to local shocks. They also show that having global operations

[6] Importantly, the loan level regressions show that controlling for firm*period fixed effects provides very similar coefficients to controlling only for firm and state*industry*period fixed effects – i.e., results suggest that both specifications control for borrower fundamentals. Therefore, the firm-level regressions, where we cannot include firm*period fixed-effects but we can include firm and state*industry*period fixed effects, can be interpreted as providing the credit availability channel.

insulates banks from changes in local monetary policy, while banks without global operations are more affected by monetary policy. We contribute by showing that local credit supply, including associated real outcomes and risk-taking, is affected by foreign monetary policy shocks through foreign (global) banks. Furthermore, not only do we analyze interest rate shocks but also QE monetary shocks, and thus our findings are also important given the recent important policy debate about the impact of changes in US and European quantitative easing on the emerging markets (see e.g. IMF/WB speech by Fed Vice Chairman Fischer (2014) and speech by Governor Rajan of the Reserve Bank of India (2014)).[7]

Second, a recent literature has started analyzing the impact of monetary policy at the loan level (Jiménez et al., 2012 and 2014). These papers, however, do not match their loan level data with firm level data, so they cannot analyze the real effects associated to the bank lending channel of monetary policy. However, real effects of monetary policy on the economy, through the banking sector, may be crucial, as shown by recent theoretical papers (Diamond and Rajan, 2006, Gertler and Kiyotaki, 2010; Kiyotaki, and Moore, 2012; Gertler and Karadi, 2011). Some empirical papers using aggregate macro data have analyzed the real effects of monetary policy (Bernanke and Blinder, 1992; Ciccarelli, Maddaloni and Peydró, forthcoming), but as we explain in this paper (following Khwaja and Mian, 2008), loan level data are necessary for the identification of credit supply. Moreover, bank-level data (e.g. as in Kashyap and Stein, 2000) cannot identify credit supply, or the associated firm-level real effects. Therefore, another crucial contribution of this paper is to show the real effects of the bank lending channel of monetary policy with loan- and firm-level data.

Finally, our paper also contributes to the literature analyzing the risk-taking channel of monetary policy, in particular, the reach for yield stemming from low international monetary policy rates and expansive QE. Expansive monetary policy rates may promote higher risk-taking by banks and other financial institutions, as argued by IMF Chief Economist Rajan (2005), Federal Reserve Governor Stein (2013) and Adrian and Shin (2011) in the last Handbook of Monetary Economics, among others.[8] There is empirical evidence for this channel (e.g., Jiménez et al., 2014; Ioannidou,

[7] Our paper also contributes to the literature in international finance that shows that foreign shocks affects the local economy through the banking sector (Peek and Rosengren. 2000; Mian, 2006; Schnabl, 2012; Kalemli-Ozcan, Papaioannou and Peydró, 2013), We contribute to this literature by analyzing the foreign monetary shocks through foreign banks and quantifying the elasticities associated to central banking policies. Note that a large part of financial globalization is through the banking sector (Kalemli-Ozcan, Papaioannou and Peydró, 2010).

[8] See also several models of Allen and Gale (2000 and 2004) summarized in Allen and Rogoff (2011), Borio and Zhu

Ongena and Peydró, forthcoming; Paligorova and Santos, 2014). We contribute by showing the international channel, in particular, that low monetary policy rates and QE in high-income countries lead foreign (global) banks to increase credit supply in emerging markets to local borrowers with higher ex-ante loan rates that substantially default more (ex-post) on their loans. Moreover, our results suggest that foreign QE affects more risk-taking in emerging markets through an expansion of credit supply to riskier firms than improves real outcomes of firms in emerging markets (consistent, among others, with some claims by Rey (2013)).

The remainder of the paper is structured as follows. Section 2 presents the empirical strategy, including the data, institutional details, and econometric equations we run. Section 3 presents and discusses the results, and Section 4 concludes.

2. Empirical strategy

In this section we present the empirical strategy to identify the impact of foreign monetary policy on local credit supply by foreign banks, and the associated risk-taking and real effects. We first discuss the data and the institutional details, and then the econometric equations we run at the loan- and firm-level.

2.1. Data and Institutional Details

We use a novel supervisory data set on the universe of business loans in Mexico from January 2002 to March 2012. The data set is compiled by the Mexican Banking and Securities Commission (CNBV) under its role as bank supervisor. These data come from regulatory reports (known as R04) sent monthly by every commercial bank to the CNBV. Reports are mandatory, updated electronically, and include detailed characteristics of all the new and continuing loans made to firms or individuals with entrepreneurial activities by every bank in Mexico. Moreover, all business loans, regardless of their size, have to be reported.

(2008), Shleifer and Vishny (2010) and Diamond and Rajan (2012). This theoretical work suggests that expansive monetary policy through the increase in funding provided by households and other agents to banks may cause an increase in risk-shifting in lending, as banks face strong moral hazard problems. A low short-term interest rate makes riskless assets less attractive and may lead to a reach-for-yield by those financial intermediaries that have short-term time horizons.

For each loan, we know the issuing bank, the borrower (firm), the outstanding amount, the annualized interest rate, both start and ending date of the loan (maturity), the fraction covered by collateral, as well as certain firm information, such as its identifier, location, and industry. Since loans are tracked every month, we are able to see their evolution until maturity. Furthermore, we observe whether the debtor obligations are being fulfilled, and in case they are not, by how much and for how long the loan has been under-performing. Even though in Mexico there are about 38 different financial institutions, bank concentration is relatively high, with the top five banks accounting for almost 79 percent of the outstanding loans in Mexico, with four of these five banks – Bancomer, Santander, HSBC and Banamex – being foreign owned and granting 56 percent of the commercial credits.[9]

To ensure the consistency of the data and to analyze real effects, we exclude from our study loans to people with entrepreneurial activity, restricting our analysis to loans to commercial firms. In Mexico, individuals with entrepreneurial activity are legally defined as "personas fisicas con actividad empresarial" whereas commercial firms are defined as "personas morales". Banks may change the classification of loans to individuals with entrepreneurial activity from commercial to consumption loans and vice versa, artificially moving the number of entrepreneurial loans in our data. Moreover, we merge our data set with Orbis (which only has commercial firms and not individual entrepreneurs) to include firm balance sheet information in order to analyze real effects. For these reasons, we only analyze loans to commercial firms. We also merge the credit data with monthly bank balance sheet reports by the CNBV, and use macroeconomic information (e.g. GDP, CPI, policy rates) for Mexico, the US, UK and Eurozone, which we obtain through the IMF.

Our final data set contains information on 149,940 firms, spanning from January 2002 to March 2012. We aggregate the observations at the firm-bank-month level, which we define as a "loan", ending up with 6,942,806 observations. For the vast majority of variables, we aggregate individual loans using a weighted average by loan volume; the only exception is loan volume which is the sum of the value of all outstanding loans that a firm has from a certain bank in a given month. Panel A of Table 1 presents the summary statistics of our main variables of interest: loan volume, maturity of the loan, fraction of the loan covered by collateral, interest rate and the average default rate. The variable *loan volume* corresponds to the sum of the value of all outstanding – new and

[9] The foreign bank in Mexico that is neither from US or Europe is the Canadian Scotiabank. We decided not to include the Canadian monetary policy in our analysis as Scotiabank only holds 0.7 percent of bank loans.

continuing – loans of a firm from a certain bank in a given period. The average credit volume is MXP 1,737,000 (roughly USD 150,000), while the median loan is close to USD 30,000.[10] The median interest rate and maturity are 14 percent and 26 months, respectively. Furthermore, while on average 28 percent of firms' debt is backed up by some sort of collateral, the median share of collateralized debt is zero. Finally, the variable *default* corresponds to the fraction of debt that is observed in arrears for more than 90 days. While, the average default rate is 9.7 percent the default rate of the median loan is zero.

The macroeconomic and policy independent variables used in our empirical analysis are also exhibited in Panel A of Table 1. The variable *intrate-mex* is the Mexican overnight interest rate (*Tasa de Fondeo Interbancaria*), while the variables *intrate-us*, *intrate-uk* and *intrate-euro* correspond to the Fed Funds rate targeted by the Federal Reserve, the Sonia rate targeted by Bank of England (BoE) and the Eonia rate targeted by the European Central Bank (ECB). Given that the Mexican economy is highly dependent on the US, we run an OLS regression of the Mexican overnight interest rate on the Fed Funds rate, on Mexican and US GDP growth and on Mexican and US CPI inflation, and use the residuals (variable *intrate-mexr*) in our benchmark regressions to account for any movement in the domestic monetary policy that is not explained by movements in the US economic activity. Likewise, we regress the Fed Funds rate on the US GDP growth and US CPI inflation. Therefore, variable *intrate-usr* is the residual from this regression, proxying for a Taylor-shock, and accounts for any movement in the monetary policy from the US that is not related to the US business cycle.[11] Given the integration and synchronization of the world economy, one possible concern is the multicollinearity of the monetary policies. However, given that we are controlling for the business cycles, the correlations between the residual monetary policies are relatively moderate.[12]

After Lehman failure, as US and European overnight interest rates went to very low levels, especially in 2009, the central banks engaged in large scale asset purchases and unlimited lending to banks with the objective of further stimulating the economy. In our analysis, we also include these

[10] Around 98.7 percent of the loans in our data set are denominated in Mexican pesos. Excluding the loans in foreign currency does not alter our results in any significant way.

[11] For the UK and the Eurozone, we do this only in robustness tests as these economies are not so integrated with Mexico.

[12] For example, *corr(intrate-usr,intrate-uk*) = 0.55 and *corr(intrate-usr,intrate-euro)* = 0.60. Furthermore, these correlations up to 2009 – when policy rates hit the zero lower bound – are around 0.30. As a robustness test in the appendix we replicate our results limiting the sample up to the end of 2009.

non-standard monetary policies. More concretely, the variables qe-us, qe-uk and qe-euro in Panel A of Table 1 display the yearly change of the balance sheet of the central bank as a share of GDP. All three central banks increased sharply their assets holdings in the third quarter of 2008, by around 8 to 10 percent of GDP. Nevertheless, going forward these programs exhibited different purchasing patterns. While the Federal Reserve, and in smaller scale the BoE, maintained its purchasing rate for a full year through the third quarter of 2009, after which it decreased to around 2 percent, the ECB sharply decreased its buying rate by early 2009. Later, in the second half of 2010, the Federal Reserve boosted its program (dubbed *QE2*), while the BoE and the ECB only increased their purchasing programs by the second half of 2011 (the ECB introduced the 3 year LTRO in December 2011). Overall, and from the third quarter of 2008 through early 2012, the Federal Reserve, the ECB and the BoE expanded their balance sheet as a share of GDP by 14.9, 12.7, and 10 percentage points, respectively.

Panel A also presents indicator variables on whether the loan is from a US, UK, Eurozone or Mexican bank (variables *us-bank, uk-bank, euro-bank* and *mex-bank*). On average, 43 percent of loans are from Mexican banks, followed by Eurozone banks, concentrating 25 percent of loans. U and UK banks have around 15 percent of the loans each. Finally, to control for movements both in the domestic and US business cycle, we use the seasonally adjusted Mexican and US real GDP growth (variables *gdp-mex* and *gdp-us*) and the Mexican and US CPI annual growth (variables *cpi-mex* and *cpi-us*). Additionally, in other regressions we include period or borrower*period fixed effects to also control for unobserved time-varying global shocks, where period refers to month in loan level regressions and year in real effects regressions.

To examine whether movements in foreign monetary policy have real effects on firms, we merge our loan-level data with information at the firm-year level from Orbis, which provides a Panel data set of a sample of Mexican firms with firm balance sheet information. To do so, we aggregate our credit data set to one observation per firm and year. Panel B of Table 1 presents the summary statistics of the firm-year data set. The first variable, $loan\ volume^{Y}$, corresponds to the sum of the value of all outstanding loans that a firm has in a given year from all the different banks. The variable $maturity^{Y}$ is the average maturity of all bank loans of a firm in a given year, weighted by loan volume. Similarly, the variables $collateral^{Y}$, $loan\ rate^{Y}$ and $default^{Y}$ correspond to the weighted averages of the collateral, interest and default rates of all bank loans of a firm in a given year, again weighted by their respective loan volume. Combining the credit information with Orbis results in a

significant loss of observations, since information of many firms in Orbis is missing. Nevertheless, we successfully match around 11,700 firm-year observations, with information on firms' total *assets*, and *total, current* and *non-current liabilities*.

Since we aggregate information at the firm level, we weigh the monetary policy of each country (both standard and non-standard) by the share of the debt that a firm had with banks from this country in the previous year.[13] Our intuition is as follows: if a firm borrows only from one bank (say an American one), then the most relevant monetary policy affecting the firm's outcomes through the bank lending channel should be the US one. In other words, assume that in the previous year 40 percent of a firm's debt was obtained from UK banks and 60 percent from Mexican banks. If firm-bank relations are sticky, which in our data set they are, then the most relevant monetary policies for this firm are from the UK (with a 0.4 weight) and Mexico (with a 0.6 weight).

For each firm, the variable $intrate^{Y}$-*mex**$share^{Y}$-*mex* refers to the annual Mexican monetary policy weighted by the share of previous year bank credit that a firm had with Mexican banks. Similarly, the variable $intrate^{Y}$-*foreign**$share^{Y}$-*foreign* is the annual average of the US, UK and Eurozone monetary policy rates, weighted by the share of debt that a firm had with US, UK and Eurozone banks in the previous year. We also analyze each foreign monetary policy variable in isolation to the other ones. These aggregate monetary policy variables allow us to investigate whether firms with higher shares of credit from banks of a particular country/economic area are more vulnerable to changes of the monetary policy of that country/region. If firms can switch banks at no cost, then their past banking relationships should not impact their current or future real activity following a particular monetary policy shock, since they could smooth it by switching to other banks or to other sources of financing. However, if switching banks is costly, the impact of, say, a UK monetary policy shock (through UK banks) can have real effects on Mexican firms' outcomes for firms dependent on UK banks.

To understand whether banks engage in reach-for-yield as monetary policies become more expansive, we divide our sample into two sets of firms, depending on the previous (ex-ante) loan rates they pay. More concretely, for each period we calculate the average loan interest rate charged to all Mexican firms, weighted by loan volume. We then define firms that are above (below) this threshold to be high-yield (low-yield) firms. The loan characteristics of these two groups are

[13] In our robustness tests, we also analyze total bank credit at the firm level using the monthly loan data.

displayed in Panel C of Table 1. Low-yield firms pay lower interest rates due to substantially higher collateral rates and due to lower default rates, thus suggesting that they are indeed less risky.

2.2. Econometric equations

As discussed earlier, for identification, we need to analyze the credit availability in regressions at the *loan-month level* (in particular, firm-bank-month level) while analyzing the real effects and credit substitution at the *firm-year level*. In this subsection, we first discuss the loan level econometric equations that we run and then the firm level ones.

A. Outcomes at the loan level

Our main objective is to understand whether foreign monetary policy shocks are transmitted to local firms through banks from the countries where the shocks occur (e.g., UK monetary policy transmitted by UK banks in Mexico through their lending to Mexican firms). To do so, we investigate whether the credit availability of a given bank is especially affected by changes in the monetary policy of the country where the bank is headquartered. For this, we need to analyze firm-bank-month data.

Our baseline specification is given by equation 1. This specification consists of an OLS regression relating the credit outcome of each firm-bank pair in a given month to the quarterly-lagged monetary policies of each of the four countries examined (both traditional and non-standard monetary policies).[14] Each monetary policy is also interacted by an indicator variable that equals one if the bank providing the loan is headquartered in this country and zero otherwise.[15]

$$(1) \qquad y_{i,b,t} = \rho + \sum_{\text{country}} [\alpha_{country}(intrate\text{-}country)_{t-3} + \beta_{country}(intrate\text{-}country)_{t-3} * (country\text{-}bank)_b] + \sum_{\text{country}} [\gamma_{country}(qe\text{-}country)_{t-3} + \delta_{country}(qe\text{-}country)_{t-3} * (country\text{-}bank)_b] + X_{b,t} + \varepsilon_{i,b,t}$$

In equation 1, $y_{i,b,t}$ corresponds to the credit outcome y of firm i with bank b at month t. Credit outcome y refers to log(loan volume), log(maturity), collateral rate, loan rate or the fraction of loan defaults in the next 12 months. The regressor $intrate\text{-}country_{t-3}$ is the one-quarter lagged monetary policy rate of a *country={US, UK, Euro, Mex}*, whereas *country-bank* is an indicator of

[14] For convenience we will refer to the Eurozone area as a *country*.
[15] For example, a loan given by a UK bank will have 0 for all the dummies except for UK monetary policy.

bank nationality.[16,17] The regressor *qe-country*$_{t-3}$ measures the yearly change in the balance sheet of the central bank (over its GDP) of a country at the last quarter (*t-3*). Finally, additional controls included in $X_{b,t}$ are the one-quarter lagged annual growth rates of the Mexican and American GDPs and CPIs (all in levels and interacted with the indicator variables of banks' nationalities). These variables allow us to control for the business cycle both in Mexico and the US, and to better isolate changes in monetary policy from other changes in economic activity.[18]

A key challenge of our empirical strategy is that different banks may have different borrowers, and therefore we cannot identify the (international) bank lending (supply) channel of monetary policy. To achieve identification, we first saturate our specification with fixed effects at the firm*bank level. By doing this, we exploit the variation within the same firm and bank over time. This not only controls for unobserved (time-invariant) firm heterogeneity (industry, location, ownership), or bank heterogeneity, but also for bank-firm relationships. We further isolate changes in the supply of credit by removing time-variant unobserved borrower shocks proxied by state*industry*period fixed effects. In other words, within the same month, we examine how credit to firms from the same state and industry changes according to the bank's nationality. Our identification comes from the fact that within a period, banks from different nationalities may be affected differently by the monetary policy shocks of their respective countries.

Moreover, we also include in some specifications firm*period fixed effects. By doing so, we examine if for the same firm in the same month, the loans offered by different banks depend on the monetary policy shocks of their parent countries. Therefore, in this case, we control exhaustively for unobserved time-varying firm fundamentals (such as risk, investment opportunities and balance sheet characteristics). One drawback of the specifications that include firm*period fixed effects is that these restrict the sample to firms that in a given point in time have loans with more than one bank, which represent only 18 percent of the firms in our data set. Furthermore, this exercise could

[16] We use the residuals of the regression of monetary policy on macro movements *intrate-mexr* and *intrate-usr* instead of *intrate-mex* and *intrate-us* to isolate in our analysis the monetary policy from the business cycle movements in Mexico and in the US. More concretely, to calculate *intrate-mexr* we use the residuals of the regression of *intrate-mex* on Mexican and US *GDP* and *CPI*, and on *intrate-us*. To calculate *intrate-usr* we use the residuals of the regression of *intrate-us* on US *GDP* and *CPI*.

[17] As robustness tests, instead of using the monetary policies with one-quarter lag, we ran specification (1) using the following alternative monetary policies: with no-lags, with one-month-lag and with 6-months-lag. All these tests yield qualitatively similar results.

[18] When we saturate the regressions with different sets of time fixed effects (in particular bank*period fixed effects) to control for time-varying unobservable heterogeneity in fundamentals, the macro controls are spanned by these fixed effects.

bias our results since these firms tend to be larger. However, their economic relevance is substantial, since they hold on average 56 percent of the overall outstanding debt. Therefore, we analyze both firms with multiple bank relationships and all firms (in this case, we control for firm*bank and state*industry*period fixed effects). We also analyze for the sample of firms with multiple bank relationships either with firm*time or with state*industry*period (and firm) fixed effects to analyze whether potential different results are due to unobservables or due to the sample selection on firms.

Importantly, period fixed effects control for unobserved global shocks, and, hence, the identification also comes in a particular period on the differential of monetary policies among Mexico, US, UK, and the Eurozone. Therefore, since our identification also compares lending from different foreign banks (themselves shocked by their home monetary policy), borrower selection is less of an issue since we find that borrowers within US, UK and Eurozone banks are not different. Using loan and firm level information, we find that across foreign banks, borrowers have similar characteristics in terms of their bank credit volume and total assets (Table A3 of Appendix) and, therefore, conditional on borrowing from foreign banks, firms with loans in US, Eurozone or UK banks are not statistically different from each other. Finally, to identify the risk-taking channel of monetary policy, we analyze compositional changes of credit supply depending on borrowers' ex-ante loan rates and ex-post loan defaults by testing equation (1) in the sample of firms with high ex-ante loan yield and then in the sample of firms with low ex-ante loan yield. In addition, we also analyze (ex-post) loan defaults as an explanatory variable in equation (1).

B. Outcomes at the firm level

While monetary policy shocks may be passed to firms through the bank lending channel, this may not imply a substantial real impact on firms if, for instance, they can smooth monetary policy shocks by easily switching banks, or by replacing bank credit for other sources of finance, like trade credit. Therefore, to analyze any real effects, we need to examine firm level data. Equation 2 presents the specification that we use to test the impact of monetary policy shocks on firms' credit and on real effects.

$$(2) \qquad y_{i,t}{}^{Y} = \theta + \sum_{\text{country}} [\lambda_{\text{country}} (intrate^{Y}\text{-}country)_{t} * (share^{Y}\text{-}country)_{i,t-1}] + \sum_{\text{country}} [\mu_{\text{country}} (qe^{Y}\text{-}country)_{t} * (share^{Y}\text{-}country)_{i,t-1}] + \alpha_{i} + \alpha_{s,ind,t} + \epsilon_{it}$$

The dependent variable y^Y first corresponds to the bank-credit outcomes aggregated at the firm-year level from all different bank loans (*loan volume*^{Y} in logs, *maturity*^{Y}, *collateral*^{Y}, *loan rate*^{Y} and *default*^{Y}), and second to other firm balance sheet components such as firm total liabilities – current and long-term – as well as firm total assets (*liabilities*^{Y}, *non-current liabilities*^{Y}, *current liabilities*^{Y} and *assets*^{Y}). These latter variables (from Orbis) are in logs and only available at the yearly frequency, thus the main regressions for firm level are at the firm-year.[19]

The first covariate, *intrate*^{Y}*-country*$_{i,t}$**share*^{Y}*-country*$_{i,t-1}$, refers to the average monetary policy rate of *country = {US, UK, Euro, Mex}* in year *t* weighted by the share of previous year debt that a firm had with banks headquartered in that country (see also previous subsection on data and Appendix for all the definitions of the variables). Similarly, the second independent variable *qe*^{Y}*-country*$_t$**share*^{Y}*-country*$_{i,t-1}$ corresponds to the annual average *QE* of *country={US, UK, Euro}* weighted by the one-year-lagged share of a firm's debt with a bank from that country.

Different from specification (1), on the left hand side, we analyze the change in overall bank credit to a firm in a given year, stemming from previous banks but also from new banks. On the other hand, the right hand side of this specification consists of a measure of firm-level exposure to each monetary policy shock that is based on previous bank relationships. The assumption behind this specification is that the intensity of the monetary policy shock of a particular country is proxied by the previous year share of a firm's debt with banks of that country, as banking relationships are sticky over time (Ongena and Smith, 2001).

Finally, we saturate our specification with fixed effects at the firm level that allow us to control for time-invariant unobserved firm heterogeneity (such as industry and location), and at the state*industry*year level, which allow to control for time varying borrower fundamentals (and exploit the variation among loans from different banks to the same industry, in the same location and the same period). α_i and $\alpha_{s,ind,t}$ are fixed effects at the firm and state*industry*year level. Importantly, as we discuss in the next section, the loan level regressions show that controlling for

[19] However, and for comparison purposes for the variables from the credit register we also run the regressions at the monthly level for bank credit related variables. For QE, and given that the data for Orbis variables is annual and we do not have the very recent observations, we only have three observations per firm. Therefore, we have little statistical power for QE for the firm level analysis. However, as we also show the firm level results in the Appendix at the month level for bank credit related variables, we can check whether (the lack of strong) results are due to lack of statistical power or economic insignificance.

firm*period fixed effects provide similar coefficients than controlling only for firm and state*industry*period fixed effects (i.e., results suggest that both specifications similarly control for borrower fundamentals). Therefore, the firm-level regressions, where we cannot include firm*year fixed-effects but we can include firm and state*industry*year fixed effects, can be interpreted as identifying the credit availability channel.

All in all, in equation (2) we investigate if firms are able to smooth monetary policy shocks of a foreign country by switching banks or other sources of finance. If firms can easily switch banks to smooth shocks, the coefficients $\lambda_{country}$–$\mu_{country}$ should not be statistically different from zero. Note that equation (2), when we analyze bank credit variables, is not a (weighted) average of equation (1), since on the right hand side equation (2) only includes a firm's old or previous banks, but on the left hand side we analyze the overall bank credit of a firm, from old and new banks. Thus, this equation tests if a monetary policy shock of the country of origin of the firm's previous banks influences the firm's overall bank credit (and other effects) in the current year. Therefore, if changing to new banks is relatively easy, monetary conditions for previous bank relationships should no be important.

Given that we also analyze firm level information on total (current and non-current) liabilities, we can check if firms are able to perfectly replace bank credit for other types of debt, or if foreign monetary policy shocks passed through the bank lending channel have a binding effect on firms' overall liabilities. In this latter case, the coefficients $\lambda_{country}$–$\mu_{country}$ for $liabilities^{Y}$, $non\text{-}current\ liabilities^{Y}$ and *current liabilities* should be statistically different from zero. Finally, if bank credit and overall liabilities are affected, real effects stemming from foreign monetary shocks should probably exist. We test this by looking at the change in firms' total assets $assets^{Y}$.

3. Results

We analyze the credit supply and risk-taking in regressions at the borrower-lender-month (loan) level and examine the real effects and credit substitution at the firm-year level. In this section, we first discuss the credit supply results, then the real effects and credit substitution, and finally, the risk-taking outcomes.

A. Outcomes at the loan level and credit supply

Table 2 (Panels A to D) presents the results of the impact of the various foreign monetary policies on the average volume, maturity, collateral, and interest rate of loans to firms in Mexico. The first column exhibits the baseline specification outlined in equation (1) controlling for fixed effects at the firm*bank level. As Panel A shows, the three different foreign monetary policy rates *only* affect credit outcomes of banks from the same country. That is, each regional policy shock affects lending via their respective foreign banks: the US, UK and Eurozone policy affects lending in Mexico via US, UK, and Eurozone banks respectively. As for the non-standard monetary policies, quantitative easing both of the US and the Eurozone only affects the credit volume of firms whose loans are from US or Eurozone banks. Conversely, the Mexican policy rate affects the credit volume of *all* banks, regardless of their nationality. In other words, the overnight rate set by the Bank of Mexico has an impact on banks operating in Mexico irrespective of whether they are Mexican.

To further control for borrower time-varying characteristics, column 2 saturates equation (1) with firm*bank and state*industry*period fixed effects. Results from columns 1 and 2 suggest that even after controlling for time-varying borrower characteristics, the coefficients of monetary policy remain very similar. As mentioned above, variation in a foreign monetary policy rate affects the banks from that origin. For example, a 1 standard deviation decrease in the Fed Funds rate raises the average loan volume of US banks in Mexico by 7.2 percent, but its effect on the loan size of other banks is statistically zero. A similar pattern is observed with *intrate-uk* (*intrate-euro*) rates in that only loans from UK (Eurozone) banks change with movements in this rate and where a 1 standard deviation decrease in the monetary policy expands credit by an average of 2 (1.8) percent.[20]

While the impact of quantitative easing on credit volume is not trivial, it is lower than that of standard monetary policy rates. For example, a 1 standard deviation expansion in the assets held by the Fed (relative to the US GDP) increases the volume of loans from US banks by 1.6 percent. Again, the volume of loans from non-US banks is not affected by movements in *qe-us*. Similarly, a 1 standard deviation increase in the ECB's assets expands credit by 2.2 percent, while *qe-uk* has no impact.

In column 4 we saturate equation (1) with firm*period fixed effects (in addition to firm*bank effects) and focus on variation across loans offered by different banks for the same firm

[20] Note that the standard deviations of interest rates and also of QE are different across the different countries' monetary policies. See Table 1 Panel A.

in the same month. However, firms who hold loans from multiple banks in a given period tend to be larger firms, and may be differently affected by monetary policy shocks. Thus, we lose more than half of the observations and some coefficients lose statistical significance, notably QE ones. Importantly however, the impact of standard monetary policy remains practically unchanged. To better understand if our coefficients change due to the sample selection, in column 3 we use the same specification as in column 2, but restrict the sample to firms that in a given period have loans with more than one bank. As column 3 indicates, the coefficients that drop by half in column 4 do so because of the sample selection towards larger firms that appear to be less vulnerable to monetary policy changes.

Panels B through D display the effects of monetary policies on the three other margins of loans – maturity, collateral, and interest rate, respectively. On average, a 1 standard deviation reduction in foreign monetary policy translates into loans not only of larger volume, but also of longer-term maturity, and, for US banks, in lower loan interest rates. Collateral is the only margin where banks seem to compensate for the extension of larger and lengthier loans. Our results suggest that, when foreign monetary policy declines by 1 standard deviation, loans from foreign banks increase their volume by 3.7 percent, lengthen their maturity by 8.6 percent, decrease interest rates by 0.5 percent, and increase collateral by 6.3 percent.[21] Furthermore, while the supply of bank credit also increases with an expansion of foreign *QE*, its economic effect is lower, and is concentrated on volume and maturity. Moreover, movements in *qe-us* have a larger impact than movements in *qe-uk* or *qe-euro*. A 1 standard deviation increase in *qe-us* results in loans from US banks that are on average 1.6 percent larger in volume, 6.6 percent lengthier, with 1.9 percent higher collateral and 0.2 percentage points lower interest rate. Importantly, note that in column 4 the coefficients are very similar to those of column 3 despite a substantial increase of the R2 (around 50 percentage points). This suggests that our main coefficients are exogenous to (firm*time) unobservables (Altonji et al., 2005).

To understand whether the loosening of credit conditions when there is expansive monetary policy is related with future defaults, Panel E of Table 2 exhibits the impact of foreign monetary policy on the share of loans observed in default at *t+12*.[22] We saturate progressively the main

[21] The effect of the foreign monetary policies on the loan rate margin is only significant through US banks.

[22] Our measure of future default for the firm-bank relation at time *t* is the default rate of the bank-firm relation at *t*+12, or in case the firm-bank pair exited our sample prior to *t+12*, the last observation available. In the empirical exercises

specification with different sets of fixed effects, as in the previous Panels. Focusing on the specification using firm*period fixed effects (column 4), the results suggest that more expansive monetary policies in the US and in the UK (standard and non-standard) induce higher future loan default rates of banks from the same country or region. For example, if at *t* the Fed funds rate declines by 1 standard deviation, the share of bank credit in default at *t+12* months increases by 0.7 percentage points, or equivalently by 7.4 percent, among US banks operating in Mexico. Similarly, a 1 standard deviation increase in *qe-us* at *t* translates into an increase in the share of bank credit in default of 3.2 percent at *t+12*. Similarly, a 1 standard deviation increment in *qe-uk* increases the share of bank credit in default at banks from this region a year later by 2 percentage points. As we will show later, this increase in default rate is due to the fact that an expansive monetary policy induces banks to lend relatively more to firms with higher risk as proxied by higher ex-ante loan rates.

B. Outcomes at the firm level and real effects

To examine whether monetary policy shocks have real effects on firms, we need to analyze firm-period level data. This allows us to investigate if the total credit that firms obtain is sensitive to changes in foreign monetary policies. However, when we restricted the analysis in the loan level regressions to firms that borrowed from at least two banks in a period, most coefficients of monetary policy remained relatively constant (see the comparison of columns 3 and 4 of Table 2). Therefore, fixed effects at both firm and state*industry*year in firm-level data provide good enough controls for unobserved borrowers allowing us to identify the bank credit channel. Moreover, as explained in the empirical strategy, we introduce an interaction of the one-year-lagged average monetary policy of a country with the one-year-lagged share of bank credit of a firm with banks from this country. A coefficient that is statistically different from zero implies that the monetary policy of a country has a stronger effect over firms with a higher ex-ante share of their credit from banks from this country. Conversely, a coefficient that is statistically zero will imply that while at the loan level we find that (foreign) monetary policy matters, firms are able to smooth these foreign shocks by switching to other banks or to other forms of credit.

The first five columns of Table 3 (Panel A and B) present the results of our bank credit outcomes for the firm-year level data. We again find that on average, firms with a higher lagged

involving the default rate at *t+12* we only use data until March of 2011. In addition, to *t+12* we also studied the impact on default at *t+6* and *t+24*. Results are qualitatively similar.

share of bank credit from foreign banks are more affected by the monetary policy in these countries, even when the lagged share is of one year (as opposed to one month). For example, for firms that had their total bank credit with US banks in the previous year, a 1 percentage point increase in the *intrate-us* in the current year leads to a reduction in the loan volume of 5.1 percent, a reduction in maturity of 8.2 percent, a decrease in collateral of 1.1 percentage points, and a decline of 1 percentage point in the share of credit in default next year. Likewise, a reduction in a given year of 1 percentage point in the average non-standard monetary policy of the US decreases bank credit volume by 0.6 percent in the following year, decreasing also the collateral requirements of firms by 0.4 percentage points.

The impact of the average non-standard monetary policy at the firm-level is close to that at the loan-level, suggesting little smoothing of monetary policy shocks by firms switching banks. These results are not surprising since the likelihood of switching banks in Mexico is very low. For instance, in our data we find that almost 94 percent of the firms continue with the same main lender from one year to the next.

For total debt and assets, we find that foreign monetary policy shocks have real impacts on firms (columns 6 to 9). For instance, total liabilities of firms (including bank credit) decline by 1.1 percent, when in a given year the average monetary policy increases 1 percentage point, and assets of firms on average decrease by 0.5 percent with a 1 percentage point increase in foreign monetary policy. However, since with this data set we only have few yearly observations for each firm after the QE period started, our results for the impact of non-standard monetary policies on real outcomes could lack statistical power. However, the quantitative credit results at the month level are substantially lower for QE than for monetary rates, thus suggesting it may not be only lack of statistical power.[23]

C. Reach-for-yield and risk-taking channel of monetary policy

[23] The results on bank credit outcomes using the firm-month level data are summarized in Table A4 in the Appendix. Again, our results suggest that firms with a higher lagged share of bank credit with foreign banks are more affected by the monetary policy in these countries. For instance, with a one percentage point decrease in the Fed funds rate, firms whose one-month-lagged debt was entirely with US banks experience a 3.5 percent increase in overall bank credit volume, a 5.6 percent increase in the length of their bank debt, a 1 percentage point increase in the required collateral and a 1.2 percent increase in the share of overall debt in default next year. Compared to the loan level effects, the impact of foreign monetary at the firm level remains very similar, which again suggests that firms do not smooth monetary policy shocks by switching banks. Note that the results are substantially smaller for QE results.

To understand the risk taking behavior of banks, and to know whether they engage in *reach-for-yield*, we examine if credit terms are more likely to change for firms with higher ex-ante loan interest rates which, as we saw in Panel C of Table 1, tend to be riskier firms. To do this, in each period we calculate the average interest rate charged by banks to all firm-bank observations, weighted by loan volume. We then separate our sample into two groups depending on whether their ex-ante cost of credit is above or below this average cost. Finally, we run equation (1) separately for these two samples of firms. The results of this exercise are exhibited in Table 4 (Panels A to E).

Results indicate that on average, foreign banks soften more lending conditions to firms with high ex-ante interest rate when foreign monetary policy is relaxed. These effects operate in the same direction for all the lending margins – volume, maturity, collateral and loan interest rate – and imply higher future loan defaults. In Panel A we see that, a 1 standard deviation decrease in the foreign monetary policy expands loan volume for the high-yield group by an average of 4.1 percent, and only by 1.9 percent in the low-yield group. Interestingly, the impact of QE does not appear to affect differently the loan volumes of firms depending on their ex-ante interest rate.

Loan maturity is the credit margin by which high-yield firms benefit relatively more with an expansion in monetary policies. As Panel B of Table 4 indicates, a reduction of 1 standard deviation in the average foreign interest rate lengthens the average loan maturity by 9.2 percent for firms with high-yield, whereas its effect is negligible among low-yield firms. Furthermore, we also find that *qe-us* has a stronger impact on the loan maturity of high-yield firms, while *qe-uk* and *qe-euro* have similar impacts across all firms. However, while banks extend on average larger and longer loans to riskier firms when foreign monetary policy expands, they do so by raising their collateral requirements. However, adjustments in collateral vary substantially depending on the bank's nationality (Panel C), and are in general relatively softer for high yield firms when foreign monetary policy is relaxed.[24] Regarding loan rates, Panel D presents our results. In general, loan interest rates from high-yield firms respond in the direction of the changes to foreign monetary policy, whereas low-yield firms do not. On average, a 1 standard deviation reduction of foreign monetary policy translates into a 0.7 percent reduction of the average loan rate of high-yield firms. As with other credit margins, interest rates of loans are also influenced by movements in QE. Our results suggest that a 1 standard deviation increase in *qe-us* translates in a reduction of 0.3 percentage points on the average loan rate of loans for high-yield firms.

[24] The exception is Eurozone for monetary rates.

Focusing on future default in Table 4 Panel E, we also find that the impact of loosening of credit conditions on future default is concentrated among firms with high-yield. In particular, default rates are more responsive to movements in the monetary policy from the US (both standard and non-standard) and from the Eurozone (mainly non-standard). For instance, a reduction of 1 standard deviation in the foreign interest rate increases the average default for high-yield firms by 10.3 percent and has no significant impact for low-yield firms. Similarly, the expansion in QE also increases the incidence of default. Changes in foreign QE central banks are associated on average with a 10.9 percent increase in the share of bank credit in default among high-yield firms.

4. Conclusions

Raghuram Rajan, the Governor of the Reserve Bank of India, as well as other central bankers in emerging markets, have noted the international spillovers of the US and European quantitative easing and argued for more coordinated global monetary policies. In this paper, we analyze the international bank lending channel of monetary policy rates and QE, through foreign banks and their effects on: the supply of credit to local firms, the associated real effects in the economy and reach-for-yield risk-taking incentives.

Despite the importance of these questions for public policy (notably central banking policies and international monetary coordination) and academia (macro-finance), identification of the international channel of monetary policy has been elusive due to the lack of exploitation of comprehensive credit registry data matched with firm and bank information. As we stressed in the Introduction, the empirical literature on the international credit channel of monetary policy has worked on macro or bank level data. We overcome this hurdle by analyzing Mexico, an excellent empirical setting for identification given the exhaustive micro data sets (credit register matched to firm and bank level data) and also given the important presence of foreign banks. We use the supervisory data set that contains all business loans in Mexico, including loan rates which are absent in most credit registers around the world, while exploiting foreign monetary policy shocks, both interest rate and non-standard quantitative easing. Loan-level data are crucial to identify credit supply (and risk-taking) and firm-level data are needed to measure the associated real effects.

The robust results suggest that a softening of foreign monetary policy increases the supply of credit of foreign banks to Mexican firms. Each regional policy shock affects supply via their respective foreign banks, i.e. US, UK and Eurozone monetary policy affects credit supply to Mexican firms via US, UK and Eurozone banks in Mexico, respectively. All loan terms are affected, but effects are substantially weaker for loan rates. Moreover, the international monetary policy channel implies strong real effects, with substantial stronger elasticities from monetary rates than QE. Finally, a decline in foreign monetary policy rates and an expansion in QE lead to higher credit supply for borrowers with higher ex-ante loan rates (reach-for-yield), with substantial higher ex-post loan defaults, thus suggesting an international risk-taking channel of monetary policy.

The results suggest that foreign QE affects more risk-taking in emerging markets through an expansion of credit supply to riskier firms rather than improving real outcomes of firms in emerging markets. The results are consistent with, among others, claims by Governor Rajan of the Reserve Bank of India (2014) and the Jackson Hole speech by Rey (2013), and thus suggest the need for a more coordinated global monetary policy, for example at the G-20 level with both high income and emerging countries. An important avenue for future research is whether local macroprudential policies (Freixas, Laeven and Peydró (2015)) can reduce, or even neutralize, the foreign externalities stemming on emerging markets from foreign monetary policy from core economic areas, or whether a more coordinated global monetary policy is the only solution.

References

Adrian, T., and H. S. Shin (2011): "Financial Intermediaries and Monetary Economics," in Handbook of Monetary Economics 3a, ed. by B. M. Friedman, and M. Woodford. New York NY: Elsevier, 601-650.

Allen, F., and D. Gale (2000): "Bubbles and Crises," *Economic Journal*, 110, 236- 255.

—— (2004): "Asset Price Bubbles and Monetary Policy," in Global Governance and Financial Crises, ed. by M. Desai, and Y. Said. London: Routledge, 19-42.

—— (2007): "Understanding Financial Crises," New York NY: Oxford University Press.

Allen, F., and K. Rogoff (2011): "Asset Prices, Financial Stability and Monetary Policy," in The Riksbank's Inquiry into the Risks in the Swedish Housing Market, ed. by P. Jansson, and M. Persson. Stockholm: Sveriges Riksbank, 189-218.

Allen, F., E. Carletti, and D. Gale (2009): "Interbank Market Liquidity and Central Bank Intervention," *Journal of Monetary Economics,* 56(5), 639–652.

Allen, F., E. Carletti, and D. Gale (2014): "Money, Financial Stability and Efficiency," *Journal of Economic Theory,* 149, 100–127.

Altonji, J. G., T. E. Elder and C. R. Taber, 2005. "Selection on Observed and Unobserved Variables: Assessing the Effectiveness of Catholic Schools," *Journal of Political Economy,* 113(1), 151-184.

Arellano, M. (1987): "Computing Robust Standard Errors for within-Group Estimators," *Oxford Bulletin of Economics and Statistics*, 49, 431-434.

Bernanke, Ben, 1983, "Nonmonetary Effects of the Financial Crisis in Propagation of the Great Depression," *American Economic Review* 73(3): 257-76.

Bernanke, B. S. and M. Gertler (1995): Inside the Black Box: The Credit Channel of Monetary Policy Transmission. *Journal of Economic Perspectives*, 9(4), 27–48.

Bernanke, B. S., and A. S. Blinder (1992): "The Federal Funds Rate and the Channels of Monetary Transmission," *American Economic Review*, 82, 901-921.

Borio, C., and H. Zhu (2008): "Capital Regulation, Risk-Taking and Monetary Policy: A Missing Link in the Transmission Mechanism," Working Paper, Bank for International Settlements.

Cetorelli, N. and L. S. Goldberg (2012): "Banking Globalization and Monetary Transmission," *Journal of Finance*, 67(5), 1811–43.

Ciccarelli, M., A. Maddaloni, and J.-L. Peydró (Forthcoming), "Trusting the Bankers: Another Look at the Credit Channel of Monetary Policy," *Review of Economic Dynamics*.

Diamond, D. W. and R. G. Rajan (2006): "Money in a Theory of Banking," *American Economic Review,* 96(1), 30–53.

European Central Bank (2009): "Recent Developments in the Balance Sheets of the Eurosystem, the Federal Reserve System and the Bank of Japan," *ECB Monthly Bulletin,* October, 81-94.

—— (2011): "The Monetary Policy of the ECB," Third edition, May.

Freixas, X. and J. Jorge (2008): "The Role of Interbank Markets in Monetary Policy: A Model with Rationing," *Journal of Money, Credit and Banking,* 40(6), 1151–1176.

Freixas, X., A. Martin, and D. Skeie (2011): "Bank Liquidity, Interbank Markets, and Monetary Policy," *The Review of Financial Studies,* 24(8), 2656–2692.

Freixas, Xavier, Luc Laeven, and José-Luis Peydró, 2015, Systemic Risk, Crises and Macroprudential Policy. *MIT Press*.

Fischer, Stanley (2014): "The Federal Reserve and the Global Economy," Speech by Vice Chairman of the Board of Governors of the Federal Reserve System delivered as the Per Jacobsson Foundation Lecture 2014 Annual Meetings of the International Monetary Fund and the World Bank Group Washington.

Gertler, M. and N. Kiyotaki (2010): "Financial Intermediation and Credit Policy in Business Cycle Analysis" In B. M. Friedman and M. Woodford (Eds.), Volume 3 of Handbook of Monetary Economics, Chapter 11, pp. 547–599.

Gertler, Mark, and Peter Karadi. 2011. "A Model of Unconventional Monetary Policy," *Journal of Monetary Economics* 58 (1): 17–34.

Holmstrom, B. and J. Tirole (1998): "Private and Public Supply of Liquidity," *Journal of Political Economy,* 106(1), 1–40.

Ioannidou, V. P., S. Ongena, and J.-L. Peydro (forthcoming): "Monetary Policy, Risk-Taking and Pricing: Evidence from a Quasi-Natural Experiment," *Review of Finance*

Jiménez, G., S. Ongena, J.-L. Peydró, and J. Saurina (2012): "Credit Supply and Monetary Policy: Identifying the Bank Balance-Sheet Channel with Loan Applications" *American Economic Review*, 102(5), 2301–26.

Jiménez, G., S. Ongena, J.-L. Peydró, and J. Saurina (2014): "Hazardous Times for Monetary Policy: What do Twenty-Three Million Bank Loans Say about the Effects of Monetary Policy on Credit Risk-Taking?" *Econometrica*, 82(2), 463-505.

Kalemli-Ozcan, S., Papaioannou, E., and J.-L. Peydró. 2010 "What Lies Beneath the Euro's Effect on Financial Integration? Currency Risk, Legal Harmonization, or Trade." *Journal of International Economics*, 81(1): 75–88.

Kalemli-Ozcan, S., E. Papaioannou, and J.-L. Peydró (2013), "Financial Regulation, Financial Globalization, and the Synchronization of Economic Activity," *Journal of Finance*, 68, 1179–1228.

Kashyap, A. K., and J. C. Stein (2000): "What Do a Million Observations on Banks Say About the Transmission of Monetary Policy?" *American Economic Review*, 90, 407-428.

Khwaja, A. I. and A. Mian (2008): "Tracing the Impact of Bank Liquidity Shocks: Evidence from an Emerging Market," *American Economic Review*, 98(4), 1413–42.

Kiyotaki, N. and J. Moore (2012): "Liquidity, Business Cycles, and Monetary Policy," NBER Working Papers 17934, National Bureau of Economic Research.

Maddaloni, A., and J.-L. Peydro (2011): "Bank Risk-Taking, Securitization, Supervision, and Low Interest Rates: Evidence from Euro-Area and US Lending Standards," *Review of Financial Studies*, 24, 2121-2165.

Mian, A. (2006): "Distance Constraints: The Limits of Foreign Lending in Poor Economies." *Journal of Finance*, 61(6), 1465–1505.

Ongena Steven and David C. Smith, (2001): "The Duration of Bank Relationships", *Journal of Financial Economics*, 61, 449-475.

Paligorova, T., and J. A. C. Santos (2012): "Monetary Policy and Bank Risk- Taking: Evidence from the Corporate Loan Market," Mimeo, Bank of Canada.

Peek, J., and E. S. Rosengren (2000): "Collateral Damage: Effects of the Japanese Bank Crisis on Real Activity in the United States," *American Economic Review* 90:30–45.

Rajan, R. G. (2005): "Has Finance Made the World Riskier?" speech presented at Jackson Hole, Federal Reserve Bank, Federal Reserve Bank, August.

Rajan, R. (2014). "Competitive Monetary Easing: Is It Yesterday Once More?" Speech at the Brookings Institution, April 10, 2014.

Reinhart, C. M., and K. S. Rogoff (2009), This Time is Different: Eight Centuries of Financial Folly, *Princeton University Press*.

Rey, H. (2013): "Dilemma Not Trilemma: The Global Financial Cycle and Monetary Policy Independence," paper presented at "Global Dimensions of Unconventional Monetary Policy," Jackson Hole, Federal Reserve Bank, August 22-24, www.kc.frb.org/publicat/sympos/2013/2013Rey.pdf.

Schnabl, P. (2012): "The International Transmission of Bank Liquidity Shocks: Evidence from an Emerging Market," *Journal of Finance*, 67:897–932.

Schularick, M., and A. M. Taylor (2012), "Credit Booms Gone Bust: Monetary Policy, Leverage Cycles, and Financial Crises, 1870–2008," *American Economic Review*, 102, 1029–61.

Shleifer, A., and R. W. Vishny, 2010, "Unstable Banking," *Journal of Financial Economics* 97(3): 306-318.

Stein, J. (2013): "Overheating in Credit Markets: Origins, Measurement, and Policy Responses," Speech by Federal Reserve Board Governor Jeremy Stein, February 7, 2013.

Trichet, J. C. (2009): "The ECB's Enhanced Credit Support," keynote address at the University of Munich, 13 July.

Table 1- Panel A. Summary Statistics Loan-level Data (monthly frequency)

Variable	# Obs	Mean	Median	St. Dev
Dependent Variables				
loan volume	6,942,806	1,737	408	3596
maturity	6,942,806	28.3	26.0	19.6
collateral	6,942,806	0.28	0.00	0.39
loan rate	6,942,806	0.14	0.14	0.04
default	6,942,806	0.10	0.00	0.29
Independent Variables				
intrate-us	6,942,806	0.02	0.00	0.02
intrate-usr	6,942,806	0.00	-0.01	0.02
intrate-uk	6,942,806	0.03	0.01	0.02
intrate-euro	6,942,806	0.02	0.01	0.01
intrate-mex	6,942,806	0.06	0.06	0.02
intrate-mexr	6,942,806	0.00	-0.01	0.01
intrate-foreign	6,942,806	0.02	0.00	0.02
qe-us	6,942,806	0.02	0.01	0.03
qe-uk	6,942,806	0.04	0.00	0.11
qe-euro	6,942,806	0.02	0.00	0.06
qe-foreign	6,942,806	0.03	0.00	0.06
us-bank	6,942,806	0.16	0.00	0.38
uk-bank	6,942,806	0.15	0.00	0.37
euro-bank	6,942,806	0.25	0.00	0.42
mex-bank	6,942,806	0.43	0.00	0.50
gdp-mx	6,942,806	0.02	0.04	0.03
cpi-mx	6,942,806	0.04	0.04	0.01
gdp-us	6,942,806	0.01	0.02	0.02
cpi-us	6,942,806	0.02	0.02	0.01

Notes: Table A1-Panel A presents the definitions of all variables.

Table 1- Panel B. Summary Statistics Firm-level Data (annual frequency)

Variable	# Obs	Mean	Median	St. Dev
Dependent Variables				
loan volume^{Y}	472,691	10,827	2,854	21,770
maturity^{Y}	472,691	32.6	32.9	20.5
collateral^{Y}	472,691	0.27	0.00	0.36
loan rate^{Y}	472,691	0.15	0.16	0.05
default^{Y}	472,691	0.10	0.00	0.25
assets^{Y}	11,763	223,734	21,580	558,734
liabilities^{Y}	11,709	93,949	10,180	222,023
non-current liabilities^{Y}	11,709	16,401	0	46,767
current liabilities^{Y}	11,709	62,108	8,810	134,384
loan volume^{Y} *of firms matched with orbis*	11,709	19,565	6,066	30,822
Independent Variables				
intrate^{Y}-us * share^{Y}-us	472,691	0.002	0.000	0.009
intrate^{Y}-usr * share^{Y}-us	472,691	-0.001	0.000	0.007
intrate^{Y}-uk * share^{Y}-uk	472,691	0.005	0.000	0.014
intrate^{Y}-euro * share^{Y}-euro	472,691	0.004	0.000	0.010
intrate^{Y}-mex * share^{Y}-mex	472,691	0.026	0.000	0.031
intrate^{Y}-mexr * share^{Y}-mex	472,691	-0.001	0.000	0.007
intrate^{Y}-foreign * share^{Y}-foreign	472,691	0.012	0.003	0.016
qe^{Y}-us * share^{Y}-us	472,691	0.005	0.000	0.015
qe^{Y}-uk * share^{Y}-uk	472,691	0.004	0.000	0.013
qe^{Y}-euro * share^{Y}-euro	472,691	0.005	0.000	0.012
qe^{Y}- foreign * share^{Y}-foreign	472,691	0.012	0.003	0.016

Notes: Table A1-Panel B presents the definitions of all variables.

Table 1- Panel C. Summary Statistics Monthly Data by firms' yield

	Low-yield firms			**High-yield firms**		
Variable	Mean	Median	St. Dev	Mean	Median	St. Dev
loan volume	4,948	3,432	4,647	812	292	1,657
maturity	39.8	34.0	30.2	31.6	35.0	17.3
collateral	0.45	0.44	0.44	0.24	0.00	0.37
loan rate	0.09	0.09	0.02	0.16	0.16	0.03
default	0.07	0.00	0.25	0.10	0.00	0.29

Notes: : *Low (High) yield firms* – A firm-bank pair is low (high) yield if the loan interest rate the firm pays on its loan is below (above) the average loan interest rate, weighted by loan volume, paid by all firms each month. Table A1 presents the definitions of all variables.

Table 2- Panel A. Impact of International Monetary Policies on Loan Volume

	(1)	(2)	(3)	(4)
intrate-usr	-0.01			
	(0.34)			
intrate-usr * us-bank	-3.71***	-3.65***	-3.55***	-3.59***
	(0.28)	(0.34)	(0.25)	(0.41)
intrate-uk	-1.21**			
	(0.48)			
intrate-uk * uk-bank	-0.27	-1.02***	-0.41	-0.93*
	(0.31)	(0.38)	(0.34)	(0.56)
intrate-euro	0.61			
	(0.58)			
intrate-euro * euro-bank	-1.63***	-1.80***	-1.13***	-0.97
	(0.45)	(0.60)	(0.43)	(0.68)
intrate-mexr	-0.76***			
	(0.27)			
intrate-mexr * mex-bank	0.43	0.39	0.24	0.14
	(0.30)	(0.39)	(0.34)	(0.55)
qe-us	-0.16			
	(0.15)			
qe-us * us-bank	0.53***	0.54**	0.33**	0.36
	(0.15)	(0.22)	(0.16)	(0.27)
qe-uk	0.36***			
	(0.12)			
qe-uk * uk-bank	-0.05	-0.06	-0.04	-0.07
	(0.21)	(0.20)	(0.20)	(0.35)
qe-euro	-0.07			
	(0.15)			
qe-euro * euro-bank	0.34*	0.37*	0.21	0.14
	(0.18)	(0.21)	(0.17)	(0.28)
Firm*Bank F.E.	Yes	Yes	Yes	Yes
State*Industry*Period F.E.	No	Yes	Yes	-
Firm*Period F.E.	No	No	No	Yes
Firms borrowing from more than 1 bank	No	No	Yes	Yes
Observations	6,942,806	6,942,806	2,749,685	2,749,685
R-squared	0.01	0.03	0.04	0.55

Notes: The estimates in this table come from ordinary least squares for the period January 2002 to March 2012. Observations are at the firm-bank-month level. The dependent variable is the firm's log loan volume with bank *b* at period *t*. *intrate-country* – Overnight rate of interbank market in country *country*. *intrate-countryr* - Residual of policy rate of country *country*. *qe-country* – Ratio of the yearly change in central bank assets to GDP of country *country*. *country-bank*– Indicator that bank *b's* headquarters are in country *country*. Other controls include the one-month lagged annual growth rate of Mexican and US real GDP and CPI. Fixed effects already absorbed by other fixed effects are indicated by "-". Standard errors are reported in parentheses and are clustered at the period and bank-industry level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table 2- Panel B. Impact of International Monetary Policies on Maturity

	(1)	(2)	(3)	(4)
intrate-usr	0.35			
	(0.383)			
intrate-usr * us-bank	-5.63***	-5.40***	-5.43***	-5.33***
	(0.62)	(1.55)	(0.91)	(1.44)
intrate-uk	0.61			
	(0.74)			
intrate-uk * uk-bank	-7.71***	-7.65***	-7.03***	-6.33***
	(0.40)	(0.74)	(0.65)	(1.15)
intrate-euro	-1.98***			
	(0.76)			
intrate-euro * euro-bank	0.32	0.43	0.14	0.90
	(0.45)	(0.99)	(0.76)	(1.21)
intrate-mexr	-0.70**			
	(0.33)			
intrate-mexr * mex-bank	0.77*	0.50	0.77	0.67
	(0.45)	(0.75)	(0.56)	(0.89)
qe-us	0.32***			
	(0.11)			
qe-us * us-bank	2.11***	2.20***	2.30***	2.30**
	(0.49)	(0.73)	(0.59)	(0.91)
qe-uk	0.41***			
	(0.10)			
qe-uk * uk-bank	-0.26	-0.22	-0.27	-0.32
	(0.27)	(0.35)	(0.31)	(0.50)
qe-euro	-0.21*			
	(0.12)			
qe-euro * euro-bank	0.35	0.38	0.28	0.25
	(0.26)	(0.30)	(0.31)	(0.48)
Firm*Bank F.E.	Yes	Yes	Yes	Yes
State*Industry*Period F.E.	No	Yes	Yes	-
Firm*Period F.E.	No	No	No	Yes
Firms borrowing from more than 1 bank	No	No	Yes	Yes
Observations	6,942,806	6,942,806	2,749,685	2,749,685
R-squared	0.22	0.24	0.24	0.65

Notes: The estimates in this table come from ordinary least squares for the period January 2002 to March 2012. Observations are at the firm-bank-month level. The dependent variable is the firm's loan maturity with bank b at period t. *intrate-country* – Overnight rate of interbank market in country *country*. *intrate-countryr* - Residual of policy rate of country *country*. *qe-country* – Ratio of the yearly change in central bank assets to GDP of country *country*. *country-bank*– Indicator that bank *b's* headquarters are in country *country*. Other controls include the one-month lagged annual growth rate of Mexican and US real GDP and CPI. Fixed effects already absorbed by other fixed effects are indicated by "-". Standard errors are reported in parentheses and are clustered at the period and bank-industry level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table 2- Panel C. Impact of International Monetary Policies on Collateral

	(1)	(2)	(3)	(4)
intrate-usr	-0.54**			
	(0.213)			
intrate-usr * us-bank	-0.76***	-0.80***	-0.92***	-1.06***
	(0.10)	(0.19)	(0.14)	(0.24)
intrate-uk	0.67***			
	(0.21)			
intrate-uk * uk-bank	-1.02***	-1.14***	-0.96***	-1.02***
	(0.11)	(0.13)	(0.10)	(0.17)
intrate-euro	-1.26***			
	(0.27)			
intrate-euro * euro-bank	-1.23***	-1.33***	-1.32***	-1.36***
	(0.24)	(0.28)	(0.21)	(0.32)
intrate-mexr	-0.78***			
	(0.17)			
intrate-mexr * mex-bank	0.10	0.04	0.23	0.25
	(0.20)	(0.23)	(0.21)	(0.33)
qe-us	0.07*			
	(0.04)			
qe-us * us-bank	0.14*	0.17**	0.15**	0.16
	(0.08)	(0.09)	(0.07)	(0.11)
qe-uk	-0.03			
	(0.04)			
qe-uk * uk-bank	-0.04	-0.05	0.05	0.07
	(0.09)	(0.10)	(0.07)	(0.12)
qe-euro	0.17**			
	(0.07)			
qe-euro * euro-bank	0.31**	0.32**	0.23*	0.24
	(0.13)	(0.15)	(0.12)	(0.18)
Firm*Bank F.E.	Yes	Yes	Yes	Yes
State*Industry*Period F.E.	No	Yes	Yes	-
Firm*Period F.E.	No	No	No	Yes
Firms borrowing from more than 1 bank	No	No	Yes	Yes
Observations	6,942,806	6,942,806	2,749,685	2,749,685
R-squared	0.01	0.03	0.04	0.55

Notes: The estimates in this table come from ordinary least squares for the period January 2002 to March 2012. Observations are at the firm-bank-month level. The dependent variable is the firm's collateral rate with bank b at period t. *intrate-country* – Overnight rate of interbank market in country *country*. *intrate-countryr* - Residual of policy rate of country *country*. *qe-country* – Ratio of the yearly change in central bank assets to GDP of country *country*. *country-bank*– Indicator that bank *b's* headquarters are in country *country*. Other controls include the one-month lagged annual growth rate of Mexican and US real GDP and CPI. Fixed effects already absorbed by other fixed effects are indicated by "-". Standard errors are reported in parentheses and are clustered at the period and bank-industry level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table 2- Panel D. Impact of International Monetary Policies on Loan Rates

	(1)	(2)	(3)	(4)
intrate-usr	0.06			
	(0.03)			
intrate-usr * us-bank	0.09***	0.10***	0.11***	0.10***
	(0.02)	(0.01)	(0.01)	(0.03)
intrate-uk	0.15***			
	(0.05)			
intrate-uk * uk-bank	-0.05	-0.01	-0.01	-0.07
	(0.04)	(0.05)	(0.05)	(0.08)
intrate-euro	0.04			
	(0.06)			
intrate-euro * euro-bank	0.01	0.04	0.04	0.02
	(0.02)	(0.04)	(0.03)	(0.04)
intrate-mexr	0.28***			
	(0.05)			
intrate-mexr * mex-bank	-0.02	-0.03	-0.01	-0.01
	(0.03)	(0.04)	(0.04)	(0.07)
qe-us	0.00			
	(0.01)			
qe-us * us-bank	-0.09***	-0.08**	-0.08***	-0.08***
	(0.01)	(0.03)	(0.02)	(0.03)
qe-uk	0.03***			
	(0.01)			
qe-uk * uk-bank	0.10*	0.09	0.09	0.09
	(0.05)	(0.06)	(0.06)	(0.09)
qe-euro	0.00			
	(0.01)			
qe-euro * euro-bank	0.00	0.01	0.01	0.00
	(0.01)	(0.01)	(0.01)	(0.01)
Firm*Bank F.E.	Yes	Yes	Yes	Yes
State*Industry*Period F.E.	No	Yes	Yes	-
Firm*Period F.E.	No	No	No	Yes
Firms borrowing from more than 1 bank	No	No	Yes	Yes
Observations	6,942,806	6,942,806	2,749,685	2,749,685
R-squared	0.38	0.46	0.45	0.82

Notes: The estimates in this table come from ordinary least squares for the period January 2002 to March 2012. Observations are at the firm-bank-month level. The dependent variable is the firm's loan interest rate with bank b at period t. *intrate-country* – Overnight rate of interbank market in country *country. intrate-countryr* - Residual of policy rate of country *country*. *qe-country* – Ratio of the yearly change in central bank assets to GDP of country *country. country-bank*– Indicator that bank *b's* headquarters are in country *country*. Other controls include the one-month lagged annual growth rate of Mexican and US real GDP and CPI. Fixed effects already absorbed by other fixed effects are indicated by "-". Standard errors are reported in parentheses and are clustered at the period and bank-industry level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table 2- Panel E. Impact of International Monetary Policies on Default

	(1)	(2)	(3)	(4)
intrate-usr	0.04			
	(0.14)			
intrate-usr * us-bank	-0.37***	-0.35**	-0.35**	-0.44*
	(0.12)	(0.17)	(0.17)	(0.26)
intrate-uk	-0.36*			
	(0.19)			
intrate-uk * uk-bank	-0.74***	-0.76***	-0.61***	-0.42*
	(0.11)	(0.14)	(0.13)	(0.22)
intrate-euro	1.23***			
	(0.23)			
intrate-euro * euro-bank	-0.41***	-0.37*	-0.18	-0.17
	(0.14)	(0.21)	(0.17)	(0.27)
intrate-mexr	0.16			
	(0.10)			
intrate-mexr * mex-bank	0.18**	0.15	0.17	0.31
	(0.08)	(0.15)	(0.13)	(0.23)
qe-us	0.03			
	(0.05)			
qe-us * us-bank	0.11***	0.11***	0.09**	0.11**
	(0.03)	(0.04)	(0.04)	(0.05)
qe-uk	0.03			
	(0.05)			
qe-uk * uk-bank	0.23***	0.18***	0.21***	0.20*
	(0.06)	(0.06)	(0.06)	(0.12)
qe-euro	-0.00			
	(0.06)			
qe-euro * euro-bank	0.19***	0.14**	0.13**	0.16
	(0.04)	(0.05)	(0.05)	(0.12)
Firm*Bank F.E.	Yes	Yes	Yes	Yes
State*Industry*Period F.E.	No	Yes	Yes	-
Firm*Period F.E.	No	No	No	Yes
Firms borrowing from more than 1 bank	No	No	Yes	Yes
Observations	5,541,733	5,541,733	2,119,528	2,119,528
R-squared	0.02	0.04	0.06	0.60

Notes: The estimates in this table come from ordinary least squares for the period January 2002 to March 2011. Observations are at the firm-bank-month level. The dependent variable is the firm's default rate at *t+12* with bank b for a loan outstanding at period t (see Section 2 of the paper). *intrate-country* – Overnight rate of interbank market in country *country. intrate-countryr* - Residual of policy rate of country *country. qe-country* – Ratio of the yearly change in central bank assets to GDP of country *country. country-bank*– Indicator that bank *b's* headquarters are in country *country*. Other controls include the one-month lagged annual growth rate of Mexican and US real GDP and CPI. Fixed effects already absorbed by other fixed effects are indicated by "-". Standard errors are reported in parentheses and are clustered at the period and bank-industry level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table 3- Panel A. Impact of International Monetary Policy on Real Variables of Firms

	(1) Loan Volume (log)	(2) Maturity	(3) Collateral	(4) Loan rate	(5) Default	(6) Liabilities	(7) Current liabilities (log)	(8) Non-current liabilities (log)	(9) Assets (log)
intrate^{Y}-us*share^{Y}-us	-5.15***	-8.20***	-1.13***	0.24***	-0.99*	-1.07*	-0.75	-1.63	-0.63*
	(0.60)	(0.78)	(0.20)	(0.04)	(0.60)	(0.59)	(0.69)	(0.99)	(0.39)
intrate-uk*share^{Y}-uk	-1.74***	-7.63***	-1.97***	0.03	-0.89	-1.60***	-1.71**	-0.70	-0.88**
	(0.55)	(0.51)	(0.23)	(0.04)	(0.80)	(0.52)	(0.73)	(0.93)	(0.39)
intrate^{Y}-euro*share^{Y}-euro	-4.27***	-3.86***	-1.76***	0.08	-0.43	-0.63	-0.48	-3.28**	0.14
	(1.41)	(0.58)	(0.30)	(0.09)	(0.48)	(0.52)	(0.60)	(1.51)	(0.48)
intrate^{Y}-mex*share^{Y}-mex	1.25	-0.14	1.49	-0.27	0.45	2.62	3.38	5.93	1.58
	(1.81)	(1.38)	(0.99)	(0.22)	(0.47)	(1.60)	(2.91)	(3.93)	(1.07)
qe^{Y}-us*share^{Y}-us	0.63*	0.15	0.40**	-0.17***	0.96*	0.24	0.23	0.82*	-0.09
	(0.35)	(0.42)	(0.18)	(0.03)	(0.57)	(0.34)	(0.39)	(0.50)	(0.30)
qe^{Y}-uk*share^{Y}-uk	0.11	0.11	-0.14	-0.13***	0.17	0.11	0.16	-0.16	-0.55
	(0.37)	(0.31)	(0.10)	(0.02)	(0.15)	(0.31)	(0.39)	(0.57)	(0.52)
qe^{Y}-euro*share^{Y}-euro	1.89***	0.51	0.16	-0.10*	0.54	0.31	0.33	0.61	-0.13
	(0.49)	(0.73)	(0.11)	(0.05)	(0.51)	(0.42)	(0.52)	(0.74)	(0.32)
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State*Industry*Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	426,108	426,108	426,108	426,108	426,108	10,210	9,283	9,283	9,347
R-squared	0.218	0.180	0.034	0.100	0.065	0.215	0.223	0.185	0.296

Notes: Estimates from OLS for the period January 2002 to March 2012. Observations are at the firm-year level. Above are indicated the dependent variables in each column. The first five columns use the sample of firms in the bank registry data. The last four columns restrict the sample to firms that are observed in the credit registry and in the Orbis data set. *intrate^{Y}-country*share^{Y}-country*– Share of firm loans from banks headquartered in country *country* at *t-1* times the overnight rate of country *country. qe^{Y}-country*share^{Y}-country* – Share of firm loans from banks headquartered in country *country* at *t-1* times the *QE* of country *country.* All regressions include fixed effects at the firm and state*industry*year level. Standard errors are reported in parentheses and are clustered at the state*year level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table 3- Panel B. Impact of International Monetary Policy on Real Variables of Firms

	(1) Loan Volume (log)	(2) Maturity	(3) Collateral	(4) Loan rate	(5) Default	(6) Liabilities	(7) Current liabilities (log)	(8) Non-current liabilities (log)	(9) Assets (log)
intrate^{Y}-foreign*share^{Y}-foreign	-2.99***	-7.49***	-1.57***	0.08	-0.78***	-1.26***	-1.15***	-1.40**	-0.52**
	(0.54)	(0.60)	(0.21)	(0.06)	(0.17)	(0.32)	(0.40)	(0.67)	(0.25)
intrate^{Y}-mex*share^{Y}-mex	-0.64	0.05	0.97	-0.83***	0.34	2.59	3.36	2.07	0.83
	(1.87)	(1.78)	(1.00)	(0.24)	(0.62)	(1.67)	(2.13)	(2.48)	(0.70)
qe^{Y}-foreign*share^{Y}-foreign	0.34	-0.25	0.12	-0.18***	0.66***	0.21	0.17	0.56*	-0.10
	(0.42)	(0.36)	(0.10)	(0.04)	(0.08)	(0.19)	(0.23)	(0.33)	(0.18)
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State*Industry*Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	426,108	426,108	426,108	426,108	426,108	10,210	9,283	9,283	9,347
R-squared	0.198	0.161	0.016	0.071	0.045	0.062	0.059	0.030	0.146

Notes: Estimates from OLS for the period January 2002 to March 2012. Observations are at the firm-year level. Above are indicated the dependent variables in each column. The first five columns use the sample of firms in the bank registry data. The last four columns restrict the sample to firms that are observed in the credit registry and in the Orbis data set. *intrate^{Y}-mex * share^{Y}-mex*– Share of loans from Mexican bank at *t-1* times the policy rate of Mexico. *intrate^{Y}-foreign * share^{Y}-foreign*– Share of loans from foreign banks at *t-1* times the average policy rate of the US, UK and Eurozone. *qe^{Y}-foreign *share^{Y}-foreign* – Share of firm loans from foreign banks at t-1 times the average *QE* of the US, UK and Eurozone. All regressions include fixed effects at the firm and state*industry*year level. Standard errors are reported in parentheses and are clustered at the state*year level. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table 4- Panel A. Impact of International Monetary Policies on Loan Volume by Ex-Ante Loan Rates

	High-yield firms		**Low-yield firms**	
	(1)	(2)	(3)	(4)
intrate-usr	-0.08		0.43	
	(0.39)		(0.27)	
intrate-usr * us-bank	-4.04***	-4.03***	-2.20***	-1.98***
	(0.29)	(0.43)	(0.42)	(0.49)
intrate-uk	-0.17		-0.55**	
	(0.54)		(0.39)	
intrate-uk * uk-bank	-1.29***	-1.25***	0.08	0.44
	(0.31)	(0.41)	(0.55)	(0.73)
intrate-euro	0.10		0.60	
	(0.64)		(0.46)	
intrate-euro * euro-bank	-1.69***	-1.98***	-1.71***	-1.58**
	(0.51)	(0.68)	(0.63)	(0.79)
intrate-mexr	-0.83**		-0.24	
	(0.32)		(0.24)	
intrate-mexr * mex-bank	0.27	0.23	1.21***	0.90
	(0.34)	(0.45)	(0.37)	(0.60)
qe-us	-0.20		0.05	
	(0.17)		(0.07)	
qe-us * us-bank	0.52***	0.54**	0.72***	0.68***
	(0.17)	(0.25)	(0.17)	(0.22)
qe-uk	0.40***		0.05	
	(0.14)		(0.08)	
qe-uk * uk-bank	0.04	0.04	-0.36	-0.24
	(0.22)	(0.21)	(0.27)	(0.49)
qe-euro	-0.08		0.00	
	(0.18)		(0.08)	
qe-euro * euro-bank	0.36*	0.39*	0.20	0.20
	(0.21)	(0.23)	(0.15)	(0.16)
Firm*Bank F.E.	Yes	Yes	Yes	Yes
State*Industry*Period F.E.	No	Yes	No	Yes
Observations	5,946,242	5,946,242	996,564	996,564
R-squared	0.01	0.03	0.01	0.09

Notes: Estimates from OLS for the period January 2002 to March 2012. Observations are at the firm-bank-month level. *Low (High) yield firms* – A firm-bank pair is low (high) yield if the interest rate it pays on its (previous) loan is below (above) the average interest rate, weighted by loan volume, paid by all firms each month. The dependent variable is a firm's log loan volume with bank b at period t. Controls include the one-month lagged annual growth rate of Mexican and US real GDP and CPI. Standard errors clustered at the period and bank-industry level are reported in parentheses. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table 4- Panel B. Impact of International Monetary Policies on Maturity by Ex-Ante Loan Rates

	High-yield firms		**Low-yield firms**	
	(1)	(2)	(3)	(4)
intrate-usr	0.34		0.24	
	(0.40)		(0.36)	
intrate-usr * us-bank	-5.92***	-5.70***	-3.69***	-3.59***
	(0.63)	(1.81)	(0.38)	(0.48)
intrate-uk	0.60		0.99*	
	(0.80)		(0.56)	
intrate-uk * uk-bank	-8.27***	-8.21***	1.24***	1.35**
	(0.42)	(0.81)	(0.32)	(0.53)
intrate-euro	-2.06**		-2.13***	
	(0.80)		(0.78)	
intrate-euro * euro-bank	-0.65	-0.61	3.55***	3.77***
	(0.55)	(1.31)	(0.39)	(0.59)
intrate-mexr	-0.90***		-0.16	
	(0.35)		(0.36)	
intrate-mexr * mex-bank	1.28***	0.90	-1.23***	-0.82
	(0.49)	(0.93)	(0.40)	(0.57)
qe-us	0.32***		0.19	
	(0.11)		(0.13)	
qe-us * us-bank	2.33***	2.46***	0.82***	0.93***
	(0.55)	(0.80)	(0.21)	(0.25)
qe-uk	0.40***		0.49***	
	(0.09)		(0.13)	
qe-uk * uk-bank	-0.24	-0.16	-0.39*	-0.44
	(0.29)	(0.39)	(0.21)	(0.65)
qe-euro	-0.24*		0.08	
	(0.12)		(0.14)	
qe-euro * euro-bank	0.32	0.33	0.29	0.41
	(0.27)	(0.34)	(0.26)	(0.31)
Firm*Bank F.E.	Yes	Yes	Yes	Yes
State*Industry*Period F.E.	No	Yes	No	Yes
Observations	5,946,242	5,946,242	996,564	996,564
R-squared	0.26	0.28	0.02	0.10

Notes: Estimates from OLS for the period January 2002 to March 2012. Observations are at the firm-bank-month level. *Low (High) yield firms* – A firm-bank pair is low (high) yield if the interest rate it pays on its (previous) loan is below (above) the average interest rate, weighted by loan volume, paid by all firms each month. The dependent variable is a firm's loan maturity with bank b at period t. Controls include the one-month lagged annual growth rate of Mexican and US real GDP and CPI. Standard errors clustered at the period and bank-industry level are reported in parentheses. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table 4- Panel C. Impact of International Monetary Policies on Collateral by Ex-Ante Loan Rates

	High-yield firms		**Low-yield firms**	
	(1)	(2)	(3)	(4)
intrate-usr	-0.66***		-0.03	
	(0.21)		(0.32)	
intrate-usr * us-bank	-0.56***	-0.58***	-1.88***	-1.92***
	(0.08)	(0.14)	(0.28)	(0.32)
intrate-uk	0.81***		-0.19	
	(0.21)		(0.37)	
intrate-uk * uk-bank	-1.05***	-1.18***	-1.06***	-1.10***
	(0.11)	(0.14)	(0.31)	(0.37)
intrate-euro	-1.30***		-1.18**	
	(0.26)		(0.47)	
intrate-euro * euro-bank	-1.53***	-1.66***	-0.27	-0.37
	(0.26)	(0.33)	(0.24)	(0.29)
intrate-mexr	-0.90***		-0.20	
	(0.17)		(0.26)	
intrate-mexr * mex-bank	0.12	0.05	0.47*	0.53
	(0.19)	(0.25)	(0.27)	(0.42)
qe-us	0.08*		0.00	
	(0.04)		(0.07)	
qe-us * us-bank	0.11*	0.14*	0.27*	0.27
	(0.06)	(0.08)	(0.16)	(0.18)
qe-uk	-0.03		0.05	
	(0.04)		(0.07)	
qe-uk * uk-bank	-0.07	-0.07	0.48**	0.36
	(0.09)	(0.10)	(0.21)	(0.30)
qe-euro	0.13**		0.36***	
	(0.07)		(0.11)	
qe-euro * euro-bank	0.25*	0.27*	0.59***	0.55***
	(0.13)	(0.16)	(0.17)	(0.21)
Firm*Bank F.E.	Yes	Yes	Yes	Yes
State*Industry*Period F.E.	No	Yes	No	Yes
Observations	5,946,242	5,946,242	996,564	996,564
R-squared	0.01	0.04	0.01	0.09

Notes: Estimates from OLS for the period January 2002 to March 2012. Observations are at the firm-bank-month level. *Low (High) yield firms* – A firm-bank pair is low (high) yield if the interest rate it pays on its (previous) loan is below (above) the average interest rate, weighted by loan volume, paid by all firms each month. The dependent variable is a firm's loan collateral rate with bank b at period t. Controls include the one-month lagged annual growth rate of Mexican and US real GDP and CPI. Standard errors clustered at the period and bank-industry level are reported in parentheses. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table 4- Panel D. Impact of International Monetary Policies on Loan Rates by Ex-Ante Loan Rates

	High-yield firms		**Low-yield firms**	
	(1)	(2)	(3)	(4)
intrate-usr	0.04		0.14***	
	(0.03)		(0.05)	
intrate-usr * us-bank	0.11***	0.12***	-0.01	-0.02
	(0.01)	(0.01)	(0.01)	(0.02)
intrate-uk	0.17***		0.01	
	(0.05)		(0.08)	
intrate-uk * uk-bank	-0.10**	-0.07	0.00	-0.00
	(0.04)	(0.06)	(0.01)	(0.05)
intrate-euro	0.02		0.18*	
	(0.06)		(0.09)	
intrate-euro * euro-bank	0.10***	0.09*	0.07***	0.06
	(0.02)	(0.05)	(0.01)	(0.05)
intrate-mexr	0.27***		0.27***	
	(0.05)		(0.07)	
intrate-mexr * mex-bank	-0.03	-0.03	-0.02	-0.04
	(0.03)	(0.05)	(0.02)	(0.05)
qe-us	0.00		-0.02*	
	(0.01)		(0.01)	
qe-us * us-bank	-0.11***	-0.10***	-0.00	0.00
	(0.01)	(0.03)	(0.01)	(0.02)
qe-uk	0.03***		0.00	
	(0.01)		(0.01)	
qe-uk * uk-bank	0.01	0.01	-0.00	-0.02
	(0.05)	(0.01)	(0.00)	(0.08)
qe-euro	-0.01		0.07***	
	(0.01)		(0.02)	
qe-euro * euro-bank	0.01	0.01	0.00	0.00
	(0.01)	(0.01)	(0.00)	(0.01)
Firm*Bank F.E.	Yes	Yes	Yes	Yes
State*Industry*Period F.E.	No	Yes	No	Yes
Observations	5,946,242	5,946,242	996,564	996,564
R-squared	0.27	0.30	0.25	0.38

Notes: Estimates from OLS for the period January 2002 to March 2012. Observations are at the firm-bank-month level. *Low (High) yield firms* – A firm-bank pair is low (high) yield if the interest rate it pays on its (previous) loan is below (above) the average interest rate, weighted by loan volume, paid by all firms each month. The dependent variable is a firm's loan interest rate with bank b at period t. Controls include the one-month lagged annual growth rate of Mexican and US real GDP and CPI. Standard errors clustered at the period and bank-industry level are reported in parentheses. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table 4- Panel E. Impact of International Monetary Policies on Default by Ex-Ante Loan Rates

	High-yield firms		**Low-yield firms**	
	(1)	(2)	(3)	(4)
intrate-usr	0.11		0.23**	
	(0.15)		(0.11)	
intrate-usr * us-bank	-0.53***	-0.52*	0.54***	0.30
	(0.10)	(0.29)	(0.15)	(0.20)
intrate-uk	-0.40*		-0.09	
	(0.21)		(0.13)	
intrate-uk * uk-bank	-0.75***	-0.77***	-0.13	-0.13
	(0.12)	(0.16)	(0.11)	(0.19)
intrate-euro	0.30		0.77***	
	(0.25)		(0.18)	
intrate-euro * euro-bank	-0.56***	-0.53**	0.05	0.07
	(0.14)	(0.25)	(0.22)	(0.25)
intrate-mexr	0.19*		0.06	
	(0.11)		(0.09)	
intrate-mexr * mex-bank	0.21**	0.18	0.14	0.13
	(0.08)	(0.18)	(0.09)	(0.13)
qe-us	0.04		0.02	
	(0.06)		(0.04)	
qe-us * us-bank	0.12***	0.13***	0.08	0.06
	(0.04)	(0.05)	(0.06)	(0.07)
qe-uk	0.03		0.07	
	(0.05)		(0.04)	
qe-uk * uk-bank	0.24***	0.19***	0.17***	0.09
	(0.06)	(0.06)	(0.05)	(0.13)
qe-euro	-0.01		-0.04	
	(0.06)		(0.05)	
qe-euro * euro-bank	0.20***	0.13*	0.20**	0.17*
	(0.04)	(0.06)	(0.08)	(0.10)
Firm*Bank F.E.	Yes	Yes	Yes	Yes
State*Industry*Period F.E.	No	Yes	No	Yes
Observations	4,755,214	4,755,214	812,620	812,620
R-squared	0.02	0.04	0.06	0.15

Notes: Estimates from OLS for the period January 2002 to March 2011. Observations are at the firm-bank-month level. *Low (High) yield firms* – A firm-bank pair is low (high) yield if the interest rate it pays on its (previous) loan is below (above) the average interest rate, weighted by loan volume, paid by all firms each month. The dependent variable is a firm's default rate at *t+12* with bank b for a loan outstanding at period t (see Section 2 of the paper). Controls include the one-month lagged annual growth rate of Mexican and US real GDP and CPI. Standard errors clustered at the period and bank-industry level are reported in parentheses. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Appendix

Table A1- Panel A. Loan-level Variable Definitions (monthly frequency)

Variable	Definition
Dependent Variables	
loan volume	Amount of the outstanding bank credit of a firm-bank pair (thousands of Mexican pesos)
maturity	Average loan maturity (in months) of a firm-bank pair, weighted by loan volume
collateral	Average fraction of loans of a firm-bank pair that is covered by the firms's assets, weighted by loan volume
loan rate	Average annualized loan rate of a firm-bank pair, weighted by loan volume
default	Average share of bank loans of a firm-bank pair with more than 90 days in arrears, weighted by loan volume
Independent Variables	
intrate-us	Fed Funds rate
intrate-usr	Residual from regression of Fed Funds rate on gdp-us and cpi-us
intrate-uk	Sonia rate
intrate-euro	Eonia rate
intrate-mex	Overnight Mexican rate
intrate-mexr	Residual from regression of Overnight Mexican interest rate on Fed Funds, gdp-mx, gdp-us, cpi-mx, cpi-us
intrate-foreign	Average policy rate of UK, US and Eurozone
qe-us	Ratio of the yearly change in the Federal Reserve's total balance sheet assets to US GDP
qe-uk	Ratio of the yearly change in the BoE's total balance sheet assets to UK GDP
qe-euro	Ratio of the yearly change in the ECB's total balance sheet assets to Eurozone GDP
qe-foreign	Average QE of the US, UK and Eurozone
us-bank	Indicator for whether bank is headquartered in the US
uk-bank	Indicator for whether bank is headquartered in the UK
euro-bank	Indicator for whether bank is headquartered in the Eurozone
mex-bank	Indicator for whether bank is headquartered in Mexico
gdp-mx	Seasonally adjusted Mexican real GDP growth
cpi-mx	Mexican CPI annual growth
gdp-us	Seasonally adjusted US real GDP growth
cpi-us	US CPI annual growth

Table A1- Panel B. Firm-level Variable Definitions (annual frequency)

Variable	Definition
Dependent Variables	
loan volume^{Y}	Amount of the annual outstanding bank credit of a firm (thousands of Mexican pesos)
maturity^{Y}	Average maturity (in months) of all bank loans of a firm in a given year, weighted by loan volume
collateral^{Y}	Average fraction of all bank loans of a firm in a given year that are covered by the firm's assets, weighted by loan volume
loan rate^{Y}	Average annualized loan rate of all bank loans of a firm in a given year, weighted by loan volume
default^{Y}	Average share of bank loans of a firm in a given year with more than 90 days in arrears, weighted by loan volume
assets ^{Y}	Total assets of firm (thousands of Mexican pesos)
liabilities^{Y}	Total liabilities of firm (thousands of Mexican pesos)
non-current liabilities^{Y}	Liabilities of a firm with a maturity over one year (thousands of Mexican pesos)
current liabilities^{Y}	Liabilities of a firm with a maturity under one year (thousands of Mexican pesos)
Independent Variables	
intrate^{Y}-us * Lshare^{Y}-us	Annual Fed Funds rate weighted by the one-year-lagged share of a firm's debt with US banks
intrate^{Y}-usr * Lshare^{Y}-us	Residual of the regression of annual Fed Funds rate on gdp-us and cpi-us- weighted by the one-year-lagged share of a firm's debt with US banks
intrate^{Y}-uk * Lshare^{Y}-uk	Annual Sonia rate weighted by the one-year-lagged share of a firm's debt with UK banks
intrate^{Y}-euro * Lshare^{Y}-euro	Annual Eonia rate weighted by the one-year-lagged share of a firm's debt with Eurozone banks
intrate^{Y}-mex * Lshare^{Y}-mex	Annual overnight Mexican rate weighted by the one-year-lagged share of a firm's debt with Mexican banks
intrate^{Y}-mexr * Lshare^{Y}-mexr	Residual of the regression of annual overnight Mexican rate on Fed Funds, gdp-mx, gdp-us, cpi-mx, cpi-us- weighted by the one-year-lagged share of a firm's debt with Mexican banks
intrate^{Y}-foreign * Lshare^{Y}-foreign	Average of annual Fed Funds, Eonia and Sonia rates weighted by the one-year-lagged share of a firm's debt with foreign banks
qe^{Y}-us * Lshare^{Y}-us	Annual ratio of the yearly change in the Federal Reserve's assets to US GDP rate weighted by the one-year-lagged share of a firm's debt with US banks
qe^{Y}-uk * Lshare^{Y}-uk	Annual ratio of the yearly change in the BOE's assets to UK GDP rate weighted by the one-year-lagged share of a firm's debt with UK banks
qe^{Y}-euro * Lshare^{Y}-euro	Annual ratio of the yearly change in the ECB's assets to Eurozone GDP rate weighted by the one-year-lagged share of a firm's debt with Eurozone banks

Table A2- Impact of International Monetary Policies on Loan Volume (January 2002 – Nov 2009)

	(1)	(2)	(3)	(4)
intrate-usr	-0.59***			
	(0.21)			
intrate-usr * us-bank	-1.80***	-1.79***	-2.05***	-2.46***
	(0.40)	(0.42)	(0.43)	(0.81)
intrate-uk	-0.97			
	(0.68)			
intrate-uk * uk-bank	-2.44***	-2.53***	-2.47***	-2.62***
	(0.43)	(0.48)	(0.53)	(0.75)
intrate-euro	0.91			
	(0.87)			
intrate-euro * euro-bank	-0.65	-0.71	-0.13	-0.72
	(0.64)	(0.68)	(0.60)	(1.12)
intrate-mexr	-0.97***			
	(0.30)			
intrate-mexr * mex-bank	0.19	-0.01	-0.30	-0.60
	(0.38)	(0.58)	(0.47)	(0.95)
Firm*Bank F.E.	yes	yes	yes	yes
State*Industry*Period F.E.	no	yes	yes	-
Firm*Period F.E.	no	no	no	yes
Firms borrowing from more than 1 bank	no	no	yes	yes
Observations	3,507,188	3,507,188	1,212,357	1,212,357
R-squared	0.013	0.032	0.047	0.582

Notes: The estimates in this table come from ordinary least squares for the period January 2002 to November 2009. Observations are at the firm-bank-month level. The dependent variable is the firm's loan volume with bank *b* at period *t*. *intrate-country* - Policy rate of country *country*. *intrate-countryr* - Residual of policy rate of country *country*. Indicator that equals 1 if bank's headquarters are in country *country*. Other controls include the one-month lagged annual growth rate of Mexican and US real GDP and CPI. Fixed effects already absorbed by other fixed effects are indicated by "-". Standard errors that are clustered at the period and bank-industry level are reported in parentheses. *significant at 10 percent, **significant at 5 percent, ***significant at 1 percent.

Table A3. Characteristics of firms borrowing with foreign banks

	(1)	(2)
	Loan volume (logs)	Total assets (logs)
euro-bank	-0.26	0.17
	(0.316)	(0.571)
uk-bank	0.18	0.21
	(0.324)	(0.970)
Constant	4.97***	5.86***
	(0.289)	(1.345)
Observations	339,116	7,638
R-squared	0.631	0.898

Notes: The estimates in this table come from ordinary least squares for the years 2002 to 2013. Each observation represents a firm-year pair. The sample is constrained to firms borrowing with foreign banks, where the omitted category is banks from the US. *country-bank* is an indicator variable that equals one if the main bank for the firm is headquartered in country *country*. The dependent variables correspond to the total bank credit and total assets (both in logs) of a firm at a given year. All regressions include fixed effects at the state*industry*year level. Standard errors that are clustered at the year and state*industry level are reported in brackets. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A4-Panel A. Impact of International Monetary Policy at the Firm-month Level

	(1) Loan volume	(2) Maturity	(3) Collateral	(4) Loan rate	(5) Default
intrate-us * share^{m}-us	-3.53***	-5.60***	-1.07**	0.21**	-1.16*
	(0.60)	(1.77)	(0.47)	(0.09)	(0.66)
intrate-uk * share^{m}-uk	-2.34***	-7.72***	-2.05***	-0.29*	-0.94
	(0.58)	(1.08)	(0.50)	(0.16)	(0.77)
intrate-euro * share^{m}-euro	-3.85***	-4.36**	-1.66**	0.04	-0.42
	(1.38)	(1.88)	(0.75)	(0.20)	(1.25)
intrate-mex * share^{m}-mex	-0.19	0.77	-0.086	-0.32	0.48
	(1.90)	(1.81)	(1.41)	(0.42)	(1.82)
qe-us * share^{m}-us	0.79*	1.02	0.32	-0.12	0.93*
	(0.48)	(1.42)	(0.30)	(0.10)	(0.57)
qe-uk * share^{m}-uk	0.18	0.26	0.32	-0.08*	0.09
	(0.31)	(0.56)	(0.22)	(0.05)	(0.26)
qe-euro * share^{m}-euro	1.33**	1.34	0.37	-0.07	0.45
	(0.53)	(1.00)	(0.32)	(0.11)	(0.55)
Observations	4,539,171	4,539,171	4,539,171	4,539,171	4,539,171
R-squared	0.030	0.146	0.035	0.115	0.049

Notes: Estimates from OLS for the period January 2002 to March 2012. Observations are aggregated at the firm-month level. *intrate-country*share^{m}-country* – One-month-lagged share of loans from a bank headquartered in country *country* times the policy rate of country *country*. *qe-country*share^{m}-country* – One-month-lagged share of loans from bank headquartered in country *country* times the *QE* of country *country*. All regressions include fixed effects at the firm, and state*industry*period level. Standard errors that are clustered at the period and firm level are reported in brackets. *significant at 10%, **significant at 5%, ***significant at 1%.

Table A4- Panel B. Impact of International Monetary Policy at the Firm-month Level

	(1) Loan volume	(2) Maturity	(3) Collateral	(4) Interest rate	(5) Default
intrate-foreign*share^{m}-foreign	-2.70***	-6.28***	-1.62***	-0.10	-0.80
	(0.60)	(1.17)	(0.46)	(0.13)	(0.73)
intrate-mex*share^{m}-mex	-0.86	0.22	-0.39	-0.32	0.38
	(1.63)	(1.68)	(1.35)	(0.38)	(1.65)
qe-foreign*share^{m}-foreign	0.42	0.39	0.025	-0.11*	0.52
	(0.27)	(0.71)	(0.16)	(0.06)	(0.33)
Observations	4,539,171	4,539,171	4,539,171	4,539,171	4,539,171
R-squared	0.029	0.142	0.033	0.108	0.048

Notes: Estimates from OLS for the period January 2002 to March 2012. Observations are aggregated at the firm-month level. *intrate-country*share^{m}-country* – One-month-lagged share of loans from a bank headquartered in *country* times the policy rate of *country*. *qe-country*share^{m}-country* – One-month-lagged share of loans from bank headquartered in *country* times the *QE* of *country*. *intrate-foreign* and *qe-foreign* correspond to the average interest rates and QEs of the US, UK and Eurozone each month. All regressions include fixed effects at the firm, and state*industry*period level. Standard errors that are clustered at the period and firm level are reported in brackets. *significant at 10%, **significant at 5%, ***significant at 1%.