Hedger of Last Resort: Evidence from Brazilian FX Interventions, Local Credit, and Global Financial Cycles*

Rodrigo Barbone Gonzalez Dmitry Khametshin José-Luis Peydró Andrea Polo

Abstract

We analyze whether the global financial cycle (GFC) affects credit in domestic currency in Brazil and the related real effects, and whether local unconventional policies can attenuate such spillovers. For identification, we exploit GFC shocks, differential reliance of domestic banks on foreign debt, and central bank interventions in FX derivatives using three matched administrative registers: the register of foreign credit flows to banks, the credit register, and a matched employer-employee database. Using loan-level data, we find that after the announcement of US Quantitative Easing tapering by Ben Bernanke, chairman of the FED, in May 2013, domestic banks with larger reliance on foreign debt reduce the supply of credit to firms, which in turn reduces employment. The tapering speech is associated with massive appreciation of the USD and increased FX volatility in EMEs. However, the Central Bank of Brazil (BCB) attenuates these negative effects announcing a large intervention program in the FX derivatives market, which consists in supplying insurance against FX risks — *hedger of last resort*. In addition to these two subsequent shocks, we analyze a panel over 2008-2015 and find a broader channel: banks with larger foreign debt respond to USD appreciation, increased FX volatility, and tighter US monetary policy decreasing credit supply. FX interventions mitigate these effects of the GFC, confirming that these policies have been effective in decreasing local economy exposure to global conditions.

JEL classification: E5; F3; G01; G21; G28

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*Authors' contacts: Rodrigo Barbone Gonzalez, Banco Central do Brasil, e-mail: rodrigo.gonzalez@bcb.gov.br; Dmitry Khametshin, Banco de España, e-mail: dmitry.khametshin@bde.es; José-Luis Peydró, ICREA-UPF, Imperial College, CREI, Barcelona GSE and CEPR, e-mail: jose.peydro@upf.edu; Andrea Polo, UPF, Barcelona GSE, CEPR and ECGI, e-mail: andrea.polo@upf.edu. This draft is from December, 2018. This working paper should not be reported as representing the views of the Banco Central do Brasil. The views expressed in this paper are those of the authors and should not be attributed to the Banco de España or the Eurosystem. We thank Philippe Bacchetta, Claudio Borio, Fernando Broner, Stijn Claessens, Giancarlo Corsetti, Julian Di Giovanni, Jordi Galí, Leonardo Gambacorta, Gita Gopinath, Alberto Martín, Marco Pagano, Lorenzo Pandolfi, Loriana Pellizon, Giacomo Ponzetto, Hyun Song Shin, Jaume Ventura, Helene Rey, Luiz A. Pereira da Silva, Victoria Ivashina, Joshua Aizenman, and seminar participants at CREI, CSEF-University of Naples II, BIS, EIEF, Frankfurt School of Management, Goethe University in Frankfurt, and the Advisory Scientific Committee of the European Systemic Risk Board for helpful comments and suggestions. José-Luis Peydró gratefully acknowledges financial support from the Spanish Ministry of Science, Innovation and Universities, Grant No ECO2015-68136-P, and from the European Research Council, Grant No. 648398.

1 Introduction

Financial crises follow periods of high local credit growth, partly financed with foreign liquidity (Gourinchas and Obstfeld (2012)). Rey in her Jackson Hole speech (Rey (2013)) argues that a global financial cycle is affecting local credit markets and bank risk-taking in emerging markets and that VIX and US monetary policy are key drivers. Shin (2016) argues that the dollar has ousted the VIX index as a barometer of the banking sector's appetite for leverage, with bank lending around the world coming under pressure when the dollar appreciates. Relatedly, Gopinath and Stein (2018) show the importance of the dollar as the dominant currency in both trade invoicing and global finance. Moreover, since the Great Recession following the global financial crisis, emerging markets have experienced large shifts in foreign exchange (FX) market conditions. Many central banks in Emerging Markets Economies (EMEs) have intervened in FX markets in the last few years to provide the private sector with insurance against FX risks (Domanski, Kohlscheen, and Moreno (2016)).

In this paper, we investigate whether changes in the FX market conditions can impact local credit markets and the real economy in Brazil and whether global financial cycle shocks are transmitted by banks with larger foreign debt. Moreover, we horserace different global financial cycle variables, in particular FX, VIX and US monetary policy. Finally, we study whether local central banks in EMEs can attenuate the spillovers of global financial cycles on local credit and in the real economy by intervening in the FX market as "hedgers-of-last-resort".

We address these questions analyzing microdata from Brazil. Brazil is an excellent case to investigate these questions since it is a large, representative emerging economy which has been subject to large external shocks and where the local central bank (Banco Central do Brasil, BCB) implemented the largest ever intervention program in the FX derivatives market in August 2013. The open positions of the BCB in these derivatives sum close to 7% of the Brazilian GDP (or 30% of its International Reserves) in the peak of the program in 2015. Other central banks in EMEs adopted similar programs in the following years (e.g. Mexico in February 2017 and Turkey in November 2017). We build our sample matching three administrative registers: a debt register of foreign credit flows to institutions domiciled in Brazil, a credit register from the Central Bank of Brazil, and a matched employer-employee dataset from the Ministry of Labor

and Employment.

For further empirical identification, we address our questions by analyzing the supply of credit by domestic banks in Brazil with different percentages of foreign debt and the associated real effects. In the first part, we adopt a difference-in-difference methodology around two consecutive shocks related to the US tapering speech and the announcement of the BCB intervention program in the FX derivatives market. In the second part, we analyze a panel from 2008 to 2015 exploiting global financial cycle (GFC) on FX (both in levels and volatility), over and above VIX and US monetary policy.

The first shock is on May 22, 2013 when, the Chairman of the US Federal Reserve, Bernanke raised the possibility of tapering its security purchases (QE) in his testimony before the Joint Economic Committee of the U.S. Congress. While unconventional monetary policies by the Federal Reserve were not expected to last forever, the tapering speech did surprise the markets. Between May 22 and end-June, on average, currencies across emerging markets depreciated 3%, spreads rose 1%, and equities fell 7% (Mishra, Moriyama, and N'Diaye (2014)). In some countries, the FX depreciation was massive (Brazil 12.5%, India 9.9%, South Africa 8.9%, Turkey 7.6%, Russia 4.6% (Eichengreen and Gupta (2015)).

In light of deep depreciation (overshooting) of the Brazilian real (BRL) and high FX volatility, the supply side of FX derivatives markets disrupted. In August 22, 2013 the BCB responded announcing a major program of FX intervention. The program consisted of daily sales of USD 500 million worth of currency non-deliverable forwards (USD forwards settled in BRL, more widely known as BCB swaps) in the Brazilian stock exchange (BMF Bovespa). In this program, by supplying FX derivatives, the BCB provided the markets insurance against further depreciation of the BRL, with the aim of satisfying the excess demand of hedging, and therefore acting as a hedger-of-last-resort (BCB (2014)). Differently from traditional sterilized FX interventions in the spot market, this intervention does not reduce the country international reserves. The markets welcomed the announcement of this program, which caused appreciation of the BRL relatively to other EMEs currencies (Chamon, Garcia, and Souza (2017))

In the second part, we analyze the effects of quarterly changes in the FX market conditions using a panel dataset over 2008-2015 and controlling for several other macro variables, both local and related to the GFC. Moreover, we also explore whether these GFC effects on credit

have reduced after the intervention of the BCB.

We are able to identify the transmission of the macro and policy shocks to the real economy via the foreign debt of domestic banks thanks to the specific conditions of the Brazilian market and to the granularity of the data. First, domestic banks cover most of the credit market. We exclude from the analysis two foreign banks as these banks are likely to be affected by different channels.[1] However, all our results are robust if we add back these two banks. Second, we analyze only loans in BRL, which represent almost the totality of the loans extended by Brazilian domestic banks to local companies. Less than 1% of the firms in the sample obtain loans indexed to the US Dollar. Third, because of loan-level data from the Credit Registry of the BCB, we can control for credit demand shifts using firm or firm-time fixed effects (e.g. Khwaja and Mian (2008)) and focus on credit supply changes to firms related to banks with larger foreign debt. Finally, the employer-employee dataset allows us to have a better understanding of the real effects of both GFC and of the alleviating FX intervention policies.

We find the following robust results. In the three months, around the tapering speech by Bernanke, banks with larger foreign debt reduce credit supply to firms as compared to the other banks. One standard deviation in banks' ex-ante foreign debt leads to a 2% lower quarterly credit growth. However, this credit supply reduction is partially reversed in the three months following the announcement of the intervention by the BCB. These loan-level results also hold at the firm level: firms more exposed to banks with more foreign debt see a reduction of their total credit after the Bernanke speech and a partial reversal after the BCB announcement. We show that both shocks have real effects, and we find that the total employment at the firm level follows a similar pattern.

Analyzing the full panel with quarterly data from 2008 to 2015, we find that banks with larger foreign debt react to the depreciation of their currency reducing credit supply to firms. We obtain similar results if, instead of the level of the FX rate, we use the volatility of the FX rate (quarterly changes in the level of FX and in the volatility of FX have a 0.8 correlation). To focus on GFC shocks, instead of using the FX rate of the Brazilian Real (BRL) against the U.S. Dollar, we use the FX rate of an index of the emerging market currencies, excluding Brazil, against the U.S. Dollar. However, all our results are robust if we use the bilateral FX

[1]The market share of excluded banks is around 13%.

rate between Brazil and the US. Results also hold if we horserace foreign debt against a set of macroeconomic variables including, among others, monetary policy in the U.S., monetary policy in Brazil, VIX, economic growth and political uncertainty in Brazil.

Furthermore, we show that the effects of changes in the FX rate on the credit supply of banks with larger foreign debt are muted in the sub-period after the intervention of the BCB. Despite large fluctuations in the FX market conditions before and after the BCB intervention, changes in the FX after the intervention do not affect credit supply. Therefore, the policy of supplying FX derivatives had been able to decrease the spillovers of global financial conditions on EMEs local economy.

Why do banks with larger foreign debt reduce credit supply after episodes of U.S. Dollar appreciation? And why is this channel muted after the intervention of the BCB? Basel II regulation on market risk imposes additional charges on unmatched FX positions (those that exceed 5% of regulatory capital), so banks have high incentives to hedge their foreign debt buying FX derivatives. Banks hedge their foreign debt mostly by rolling monthly forward contracts and futures despite the average maturity of their foreign debt is, on average, much longer. Large global banks and foreigners typically supply FX derivatives in BMF Bovespa and OTC markets. Most domestic commercial banks buy these derivatives for balance sheet hedging. After local currency depreciation episodes (accompanied by an increase in the volatility of the FX rate), banks struggle to find hedging instruments or find them at a much higher price.[2] To an extreme, just after the Bernanke speech, there was hardly any supplier of hedging instruments in the market. Hence, after local currency depreciation, banks with larger shares of foreign debt reduce credit supply since they experience an increase in the cost of rolling over their FX derivatives. The BCB intervenes "to provide liquidity to the FX currency markets [...] A sale of forward FX by the BCB will compress forward points against spot. This will lower the cost of

[2]Newspapers articles often mention an increase in the cost of hedging after episodes of depreciation/increased volatility in the FX rate for emerging markets. Here are some examples from Brazil, China and India. "Brazil Real hedging cost jumps as Latin American currencies sink" September 2016, Bloomberg. "Chinese companies that have borrowed heavily in dollars face sharply higher currency hedging costs at a time when the yuan's rising volatility means they need to hedge more" Reuters, January 2015. "Hedging cost of domestic corporate houses have increased by 1-2 percent due to the ongoing rupee volatility" Zeenews India, June 2012. Sushko et al. (2017) show that implied volatility of the FX rate is positively associated with the deviations of covered interest parity (the difference between the forward premium and the interest rate differential). In unreported regressions we find similar results for Brazil.

hedging" (Garcia and Volpon (2014)). In other words, the BCB provides the insurance against GFC shocks that banks (and firms) need.

The strategy by the BCB to act as a "hedger of last resort", which has been recently replicated by Turkey and Mexico, has potential costs. First, it works insofar as economic agents believe they can go from forwards to spot U.S. Dollars, i.e. convertibility risk is negligible. This has not been an issue in Brazil (or most EMEs), because EMEs central banks usually keep the buffer of international reserves at very high levels. Second, hedger of last resort policy, as lender of last resort policies, can increase moral hazard and incentivize domestic banks to take up riskier (foreign) funding.

There is a large literature on the bank lending channel in emerging markets and its dependence on the global financial conditions (Kalemli-Ozcan, Papaioannou, and Perri (2013), Baskaya et al. (2017), Cetorelli and Goldberg (2011), De Haas and Van Horen (2013), Cerutti, Claessens, and Ratnovski (2017),Schnabl (2012), Morais, Peydró, and Ruiz Ortega (2015), and Paravisini, Rappoport, and Schnabl (2015)). We corroborate to these findings. However, none of these papers analyze how local unconventional policies, such as FX interventions, attenuate the spillovers of the global financial cycle (Rey (2013), Shin (2016)) on local credit markets and on the overall economy. We show that interventions in FX derivatives attenuate the impact of the global financial cycle on credit supply and the related real effects. In the model of Bruno and Shin (2015), which analyze the impact of the changes in the FX rate considering the currency mismatch of the non-financial firms, local banks do not play any significant role as they are assumed to be fully hedged. Despite being "fully hedged" and compliant with market risk prudential regulation, episodes of depreciation of the local currency may still be relevant for credit markets of domestic banks in local currency. As we point out in this paper, the short-term nature of the average hedging instruments used by commercial banks vis-à-vis the much longer maturities of their foreign debt are a source of vulnerability partially mitigated by "hedger of last resort" policies.

A growing literature on FX interventions has focused on sterilized FX interventions. The evidence on the effectiveness of these tools is a source of controversy though. According to Chang (2018): "The dominant view from academia is that sterilized foreign exchange (FX) intervention has a tiny, if any, impact on real variables, which makes it virtually useless as

an independent macroeconomic policy tool." However, the most recent evidence suggests that these interventions may have, at least, some effects in smoothing and stabilizing exchange rates (Blanchard, Adler, et al. (2015), Fratzscher et al. (2015)). In this paper, we focus on a different form of intervention and we show a potent channel of intervening in the derivative FX market instead of the spot one. We also show with micro data that this intervention can be successfully used as an independent policy tool.

The paper proceeds as follows. Section 2 provides institutional details. Section 3 describes the data. Section 4 discusses the results, and Section 5 concludes.

2 Derivatives, FX Interventions, and Tapering in Brazil

Due to historical restrictions to buy US dollars in the Brazilian spot market, the country's FX derivative markets developed more and became larger than the spot one.[3] The participants of the FX derivative markets in Brazil rely on option contracts, futures, and the on-shore dollar rate (also traded as a contract and known as "Cupom Cambial") at Brazil's main clearing, BMF Bovespa. On top of these derivatives, the BCB "swaps" (also auctioned on BMF Bovespa) and comparable OTC forwards traded at the organized OTC venue, "Central de Custódia e Liquidação Financeira de Títulos Privados (CETIP)" constitute the core of this market. All of these FX derivatives are settled in BRL. Non-deliverable forwards (NDFs) against BRL are frequently traded offshore and, in this case, settled in USD.

The BRL emerges as the official Brazilian currency in 1994 as a currency peg on the USD. Between 1994 and 1999,[4] BCB intervened in the derivative's market directly buying or selling futures in the stock exchange particularly in times of instability such as in the Asian and Russian crises. After 1999, to give more transparency to its role in the derivatives' markets, BCB developed its own instrument, generically called BCB swaps.[5] BCB swaps are fungible and daily

[3] Garcia, Medeiros, Santos, et al. (2014) show that FX price discovery takes place in the Brazilian derivatives market.

[4] In 1999, Brazil adopts an inflation targeting regime

[5] We follow the phrasing BCB swaps to stick to the usual Brazilian jargon referring to such derivatives. As detailed by Garcia and Volpon (2014), the product is technically a domestic non-deliverable forward (NDF) settled in BRL. It is worth noticing that BCB swaps evolved overtime. In 1999, this instrument is introduced in the stock exchange BMF Bovespa as a "standardized" currency swap. Differently from typical OTC contracts, these swaps are auctioned with standard maturities in units of USD 50,000 (and not freely negotiated between two parties). Since 2004, these instruments have daily adjustments more closely resembling a future contract than a forward. In

negotiated at the BMF Bovespa, but only the BCB can issue the contract and call auctions at the primary market. There are no restrictions to take part on the auctions, but financial institutions tend to absorb more than 70% of the volumes at the primary market.

BCB swaps are structured in such a way that, at maturity, the BCB pays to its counterparty the realized variation in the BRL/USD exchange rate. In return, the BCB receives an overnight money market rate minus an on-shore dollar rate (that trades at similar prices as those of "Cupom Cambial" and are embedded in auctions called by the BCB). In other words, the BCB typically assumes a short position in USD and, hence, is to incur losses if BRL depreciates over the contract period. Whereas "traditional swaps" consist of selling dollar derivatives; in certain episodes, the BCB takes the opposite side of the swaps, the "reverse swaps" are similar to buying back dollar derivatives, drawing (instead of introducing) dollar liquidity in the derivatives' market. Similarly, "reverse swaps" are settled in BRL and do not change the level of international reserves.

Central banks in emerging markets intervene in the FX typically using sterilized interventions, i.e. offering swaps or forwards that settled in USD or USD repo lines. Alternatively, they may auction USD at the spot market (e.g. Mexico, Korea, Russia, and Brazil occasionally).[6] However, according to Subramanian (2013), "the international experience suggests that sterilized intervention to defend a currency, especially during crises, tends to be ineffective or counterproductive".[7] The BCB more commonly intervene in the derivatives market, using the BCB swaps. Interventions using derivatives that settle in local currency avoid compromising large amounts of international reserves. Since the level of foreign reserves is considered an indicator of economic health in EMEs, preserving high levels of reserves in face of strong global

Brazil, these derivatives are called "swap cambial com ajuste periódico" and traded in the stock exchange BMF Bovespa under the code SCC or "swap cambial com ajuste periódico baseado em operações compromissadas de um dia" (code SCS).

[6] In the 2008 crisis, BCB auctioned USD 14.5 billion in the spot market and extended repo lines in dollars in several occasions (Pereira da Silva and Harris (2012)) BCB has also auctioned at spot market between February and April of 2012 and used forwards in several occasions (Janot and Macedo (2016); Kohlscheen and Andrade (2014)). During 2013, the "repo lines" were part of the first phase of the intervention program. In these cases, the BCB auctions these lines to currency dealers that distribute the "greenbacks" to the market as needed. The FX repo auctions immediately decrease international reserves and are offered with a repurchase agreement of the USD spot. The BCB immediately "sterilize" this liquidity shortage in local currency using open-market operations to preserve monetary policy targets.

[7] Moreover, Kearns and Rigobon (2005) find evidence that these interventions have strong intra-day effects, but they are quite small on the subsequent days. Dominguez (2006) find similar effects for FX volatility.

financial shocks is at the heart of this policy.

These FX interventions aim at confronting excess volatility and excessive devaluation (i.e. "overshooting") by providing the markets with additional insurance contracts against the BRL depreciation. "The forex interventions are not meant to establish a floor for the exchange rate, but to provide the needed liquidity for the depreciation to take place without excess volatility and overshooting — which may entail unnecessary economic costs" (Garcia (2013)). Because BCB swaps provide the markets with hedging instruments similar to OTC forwards, the policy targets firms and financial intermediaries that demand FX instruments for hedging or for speculative purposes, and not the market participants who use the currency for actual settlement.[8] The former include institutions with needs of addressing their balance sheet exposures (e.g., banks that continually roll over foreign debt). To the extent that convertibility risk is negligible, the BCB "swaps" are nearly perfect substitutes of the actual USD balances (Garcia (2013)).

By supplying the markets with FX risk insurance, a central bank acts, effectively, as a hedger of last resort. This policy goes in parallel with its standard function of lender of last resort whereby the regulator aims at mitigating systemic risks by lending to the financial system in times of aggregate liquidity shocks. As an insurance mechanism, the FX derivative interventions can distort banks' (and firms') ex-ante incentives to rely upon risky funding. Analogously to liquidity provision, the BCB's actions as the ultimate provider of hedging may help to minimize the costs of excessive volatility. In our analysis, we evaluate one of the implications of the policy: its effectiveness to protect domestic credit markets from global financial shocks.

The Tapering speech, the dollar and derivatives' market

In May 2013, after a prolonged period of unconventional monetary policy in the US, Ben Bernanke, the chairman of the Federal Reserve, in his Congressional speech announced that the monetary authority was considering to taper QE in the future in light of better economic outlooks. This speech immediately launched a roller-coaster effect in the US and in global financial markets. In the following months, EMEs witnessed massive capital outflows. In most cases, capital outflow was substantial and local currency depreciation was steep and associated

[8]Firms in need of actual settlement find these resources through currency dealers authorized by the BCB (BCB (2002)) These dealers are institutions authorized to sell spot dollars, organize informal auctions, and participate in auctions of FX repo lines organized by the BCB.

with an increase in FX volatility. Figure 1 illustrates the macroeconomic conditions in Brazil around the analyzed period.

[Figure 1 about here.]

The steep depreciation of the BRL and increased implied volatility had several implications for the derivatives' market. Prior to May, 2013, foreigners were net providers of FX derivatives (Figure 2). Firms ("others") were net buyers of such derivatives. These markets were balanced and the BCB was almost entirely absent. In Figure 2, we notice that since the Tapering speech, the foreigners start moving from net providers to buyers of FX protection. Similarly, we observe increased demand from firms. The BCB started offering BCB swaps immediately from that point and banks were the main buyers of those. By the end of June, the BCB also offered currency repo lines. By August, the full disruption in the supply side of derivatives forced the BCB to move from "random" auctions of currency swaps to announcing a program with daily auctions.

[Figure 2 about here.]

Increased hedging costs are likely to be relevant not only for the local commercial banks but also for the global financial intermediaries of dollar liquidity. To the extent the BCB policy offers abundant supply of hedging, it could soften this derivative supply shock mostly stemming from global investment banks (the usual providers of hedging) and, hence, alleviate dollar liquidity shortages to the domestic commercial banks and firms. In a dynamic setup, the scale of operations could further indicate BCB's commitment to sharing the risks of the FX rate adjustments in the future periods. As such, the policy could affect not only the current refinancing costs but also expectations about banks' (and firms') future costs of funding.

The Intervention Program

Because the initial policy steps since the Tapering were not effective, capital outflows continued, and by the end of June BRL lost more than 12% of its value against the US Dollar. In August, 22, three months after the Bernanke speech, a formal program was announced where the BCB committed to daily sales of USD 500M of swaps from Monday to Thursday and an

additional USD 1MM every Friday on repo lines. The volume of swaps effectively offered by the BCB after the announcement did not increase significantly, but the announcement in itself had strong effects.The markets welcomed this policy announcement, which led to a 10 to 19% appreciation of BRL (Chamon, Garcia, and Souza (2017) and Figure 3).

[Figure 3 about here.]

Later in 2013, depreciation resumed and, on December, 18, BCB announced the second round of interventions. In the second wave, BCB auctioned USD 200M daily in swaps and repo auctions only by demand. The impact of this second wave was more modest with an upper bound of the estimated effect around 5% of appreciation (Chamon, Garcia, and Souza (2017)). In December 2014, the BCB announced auctions between USD 50 to 100M. The program effectively resumed at March, 31 of 2015 (BCB (2015)). In his testimony in front of the Senate in March, 24, 2015, the president of BCB, Alexandre Tombini, stated "the swap program is an important instrument to smooth FX ratio effects [...] it allows the private sector to navigate in safety [in moments] when the dollar spikes from [BRL] 2.85 to 3.20" (Portal Brasil (2015)). This intervention program in the FX derivatives market was the largest of its kind, reaching 7% of the Brazilian GDP in its peak.

The policy could affect the local commercial banks in several ways. In broad terms, the Tapering Tantrum increased the funding costs of the domestic banks, both directly — by raising the opportunity costs of investing in Brazil and decreasing supply of USD in the spot market, and indirectly — by pushing up the hedging costs practiced by financial market intermediaries. On top, prudential regulation in Brazil imposes additional charges on large unmatched FX positions (those that exceed 5% of regulatory capital). On-balance-sheet hedging (via foreign denominated assets) is costly due to the large interest rate differential; additionally, FX-denominated lending is limited to the trade sector and comprises a rather negligible part of the total assets of the domestic commercial banks. As a result, banks hedge their foreign debt predominantly using off-balance sheet (and short-term) instruments. In particular, domestic commercial banks use mostly FX Forwards and Futures that they roll over every month. It is worth noticing the large maturity mismatch between banks' foreign debt and the derivatives they use for balance sheet hedging emerge.In April 2014, 70% of the derivatives hold by banks were due in less

than 30 days, whereas 71% of their foreign debt in more than one year (Figure 4). With the announcement of the swap program in 22nd of August, BCB effectively promised to promote the supply of FX derivatives selling BCB swaps as much as needed.

[Figure 4 about here.]

3 Data and Identification Strategy

In this paper, we match three data sets: the credit register of corporate loans, a register of foreign claims hold by institutions domiciled in Brazil (both administered by the BCB), and the formal employment registry (from the Brazilian Ministry of Labor and Employment). We augment this data with bank balance and macroeconomic variables. Our final panel sample spans all calendar quarters from 2008 until the middle of 2015.

Financial regulation in Brazil instructs every financial institution to submit comprehensive information on each credit exposure larger than BRL 5,000 to the Credit Registry of the BCB ("Nova Central de Risco"). These data contains detailed characteristics of the underlying credit contracts, including credit volumes (either committed or drawn), interest rates, maturity, as well as monthly information on each loan performance matched by the borrower fiscal id. We further aggregate loan-level credit exposures into the firm-bank level to calculate total committed credit provided by each bank to a particular firm. We perform this aggregation at the bank holding company level in order to mitigate any concerns about credit supply dependence of banks with common management strategy. We further trace the quarterly dynamics of this exposure over the whole sample period for each bank-firm pair present in the database. For computational reasons, we sample the data from the original database by firm (i.e. we collect a random sample of firms ever represented in the credit registry and withdrawn their credit histories from all financial institutions that ever lend to these firms). Our sample covers 30% of all the firms that have credit from at least one bank in at least one quarter during the sample period.

As we focus on credit supply in local currency, we drop firm-bank observations with at least one loan indexed in currencies other than Brazilian Real (BRL). In our sample, as of the end of April 2013, less than 1% of firms have any liability indexed to a foreign currency. We also exclude from the loan-level analysis non-profit organizations and financial firms, as well

as loans that are not originated by commercial banks. Since we aim to control for unobservable credit demand shifts using a fixed effect estimator, we further restrict the sample to include firms with at least two bank lenders in a given quarter. These firms represent over 86% of total corporate credit extended by the bank sector. Importantly, we exclude from our baseline analysis credit claims of foreign banks. With the exception of two larger institutions, most foreign banks in Brazil are involved in investment banking rather than in commercial activity. As of the end of April 2013, the two largest foreign banks involved in commercial activity accounted for 13% of the corporate credit in the economy. We include only domestic commercial banks in the baseline sample, because we want to identify the impact of global financial and policy shocks via banks' foreign debt (however, results do not change when we add back the two large foreign banks). As an additional exercise, we also analyze firm substitution between the different sources of credit (including foreign, investment banks, and all remaining financial institutions).Our main dependent variable is the growth rate of firm-bank credit exposures (in log terms) winsorized at 1% and 99% percentiles.

We quantify our main bank treatment variable using data on bank's foreign debt. The original data on banks' foreign debt is extracted from the BCB register of foreign claims ("Registro de Operaçôes Financeiras (ROF)") and it comprises contract-level data on bonds and loans issued by institutions domiciled in Brazil with the corresponding claims extended by identified foreign investors. We further recast the foreign debt variable in terms of BRL using end-of-quarter exchange rates.[9] Finally, we calculate our main bank treatment variable as the ratio of all these foreign claims to total liabilities at each end of quarter.

This foreign debt variable captures the exposure of each bank in our sample to time-varying FX (or global financial) risks. Part of these FX risks (stemming from bank's foreign debt) may be offset using security holdings or credit claims denominated or indexed in the corresponding foreign currency, i.e. using on-balance sheet hedging. However, we find that Brazilian commercial banks have neglectable FX exposures on their asset side. As a consequence, most FX risks are indeed hedged using off-balance sheet instruments, obtained in the derivatives' markets (either the stock exchange, BMF Bovespa, or the main organized OTC market, CETIP). Hence, the bank level foreign debt is a good proxy of hedging demand.

[9] more than 93% of banks' foreign debt is nominated in USD.

We augment our database using the following bank observables: bank size (log of bank assets), capital (bank capital to its total assets), NPL (share of non-performing loans in the total credit portfolio of a bank) and the state ownership indicator. Furthermore, at the firm-bank level, we control for (log of) beginning-of-period credit exposure, the share of unused (undrawn) credit line to total exposure, and a default indicator to capture bank-firm specific determinants of the credit outcomes. We also include a control for the percentage of loans given to exporter/importer firms (out of total loans). Variations in the FX rate can in fact change the net worth of these loans and impact, via this channel, the credit supply. This net exposure to the trade sector is a time-varying bank variable calculated as the share of credit to net exporters minus the share of credit to net importers.[10] Finally, we can also account for the net FX unhedged exposure (including all on and off balance sheet FX exposures normalized by bank's equity. Banks unhedged FX positions are subjected to capital requirements under the market risk Basel framework.

To capture some compositional effects of foreign debt, we additionally condition the estimates on the bank-level share of external debt structured as loans versus bonds (Foreign Debt Structure) also extracted from the foreign claims' registry. We explicitly account for the maturity structure of the foreign bank debt by conditioning on the share of foreign debt with remaining maturity of less than one year (the Short foreign debt variable). Immediate refinancing needs may act as an a relevant driver of bank credit supply. The inclusion of this variable in the control list rules out concerns about the correlation of debt maturity with the level of foreign debt.

Tables 1 reports the summary statistics for the Tapering shock. We have 46 banks with non-zero credit claims on firms right before the tapering shock. The average corporate loan is extended by a bank with 5% of foreign debt in its total liabilities. At the end of April 2013, 23% of this foreign debt is short-term and 56% are loans (rather than bonds issued by the bank).

Finally, with augment the data with information on firms' employment status. The latter is derived from the registry of the Brazilian Ministry of Labor and Employment. The original data

[10]Firm's net exports/imports are calculated for each quarter in the sample as the difference between the total exports and the total imports in the preceding twelve months. Data on exports and imports come from "Sistema Cambio", a special register for FX spot transactions. The trade sector (as all firms) fulfills "Sistema Cambio" to request FX transactions against the BCB or any FX dealer.

file collects information on each job spell defined by the work start and end dates matched by employer-employee tax numbers. We then calculate the stock of the active firm-level formal labor force as of the end of each quarter between April 2013 and April 2014 and other control variables. We use (the log of) the number of employees and their average log tenure as of the end of April 2013 as controls. Moreover, we use the firm-employment growth rate as a dependent variable to trace the real effects of shrinking credit supply after the Tapering. The latter is defined as the change of the number of employees over the average number of firm workers during the each quarter (Table 1).

[Table 1 about here.]

Moving from the cross-sectional analysis to the full panel data allows explicitly estimation of credit supply dependence on GFC shocks. The main treatment macro-regressors are the changes in the currency index of emerging market economies (EMEs) or their implied volatility. We construct these EME FX indexes as the average of 20 local currency indices.[11] To focus on the global financial shocks and mitigate concerns about endogeneity between Brazilian spot FX rates and the FX interventions, we do not include the Brazilian Real in the calculation of the EMEs index. We calculate the quarterly index changes as the difference in the average logs of its daily values (with positive differences indicating a strengthening of US Dollar). The changes in the EME FX implied volatility is constructed similarly.

As the recent literature documented a noticeable dependence of the local credit supply on the global financial cycle, in particular, money rates in the US, we also consider the changes in the Wu-Xia Short Shadow (Federal Funds) Rate (Wu and Xia (2016)).

Finally, to measure the level of interventions of the BCB in the derivatives' markets, we use a dummy variable equal to one for the quarters following the policy announcement (2013Q3 onwards). As an alternative proxy, we use the ratio of the gross swaps position of the BCB relative to its international reserves. Even though the intervention contracts are settled in local currency, the BCB international reserves are an important indicator of potential convertibility

[11] Bulgarian Lev, Chilean Peso, Colombian Peso, Czech Koruna, Hungarian Forint, Indian Rupee, Indonesian Rupiah, Malaysian Ringgit, Mexican Peso, Peruvian Sol, Philippines Peso, Polish Zloty, Romanian Leu, Russian Ruble, S. African Rand, Singapore Dollar, South Korean Won, Taiwan Dollar, Thai Baht, and Turkish Lira. Data extracted from Bloomberg.

risks. It is worth noticing that prior to 2013, the BCB has also issued "reverse swaps" taking the opposite position than the one explored after the Tapering shock (i.e. dawning dollar liquidity from the derivatives' markets). The period where BCB used this instrument can be identified by the negative figures of the variable FX intv (cont) (See Table 2 and Figure 1). Table 2 presents summary statistics of the panel data.

[Table 2 about here.]

4 Results

4.1 The QE Tapering Shock and the FX Intervention Shock

Table 3 reports the baseline estimates of the credit supply dependence on foreign debt around the QE Tapering shock (May 22, 2013). We use one quarter after the shock, i.e. the dependent variable is the credit growth at the bank-firm level between April and July of 2013. To allow for rather conservative inference, we calculate the standard errors under the two-way bank and industry clustering with the latter defined by the first three digits of firm's CNAE attribute.[12] Cross-section specification in first differences eliminates any time-invariant level component of firm credit demand as well as the macroeconomic effects common to all firms and banks. Because we can introduce firm fixed effects, credit demand shifts are absorbed and the coefficients can be directly attributed to banks' supply decisions.

[Table 3 about here.]

All estimates in Table 3 indicate that the dependence on foreign debt has a negative effect on credit supply in the aftermath of the tapering talk. The coefficient of the foreign debt is negative and statistically different from zero at the conventional levels. The estimated economic effect of one standard deviation differential in foreign debt is around -2% of quarterly credit growth. This estimate is robust to the inclusion of firm fixed effects (column 2) which absorb approximately 60% of the variation of the dependent variable. We find similar estimates when accounting for observable determinants of credit market outcomes (columns 3 and 4).

[12]The CNAE is the classification officially used by the Brazilian Statistics National System to classify industrial sectors.It closely resembles NAICS

Firms with larger unused credit lines demonstrate higher credit growth rates, while firms that were in default or more indebted ex-ante demonstrated lower credit growth. Banks with foreign debt structured mostly under loan agreements (rather than bonds) have a lower contraction of their credit supply. Shorter maturities of foreign debt, on the contrary, affect bank credit supply negatively, suggesting that higher refinancing needs in USD may force the bank to shrink its loan portfolio in BRL.

The variables Exposure to trade and Net FX exposure have the expected positive signs. Depreciation of the local currency, at least in the short-term, improves trade conditions of exporters and, hence, increase the net worth of banks that fund their operations. Also, banks that are net exposed to FX, or unhedged, face losses if net short of dollars, and gains if long in dollars. Reevaluation of their FX assets and liabilities directly materialize in credit supply. The median bank in our sample is modestly short in USD in April (Table 1).

While the baseline results suggest that the banks' *ex-ante* dependence on foreign debt had a negative effect on the credit supply, a firm could offset part of this shock by substituting the more affected banks with another (less or unaffected) lender. To check whether indeed it was the case, we run firm-level regressions with the growth rate of firm total credit as a dependent variable. The corresponding estimates are reported in Table 4, where the left panel presents estimates for the total credit growth of banks included in the sample, while the right one reports the analogous set of regressions with credit from all financial intermediaries — local or foreign, commercial or investment — and non-bank financial institutions as the dependent variable. All bank and loan-level explanatory variables are calculated as weighted averages of the *ex-ante* bank-firm credit exposure. As long as the supply shock is not highly correlated with credit demand, the coefficient on the foreign debt not only represent firm-level effects, but can be used to characterize certain degree of credit substitution.

[Table 4 about here.]

The estimates suggest that the credit supply shift was only partially offset by firms. Hence, the estimated coefficient is negative and statistically significant at 1% level (we calculate the standard errors under two-way clustering allowing for potentially non-zero error correlation if the firms belong to the same industry or have the same main creditor). A one standard deviation

change in (weighted) bank reliance on foreign debt corresponds to 1 to 1.5% lower quarterly growth rates of credit and resorting to unaffected or less affected banks do not insulate firms from the shock. This result is robust to control for unobserved heterogeneity at the industry*state level, as well as for ex-ante firm and creditors characteristics. The estimates reported in the right panel are only marginally smaller. This observation also suggests that neither foreign banks nor non-bank lenders were of a great help in offsetting the credit supply decrease of the domestic banks.

To estimate the effect of the BCB FX intervention program, we first add to the regressions the following quarter of credit growth dynamics. Namely, we expand the dataset in such a way that each bank-firm pair contains two observations corresponding to (1) the first three months after the Tapering shock (April 2013–July 2013) and (2) to the next quarter of the BCB interventions (July 2013–October 2013). To trace the policy effect, we augment the explanatory variables with a dummy variable indicating the period after policy announcement (the second quarter) and with an interaction of this indicator with bank foreign debt.[13] The "post-policy" dummy, if identified, demonstrates the difference in the aggregate growth rates of credit between the two periods. The interaction shows whether the loan growth dynamics of the exposed banks changed significantly after the BCB policy was announced. To better address potential demand shifts, we include firm-time fixed effects. We fix all other explanatory explanatory variables at their *ex-ante* levels.

Table 5 reports the corresponding estimates (left panel). According to these results, the FX interventions had a positive effect on the credit supply. Before the policy announcement, banks with high levels of foreign debt demonstrate lower credit growth rates in comparison to the less or non-exposed banks. In the first quarter following the policy announcement, this difference is partially mitigated, i.e. more exposed banks increase credit supply. In particular, in the first post-policy quarter, the credit supply sensitivity to foreign debt is estimated to be half as the one of the post-tapering quarter. In other words, the BCB policy reduced the credit growth differential across differently exposed banks, although, it was not able to completely offset the original shock. These results are robust to inclusion of additional interactions of all control

[13]The coefficients of the variable *Foreign Debt* are exactly the same as in Table 3 since they represent the impact of having a larger foreign debt exposure when the dummy variable Post is equal to 0 (that is, around the QE Tapering shock)

variables, in particular, Net FX exposure, with the post-policy dummy.

[Table 5 about here.]

The right panel of Table 5 reports the results of a similar exercise but with three-quarters of credit growth observations encoded in the "post-policy" period. Quantitatively and statistically, the estimates are akin to the ones discussed above. The results suggest that the BCB interventions is as effective at the beginning of the policy implementation as it is in the following quarters.

Table 6 presents firm level evidence on total credit in the context of policy evaluation. We concentrate on the same two periods: the first quarter after the Tapering announcement and the subsequent three-months post the FX intervention program. The estimates of the credit supply elasticity to foreign debt during the period immediately after the US monetary tightening shock are close to the ones obtained in Table 4. Also at the firm level, we find a positive effect of the FX interventions, suggesting that the policy is binding for firms.

[Table 6 about here.]

To quantify the transmission of these two shocks to the labor market, we run a set of similar firm-level cross-section regressions but instead of having total credit growth as a dependent variable, we analyze the employment growth rates. Did firms which observe a lower credit growth due to their *ex-ante* exposure to banks with larger foreign debt also experience lower labor force growth? The results are reported in Table 7.

[Table 7 about here.]

Table 7 results suggest that firms transmitted part of the credit supply shift to the labor market. Within the same industry and state, firms that are mostly funded by the banks more exposed to the Tapering shock demonstrated lower labor force growth. In the quarters following the BCB policy announcement, there is a reversal of this dynamics: the more exposed firms relatively increase their employment growth rates. The economic and statistical significance of this effect becomes strong if we average the three quarters following the policy announcement (right panel).

4.2 Full Panel Data Analysis

In the previous section, we report a diff-in-diff analysis around the two subsequent shocks of May and August 2013. In this section, we present a full panel between 2008 and 2015 and we ask whether, outside those two specific episodes, it is true that on average banks with larger foreign debt change their credit supply in reaction to global shocks (transmitted through the FX markets) and if FX interventions can attenuate these effects.

Namely, we run a series of panel regressions with quarterly data where the dependent variable is the growth of credit (at the firm-bank level) and the key independent regressor is the interaction between the lagged bank foreign debt and the lagged changes in the currency index of emerging market economies (EMEs) or their implied volatility.

To attribute our results to the global financial cycle shocks, we introduce additional interactions between the bank foreign debt and several other macroeconomic variables. Recent literature documents a noticeable dependence between credit supply and the GFC and, in particular, to FED funds rates and the FED balance sheet expansion in the US (e.g. Morais, Peydró, and Ruiz Ortega (2015). We interact Wu-Xia Short Shadow Federal Funds rate (SSR) with banks' foreign debt to identify this latter effect. Since the correlation between quarterly changes in US monetary policy and broad FX conditions in EMEs is not very high, we are able to estimate the effects of the two altogether. As before, we use two-way bank and industry-time clustering to make inferences robust to any non-zero correlation of the observations (contemporaneous or in time) that have a common bank.

Since EME's currency devaluation can have a significant effect on firm's credit demand, we use firm-time fixed effects in an attempt to identify credit supply movements. Analogously to the diff-in-diff analysis, we include the same list of additional time-varying lagged bank and firm-bank controls to account for other drivers of credit supply and to capture potential confounding factors, as well as to boost the efficiency of the fixed effect estimator.

Table 8 reports the baseline results for the panel data specifications. Column 1 indicates that the EME's FX rate was an important stand-alone factor of the credit supply of the Brazilian banks that rely on foreign debt. Column 2 shows that this result was robust to the inclusion of the US SSR interacted with the banks' foreign debt. As expected, tighter monetary policy in the

US has a negative effect on the Brazilian banks with higher dependence on international capital markets. For a bank with the average level of foreign debt, a 25bp increase in the US SSR is equivalent to a -1% annual growth rate of credit supply.

[Table 8 about here.]

The baseline results demonstrate that global financial shocks are relevant determinants of the local credit supply. The strengthening of the US dollar against the EMEs' currencies had economically and statistically important negative effects on the credit supply of these economies. A positive shock in the FX index of one standard deviation accounts for a shift in the subsequent local credit growth rates of approx. -2% per year for a domestic bank with the average level of foreign debt. The effect is almost twice as high when estimated conditionally on other macroeconomic variables interacted with bank foreign debt dependence (column 3).

In columns 4–6, we report similar specifications with foreign debt interacted with the implied volatility of EMEs currencies. Rising uncertainty frequently accompanies local currency devaluations (quarterly changes in the level of FX and in the volatility of FX have a 0.8 correlation) and may clearly affect investors hedging costs. We find that, following positive shocks to the FX volatility, the growth rates of credit provided by the banks with higher foreign debt are lower than those of the non-exposed banks. After a one standard deviation shock to the FX volatility index, a bank with a 5% higher foreign debt contracts credit by an additional 2.3% relatively to the same firm-time. The economic effect is twice as high in the specification controlling for other local and global macroeconomic conditions (column 5).

We implement a set of robustness checks and report the results in Tables 9 and 10. Brazil is an important exporter of soybeans, iron ore, petroleum, meat and sugar, and as such, it is subject to worldwide commodity price shocks. Changes in commodity rice may also trigger FX rate adjustments that are frequently accompanied by an increased level of uncertainty. If we run the baseline regression with the commodity price index instead of the FX index we find similar results. We report the corresponding estimates in column 1. As commodity price changes and FX shocks are strongly negatively correlated, the estimated parameters have the opposite sign. The economic and statistical relevance of the effect is similar to the previous estimates. To make sure that all our results do not stem from the two large episodes of depreciation and

appreciation of the previous analysis (QE Tapering and FX Intervention), we rerun the baseline regression omitting the second and the third quarters of 2013. We also introduce policy uncertainty measure (Baker, Bloom, and Davis (2016)) as an additional interaction with bank foreign debt variable. Finally, we include additional interactions of FX shocks with the foreign debt variable (i.e. bank size, state ownership indicator, as well as exposure to trade and net FX positions). None of these estimates change the baseline results significantly.

[Table 9 about here.]

[Table 10 about here.]

In another robustness check, we introduce Brazil external debt as an additional indicator of macroeconomic conditions (Table 11). That is, we interact foreign debt with changes in (log of) external debt of Brazil or its banking sector. The effects of FX rate and volatility are robust to the inclusion of these additional interactions. This reinforces our cost-of-hedging channel since we show that our results are not driven just by changes in capital flows. Furthermore, Table 12 reports the estimates conditioned on macroprudential policies (for instance, policies on reserve requirements, Loan-To-Value etc); the latter is measured as the change in the macroprudential policy index constructed using Pereira da Silva and Harris (2012) extensive report on those. The effects of FX shocks preserve their magnitude and statistical significance when controlling for these additional interactions.

[Table 11 about here.]

[Table 12 about here.]

In the last part of our analysis, we explore the effects of BCB interventions in the panel setup. Before and after the FX intervention announcement (from 2008 to the first half of 2013 and from the second half of 2013 to 2015) there are large variations in both the level of FX rate and its volatility. Thus, we can investigate whether the changes in the FX market conditions matter less in the second part of the sample after the BCB intervenes as a hedger-of-last-resort. To do this, we further interact the variables of interest with a dummy variable equal to one for the periods after the policy announcement (2013Q3 and afterwards). The estimates reported in

Table 13 show that the coefficient on the triple interaction of bank foreign debt, FX rate, and FX interventions is positive and statistically significant. The result indicates that the BCB did offset the otherwise-negative effect of FX shocks on the exposed banks.

[Table 13 about here.]

Finally, we use a continuous variable of FX interventions as an alternative measure of BCB policy intensity. The latter is built as the ratio of the Bank swap notional amounts relative to its international reserves and it ranges up to 30% by the end of our sample. In 2011 and 2012, the BCB used the "reverse swap" instrument to mitigate the excess appreciation of BRL, although at a much smaller scale in comparison to the intervention in 2013. Hence, the policy variable defined in this way have also negative values. A higher and positive level of the BCB interventions indicates its increasing role as a hedger of last resort. These results go well in line with our previous conclusions, i.e. an increase in the policy intensity by one standard deviation decreases the sensitivity of the exposed banks to the global shocks by half (Table 14).

[Table 14 about here.]

After the FX intervention of the BCB, global financial shocks are less relevant to more exposed banks. In other words, the hedger-of-last-resort policy has been effective in decreasing local economy exposure to global financial conditions.

5 Conclusions

In this paper, we show that global financial conditions are transmitted to EMEs' firms via the foreign debt of domestic banks, but central banks' interventions in FX can alleviate this channel. Central banks may intervene either in the spot markets (sterilized interventions) or in the derivatives' markets. We focus in this latter case in Brazil, where a massive intervention program with daily auctions is implemented in August, 2013. This hedger of last resort type of intervention allows local commercial banks (in demand for hedging) to adjust to the new macroeconomic conditions less costly by transferring part of these FX risks to the balance sheet of the local central bank.

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Figure 1: Macroeconomic conditions in Brazil around the Tapering speech.

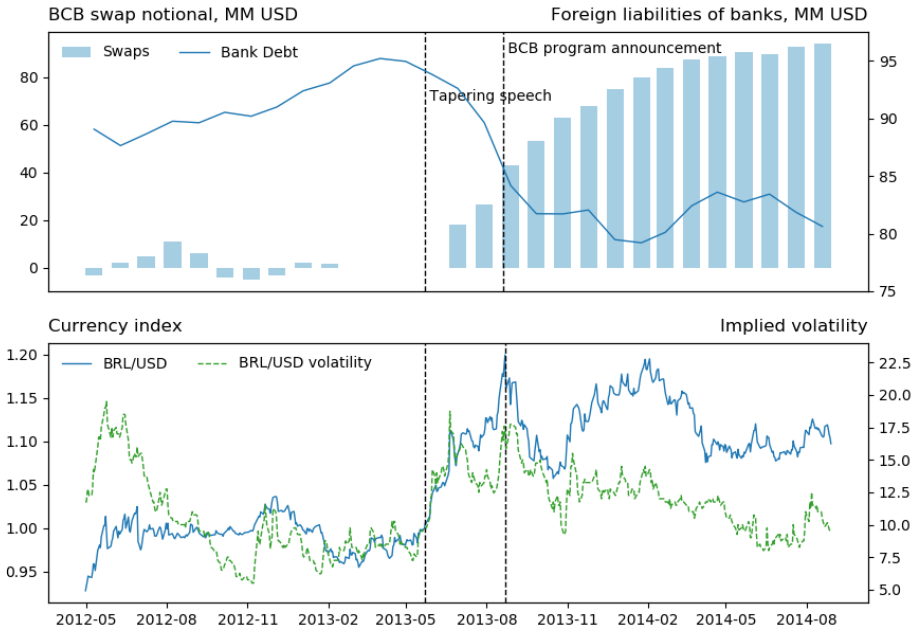
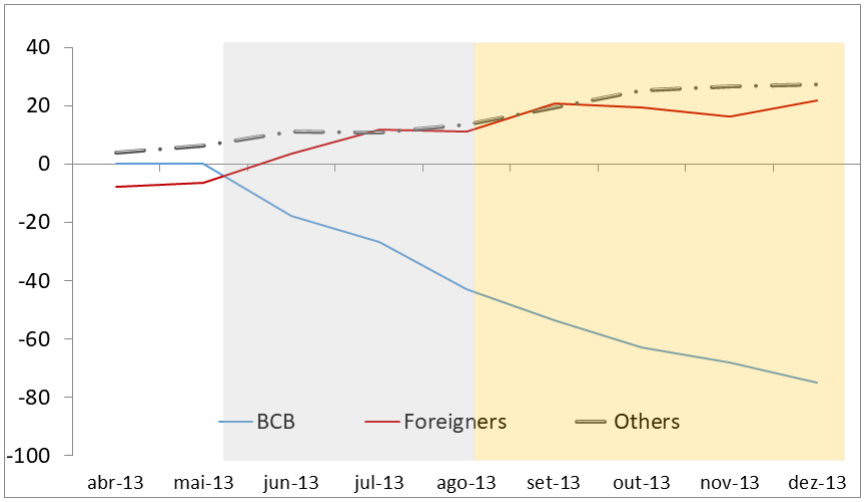
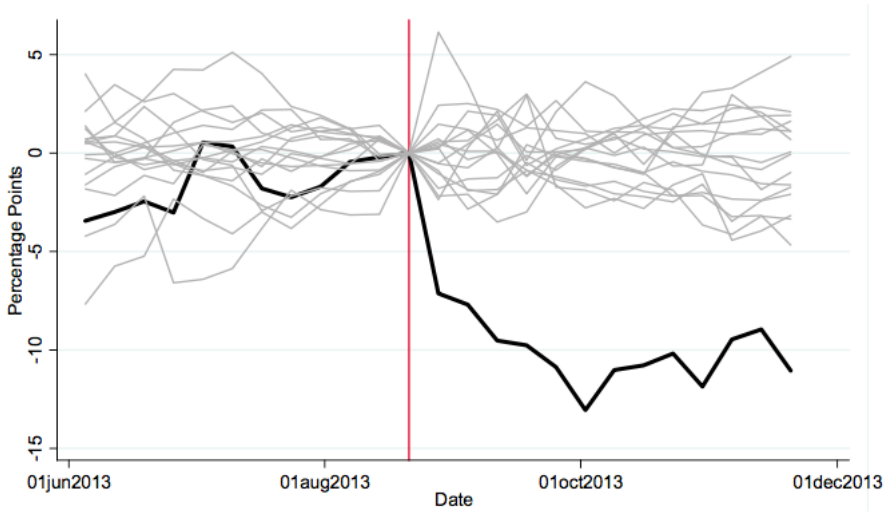


Figure 2: FX derivatives players and their net positions.



Source: BMF Bovespa and CETIP. Gray area represents the time window between the tapering speech prior to the swaps program. The yellow are represents the first phase of the program. The values are in billions of BRL.

Figure 3: Effects of the the Aug, 22 intervention in BRL/USD exchange rate



Source:Chamon, Garcia, and Souza (2017)

Figure 4: Maturity composition of foreign debt and FX derivatives.

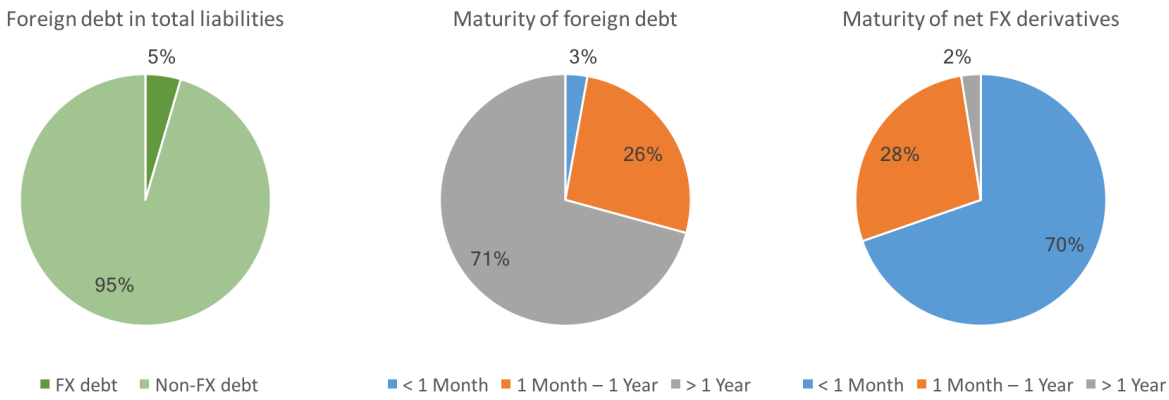


Table 1: Summary statistics, firm-bank level, QE tapering

	# obs.	Mean	SD	10%	25%	50%	75%	90%
			Firm-bank level					
Δ Credit:								
Apr'13–Jul'13	126130	−0.00	0.36	−0.26	−0.12	−0.05	0.03	0.34
Aug'13–Oct'13	116188	−0.02	0.33	−0.26	−0.13	−0.05	0.02	0.27
Nov'13–Jan'14	107929	−0.02	0.32	−0.27	−0.13	−0.05	0.02	0.27
Feb'14–Apr'14	101673	−0.04	0.30	−0.28	−0.13	−0.06	0.01	0.21
			Firm level					
Δ Total credit:								
Apr'13–Jul'13	51453	0.02	0.23	−0.17	−0.09	−0.03	0.08	0.30
Aug'13–Oct'13	51263	−0.04	0.28	−0.24	−0.11	−0.04	0.05	0.23
Nov'13–Jan'14	50889	−0.03	0.28	−0.24	−0.11	−0.04	0.06	0.25
Feb'14–Apr'14	50368	−0.05	0.28	−0.25	−0.12	−0.05	0.03	0.20
Δ Total credit (+ all other lenders):								
Apr'13–Jul'13	51453	0.02	0.25	−0.18	−0.09	−0.02	0.10	0.32
Aug'13–Oct'13	51263	−0.02	0.27	−0.22	−0.11	−0.03	0.07	0.26
Nov'13–Jan'14	50889	−0.01	0.27	−0.23	−0.10	−0.03	0.07	0.27
Feb'14–Apr'14	50368	−0.03	0.27	−0.23	−0.11	−0.04	0.04	0.22
Δ Employment:								
Apr'13–Jul'13	51453	0.01	0.23	−0.20	−0.05	0.00	0.06	0.22
Aug'13–Oct'13	51263	0.01	0.22	−0.18	−0.04	0.00	0.06	0.21
Nov'13–Jan'14	50889	0.02	0.20	−0.13	0.00	0.00	0.07	0.20
Feb'14–Apr'14	50368	0.08	0.15	0.00	0.00	0.02	0.13	0.24
Foreign debt	51453	0.05	0.02	0.02	0.03	0.05	0.06	0.07
Unused credit line	51453	0.20	0.21	0.00	0.04	0.13	0.30	0.49
Credit level	51453	5.90	1.36	4.28	4.98	5.80	6.65	7.60
Default	51453	0.03	0.15	0.00	0.00	0.00	0.00	0.00
Capital	51453	0.09	0.02	0.06	0.07	0.09	0.10	0.11
Size	51453	6.35	0.71	5.62	6.45	6.59	6.69	6.73
NPL	51453	0.06	0.02	0.03	0.04	0.06	0.07	0.08
Foreign debt in loans	51453	0.56	0.31	0.09	0.31	0.60	0.83	0.98
Foreign debt < 1y	51453	0.23	0.10	0.08	0.17	0.25	0.29	0.34
State owned	51453	0.54	0.36	0.00	0.19	0.60	0.88	1.00
Exposure to trade	51453	−0.02	0.03	−0.05	−0.04	−0.03	0.01	0.04
Net FX exposure	51453	−0.12	0.05	−0.18	−0.16	−0.13	−0.08	−0.04
Av. tenure	51453	2.79	0.77	1.85	2.31	2.80	3.28	3.74
Employment	51453	2.40	1.43	0.69	1.39	2.20	3.18	4.25
Public company	51453	0.01	0.11	0.00	0.00	0.00	0.00	0.00

Table 2: Summary statistics, firm-bank panel, full sample

	Mean	SD	10%	25%	50%	75%	90%
Δ Credit	−0.01	0.38	−0.31	−0.14	−0.04	0.04	0.36
Foreign debt	0.04	0.03	0.00	0.02	0.04	0.05	0.08
Bank and bank-firm controls							
Capital	0.09	0.03	0.04	0.07	0.09	0.11	0.12
Size	5.91	1.28	4.14	5.81	6.36	6.62	6.81
NPL	0.06	0.03	0.03	0.04	0.07	0.08	0.09
Foreign debt in loans	0.52	0.45	0.00	0.02	0.65	1.00	1.00
State owned	0.44	0.50	0.00	0.00	0.00	1.00	1.00
Exposure to trade	0.01	0.06	−0.07	−0.02	0.00	0.04	0.08
Net FX exposure	−0.01	0.02	−0.04	−0.03	−0.01	−0.00	0.00
Unused credit line	0.18	0.28	0.00	0.00	0.01	0.24	0.62
Credit level	4.65	1.53	2.74	3.56	4.58	5.60	6.58
Default	0.04	0.20	0.00	0.00	0.00	0.00	0.00
GFC and macroeconomic shocks							
Δ EME FX index	0.01	0.04	−0.04	−0.02	0.00	0.03	0.06
Δ EME FX volatility	0.01	0.18	−0.21	−0.10	−0.03	0.12	0.19
Δ US shadow rate	−0.21	0.41	−0.58	−0.41	−0.14	−0.01	0.18
Δ BR money rate	0.05	0.88	−1.14	−0.35	0.06	0.78	0.97
Δ Inflation	0.12	0.53	−0.67	−0.22	0.14	0.41	0.68
Δ IBC BR	0.00	0.02	−0.01	−0.00	0.01	0.01	0.03
Δ VIX	−0.01	0.25	−0.25	−0.21	−0.03	0.09	0.19
Δ Policy uncertainty	0.03	0.42	−0.55	−0.25	−0.06	0.40	0.49
Δ Commodity price	0.00	0.07	−0.06	−0.03	0.00	0.06	0.10
Δ External debt	0.03	0.04	−0.02	0.01	0.04	0.06	0.08
Δ External debt of banks	0.02	0.08	−0.06	−0.02	0.02	0.07	0.15
Δ Macrotool	0.13	3.24	−2.00	−1.00	0.00	1.00	3.00
BCB FX intv (cont)	0.05	0.12	−0.11	−0.01	0.00	0.06	0.26
BCB FX intv (0/1)	0.25	0.43	0.00	0.00	0.00	0.00	1.00

Number of observations is 4 365 695.

Table 3: QE tapering: credit supply, firm-bank level

	Δ Credit			
	(1)	(2)	(3)	(4)
Foreign debt	-1.02^{***}	-0.88^{***}	-0.79^{***}	-0.66^{***}
	(0.29)	(0.21)	(0.17)	(0.12)
Unused credit line			0.13^{***}	0.13^{***}
			(0.02)	(0.02)
Credit level			-0.03^{***}	-0.03^{***}
			(0.01)	(0.01)
Default			-0.04^{***}	-0.04^{***}
			(0.01)	(0.01)
Capital			0.22^{*}	0.41^{**}
			(0.12)	(0.15)
Size			0.02^{***}	0.03^{***}
			(0.00)	(0.00)
NPL			0.03	-0.12
			(0.13)	(0.10)
Foreign debt in loans			0.07^{***}	0.06^{***}
			(0.01)	(0.01)
Foreign debt < 1y			-0.17^{***}	-0.13^{***}
			(0.03)	(0.03)
State owned			0.03^{***}	0.03^{**}
			(0.01)	(0.01)
Exposure to trade				0.14^{**}
				(0.06)
Net FX exposure				0.19^{***}
				(0.04)
Firm FE	*n*	*y*	*y*	*y*
R^2	0.01	0.42	0.43	0.43
# observations	126130	126130	126130	126130
# firms	51453	51453	51453	51453
# banks	46	46	46	46
# industries	202	202	202	202

The table reports estimates of versions of the equation

$$\Delta\text{Credit}_{f,b} = \beta_1 \text{Foreign Debt}_b + \gamma X_{f,b} + \theta_f + e_{f,b},$$

where $\Delta\text{Credit}_{f,b}$ is log growth rate of credit provided to firm f by bank b, over one quarter after Tapering Speech (end of April'13–end of July'13), Foreign Debt_b is bank's *ex-ante* share of foreign debt in its total liabilities, θ_f is firm fixed effect, and $X_{f,b}$ is a list of controls; all explanatory variables are measured as of the end of April'13. Constant in column 1 is omitted. Standard errors (in parenthesis) are calculated under two-way clustering by bank and 3-digit CNAE industry.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4: QE tapering: total credit, firm level

	Δ Total credit			Δ Total credit (+ all other lenders)		
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign debt	-0.99^{***}	-0.94^{***}	-0.80^{***}	-0.79^{***}	-0.73^{***}	-0.60^{***}
	(0.08)	(0.09)	(0.09)	(0.05)	(0.06)	(0.11)
Industry-state FE	*n*	*y*	*y*	*n*	*y*	*y*
Controls	*n*	*n*	*y*	*n*	*n*	*y*
R^2	0.01	0.11	0.13	0.00	0.11	0.13
# observations	51453	51453	51453	51453	51453	51453
# (main) banks	44	44	44	44	44	44
# industries	202	202	202	202	202	202

The table reports estimates of versions of the equation

$$\Delta\text{Credit}_f = \beta_1 \text{Foreign Debt}_f + \gamma X_f + \theta_i + e_f,$$

where ΔCredit_f is log growth rate of total credit liabilities of a firm f, over one quarter after Tapering Speech (end of April'13–end of July'13), Foreign Debt_f is a weighted average of firm lenders' *ex-ante* share of foreign debt in their total liabilities, θ_i is industry-state fixed effect, and X_f is a list of controls; all explanatory variables are measured as of the end of April'13; bank-firm level variables are aggregated to the firm level by taking the weighted average of the corresponding values with weights proportional to the bank's share in firm total *ex-ante* credit liabilities. Controls include the same variables as in column (4) of Table 4, as well as, log of Number of Employees, log of Average tenure of employees, and Public company dummy (not reported). The left panel uses growth of credit of all local commercial banks as the dependent variable; the right panel uses growth of credit of all domestic commercial, foreign and investment banks and non-bank institutions. Constant in column 1 is omitted. Standard errors (in parenthesis) are calculated under two-way clustering by main bank and 3-digit CNAE industry.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5: QE tapering vs. FX interventions: credit supply, firm-bank level

	Δ Credit (+1 policy quarter)				Δ Credit (+3 policy quarters)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Foreign debt	-1.02^{***}	-0.88^{***}	-0.74^{***}	-0.66^{***}	-1.02^{***}	-0.88^{***}	-0.86^{***}	-0.66^{***}
	(0.29)	(0.21)	(0.14)	(0.12)	(0.29)	(0.21)	(0.13)	(0.12)
Foreign debt × FX intv (0/1)	0.49^{*}	0.45^{**}	0.45^{**}	0.26^{*}	0.54^{***}	0.51^{***}	0.49^{***}	0.20^{*}
	(0.26)	(0.17)	(0.17)	(0.13)	(0.19)	(0.13)	(0.13)	(0.12)
Net FX exposure			0.10^{**}	0.19^{***}			0.07	0.19^{***}
			(0.05)	(0.04)			(0.04)	(0.04)
Net FX exposure × FX intv (0/1)				-0.19^{***}				-0.16^{***}
				(0.06)				(0.05)
FX intv (0/1)	-0.02^{***}				-0.03^{***}			
	(0.01)				(0.00)			
Firm-time FE	*n*	*y*	*y*	*y*	*n*	*y*	*y*	*y*
Controls	*n*	*n*	*y*	*y*	*n*	*n*	*y*	*y*
Controls × FX intv (0/1)	*n*	*n*	*n*	*y*	*n*	*n*	*n*	*y*
R^2	0.01	0.42	0.43	0.43	0.00	0.42	0.44	0.44
# observations	242318	242318	242318	242318	451920	451920	451920	451920
# firms	51453	51453	51453	51453	51453	51453	51453	51453
# banks	46	46	46	46	46	46	46	46
# industries	202	202	202	202	202	202	202	202

The table reports estimates of versions of the equation

$$\Delta\text{Credit}_{f,b,t} = \beta_1 \text{Foreign Debt}_b + \beta_2 \text{Foreign Debt}_b \times \text{FX intv } (0/1)_t + \gamma X_{f,b} + \theta_{f,t} + e_{f,b,t},$$

where $\Delta\text{Credit}_{f,b,t}$ is quarterly log growth rate of credit provided to firm f by bank b, Foreign Debt_b is bank's *ex-ante* share of foreign debt in its total liabilities (demeaned), $\theta_{f,t}$ is firm-quarter fixed effect, and $X_{f,b}$ is a list of controls; all explanatory variables are measured as of the end of April'13. FX intv_t is equal to one for periods t of active BCB FX intervention program, and zero otherwise. Controls include the same variables as in column (4) of Table 4; all continuous explanatory variables are demeaned. The left panel spans the period of end of April'13–end of October'13 (2 quarters with 1 quarter of the post-policy period). The right panel spans the period of end of April'13–end of April'14 (4 quarters with 3 quarters of the post-policy period). Constant in columns 1 and 5 is omitted. Standard errors (in parenthesis) are calculated under two-way clustering by bank and 3-digit CNAE industry.

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

Table 6: QE tapering vs. FX interventions: total credit, firm level

	Δ Total credit				Δ Total credit (+ other lenders)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Foreign debt	-0.99^{***}	-0.94^{***}	-0.68^{***}	-0.80^{***}	-0.79^{***}	-0.73^{***}	-0.51^{***}	-0.60^{***}
	(0.08)	(0.09)	(0.09)	(0.09)	(0.05)	(0.06)	(0.09)	(0.11)
Foreign debt × FX intv (0/1)	0.31^{**}	0.27^{*}	0.27^{*}	0.51^{**}	0.36^{***}	0.30^{***}	0.30^{***}	0.49^{**}
	(0.14)	(0.14)	(0.14)	(0.19)	(0.11)	(0.11)	(0.11)	(0.22)
FX intv (0/1)	-0.06^{***}				-0.04^{***}			
	(0.01)				(0.00)			
Industry-state-time FE	*n*	*y*	*y*	*y*	*n*	*y*	*y*	*y*
Controls	*n*	*n*	*y*	*y*	*n*	*n*	*y*	*y*
Controls × FX intv (0/1)	*n*	*n*	*n*	*y*	*n*	*n*	*n*	*y*
R^2	0.02	0.12	0.15	0.16	0.01	0.11	0.15	0.15
# observations	102716	102716	102716	102716	102716	102716	102716	102716
# firms	51453	51453	51453	51453	51453	51453	51453	51453
# (main) banks	44	44	44	44	44	44	44	44
# industries	202	202	202	202	202	202	202	202

The table reports estimates of versions of the equation

$$\Delta\text{Credit}_{f,t} = \beta_1 \text{Foreign Debt}_f + \beta_2 \text{Foreign Debt}_f \times \text{FX intv } (0/1)_t + \gamma X_f + \theta_{i,t} + e_{f,t},$$

where $\Delta\text{Credit}_{f,t}$ is quarterly log growth rate of total credit liabilities of a firm f, Foreign Debt_f is a weighted average of firm lenders' *ex-ante* share of foreign debt in their total liabilities (demeaned), $\theta_{i,t}$ is industry-state-time fixed effect, and X_f is a list of controls; all explanatory variables are measured as of the end of April'13; bank-firm level variables are aggregated to the firm level by taking the weigted average of the corresponding values with weights proportional to the bank's share in firm total *ex-ante* credit liabilities. Controls include the same variables as in column (4) of Table 4, as well as log of Number of Employees, and log of Average tenure of employees (not reported); all continuous explanatory variables are demeaned. The left panel uses growth of credit of all local commercial banks as the dependent variable; the right panel uses growth of credit of all domestic commercial, foreign and investment banks and non-bank institutioins. The panels span the period of end of April'13–end of October'13 (2 quarters with 1 quarter of the post-policy period). Constant in columns 1 and 5 is omitted. Standard errors (in parenthesis) are calculated under two-way clustering by main bank and 3-digit CNAE industry.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 7: QE tapering vs. FX interventions: total employment, firm level

	Δ Employment (+1 policy quarter)				Δ Employment (+3 policy quarters)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Foreign debt	-0.22^{**}	-0.22^{***}	-0.29^{***}	-0.39^{***}	-0.22^{**}	-0.22^{***}	-0.27^{***}	-0.39^{***}
	(0.09)	(0.07)	(0.10)	(0.09)	(0.09)	(0.07)	(0.08)	(0.09)
Foreign debt × FX intv (0/1)	0.05	0.05	0.05	0.25	0.14^{*}	0.14^{***}	0.14^{***}	0.30^{***}
	(0.08)	(0.07)	(0.07)	(0.22)	(0.07)	(0.05)	(0.05)	(0.09)
FX intv (0/1)	-0.00^{**}				0.03^{***}			
	(0.00)				(0.00)			
Industry-state-time FE	*n*	*y*	*y*	*y*	*n*	*y*	*y*	*y*
Controls	*n*	*n*	*y*	*y*	*n*	*n*	*y*	*y*
Controls × FX intv (0/1)	*n*	*n*	*n*	*y*	*n*	*n*	*n*	*y*
R^2	0.00	0.10	0.12	0.12	0.00	0.12	0.13	0.14
# observations	102716	102716	102716	102716	203973	203973	203973	203973
# firms	51453	51453	51453	51453	51453	51453	51453	51453
# (main) banks	44	44	44	44	44	44	44	44
# industries	202	202	202	202	202	202	202	202

The table reports estimates of versions of the equation

$$\Delta\text{Employment}_{f,t} = \beta_1 \text{Foreign Debt}_f + \beta_2 \text{Foreign Debt}_f \times \text{FX intv } (0/1)_t + \gamma X_f + \theta_{i,s,t} + e_{f,t},$$

where $\Delta\text{Employment}_{f,t}$ is quarterly growth rate of number of fixed contract employees of a firm f, Foreign Debt_f is *ex-ante* share of foreign debt in total liabilities of firm lenders (weighted average with weights proportional to the bank credit provided to a firm), $\theta_{i,s,t}$ is industry-state-time fixed effect, and X_f is a set of controls; all explanatory variables are measured as of the end of April'13. FX intv$(0/1)_t$ is equal to one for periods t of active BCB FX intervention program, and zero otherwise. Controls (not reported) include the same variables as in column (4) of Table 4 (weighted average with weights proportional to the bank credit provided to a firm), as well as log of Number of employees and Average tenure of employees; all explanatory variables are demeaned. The left panel spans the period of end of April'13–end of October'13 (2 quarters with 1 quarter of the post-policy period). The left panel spans the period of end of April'13–end of April'14 (4 quarters with 3 quarters of the post-policy period). Constant in columns 1 and 5 is omitted. Standard errors (in parenthesis) are calculated under two-way clustering by main bank and 3-digit CNAE industry.

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

Table 8: Global financial cycle shocks, full panel

	(1)	(2)	(3)	(4)	(5)	(6)
Foreign debt × Δ EME FX index	−3.58***	−3.65***	−7.86***			
	(1.27)	(1.05)	(2.83)			
Foreign debt × Δ EME FX volatility				−0.38*	−0.75***	−1.73***
				(0.20)	(0.20)	(0.59)
Foreign debt × Δ US shadow rate		−0.28***	−0.11		−0.40***	−0.39***
		(0.07)	(0.10)		(0.09)	(0.09)
Firm-quarter FE	*y*	*y*	*y*	*y*	*y*	*y*
Controls	*y*	*y*	*y*	*y*	*y*	*y*
Macro interactions	*n*	*n*	*y*	*n*	*n*	*y*
R^2	0.43	0.43	0.43	0.43	0.43	0.43
# observations	4365695	4365695	4365695	4365695	4365695	4365695
# firms	153508	153508	153508	153508	153508	153508
# banks	68	68	68	68	68	68
# (2D) industry-quarters	2401	2401	2401	2401	2401	2401

The table reports estimates of versions of the equation

$$\Delta\text{Credit}_{f,b,t} = \beta_1 \text{Foreign Debt}_{b,t-1} + \beta_2 \text{Foreign Debt}_{b,t-1} \times \Delta\text{FX}_{t-1} + \gamma X_{f,b,t-1} + \theta_{f,t} + e_{f,b,t},$$

where $\Delta\text{Credit}_{f,b,t}$ is quarterly log growth rate of credit provided to firm f by bank b, $\text{Foreign Debt}_{b,t}$ is bank's share of foreign debt in its total liabilities, $\theta_{f,t}$ is firm-quarter fixed effect, and $X_{f,b,t}$ is a list of controls. The sample period is 2008Q1–2015Q2. In all columns, the estimates are conditioned on lagged Lender control variables including Bank capital, Bank size, NPL, Foreign debt, Share of loans in foreign debt, Share of short foreign debt, State ownership, Credit line, Credit level, Default indicator, and Exposure to trade; additional macroeconomic variables interacted with Foreign debt in columns 3 and 6 include: (changes in) Brazilian money market rate, Inflation, IBC BR index, and VIX (not reported). Standard errors (in parenthesis) are calculated under two-way clustering by bank and (2-digit CNAE) industry-quarter.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 9: Global financial cycle shocks, full panel, robustness checks (EME FX index)

	Commodity price	Except 2013 Q2-3	Policy uncertainty	Extra interactions
	(1)	(2)	(3)	(4)
Foreign debt × Δ Commodity price	2.18***			
	(0.67)			
Foreign debt × Δ EME FX index		−3.89***	−7.88***	−3.41***
		(1.13)	(2.81)	(1.00)
Foreign debt × Δ Policy uncertainty			−0.08	
			(0.10)	
Δ EME FX index × Size				0.01
				(0.01)
Δ EME FX index × State owned				−0.03
				(0.04)
Δ EME FX index × Exposure to trade				1.16
				(0.77)
Δ EME FX index × Net FX exposure				2.31
				(1.94)
Firm-quarter FE	*y*	*y*	*y*	*y*
Controls	*y*	*y*	*y*	*y*
Macro interactions	*n*	*n*	*y*	*n*
R^2	0.43	0.43	0.43	0.43
# observations	4365695	4051889	4365695	4365695
# firms	153508	152968	153508	153508
# banks	68	68	68	68
# (2D) industry-quarters	2401	2239	2401	2401

The table reports estimates of versions of the equation

$$\Delta\text{Credit}_{f,b,t} = \beta_1 \text{Foreign Debt}_{b,t-1} + \beta_2 \text{Foreign Debt}_{b,t-1} \times \Delta\text{FX}_{t-1} + \gamma X_{f,b,t-1} + \theta_{f,t} + e_{f,b,t},$$

where $\Delta\text{Credit}_{f,b,t}$ is quarterly log growth rate of credit provided to firm f by bank b, $\text{Foreign Debt}_{b,t}$ is bank's share of foreign debt in its total liabilities, $\theta_{f,t}$ is firm-quarter fixed effect, and $X_{f,b,t}$ is a list of controls. The sample period and control variables are as in Table 8. Standard errors (in parenthesis) are calculated under two-way clustering by bank and (2-digit CNAE) industry-quarter.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 10: Global financial cycle shocks, full panel, robustness checks (EME FX volatility)

	Except 2013 Q2-3	Policy uncertainty	Extra interactions
	(1)	(2)	(3)
Foreign debt × Δ EME FX volatility	−0.77***	−1.73***	−0.69***
	(0.21)	(0.59)	(0.21)
Foreign debt × Δ Policy uncertainty		−0.06	
		(0.10)	
Δ EME FX volatility × Size			−0.00
			(0.00)
Δ EME FX volatility × State owned			0.01
			(0.01)
Δ EME FX volatility × Exposure to trade			0.23*
			(0.13)
Δ EME FX volatility × Net FX exposure			0.13
			(0.44)
Firm-quarter FE	*y*	*y*	*y*
Controls	*y*	*y*	*y*
Macro interactions	*n*	*y*	*n*
R^2	0.43	0.43	0.43
# observations	4051889	4365695	4365695
# firms	152968	153508	153508
# banks	68	68	68
# (2D) industry-quarters	2239	2401	2401

The table reports estimates of versions of the equation

$$\Delta\text{Credit}_{f,b,t} = \beta_1 \text{Foreign Debt}_{b,t-1} + \beta_2 \text{Foreign Debt}_{b,t-1} \times \Delta\text{FX}_{t-1} + \gamma X_{f,b,t-1} + \theta_{f,t} + e_{f,b,t},$$

where $\Delta\text{Credit}_{f,b,t}$ is quarterly log growth rate of credit provided to firm f by bank b, $\text{Foreign Debt}_{b,t}$ is bank's share of foreign debt in its total liabilities, $\theta_{f,t}$ is firm-quarter fixed effect, and $X_{f,b,t}$ is a list of controls. The sample period and control variables are as in Table 8. Standard errors (in parenthesis) are calculated under two-way clustering by bank and (2-digit CNAE) industry-quarter.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 11: Global financial cycle shocks, full panel, control for aggregate external debt

	(1)	(2)	(3)	(4)
Foreign debt × Δ EME FX index	-5.54^{**}	-3.58^{***}		
	(2.42)	(1.11)		
Foreign debt × Δ EME FX volatility			-0.93^{**}	-0.66^{***}
			(0.40)	(0.23)
Foreign debt × Δ External debt	−2.90		−1.20	
	(2.66)		(1.96)	
Foreign debt × Δ External debt of banks		0.07		0.46
		(0.55)		(0.59)
Firm-quarter FE	*y*	*y*	*y*	*y*
Controls	*y*	*y*	*y*	*y*
R^2	0.43	0.43	0.43	0.43
# observations	4365695	4365695	4365695	4365695
# firms	153508	153508	153508	153508
# banks	68	68	68	68
# (2D) industry-quarters	2401	2401	2401	2401

The table reports estimates of versions of the equation

$$\Delta\text{Credit}_{f,b,t} = \beta_1 \text{Foreign Debt}_{b,t-1} + \beta_2 \text{Foreign Debt}_{b,t-1} \times \Delta\text{FX}_{t-1} + \gamma X_{f,b,t-1} + \theta_{f,t} + e_{f,b,t},$$

where $\Delta\text{Credit}_{f,b,t}$ is quarterly log growth rate of credit provided to firm f by bank b, $\text{Foreign Debt}_{b,t}$ is bank's share of foreign debt in its total liabilities, $\theta_{f,t}$ is firm-quarter fixed effect, and $X_{f,b,t}$ is a list of controls. The sample period and control variables are as in Table 8. Standard errors (in parenthesis) are calculated under two-way clustering by bank and (2-digit CNAE) industry-quarter.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 12: Global financial cycle shocks, full panel, control for macroprudential policies

	(1)	(2)
Foreign debt $\times$ Δ EME FX index	-2.66^{***}	
	(0.94)	
Foreign debt $\times$ Δ EME FX volatility		-0.54^{***}
		(0.19)
Foreign debt $\times$ Δ Macrotool	0.03^{*}	0.04^{**}
	(0.02)	(0.02)
Firm-quarter FE	y	y
Controls	y	y
R^2	0.43	0.43
# observations	4365695	4365695
# firms	153508	153508
# banks	68	68
# (2D) industry-quarters	2401	2401

The table reports estimates of versions of the equation

$$\Delta\text{Credit}_{f,b,t} = \beta_1 \text{Foreign Debt}_{b,t-1} + \beta_2 \text{Foreign Debt}_{b,t-1} \times \Delta\text{FX}_{t-1} + \gamma X_{f,b,t-1} + \theta_{f,t} + e_{f,b,t},$$

where $\Delta\text{Credit}_{f,b,t}$ is quarterly log growth rate of credit provided to firm f by bank b, Foreign $\text{Debt}_{b,t}$ is bank's share of foreign debt in its total liabilities, $\theta_{f,t}$ is firm-quarter fixed effect, and $X_{f,b,t}$ is a list of controls. The sample period and control variables are as in Table 8. Standard errors (in parenthesis) are calculated under two-way clustering by bank and (2-digit CNAE) industry-quarter.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 13: Global financial cycle shocks and FX Interventions, full panel

	(1)	(2)	(3)	(4)
Foreign debt × Δ EME FX index	−4.57***	−9.17***		
	(1.60)	(3.31)		
Foreign debt × Δ EME FX index × BCB FX intv (0/1)	4.81*	5.01**		
	(2.60)	(2.21)		
Foreign debt × Δ EME FX volatility			−0.93***	−2.14***
			(0.29)	(0.75)
Foreign debt × Δ EME FX volatility × BCB FX intv (0/1)			0.81	1.33**
			(0.53)	(0.58)
Foreign debt × BCB FX intv (0/1)	0.04	0.05	0.06	−0.02
	(0.14)	(0.12)	(0.13)	(0.10)
Firm-quarter FE	*y*	*y*	*y*	*y*
Controls	*y*	*y*	*y*	*y*
Macro interactions	*n*	*y*	*n*	*y*
R^2	0.43	0.43	0.43	0.43
# observations	4365695	4365695	4365695	4365695
# firms	153508	153508	153508	153508
# banks	68	68	68	68
# (2D) industry-quarters	2401	2401	2401	2401

The table reports estimates of versions of the equation

$$\begin{aligned}\Delta\text{Credit}_{f,b,t} = {} & \beta_1 \text{Foreign Debt}_{b,t-1} \\ & + \beta_2 \text{Foreign Debt}_{b,t-1} \times \Delta\text{FX}_{t-1} + \beta_3 \text{Foreign Debt}_{b,t-1} \times \text{FX intv (0/1)}_{t-1} \\ & + \beta_4 \text{Foreign Debt}_{b,t-1} \times \Delta\text{FX}_{t-1} \times \text{FX intv (0/1)}_{t-1} + \gamma X_{f,b,t-1} + \theta_{f,t} + e_{f,b,t}.\end{aligned}$$

where $\Delta\text{Credit}_{f,b,t}$ is quarterly log growth rate of credit provided to firm f by bank b, $\text{Foreign Debt}_{b,t}$ is bank's share of foreign debt in its total liabilities, $\theta_{f,t}$ is firm-quarter fixed effect, and $X_{f,b,t}$ is a list of controls. The sample period is 2008Q1–2015Q2. In all columns, the estimates are conditioned on lagged Lender control variables including Bank capital, Bank size, NPL, Foreign debt, Share of loans in foreign debt, Share of short foreign debt, State ownership, Credit line, Credit level, Default indicator, and Exposure to trade, as well as Foreign debt interacted with Δ US SSR; additional macroeconomic variables interacted with Foreign debt in columns 2 and 4 include: (changes in) Brazilian money market rate, Inflation, IBC BR index, and VIX (not reported). Standard errors (in parenthesis) are calculated under two-way clustering by bank and (2-digit CNAE) industry-quarter.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 14: Global financial cycle shocks and FX Interventions, full panel, continuous measure of interventions

	(1)	(2)	(3)	(4)
Foreign debt × Δ EME FX index	−5.90***	−10.12***		
	(2.05)	(3.52)		
Foreign debt × Δ EME FX index × BCB FX intv (cont)	23.13**	23.96***		
	(11.23)	(8.73)		
Foreign debt × Δ EME FX volatility			−1.33***	−2.43***
			(0.41)	(0.80)
Foreign debt × Δ EME FX volatility × BCB FX intv (cont)			6.45**	8.29***
			(2.55)	(2.48)
Foreign debt × BCB FX intv (cont)	0.55	0.59	0.16	0.10
	(0.53)	(0.48)	(0.45)	(0.42)
Firm-quarter FE	*y*	*y*	*y*	*y*
Controls	*y*	*y*	*y*	*y*
Macro interactions	*n*	*y*	*n*	*y*
R^2	0.43	0.43	0.43	0.43
# observations	4365695	4365695	4365695	4365695
# firms	153508	153508	153508	153508
# banks	68	68	68	68
# (2D) industry-quarters	2401	2401	2401	2401

The table reports estimates of versions of the equation

$$\begin{aligned}\Delta\text{Credit}_{f,b,t} = {} & \beta_1 \text{Foreign Debt}_{b,t-1} \\ & + \beta_2 \text{Foreign Debt}_{b,t-1} \times \Delta\text{FX}_{t-1} + \beta_3 \text{Foreign Debt}_{b,t-1} \times \text{FX intv (cont.)}_{t-1} \\ & + \beta_4 \text{Foreign Debt}_{b,t-1} \times \Delta\text{FX}_{t-1} \times \text{FX intv (cont.)}_{t-1} + \gamma X_{f,b,t-1} + \theta_{f,t} + e_{f,b,t}.\end{aligned}$$

where $\Delta\text{Credit}_{f,b,t}$ is quarterly log growth rate of credit provided to firm f by bank b, $\text{Foreign Debt}_{b,t}$ is bank's share of foreign debt in its total liabilities, $\theta_{f,t}$ is firm-quarter fixed effect, and $X_{f,b,t}$ is a list of controls. The sample period is 2008Q1–2015Q2. In all columns, the estimates are conditioned on lagged Lender control variables including Bank capital, Bank size, NPL, Foreign debt, Share of loans in foreign debt, Share of short foreign debt, State ownership, Credit line, Credit level, Default indicator, and Exposure to trade, as well as Foreign debt interacted with Δ US SSR; additional macroeconomic variables interacted with Foreign debt in columns 2 and 4 include: (changes in) Brazilian money market rate, Inflation, IBC BR index, and VIX (not reported). Standard errors (in parenthesis) are calculated under two-way clustering by bank and (2-digit CNAE) industry-quarter.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.