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Capital Controls, Domestic Macroprudential Policy and the Bank Lending Channel of Monetary Policy

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Abstract

We study how capital controls and domestic macroprudential policy tame credit supply booms, respectively targeting foreign and domestic bank debt. For identification, we exploit the simultaneous introduction of capital controls on foreign exchange (FX) debt inflows and an increase of reserve requirements on domestic bank deposits in Colombia during a strong credit boom, as well as credit registry and bank balance sheet data. Our results suggest that first, an increase in the *local* monetary policy rate, raising the interest rate spread with the United States, allows more FX-indebted banks to carry trade cheap FX funds with more expensive peso lending, especially toward riskier, opaque firms. Capital controls tax FX debt and break the carry trade. Second, the increase in reserve requirements on domestic deposits directly reduces credit supply, and more so for riskier, opaque firms, rather than enhances the transmission of monetary rates on credit supply. Importantly, different banks finance credit in the boom with either domestic *or* foreign (FX) financing. Hence, capital controls and domestic macroprudential policy complementarily mitigate the boom and the associated risk-taking through two distinct channels.

JEL codes: E52; E58; F34; F38; G21; G28.

Keywords: Capital controls; Macroprudential and monetary policy; Carry trade; Credit supply; Risk-taking.

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1. Introduction

Credit booms greatly amplify business cycle fluctuations and are the main predictors of financial crises, especially credit booms that are financed with foreign liquidity (Gourinchas and Obstfeld, 2012; Jordà, Schularick, and Taylor, 2011; Mendoza and Terrones, 2008; Reinhart and Reinhart, 2008; Schularick and Taylor, 2012). Macroprudential policies, including capital controls (CC), try to tame excessive credit booms. Since the Global Financial Crisis (GFC) of 2008-2009, macroprudential policies have become increasingly popular among both academics and policymakers (Freixas, Laeven and Peydró, 2015) and their use has risen constantly (Claessens, 2015; Alam et al., 2019). Moreover, the International Monetary Fund (IMF) has endorsed capital controls as a temporary and last resort tool for managing credit booms led by large capital inflows, especially when room for standard macroeconomic policy is exhausted (Blanchard, 2013; IMF, 2012, 2018; Ostry et al., 2010; Qureshi et al., 2011).

In the same spirit, a class of models rationalizes capital controls as a Pigouvian tax to reduce the negative externalities on systemic risk and aggregate demand associated with excessive foreign debt (Benigno et al., 2016; Bianchi, 2011; Brunnermeier and Sannikov, 2015; Jeanne and Korinek, 2010; Korinek, 2011, 2018; Korinek and Sandri, 2016; Schmitt-Grohé and Uribe, 2016). Other authors support capital controls based on the idea that controls insulate local monetary policy from shocks originated in global financial centers (Rey, 2015; Farhi and Werning, 2012, 2014, and 2016; Davis and Presno, 2017).

We analyze the effects of capital controls and domestic macroprudential policy on credit supply. For identification, we exploit the simultaneous introduction of capital controls on foreign exchange (FX) debt inflows and an increase of reserve requirements on domestic bank deposits in Colombia during a strong credit boom, as well as administrative credit registry and supervisory bank balance sheet data. In brief, we find the following robust results.

First, banks use cheaper FX-funding from abroad to arbitrage contractionary local monetary (interest rate) policy. An increase in the local monetary policy rate raises the interest rate differential with respect to the United States, allowing more FX-indebted banks to carry trade cheap FX-funds with expensive local credit supply. The carry trade is stronger during periods of relatively larger deviations from the Covered Interest Parity (CIP) and amplifies bank risk-taking in lending, as it directs the supply of credit toward ex-ante riskier and relatively opaque local firms. Capital controls, by taxing FX-debt, reduce the interest rate differential and break the carry trade, enhancing the bank-lending channel of local monetary policy rates and reducing bank risk-taking.

Second, the increase in reserve requirements on domestic deposits directly reduces credit supply during the boom, and more so for riskier firms, rather than indirectly enhancing the effects of monetary rates on credit supply. Importantly, banks' reliance on domestic deposits and FX-financing are strongly negatively correlated, suggesting that those banks which restrict credit supply more due to capital controls are less influenced by the domestic reserve requirements, and the other way around. This implies that the two policies affect credit supply independently of each other and that both contribute to slowing down the credit boom.

Our main contribution to the literature is to show that both capital controls and domestic macroprudential policy tame credit supply booms, including credit supply to ex-ante riskier firms, by targeting different but complementary sources of bank debt. Capital controls target bank foreign funding, thereby improving the effectiveness of the bank lending channel of local monetary policy. Domestic macroprudential policy targets bank domestic debt, directly attenuating credit supply booms. As credit booms stem from *both* foreign *and* local liquidity, and we find that banks which finance the credit boom with domestic deposits *rely less* on foreign (FX) debt (and vice versa), our results suggest that a Tinbergen rule with two (macroprudential) instruments is necessary to tackle the two (intermediate) objectives (sources of liquidity). In other terms, the two macroprudential instruments target the two sources of bank debt, foreign and domestic, that drive the credit boom.

The remaining of this Introduction provides a detailed preview of the paper and a discussion of the related literature and its contrast with this paper.

Preview of the paper. We analyze two related research questions. First, we ask whether (and if so, why) capital controls (CC) on FX-financing strengthen the bank-lending channel of monetary policy by increasing the pass-through of variations in the *local* policy rate to domestic credit, and the implications of this for bank risk-taking. Second, we investigate the impact of domestic macroprudential measures on credit supply, in particular reserve requirements (RR) levied on bank local financing through household and firm deposits, as well as whether RR affects the impact of monetary policy rates on credit supply. By doing so, we can analyze whether the two macroprudential measures operate through different channels targeting respectively bank foreign or domestic liabilities, and whether they help mitigate credit supply booms, including the risks stemming from credit expansion during a boom.

Our work is based on two administrative datasets provided by the Colombian Financial Supervisory Authority. First, we have access to the National Credit Registry (CR), which collects detailed quarterly corporate loan information at the loan-level. The CR tracks information on the universe of commercial loans provided to nonfinancial companies. Second, we have access to bank supervisory quarterly balance sheets, which include data on bank size, profitability, capital, nonperforming loans (NPL), and, most importantly for our purposes, the volume of the sources of bank financing taxed through RR and CC (domestic deposits as well as FX funding).

For capital controls, we exploit the Central Bank of Colombia's introduction in May 2007, during a strong credit boom, of a 40 percent *unremunerated* reserve requirement (URR) on FX debt inflows. At the time, local interest rates – as reflected by the overnight interbank rate – were as high as 8.4 percent. Hence, the new regulation resulted in high taxation of FX debt inflows as a large part (40 percent) of the inflows were in the central bank as unremunerated reserves. CCs were borne by the banks to the extent that FX funding was raised to finance peso investments,[1] including lending, and were deposited for six months at the central bank without any remuneration; the deposit could be withdrawn before this deadline, but upon the payment of a heavy fee (decreasing in time and ranging from 9.4 percent of the deposit in the first month to 1.6 percent during the sixth and last month). CCs were lifted by October 2008 amid signs of an economic slowdown related to the unfolding of the GFC after Lehman Brothers' collapse.[2]

Concerning the domestic macroprudential measures, we exploit a contemporaneous policy change to traditional reserve requirements (RR) on peso-denominated deposits. In May 2007, the Central Bank introduced a *marginal* RR on bank deposits, on top of the ordinary reserve requirement, applied to the overall volume of new deposits received after May 7th, 2007. The marginal RR was not remunerated (at a time of high local interest rates) and was initially fixed at

[1] When a bank's FX funding finances FX loans to local firms, the bank's customer pays the CC (in other terms, to avoid double taxation of capital inflows, bank FX funding is exempted). We also analyze FX loans to firms.
[2] Together with CC, the Central Bank fixed a cap on banks' gross FX-position (i.e. the sum of on- and off-balance-sheet FX assets and liabilities), equal to 500% of banks regulatory capital, which further constrained banks' ability to access FX-financing.

27 percent for checking deposits and 12 percent for savings deposits, though it was eventually made uniform at 27 percent for both savings and checking deposits by June 2007.[3]

Both CC and RR are non-random, but rather induced by the credit boom, which affects both the demand and the supply of credit, i.e. both firms' and banks' financing and lending strategies. In this respect, we identify credit supply channels by exploiting variation in loan conditions for the same firm, in a given year:quarter, across banks with different exposure to either CC or RR. Put differently, we exploit ex-ante heterogeneity in bank foreign (FX) funding and local funding (domestic deposits), respectively, as capital structures tend to be sticky over time. Therefore, we run loan-level regressions saturated with firm*year:quarter fixed effects, controlling for all idiosyncratic, observed and unobserved, time-varying unobserved shocks at the firm level (Khwaja and Mian, 2008).[4] Moreover, to understand the interaction of CC and RR with the local monetary policy rate, we further interact banks' exposures with local policy rates (Kashyap and Stein, 2000; Jiménez et al., 2012, 2014), as well as with the spread between the local and the US monetary rates. We also analyze the impact of macroprudential policies on risk-taking in credit supply (Jiménez et al., 2017).

Our main findings are as follows. We first evaluate the pass-through of the *local* policy rate variation on domestic bank credit over the three-year period from 2005Q2 to 2008Q2. The period ends before the Global Financial Crisis (GFC). In loan level regressions exploiting time variation only, we find that before the introduction of the macroprudential measures, an increase in the local policy rate is associated with positive subsequent growth in the volume of bank credit. However, after (compared to before) the implementation of the macroprudential policies, higher monetary policy rates imply lower credit volume.[5]

We next investigate a mechanism for explaining these findings. In principle, both CC and RR might influence the relation between the central bank's monetary policy rate and bank credit. Both

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[3] At the time of the introduction of the *marginal* RR (May 2007), the level of the *ordinary* RR was 12% and 6% for checking and savings deposits, respectively, but it was eventually levelled at 8.3% in June of 2007.

[4] Alternatively, in robustness checks, we control for borrower demand via industry*time fixed effects for the sample of all firms, so to include as well those firms indebted with only one bank, which are excluded from the application of firm*time fixed effects.

[5] Overall, a higher monetary policy rate after the introduction of both macroprudential policies is associated with at most a non-positive reaction of bank credit, consistent with the strong credit boom that Colombia was experiencing.

local and foreign bank financing are in fact more expensive with the measures in place, which might render the influence of the local policy rate on bank credit more negative.

Our results show, however, that bank (foreign) FX-funding, not domestic deposit funding, drives the results. In particular, using the local-*versus*-U.S. policy rate differential, we find that before CC, banks with higher (versus lower) ex-ante FX funding increase their credit supply relatively more when the differential monetary rate goes up.[6] Moreover, after CC, these banks cut credit supply more sharply in reaction to an increase in the monetary interest rate differential. The effects are both statistically and economically significant. Before CC, following a 1 percentage point (p.p.) increase in the monetary policy interest rate spread, banks with a 1 standard deviation (s.d.) higher FX funding increase lending (to the same firm in the same quarter) by 3.8 p.p.. After CC, however, the same variations in the monetary rate spread and FX funding are associated with a relative reduction in credit by 3.5 p.p. These findings are consistent with a carry trade strategy by local banks, which borrow cheaply in FX to lend at higher rates in pesos, and with CC breaking such carry by strongly increasing the cost of bank FX borrowing.[7]

The carry trade affects local companies heterogeneously. We sort firms according to several proxies of *pre-policy* riskiness: the average interest payments on bank loans, the average share of bank loans with short maturity, i.e. below one year, a dummy variable for whether a firm ever defaulted on a bank loan, and a dummy variable describing whether a company's balance sheet is publicly supervised or not, which we interpret as a proxy for firm's opaqueness. Consistently across the different risk measures, we find that the pre-CC expansion in credit supply due to carry trade favors relatively riskier and opaque firms, whose credit also suffers a sharper reduction after the enforcement of CC.

[6] We do not find evidence of a significant interaction of exposure to RR with the local interest rate policy, or the difference between the local and the US monetary rates.

[7] While the main focus of our paper rests on the interaction of CC with local interest rate policy, we also provide evidence that CC halt the dependence of domestic bank credit from global shocks. We show that absent CC, a tightening of global liquidity conditions (as proxied by a jump in the VIX), and/or a fall in global demand (captured by a decline in oil prices), triggering a depreciation of the Colombian currency, pushes more FX-indebted banks to cut credit. The introduction of CC reduce those effects, therefore dampening the implications of global shocks for bank credit. These findings align, among others, to the cross-country aggregate evidence in Zeev (2017), who shows that output is less sensitive to global credit supply shocks in countries with CC in place. For cross-country aggregate evidence against this hypothesis, see Bergant et al. (2020).

To further understand the mechanism behind our results we provide two additional tests. First, we rerun the analysis over a representative subsection of credit registry loans for which we can access the breakdown by currency (peso versus FX). We find that the just-described results are driven by corporate lending in peso. This finding is reassuring for two reasons: i) reinvesting globally borrowed FX funds in local peso loans rather than FX loans grants higher returns, given the positive policy risk-free rate differential; ii) banks would bear the CC tax only if FX funds were reinvested in peso-denominated assets, so that credit supply variations induced by CC must show up among peso loans.[8] As a second test, we substitute the Colombia-U.S. policy rate spread with the deviations from the CIP computed by Du and Schregher (2016) over the three-month sovereign yield spread between Colombia and U.S. rates. Indeed, our results go through, i.e. positive variations in deviations from the CIP are associated with a relative jump (descent) in credit supply by higher FX-indebted banks before (after) the introduction of CC. This finding is important, as banks mostly hedge their FX liabilities and CIP deviations grant carry trade returns on top of the costs associated with hedging.[9]

Our estimates suggest that carry trade lending implies higher bank risk-taking. During the boom, it increases the leverage of risky and opaque companies, which are likely to suffer more during a subsequent bust. At the same time, banks finance this risk-taking through FX non-core liabilities, which tend to be more fragile (Dagher and Kazimov, 2015; Demirgüç-Kunt and Huizinga, 2010; Hahm, Shin and Shin, 2013; IMF, 2019; Ivashina, Scharfstein and Stein, 2015). In this respect, CC reduce banks' risk-taking (on assets and liabilities), on top of enhancing the bank-lending channel by halting one way for arbitraging local monetary rate policy.

After the introduction of RR, banks with higher ex-ante exposure to RR (higher ex-ante reliance on savings deposits and checking deposits) cut credit supply – i.e. reduce lending to the same firm at the same time compared with banks less exposed to RR. Moreover, this reduction in credit supply is robust to controlling for exposure to CC, or to CC and its interaction with the local

[8] Note that if banks borrowed in FX to finance FX loans, the CC would be borne by the ultimate borrower, i.e. a local company. The reduction in FX loans associated with CC would show up as a demand shock, which is controlled for in our empirical setting by firm*year:quarter fixed effects (Khwaja and Mian, 2008).

[9] The effect of CIP deviations also survives if we additionally include the interaction of bank FX funding with the component of the three-month sovereign spread which is not accounted for by CIP-deviations, i.e. the three-month forward premium. Note that in our sample period CIP deviations are relatively small as compared to those observed after the Global Financial Crisis, but nonetheless account for roughly 17 percent of the mean sovereign yield spread between Colombia and the United States.

policy rate, a first suggestion that the two macroprudential channels affect credit supply through two distinct channels. The robust results suggest a large economic impact of RR on bank credit supply. A 1 s.d. overall increase in ex-ante deposits affected by the RR shock (i.e. the sum of checking deposits and saving deposits) implies a 5.4 p.p. reduction in bank credit supply. Moreover, the RR policy change exerts heterogeneous effects across firms, with riskier and more opaque companies significantly more affected.

[Insert Figure 1 here]

A final question is whether CC and RR affect different lenders through distinct channels, and whether both instruments are necessary to tame credit booms and associated risk-taking. The scatterplot in Figure 1, reporting bank reliance on local savings deposits and checking deposits on the x-axis and bank FX funds on the y-axis (both measures are expressed as a share of total assets), indicates that this is the case. Banks more exposed to RR (domestic bank deposits) are *less* exposed to CC (FX bank funding), and over the period of analysis, the two variables are correlated negatively (by a factor of 37%, significant at a 1% level).[10] Hence, CC and RR – i.e. macroprudential measures targeting foreign and domestic bank debt, respectively – affect credit supply through different channels.

Related literature. We contribute to several strands of literature. First, as we show that capital controls, by reducing banks' carry trades, increase the effectiveness of variations of the *local* monetary policy rate on bank credit supply, we contribute to the large literature on the bank lending channel (e.g. Bernanke and Gertler, 1995; Kashyap and Stein, 2000; Jiménez et al., 2012 and 2014; Acharya et al., 2020), including the related literature on international finance and monetary policy (e.g. Bräuning and Ivashina, 2020a, 2020b; Bruno and Shin, 2015a, 2015b; Cetorelli and Goldberg, 2012; Morais et al., 2019; Rey, 2015).

Several studies investigate empirically the extent of monetary policy autonomy depending on the degree of capital account openness, often in a cross-country framework (e.g. Klein and Shambaugh, 2015; Han and Wei, 2018). We contribute to this literature by showing a specific mechanism through which capital inflows reduce the pass-through of *local* interest rate policy to

[10] The two channels operate independently and are both significant in regressions in which both channels are allowed to affect bank credit.

domestic credit, namely carry trade strategies by domestic banks.[11] This finding is consistent with recent theoretical insights from Cavallino and Sandri (2019) that a local monetary contraction – by widening the interest rate differential between a small open economy and the rest of the world – drives carry trade inflows, which can significantly increase credit and risk in the local economy. On the empirical front, Fendoglu, Gulsen and Peydró (2019) document, in accordance with our results, that carry trade inflows on the interbank market impaired the bank lending channel of monetary policy in Turkey. Crucially, we show that capital controls are effective in breaking the carry trade, thereby contributing to increase the pass-through (effectiveness) of domestic monetary policy rates to bank credit supply (postulated by Rey, 2015). Furthermore, we find that CC reduce bank risk-taking in both bank assets and liabilities. The pre-CC bank carry trade, driven by the local interest rate policy, increases credit supply to the ex-ante riskier and more opaque firms, and banks finance this risk-taking with FX fragile funding. This result depicts a previously overlooked but nonetheless important prudential mechanism of CC, especially beneficial in light of the poor performance of carries during major financial downturns, including the GFC (Koijen et al., 2018).

Closer to our paper, Dias et al. (2021) exploit the Colombian CC in 2007 to analyze the relation between capital controls and monetary policy. Similarly to us, they conclude that CC strengthen the transmission of monetary policy rates on lending. However, our focus is different, centered on the influence of *local* (as opposed to *international*) monetary policy. We also analyze a particular mechanism, namely banks' carry trade from cheaper FX funds to the supply of credit in higher-rate peso loans (and even more to riskier and opaque local firms), which we show to be especially reactive to the difference between *local* and *international* policy rates. Moreover, we analyze the interaction with different macroprudential policies, finding that capital controls and domestic macroprudential policy complementarily mitigate the boom and the associated risk-taking through two distinct channels, independently operating through global and domestic liquidity, respectively.

Our paper additionally speaks to a growing literature on the deviations from CIP.[12] In particular, consistent with our findings, Avdjiev et al. (2019) document that a stronger USD is

[11] Other studies focus on carry trades by large nonfinancial companies (NFCs) in Emerging Markets (Acharya and Vij, 2016; Caballero, Panizza, and Powell, 2016; Bruno and Shin, 2017), and highlight how their U.S. dollar debt increases when carry trade is more favorable. Liao (2020) shows that carry trade explains a large fraction of international bond issuance. Differently, our attention rests on carry trades by domestic banks in Emerging Markets, involving local currency loans to domestic NFCs, including SMEs.

[12] For evidence on deviations from CIP in both Advanced and Emerging Economies, see e.g. Borio, McCauley and McGuire, 2016; Cerutti, Obstfeld and Zhou, 2019; Du and Schreger, 2016; Du, Tepper and Verdelhan, 2018.

associated with significant CIP-deviations and with a reduction in USD-denominated cross-border banking flows. We show that CIP-deviations can hamper the transmission of local policy rate hikes to domestic credit and that CC are eventually useful to enhance such transmission.

We also contribute to the literature by showing complementarities between domestic macroprudential policies and capital controls, highlighted theoretically by Korinek and Sandri (2018). Credit booms stem from both local and foreign sources of liquidity, with the latter flowing to the local economy either through foreign lending or through domestic bank international non-core FX funding (Avdjiev, McCauley and McGuire, 2012; Borio, McCauley and McGuire, 2011; Hahm, Shin and Shin, 2013). We show that CC tame credit booms because, by targeting foreign bank debt, they increase the effectiveness of domestic interest rate policy on credit supply. However, CC do not target domestic liquidity -e.g. bank deposits from local households and firms- that constitute the bulk of domestic bank funding. We show that domestic macroprudential policy via (tightening of) RR cuts credit supply by targeting domestic bank deposits. The increase in RR on domestic deposits directly reduces credit supply during the boom, and more so for riskier firms, rather than (indirectly) enhancing the effects of local monetary rates on credit supply.[13]

Overall, our results innovate the literature on macroprudential policy (see e.g. Galati and Moessner, 2013; 2018) by suggesting a "prudential Tinbergen rule" for tackling booms driven by a combination of domestic and foreign liquidity that is used by different financial intermediaries for financing their lending activities. Two instruments, i.e. CC and one domestic prudential measure –RR in our Colombian episode– are necessary to tackle the two (intermediate) objectives (sources of liquidity).

The rest of the paper is organized as follows. Section 2 describes the two policy changes and the datasets. Section 3 presents the results on the bank lending channel of monetary policy. In Section 4, we discuss findings on domestic reserve requirements. Section 5 briefly concludes.

[13] We analyze CC in conjunction with other domestic RR-policies, highlighting different channels of transmissions to credit supply, whereas most existing studies focus on just one of the two policies. For evidence on the effectiveness of prudential RR, see, among others, Barroso et al. (2020), Cordella et al. (2014) and Federico, Vegh and Vuletin (2014).

2. Institutional Settings and Data

2.1 Capital Controls on Capital Inflows and Reserve Requirements Policy in Colombia

The Colombian economy expanded rapidly in the mid-2000s, with annual GDP growth above 4 percent in both 2004 and 2005. At least from early 2006, inflationary pressures further intensified due to a pronounced surge in domestic credit. The annual growth rate of commercial credit more than doubled in 2006- from less than 10 percent to 22 percent (Figure 2, Panel A). The Central Bank reacted by steadily increasing the interest rate, from 6 percent at the end of 2005 to 8 percent by early 2007 and further up to 10 percent in mid-2008. A higher monetary policy rate was accompanied by a widening interest rate differential *vis-à-vis* the U.S. Fed Funds Rate as early as mid-2006 (Figure 2, Panel B). These developments triggered strong capital inflows - especially non-FDI debt inflows - by third quarter 2006 (and peaking in first quarter 2007 just before the introduction of capital controls), as well as an associated sharp appreciation of the Peso-USD nominal exchange rate.

To deal with the acceleration of domestic credit boom, financed in part with foreign liquidity, the Central Bank resorted to a package of unconventional prudential measures on May 7th, 2007.

[Insert Figure 2 here]

First, Capital Controls were introduced in the form of an Unremunerated Reserve Requirement (URR) on all new FX debt inflows.[14] The URR works as follows: upon disbursement of the FX credit to a Colombian firm (either a bank or a nonfinancial company), 40 percent of the nominal loan amount is deposited in an account at the Central Bank, with no remuneration in return. The deposit is always borne by the ultimate borrower of the debt and can be withdrawn without penalty only after six months.[15] At the time, local interest rates –as reflected by the overnight interbank rate– were as high as 8.4 percent. The new regulation resulted in high taxation of FX debt inflows. CC were borne by the banks to the extent that FX funding was raised to finance peso investments,

[14] Portfolio inflows were initially excluded, but eventually made subject to the URR just one week after. On the contrary, foreign direct investments (FDI) were not subject to the URR, though in May 2008 a minimum stay of 2 years was applied to FDI.

[15] Earlier withdrawals were allowed with the payment of a heavy penalty. The penalty decreased in time and ranged from 9.4 percent of the deposit in the first month to 1.6 percent during the sixth and last month.

including lending. When bank FX funding finances FX lending, it is the bank's customer that pays the CC (to avoid double taxation of capital inflows, bank FX funding is exempted).[16] In this paper, we focus on the impact of CC on domestic credit through a bank-financing channel, where most firms in Colombia are small and medium sized enterprises (SMEs) without access to FX corporate debt.[17] Finally, CC were lifted by October 2008 amid signs of an economic slowdown related to the unfolding of the GFC after Lehman's collapse. Moreover, joint with CC, the Central Bank introduced an upper bound on the banks' gross FX-position (i.e. the sum of on- and off-balance-sheet FX assets and liabilities), equal to 500% of banks regulatory capital. This constrained further banks' ability to access FX-financing.

Contemporaneously with the CC, the Central Bank also modified its policy on Reserves Requirements (RR) on bank domestic financing. In May 2007 the Central Bank introduced a *marginal* RR on bank deposits, to be applied on top of the ordinary reserve requirements to new deposits received after May 7th, 2007. In other terms, the *marginal* RR would only apply on the increase in total bank deposits after May 7th, 2007. The marginal RR was not remunerated (at a time of high local interest rates) and was fixed at 27 percent for checking deposits and 12 percent for savings deposits. At the time of the introduction of the *marginal* RR, the level of ordinary RR was 12 percent and 6 percent for checking and savings deposits, but it was eventually raised to 8.3 percent just one month later in June 2007 – contemporaneously, the marginal RR was set at 27 percent for both savings and checking deposits. The marginal RR was eliminated in August 2008.[18]

2.1 Data and Summary Statistics

Our work is based on two administrative datasets provided by the Colombian Financial Supervisory Authority (*Superintendencia Financiera de Colombia*). First, we have access to the

[16] Colombian banks and banks from other countries that follow Basel capital rules basically fully hedge their FX exposure.

[17] In a related paper (Fabiani et al., 2021), we analyze the effects of CC directly borne by non-financial companies, focusing in particular on the subsample of roughly 1,200 (large and export-oriented) firms issuing FX-debt without credit intermediation by banks operating in Colombia. For comparison, the largest sample in this paper is comprised of 110,226 companies.

[18] In 2007, regulators also introduced changes with respect to loan provisions. Countercyclical loan provisions were introduced in July 2007 and the criteria was that each financial institution must accumulate or deplete its countercyclical provisions according to four criteria: deterioration of portfolio, efficiency, fragility and loan growth. In addition, in May 2007, there was a change in the rule for computing banks' loan losses provisions, based on expected rather than incurred losses. Throughout the paper, we show that our findings are not significantly affected by such policy change (whose effects are investigated by López, Tenjo and Zárate, 2014, and Morais et al., 2020).

National Credit Registry (CR), which collects detailed quarterly information at the loan level for corporate loans, with information on loan volume and other loan characteristics.[19] The CR tracks information on the universe of commercial loans provided to nonfinancial companies. We aggregate loan-level data at the firm*bank level, by computing the total debt provided by a given bank to a company in a given year:quarter. Second, we have access to bank supervisory quarterly balance sheets, which include data on bank size, profitability, capitalization, nonperforming loans (NPL), and, most importantly for our purposes, the volume of the sources of bank financing taxed through RR and CC, i.e. domestic deposits and foreign FX inflows, respectively. The two datasets are matched through unique banking group identifiers.

We report the summary statistics in Table 1. In Panel A, we show the summary statistics for the largest sample we analyze throughout the paper, referring to regressions where we exploit time-variation to measure the unconditional impact of local monetary policy rate on bank credit. In this setting, we apply at most firm*bank fixed effects and bank controls. Therefore, the only requisite for a firm*bank pair to enter the sample is that it appears twice in the CR during the period of analysis 2005Q2-2008Q2.[20] This leaves us with 110,226 companies and 40 banks, corresponding to 12 major banking groups. Throughout the different year:quarters, this sample accounts on average for about 90 percent of total commercial credit.[21] $Loan_{f,b,yq}$ is expressed as the log of total outstanding (end of quarter) firm-(f)*bank-(b) debt, expressed in Colombian pesos as of 2005Q1. To get a sense of the magnitude of loans, the average loan is roughly 8,500USD as of 2005Q1. There are large differences in loan size across companies, though. A one interquartile variation in loan size reflects larger loans by more than 40,000USD as of 2005Q1.

[19] For each loan, we observe the interest payments (not interest rates), which we use to proxy for credit risk, and an indicator for whether the maturity of the loan is less than one year to proxy for liquidity risk.
[20] Note: CC were removed in early October 2008, i.e. in 2008Q4. Nonetheless, we always stop our sample in 2008Q2 to avoid contaminating the effects of capital controls with those of the 2008-2009 Global Financial Crisis, which implied a sharp increase in the volatility of capital inflows (Forbes and Warnock, 2012) and which unfolded beyond the US borders after the failure of Lehman Brothers in mid-September 2008. All results on CC presented below are robust to the inclusion of observations for 2008Q3 in our samples. Moreover, our main results are even qualitatively robust (and, if anything, quantitatively stronger) after restricting the sample to 2007Q3, despite the significant reduction in the heterogeneity in monetary policy rates and banks' FX-financing (note that the Colombian central bank was raising the interest rate during this period). Additional cross-country (time-series) analysis based on BIS data shows that credit in Colombia slowed down significantly after 2007Q2, relatively to other Emerging Economies, including their subsample from Latin America. Results based on different samples (either shorter or longer) are available upon request.
[21] We exclude both financial companies and public utilities from the analysis, which roughly account for 10% of total commercial credit.

Throughout our period of analysis, the monetary policy rate, labelled as i_{yq-1}, is close to 7.5 percent on average. We also employ other measures of interest rate policy, including the growth of the local policy rate over a half year and over one year. Additionally, we use Taylor rate residuals, derived from two different rules: one expressing the policy rate as a function of the lagged yearly inflation rate and output gap (Rule 1), and the other as a function of yearly inflation and log GDP (Rule 2). A further important measure in our analysis is given by the spread between the local policy rate and the effective US FED Funds Rate, i.e. $MPspread^{US}_{yq-1}$. Throughout the period of analysis, the spread is constantly positive and is about 3 percent on average. The distribution of the spread between the 3-month sovereign Colombian and U.S. yields mirrors very closely that of $MPspread^{US}_{yq-1}$ (augmented by a half p.p. premium). A factor explaining the sovereign spread may be deviations from the CIP. Although the largest deviations are observed after the Financial Crisis (see, e.g., Borio et al., 2016), they are still significant throughout our period of analysis and amount on average to 17 percent of the mean sovereign yield spread.[22] Finally, throughout all regressions on monetary policy rates, we apply further lagged macro controls, namely the annual growth rate of GDP, the lagged CPI index with base in 2005Q1 and the log Peso-USD exchange rate (expressed as Colombian Pesos per 1USD, so that an increase corresponds to a depreciation of the local currency).[23]

[Insert Table 1 here]

Panel B shows summary statistics for the smaller sample we focus on for the investigation of carry trade lending strategies triggered by variations in the local monetary policy rate. In this framework, we saturate the model with firm*year:quarter fixed effects, which excludes companies borrowing from one bank only in a given year:quarter, explaining the drop in observations with

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[22] The deviations from the CIP are retrieved from Du and Schreger (2016). In particular, they note that - absent CIP deviations - at a given tenor, the Colombia-US sovereign yield spread should equal the forward premium applied on a cross-currency swap that: i) buys U.S. zero-coupon Treasuries out of Colombian Peso; and ii) allows later on to enjoy the cash flows from US Treasuries in Colombian Pesos. Hence, they compute such forward premium (labelled as FP_{yq-1} in Panel B of Table 1) and subtract it from the Colombia-U.S. Sovereign yield spread, obtaining a series of deviations from the CIP. Du and Schreger (2016) compute those deviations for different sovereign bond tenors. We retain data for the 3-month tenor for two reasons. First, such data are available throughout the entire period of analysis for Colombia. Second, there is a tight link between the Colombian-US monetary policy rate spread and the 3-month sovereign yield spread. We aggregate data at the quarterly level by taking the average of the daily values.

[23] The Peso-USD exchange rate substantially correlates with both the VIX, reflecting the large influence of global liquidity conditions on the Colombian external sector, and with the oil price - which we alternatively use in some regressions – reflecting Colombia's dependence on oil exports.

respect to Panel A. Note that companies with multiple lending relationships are typically larger, reflected by the fact that average loan size almost doubles. Indeed, the smaller sample of 37,867 multibank companies in Panel B represents a very large share of total commercial credit, close to 80 percent on average in our period (and, in turn, 90 percent of the aggregate credit in the sample of Panel A). Credit supply channels identified from regressions run over this sample therefore provide a representative picture of macroeconomic developments in bank credit. Regarding bank-level variables, the average FX indebtedness, denoted by $FX\text{-}Funds_{b,yq-1}$, equals 4.6 percent of total assets in the period from 2005Q2 to 2008Q2. This is a relatively large figure, larger for instance than the average common equity capital ($CET_{b,yq-1}$) over the same period, and more than half of the minimum threshold for regulatory capital (summing up Tier 1 and Tier 2 capital), fixed at 9 percent of total assets.

Importantly, the distribution of bank $FX\text{-}Funds_{b,yq-1}$ displays large heterogeneity, with a s.d. of 2.59 p.p. Nonetheless, the bulk of bank liabilities is given by domestic liquidity. In particular, savings deposits, denoted by the variable $SavingD_{b,yq-1}$, finance on average more than a third of a bank's total assets, whereas checking deposits (i.e. current accounts) -represented by the variable $CheckingD_{b,yq-1}$- fund 13.6 percent of total assets on average. Further, we have data on bank size (i.e. log total assets), nonperforming loans (i.e. loans at least 90 days past due, accounting on average for 2.7 percent of total loan volume at the bank level), and return on assets, which are quite homogenously distributed across banks and equal 1.4 percent on average on a quarterly basis.

Finally, for analyzing risk-taking associated with carry trade lending, we build various indicators of firm-level riskiness and opaqueness. First, we proxy credit risk through the average yield paid by a company over the pre-policy period 2005Q1 to 2007Q1, proxied through interest payments (rescaled by loan size) and denoted by $Firm\ Risk_{f,pre}$. This is computed by taking, in each year:quarter, the weighted average of the loan-level "yields", with weights given by the loan shares relative to the total volume of bank debt at the firm level. Next, we take a firm-level average across the period 2005Q1 to 2007Q1. Note that an interquartile variation in such a variable corresponds to a 6.1 p.p. increase in the average firm-level yield, i.e. a 43 percent increase relative to the mean value, which we interpret as a sizable magnification of credit risk. The average reliance on short-term debt is computed with an analogous procedure, which is based on a 0/1 dummy for whether a loan has maturity no longer than one year. Companies rely on short-term debt for roughly one third of their total borrowing on average. The distribution, however, reveals significant differences across firms. A one interquartile variation implies higher reliance on short-term debt by a factor of 46.8 p.p. Firms in the fourth quartile of the distribution have more than half of their total debt with outstanding maturity below or equal to one year. These figures reflect large heterogeneity in refinancing risk across companies. As an additional measure for firm (default) risk, we also build a dummy with a value of 1 if a company has one or more loans with payments at least 90 days past due over the period 2005Q1 to 2007Q1, and 0 otherwise. In fact, the average value for this dummy shows that roughly 30 percent of the loans in our sample are granted to firms with such past due payments. Finally, a firm's opaqueness is proxied by a 0/1 dummy for whether a company's balance sheet is supervised by a public authority or not in the pre-policy period,[24] under the implicit assumption that balance sheet disclosure enhances firm transparency. Supervised companies represent about 10 percent of the firms in our sample, but they nonetheless account for about 30 percent of the loans, suggesting that those firms are larger and have more relationships in place with banks operating in Colombia.

Panel C reports the summary statistics for the sample we consider in the analysis of the RR policy. In this case, we run a traditional difference-in-differences exercise, comparing the evolution of bank credit before and after the introduction of the policy across differently exposed banks. Since shocks to the RR take place over the period 2007Q2-2008Q2, we build symmetric pre/post five quarter windows by running regressions over the year:quarters from 2006Q1 to 2008Q2. Again, as we isolate credit supply channels by saturating the model with firm*year:quarter fixed effects, the sample includes companies with at least two banking relationships in each year:quarter. To measure a bank's exposure to the RR shocks, we fix bank-level variables at their 2007Q1 value, the year:quarter preceding the shocks. We consider both savings and checking deposits alone, and their sum, denoted by the variable RR-Depo$_{b,2007Q1}$, which provides a measure of a bank's overall reliance on the liabilities targeted through the RR policy. The sum of checking and saving deposits accounts for nearly half of bank total assets in 2007Q1. In general, the distribution of all bank balance sheet items in 2007Q1 is very similar to that described above for the longer period 2005Q2-2008Q2, suggesting a substantial stickiness in bank capital structure.

[24] Companies with sufficiently large size, as measured by total assets, must disclose their balance sheet to Colombia's Authority for Supervision of Corporations (*Superintendencia de Sociedades*). Such data are also publicly available at the Authority's website.

3. Capital Controls and the Bank-Lending Channel of Monetary Policy

In this section, we analyze how prudential measures affect the transmission of the local policy rate to bank credit. First, we verify that in the period of enforcement of CC and RR, the transmission is stronger, i.e. an increase in the local policy rate has a more negative effect on bank credit. Second, we ask whether the two policies are responsible for the enhancement of the bank-lending channel of monetary policy. Third, we investigate the implications of such lending strategy for bank risk-taking, and the eventual influence of CC on it.

3.1 Local Monetary Policy Rate and Bank Credit

We investigate the transmission of the local policy rate to bank credit through the lens of a loan-level regression model which exploits time variation over the period 2005Q2-2008Q2 within a given firm-bank pair. The most robust version of the model follows:

$$Y_{f,b,yq}=\beta_1 i_{yq-1} + \beta_2 Post_{yq} + \beta_3 Post_{yq}*i_{yq-1} + \gamma_1 MacroControls_{yq-1} + \gamma_2 BankControls_{b,yq-1} + \delta_{f,b} + \varepsilon_{f,b,yq}$$

The dependent variable, $Y_{f,b,yq}$, is the log total volume of outstanding debt provided by bank b to firm f in year:quarter yq (i.e. $Loan_{f,b,yq}$). The main coefficient of interest is β_3, describing the additional marginal effect of the lagged local policy rate i_{yq-1} on bank credit after the enforcement of CC and RR, on top of the pre-policy marginal effect, captured by β_1. $Post_{yq}$ is a dummy variable with value 1 from 2007Q2 onward and with value 0 before.

As the monetary policy rate is influenced by macroeconomic developments, which can affect bank credit as well, we include a vector of macro controls, $MacroControls_{yq-1}$, which may determine the Central Bank's policy reaction function. The Colombian monetary policy rate is formally governed by a pure inflation targeting regime so that we employ the lagged annual GDP growth rate and level of price, proxied by the CPI. Moreover, we add the lagged log exchange rate, controlling for the eventual influences of external factors (e.g. the dynamics of the Balance of Payments) on the local policy rate. The model is further augmented with a vector of lagged bank controls, consisting of bank FX funding, savings and checking deposits, size, ROA, common equity, and NPLs. We saturate the model with firm*bank fixed effects, denoted by $\delta_{f,b}$, which take care of all (observed and unobserved) time-invariant heterogeneity at the level of the single lending relationship. Finally, $\varepsilon_{f,b,yq}$ is an error term. We double-cluster standard errors at the firm and bank*(four-digit SIC)-industry level, a convention we maintain throughout the paper. Hence, we allow for correlation of the error-term both within-borrower (across time and lenders) *and* within-lender (across time and firms of a given industry).[25]

[Insert Table 2 here]

Table 2 shows the results from the estimation of the model. We report coefficients under progressively saturated versions of the model. In particular, in column 1, we employ just firm fixed effects, needed as a minimal set of controls to account for differences in the size of loans across firms. The related coefficients imply that, in the pre-policy period, a 1 p.p. increase in the local policy rate is associated with a jump in loan volume of 2.9 p.p. After CC and RR are enforced, however, the relation becomes negative,[26] which corresponds to an enhancement of the bank-lending channel. From a qualitative perspective, these relations are robust across all versions of the model and also survive the addition of firm*bank fixed effects, which increase the R-squared by 15 p.p. In the most saturated version of the model in column 5, corresponding to the equation commented above, before the introduction of CC and RR, a 1 p.p. increase in the local interest rate is associated with an expansion in loan volume of 3.5 p.p. After their introduction, however, we find again that the relation is more negative, and the interest rate does not overall exert a significant impact on loan volume. In other terms, irrespective of the model we consider, the results suggest that the introduction of the prudential measures contribute to strengthening the bank-lending channel of monetary (interest rate) policy.

[Insert Table 3 here]

In Table 3, we perform several robustness checks. In Panel A, we estimate alternative specifications of our model. In column 1, we modify the baseline model (in column 5 of Table 2) by further including firm*quarter(seasonal) fixed effects, which account for firm-specific seasonal demand shocks. In column 2, we control for the lagged loan-level provision for losses, rescaled by

[25] We cluster at the bank*industry level rather than at the bank level because the latter option would leave us with less than 50 clusters, the conventional threshold for the minimum number of clusters (Cameron and Miller, 2015) which grant that asymptotic properties of the variance-covariance matrix estimator kick in. By taking the interaction of bank and (four-digit SIC) industry dummies, we obtain 4,246 clusters. Note that estimating standard errors interacting bank dummies with less granular (two- or three-digit SIC) industry dummies would leave the significance of our results unchanged. Still, we use four-digit SIC industry dummies as we also use such variables as fixed effects throughout the paper. Moreover, we show in robustness checks that our results survive under more conservative clustering strategies.

[26] We do not report the p-values of the test with null hypothesis: $\beta_1+\beta_3=0$. In columns 1 to 4 the p-value is constantly below 0.05, whereas in column 5 it is above 0.10.

the loan amount. Contemporarily to the prudential shocks, a modification of the accounting rules for computing loan loss provisions was introduced and we aim to show that this does not interact significantly with our findings. In column 3, we rerun the baseline model weighting observation by the log loan size, so that the estimated coefficients do not reflect variations in very small loans. We augment the baseline weighted least squares model by progressively including again firm*quarter fixed effects in column 4 and loan loss provisions in column 5. Reassuringly, across all such model specifications, the period characterized by CC and RR is associated with a stronger negative effect of the local policy rate on bank credit, so that the qualitative interpretation of our findings does not change. We estimate the baseline model under alternative clustering strategies at the level of firm and bank in column 6, firm and bank and year:quarter in column 7, and firm and bank*industry and year:quarter in column 8, and find that our coefficients of interest are nonetheless significant at conventional levels.

Next, in Panel B, we verify that these findings hold across different proxies of the monetary policy rate. Importantly, in column 1, the increased pass-through to bank credit is robust to substituting the local policy rate with the spread between the local policy rate and the U.S. Effective Federal Funds Rates. This measure controls for an eventual dependence of local policy rates with cycles in U.S. monetary policy rates; the related coefficients imply that after the introduction of CC and RR, "purely" local positive interest rate variations reduce bank credit (by 0.57 p.p. in reaction to a 1 p.p. expansion in the spread). Generally, though, results are consistent across the different proxies of local interest rate policy. Note in particular that when employing Taylor residuals, we also obtain a full restoring of the bank-lending channel in the ex-post period; that is, before the introduction of CC and RR the local policy rate is positively linked to loan volume dynamics, and negatively thereafter (columns 4 and 5).

3.2 Local Monetary Policy Rate and Bank Credit: Carry Trade Mechanism

In this subsection, we investigate a mechanism for the previously documented results. In particular, we ask whether CC interact with the relation between local policy rates and bank debt, while controlling for the potential simultaneous effects of RR-taxed liabilities. We first present the empirical strategy and next discuss the findings.

3.2.1 Empirical Strategy

We present the most robust version of the model, estimated over the period 2005Q2-2008Q2:

$$
\begin{aligned}
Y_{f,b,yq} = {} & \text{FX-Funds}_{b,yq-1} * \left(\beta_1 + \beta_2 \text{MPspread}^{US}_{yq-1} + \beta_3 \text{Post}_{yq} + \beta_4 \text{MPspread}^{US}_{yq-1} * \text{Post}_{yq} \right) + \\
& \text{SavingD}_{b,yq-1} * \left(\sigma_1 + \sigma_2 \text{MPspread}^{US}_{yq-1} + \sigma_3 \text{Post}_{yq} + \sigma_4 \text{MPspread}^{US}_{yq-1} * \text{Post}_{yq} \right) + \\
& \text{CheckingD}_{b,yq-1} * \left(\phi_1 + \phi_2 \text{MPspread}^{US}_{yq-1} + \phi_3 \text{Post}_{yq} + \phi_4 \text{MPspread}^{US}_{yq-1} * \text{Post}_{yq} \right) + \\
& \text{FX-Funds}_{b,yq-1} * \left(\mu_1 + \mu_2 \text{Macro}_{yq-1} + \mu_3 \text{Post}_{yq} + \mu_4 \text{Macro}_{yq-1} * \text{Post}_{yq} \right) + \\
& \text{BankControls} * \left(\Gamma_1 + \Gamma_2 \text{MPspread}^{US}_{yq-1} + \Gamma_3 \text{Post}_{yq} + \Gamma_4 \text{MPspread}^{US}_{yq-1} * \text{Post}_{yq} \right) + \\
& + \delta_{f,b} + \delta_{f,yq} + \varepsilon_{f,b,yq}
\end{aligned}
$$

The dependent variable, $Y_{f,b,yq}$, is the log total volume of outstanding debt provided by bank b to firm f in year:quarter yq (i.e. $\text{Loan}_{f,b,yq}$). We study how these variables react to variations in the local versus U.S. policy rate spread, depending on the banks' relative reliance on FX liabilities (affected by the CC). To better highlight the carry trade mechanism, we report in our main table results employing the policy rate spread, but we also show that results are robust if we use the simple lagged local policy rate.

The main coefficients of interest are β_2 and β_4. Under the carry trade hypothesis, β_2 is positive, as banks with higher FX funding lend more when the wedge between the policy rates goes up, while β_4 is negative, as CC break the carry by increasing the costs of FX funding, thereby reducing the gains associated with larger policy rate wedges. Crucially, we horse race our carry trade mechanism against the alternative hypothesis that domestic deposit funding drives the different relation between loan volume and local monetary policy rate before and after 2007Q2. In such a case, RR are important instead of CC for the strengthening of the bank-lending channel of monetary policy, and the inclusion of the interaction of savings and checking deposits with both the policy rate spread and the post dummy nullifies the coefficients β_2 and β_4.[27]

[27] Formally, the simple sensitivity of β_2 and β_4 to the inclusion of the full interaction of domestic deposits with the interest rate spread and the post dummy does not prove itself that RR are key to strengthening the bank-lending channel of monetary policy. This would also require that σ_2 and ϕ_2 are positive, so that savings and checking deposits drive the positive association between policy rate variations and loan size before 2007Q2, and that σ_4 and ϕ_4 have negative values, suggesting that shocks to RR are responsible for the more negative correlation between loan volume and variations in the local policy rate after the enforcement of the measures.

We control as well for the interactions of bank FX funding with the other macro controls (and with the post-dummy), e.g. because variations of the exchange rate, which correlate with the MP-spread, might induce a different reaction in credit supply across differently FX exposed banks. Moreover, we allow for all remaining bank characteristics to influence bank debt differently depending on the lagged level of the policy rate spread, before and after the enforcement of the policy (e.g. higher levels of bank capitalization are associated with credit expansions when the interest rate is relatively higher, Jiménez et al., 2012).

Finally, we saturate the model with firm*bank fixed effects, $\delta_{f,b}$, and, importantly, firm*year:quarter fixed effects, denoted by the parameters $\delta_{f,yq}$. Following Khwaja and Mian (2008) and Jiménez et al. (2012 and 2014), these fixed effects are crucial for the isolation of the bank lending channel of monetary policy, as they allow the comparison of the evolution of credit to the same firm in a given year:quarter in reaction to variations of the policy rate, depending on the different funding structures of the firm's lenders. In other terms, such fixed effects fully control for firms' time-varying demand shocks.

3.2.2 Results

We report results in Table 4. Note that, with respect to the largest sample in Table 2, the inclusion of firm*year:quarter fixed effects reduces sample size, as it excludes all companies with just one lending relationship. However, we validate the baseline results from the previous subsection (i.e. using time variation only) in this smaller sample in column 1.

[Insert Table 4 here]

In column 2, we start testing the carry trade mechanism by fully interacting bank FX funding with the lagged interest rate spread and the post dummy. We also control for the full interaction of banks FX funding with the other macro controls, and allow other bank characteristics to exert a different, unconditional, impact on credit before and after the introduction of the prudential measures in 2007Q2. Two results emerge immediately. First, in line with carry trade lending strategies, β_2 is positive and β_4 is negative. That is, before CC, banks with higher share of FX funds expand credit relatively more when the spread goes up, while after CC they reduce lending in reaction to a positive variation of the spread. Importantly, $|\beta_4| > |\beta_2|$, suggesting that CC revert the dynamics, instead of just attenuating it, thereby contributing to restoring the transmission of local interest rate policy to bank credit.

In column 3, we control for time-varying macro-economic shocks by including year:quarter fixed effects and coefficients are virtually unaffected. In column 4, we take a more serious step in the direction of isolating credit supply channels by augmenting the model with industry (four-digit SIC)*year:quarter shocks, but the resulting variation in coefficients is again minimal. In column 5, we finally introduce firm*year:quarter fixed effects, therefore fully controlling for time-varying firm idiosyncratic demand shocks. If anything, the magnitude of the coefficients β_2 and β_4 increases.

Finally, in column 6, we report the most robust version of the model where we additionally interact all the banks characteristics with the policy rate spread and with the post dummy. Validating the carry trade mechanism, β_2 and β_4 are further strengthened. Importantly, the impact of carry trade lending strategies on bank domestic credit is both statistically and economically significant. In reaction to a 1 p.p. jump in the policy rate spread, before CC, banks with a 1 s.d. (i.e. 2.6 p.p., see Table 1) higher share of FX funds expand credit in relative terms by 3.8 p.p.. After CC, however, the same combination of spread-increase and larger FX funding is associated with a relative reduction in credit supply by 3.5 p.p.. The application of CC therefore sharply reduces carry trade incentives and contributes to restoring a negative relation between local policy rate variations and credit among highly FX indebted banks.

Differently, as shown in the Table A3 in the Appendix, whereby we display the horse race between the FX and the RR taxed liabilities, the interaction of the latter domestic liabilities with the policy rate spread (and the post dummy) is not significant, suggesting that the change in RR-policy did not contribute to strengthening the bank-lending channel of monetary policy rates.

3.2.3 Robustness and Additional Findings

In Table 5, we estimate alternative specifications of the model. In column 1, we further control for loan loss provisions, and their interaction with both the policy rate spread and the post dummy. In column 2, we rerun the baseline model (in column 6 of Table 4) with observations weighted by log loan size, so to allow our coefficients to be driven from more meaningful credit relationships. In column 3, we complement the WLS estimation with the full interaction of the loan loss provisions with the policy rate spread and the post dummy. In columns 4 to 6, we estimate both by OLS and WLS the baseline model (and its augmented version with loan loss provisions), removing firm*year:quarter fixed effects and substituting them with industry*year:quarter fixed effects. This allows us to retrieve information on bank credit for companies borrowing from one bank only. Importantly, coefficients are virtually unaffected from all such modifications of our baseline model, so that both the qualitative and quantitative interpretation of our channel provided in the previous subsection go through.[28]

We estimate the baseline model under alternative clustering strategies at the level of firm and bank in column 7, firm and bank and year:quarter in column 8, firm and bank*industry and year:quarter in column 9, and find that our coefficients of interest are nonetheless significant at conventional levels.

[Insert Table 5 here]

We next examine the evolution of the carry trade lending mechanism over our period of analysis. In our regressions, we check the relative difference of the conditional response of FX indebted banks to the policy rate spread before and after the introduction of CC in 2007Q2. However, one might worry that the contraction in the strength of carry trade lending strategies that we attribute to the CC period might reflect a declining trend that took place before the introduction of CC. To address such concerns, we estimate the following model:

$$\text{Loan}_{f,b,yq}=(\beta_1+\beta_2\text{Pre}_{yq}+\beta_3\text{Post}_{yq})*\text{MPspread}^{US}_{yq-1}*\text{FX-Funds}_{b,yq-1}+\text{Controls}_{b,yq-1}+\delta_{f,b}+\delta_{f,yq}+\varepsilon_{f,b,yq}$$

where: Pre_{yq} is a dummy with value 1 from 2006Q2 onward and 0 otherwise, whereas Post_{yq} is our usual post-policy dummy with value 1 from 2007Q2 onwards.[29] Under this specification: β_1 represents the intensity of the carry trade lending strategy during the period 2005Q2 to 2006Q1; β_2 estimates the intensity over 2006Q2-2007Q1 compared with the previous period; and finally, β_3 measures the change in the strength of carry trade lending over the CC-period 2007Q2-2008Q2

[28] We further validate that our findings are robust to controlling for the full interaction of the policy rate spread and the post-dummy with an indicator for whether a bank is foreign-owned or not (the related regression table is available upon request). Indeed, our main coefficients of interest related to the carry-trade channel remain both qualitatively and quantitatively unchanged.

[29] $\text{Controls}_{b,yq-1}$ reflects the most robust version of the model, in which other balance sheet items are also fully interacted with $\text{MPspread}^{US}_{yq-1}$ (and both the Pre_{yq} and the Post_{yq} dummies) and $\text{FX-Funds}_{b,yq-1}$ is further interacted with macro controls (and both the Pre_{yq} and the Post_{yq} dummies). $\delta_{f,b}$ and $\delta_{f,yq}$ denote firm*bank and firm*year:quarter fixed effects.

(relative to the period 2006Q2-2007Q1). We depict these three coefficients in Figure 3. The coefficient β_1 is positive but not statistically significant, whereas the larger and statistically significant coefficient β_2 suggests that the strongest period for carry trade has been 2006Q2-2007Q1.

[Insert Figure 3 here]

Finally, β_3 is strongly negative and statistically significant, ultimately suggesting that the contraction in carry trade lending before the policy cannot be attributed to preexisting trends. Moreover, the strengthening of the carry trade lending strategy over the period 2006Q2 to 2007Q1 is consistent with both aggregate and bank-level figures on FX inflows. Note in Figure 2, Panel B, it is around 2006Q2 that Colombia has large (non-FDI) capital inflows associated with a higher policy rate which widens the spread with the U.S. Effective Federal Funds Rate. In Figure 4, we show the total quarterly FX debt intakes by Colombian banks (through long-term loans and bonds).[30] Also in this more granular chart the capital boom ramps up at the end of 2006 and beginning of 2007 and is eventually halted by CC, therefore tightly mirroring the dynamics portrayed by our estimates.

[Insert Figure 4 here]

An especially important and interesting set of controls in our analysis is provided by the interaction of bank FX funding with proxies of conditions in the Colombian external sector, which might influence the ability of local banks to access FX liabilities as well as the value of such liabilities throughout time. In Table 6, we show our findings under alternative proxies. First, in column 1, we display the baseline model in column 6 of Table 4, in which we use the log exchange rate (expressed as Colombian Pesos per 1 USD, so that an increase denotes a depreciation of the local currency). Interestingly, before CC, a 1 s.d. appreciation of the exchange rate triggers a relatively larger increase in lending by 1 p.p. among banks with a 1 s.d. larger FX funding. However, under CC, this effect is not significant. In column 2, we replace the log exchange rate with the VIX, commonly interpreted as an indicator of global risk aversion (liquidity conditions) that significantly responds to U.S. monetary policy shocks (Miranda-Agrippino and Rey, 2020)

[30] Importantly, they exclude FX-liabilities issued by Colombian banks through foreign subsidiaries and therefore significantly underestimates the extent of FX-borrowing.

and drives capital flows worldwide (Rey, 2015).[31] Our main coefficients of interest are robust to this replacement. Moreover, the interaction of the VIX with banks FX funding suggests that a 1 s.d. loosening in global risk aversion (decline in VIX) is associated with a relative jump in lending by 2.4 p.p. for banks with a 1 s.d. larger FX funding pre-CC. In line with results for the exchange rate, though, such influence is nullified by CC. Finally, in column 3, we use oil price as an indicator of external sector conditions for Colombia. Despite oil representing the bulk of Colombian exports, its price is largely determined by exogenous factors and comoves substantially with the exchange rate (over our period, by a factor of 80 percent). Once again, the carry trade coefficients are not affected and a 1 s.d. increase in oil prices drives a relative expansion of lending by 5 p.p. for banks with a 1 s.d. larger FX funding, an influence halted by CC. Overall, these results are consistent with a mechanism such that when global conditions are loose, the value of bank FX liabilities increases and so does their credit supply (see, e.g., Bruno and Shin, 2015b). This channel is eventually broken by CC.

[Insert Table 6 here]

Finally, we check in Table A4 in the Appendix that the carry trade channel is robust to substituting the policy rate spread with the simple policy rate. The coefficients from the most robust version of the model in column 6 imply that, before CC, banks with a 1.s.d. larger FX funds respond to a 1 p.p. jump in the policy rate by increasing lending by 1.8 p.p.. Under CC, the same combination of policy rate increase and larger FX funding is associated with a relative lending cut by 1.5 p.p.

3.2.4 Dissecting the Carry Trade Mechanism: Peso *vs* FX-Lending and CIP deviations

In Table 7, we repeat the exercise over a smaller sample of observations for which loan volume is broken down by currency, i.e. domestic (peso) and FX-lending.[32] We consider peso and FX-

[31] Reflecting a significant interdependence between the VIX indicator and external sector conditions in Colombia, the joint inclusion of the VIX and the exchange rate in a regression model generates multicollinearity issues. For this reason, we include the two variables in alternative models rather than together. Similar considerations apply to oil price, which is the main driver of Colombian exchange rates, given the prominent role of oil exports.

[32] We report the summary statistics for this smaller sample in Table A1 of the Appendix. Note that this sample consists of large companies with supervised balance sheets and accounts across time for 55 percent to 60 percent of the total loan volume for multibank nonfinancial companies in the regression sample in Table 4.

loans separately in column 1 and 2, respectively. The coefficients clearly show that peso lending drives the results just described, which further corroborates the carry trade hypothesis.

While a carry trade strategy is in principle profitable also with FX loans (under the reasonable assumption that these are more expensive in Colombia than in global interbank and wholesale funding markets), the strategy will nonetheless grant higher returns through peso-lending, given the positive policy rate differential. Also, banks would bear the CC tax only if FX funds were reinvested in peso-denominated assets, so that credit supply variations induced by CC must show up among peso loans. If banks borrow in FX to finance FX loans, the CC is borne by the ultimate borrower, i.e. a local company. As a result, the reduction in FX-loans associated with CC should show up as a demand shock in a loan level analysis, but we fully control for it by adding firm*year:quarter fixed effects (Khwaja and Mian, 2008). Finally, in column 3, the share of peso loans out of total bank debt also evolves according to the carry trade lending, although pre-policy carry is just marginally significant, and column 4 replicates the baseline analysis on total bank debt in this smaller sample by summing up peso and FX loans.

[Insert Table 7 here]

Moreover, we investigate the relation between the documented carry trade strategies by local banks and the deviations from CIP, computed over the 3-month yield spread between Colombia and U.S. sovereign bonds. Importantly, banks tend to fully hedge their FX borrowing. Hence, validating that our results are robust to substituting the policy rate spread with a proxy for CIP deviations is relevant, because such deviations grant returns from the carry even under fully hedged currency risk.

In Table 8 we report results from this exercise. We start by substituting the policy rate spread with the spread between the Colombian and U.S. sovereign 3-month yields. As already detailed in the data section, the two variables are very tightly linked, and in practical terms the sovereign spread corresponds to the policy rate differential plus a half p.p. premium. We repeat our regressions with the sovereign spread since the CIP-deviations retrieved from Du and Schreger (2016) are based on it. Indeed, results in column 1 of Table 8 confirm that carry trade lending strategies are operative also based on such 3-month sovereign spread. Quantitatively speaking, before the introduction of CC, a 1 p.p. increase in the sovereign spread triggers a relative jump in credit supply of 2 p.p. by banks with a 1 s.d. higher FX funding. After the introduction of CC, however, the same combination of sovereign spread hike and higher banks FX funding leads to a 2.76 p.p. cut in credit supply.

In column 2, we introduce the deviations from the CIP. Again, the coefficients are consistent with carry trade lending. That is, before (after) CC, higher CIP-deviations bring relatively larger (smaller) volumes of credit supply for more FX-exposed banks. A reasonable concern is that these results are confounded by the fact that CIP-deviations tend to be higher at times of relatively high sovereign spread, so that they do not necessarily reflect carries prompted by returns under full hedging of currency risk. For this reason, we perform an additional regression in column 3 in which we augment the model with the component of the 3-month sovereign spread which is not accounted for by CIP-deviations, namely the 3-month forward premium, $FP_{yq-1.}$ We perform a full horse-race in which also this factor is fully interacted with not only bank FX funding, but also with the other bank controls. The resulting estimates suggest that the carry trade lending strategy is driven by both forward premia and CIP deviations. Nonetheless, CIP deviations exert a relatively greater influence on the dynamics of credit supply for FX indebted banks, suggesting that banks are relatively more inclined to pursue fully hedged carries (against FX risk). Absent CC, among banks with a 1 s.d. higher FX funding, a 1 p.p. increase in CIP deviations (forward premia) triggers an increase in credit by 3.5 p.p. (1.7 p.p.). With CC in place, the same combination of higher CIP deviations (forward premia) and bank FX funding leads to a 7.7 p.p (1.3 p.p.) decline in credit. Finally, we replicate the analysis in column 4 with peso loans, in column 5 with FX loans and in column 6 with the share of peso loans as dependent variables. Consistent with our previous findings, higher CIP deviations (and forward premia as well, but less intensively) drive carry trade predominantly over peso loans for banks with relatively larger FX funding.

[Insert Table 8 here]

3.2.5 Carry Trade Mechanism and Risk-Taking: Heterogenous Effects across Firms

We investigate whether carry trade lending heightens bank risk-taking, and the eventual influence of CC on it, by looking for heterogenous effects across companies, depending on their riskiness and opaqueness. In detail, we proxy for credit risk by sorting companies based on quartiles of the distribution of the average interest payments in the pre-policy period, i.e. Firm $Risk_{f,pre.}$ An identical classification ranks firms by liquidity risk based on the distribution of the average pre-policy reliance on short-term debt, i.e. Short-Term $Debt_{f,pre}$. Additionally, we split companies depending on whether they defaulted on at least one loan during the period 2005Q1-2007Q1, which further proxies for default risk. Finally, we divide companies by transparency and opaqueness based on whether their balance sheet is publicly supervised or not.

[Insert Table 9 here]

Table 9 reports estimates from the regressions on loan volume from the most robust version of the model. To start with, companies in the first quartile of credit risk (Firm $Risk_{f,pre}$) are not impacted by the carry trade, neither before nor after CC. On the contrary, firms with greater credit risk experience larger fluctuations in bank debt associated with the carry, and especially so for companies with above-median credit risk. For instance, in reaction to a 1 p.p. jump in the policy rate spread, before CC, banks with a 1 s.d. higher share of FX funds expanded credit to firms in the fourth quartile of credit risk by 7.3 p.p. After CC, these firms also suffer sharper cuts, by 7.7 p.p.

Similar dynamics apply to firms with different levels of liquidity risk. Indeed, carry trade lending does not affect bank debt of firms with the lowest liquidity risk, but significantly impacts loans to firms with higher reliance on short-term debt. Moreover, before CC, when the spread goes up by 1 p.p., companies that ex-ante default (do not default) on one or more loans enjoy a relative credit expansion of 5.1 p.p. (3 p.p.) by banks with a 1 s.d. higher share of FX funds; after CC, the same combination of jumps in the spread and in lenders' FX funds brings a relative credit reduction of 4.7 p.p. (3.2 p.p.), suggesting that both the credit expansion due to the carry and the CC-induced cut are stronger among riskier companies. Finally, opaque firms do not benefit more than transparent ones from carry lending before CC, but after their enforcement they undergo a much larger reduction in credit, by 5.5 p.p. in response to the usual 1 p.p. increase in the spread and 1 s.d. jump in banks' FX exposure.

Overall, these findings are consistent with increased bank risk-taking due to carry trade lending. Also, they indicate that CC contribute to mitigating these risks, as the post-CC reduction in lending by highly FX indebted banks (following an interest rate spread increase) is concentrated among risky and opaque borrowers.

4. The impact of Reserve-Requirements on Bank Credit

In this section, we evaluate the impact of the shocks to RR on domestic deposits on bank credit. First, we present the empirical strategy. Second, we discuss the baseline findings. Third, we provide some robustness checks. Fourth, we check whether the impact of RR is heterogeneously distributed across firms. Last, we ask whether bank domestic deposits and foreign funding are substitutes or complements,[33] which reveals whether RR and CC affect credit supply through distinct channels.

4.1 Empirical Strategy

We run a difference-in-differences exercise in symmetric five-quarter windows around the modification of the RR-policy in 2007Q2, i.e. over the period 2006Q1 to 2008Q2. We employ the following model:

$$Loan_{f,b,yq} = \beta_1 Post_{yq} * RR\text{-}Depo_{b,2007Q1} + \gamma Post_{yq} * BankControls_{b,2007Q1} + \delta_{f,b} + \delta_{f,yq} + \varepsilon_{f,b,yq}$$

The dependent variable is loan volume. The main coefficient of interest is β_1, describing the impact of ex-ante heterogeneity in RR-taxed deposits, i.e. the sum of checking and saving deposits, on the ex-post volume of credit. Note that heterogeneity across bank reliance on deposits taxed by the RR-shock is taken as of 2007Q1, and an identical convention is applied to bank controls. The model is augmented with firm*bank dummies, whereas firms' credit demand is controlled through firm*year:quarter fixed effects (Khwaja and Mian, 2008). $\varepsilon_{f,b,yq}$ is an error term, double-clustered at the firm and bank*industry level.

The consistency of our estimates crucially depends on the parallel trend assumption: absent the modification of RR policy in 2007Q2, banks with different reliance on checking and savings deposits would experience parallel ex-ante and ex-post credit dynamics. We test the validity of such assumption in our setting using the alternative model:

$$Loan_{f,b,yq} = \beta_{1,yq} * (1[year{:}quarter=yq]) * RR\text{-}Depo_{b,2007Q1} + \gamma Post_{yq} * Bank\ Controls_{b,2007Q1} + \delta_{f,b} + \delta_{f,yq} + \varepsilon_{f,b,yq}$$

[33] Note that the sum of domestic (saving and checking) deposits and FX-funding constitutes, on average, roughly 54 percent of banks' total assets. Hence, whether banks with a higher share of domestic deposits are more or less indebted in FX is ultimately an empirical question.

That is, we allow the relation between RR-$Depo_{b,2007Q1}$ and loan volume to vary over the different year:quarters in our sample, as 1[year:quarter=yq] is a dummy variable with value 1 in year:quarter yq and 0 otherwise. We fix 2006Q1 as the baseline period. A heuristic validation of the parallel trend assumption requires that the RR-treatment effect is zero before 2007Q2, and significant thereafter.

4.2 Baseline Results

[Insert Table 10 here]

We report baseline results in Table 10. In column 1, we apply a minimal set of controls, including firm fixed effects and bank controls, interacted with the post dummy. The treatment effect is negative and significant at the 1 percent level. We next saturate the model, first by including firm*bank fixed effects, which imply an increase in the R-squared by roughly 30 p.p.. The treatment effect remains negative and significant (column 2). We then control for time-varying shocks, either common across all firms (column 3) or industry-specific (column 4), by applying year:quarter and industry*year:quarter fixed effects, respectively. Coefficients are virtually unaffected.

In column 5, we fully shut down firm demand shocks with firm*year:quarter fixed effects. The treatment effect remains significant at the 1 percent level, suggesting also a strong economic impact of RR-shock. A 1 s.d. (7.8 p.p.) increase in the share of total assets financed with either savings or checking deposits implies a 5.4 p.p. reduction in bank credit. In column 6, we test separately for the effect of checking and savings deposit exposures. The coefficients suggest a stronger effect of exposure to checking deposits, as a 1 s.d. (4.1 p.p.) jump implies a 7.6 p.p. reduction in loan volume. The effect of exposure to saving deposits is smaller, but nonetheless economically meaningful, corresponding to about 2.9 p.p. in reaction to a 1 s.d. (7 p.p.) increase.

4.3 Robustness

First, in Panel A of Table 11, we estimate alternative specifications of the model. In column 1, we further control for loan loss provisions, both alone and interacted with the post dummy. In column 2, we rerun the baseline model (from column 6 of Table 10) with observations weighted by log loan size to allow our coefficients to be driven from relatively larger credit relationships. In column 3, we complement the WLS estimation with loan loss provisions and their interaction with post dummy. In columns 4 to 6, we estimate, both by OLS and WLS, the baseline model (and its augmented version with loan loss provisions), removing firm*year:quarter fixed effects and substituting industry*year:quarter fixed effects. This allows us to include in the regression sample those companies that borrow from only one bank. Importantly, coefficients are virtually unaffected by all such modifications of our baseline model, so that both the qualitative and quantitative interpretation of our channel provided in the previous subsection go through.

In columns 7, 8, and 9, we estimate the baseline model under alternative clustering strategies. In column 7, we estimate at the level of firm and bank. In column 8, firm and bank and year:quarter. And in column 9, firm and bank*industry and year:quarter. Our coefficients of interest remain significant at least at the 12 percent level in the case of firm and bank clustering.

Second, we run cross-sectional regressions in which the dependent variable is the loan growth rate between 2007Q1 (the year:quarter before the shock to RR) and j quarters ahead, $j=\{1,2,3,4,5\}$, to validate that the negative treatment effect persists across periods shorter than the five-quarter period we consider in the baseline finding. Results in Panel B of Table 11 suggest that this is the case.

[Insert Figure 5 here]

Third, we further inspect the validity of the parallel trend assumption. Figure 5 depicts the time-varying coefficient of the treatment effect (relative to a baseline, fixed at zero, for 2006Q1). Indeed, before 2007Q2, overall exposure to savings and checking deposits does not affect bank credit. After the RR shock, however, the coefficient becomes markedly negative and statistically different from zero, which provides suggestive evidence in favor of the parallel trend assumption being verified.

Fourth, we run a placebo test. That is, we consider a pre-policy sample from 2005Q1 to 2006Q4, and fix exposures and bank controls as of 2005Q4. This is a "fake" exposure, which should not be associated with a contraction in credit, which is confirmed in Panel C of Table 11.[34]

[Insert Table 11 here]

4.4 Heterogenous Effects across Firms

[34] The summary statistics for the placebo test are in Table A2 of the Appendix.

As with carry trade regressions, we sort companies according to proxies of credit risk, liquidity risk, default risk, and opaqueness, and repeat the baseline exercise across such different groups of firms. Table 12 displays the results.

[Insert Table 12 here]

The reduction in credit is not significant among firms with the lowest credit risk (those in the lowest quartile of the ex-ante distribution of average interest payments over loans). On the other hand, it is significant across riskier companies, and the reduction in credit among them increases as their riskiness does. In particular, firms in the upper quartile of credit risk experience a 15.4 p.p credit on loans from banks more RR-exposed by a 1 s.d. increase. Similarly, only companies with above-median liquidity risk suffer credit reduction from more RR-exposed financial institutions. Furthermore, there is not a statistically significant difference between companies with and without ex-ante loan defaults, but stark differences emerge between transparent companies and opaque companies. The former do not suffer any credit reductions due to RR shocks, whereas the latter suffer a 7.8 p.p. credit cut by lenders more exposed to RR by a 1 s.d. increase.

4.6 Banks' Domestic and Foreign Funding: Complements or Substitutes?

We have so far shown that: i) the bank-lending channel of monetary policy rates is strengthened by CC, which affects bank foreign liquidity; ii) the shocks to RR exert a large direct negative effect on bank credit by raising the cost of core domestic liquidity. Both policies therefore contribute to taming credit booms. It remains to be understood whether the foreign and domestic liquidity are complements or substitutes in bank funding structure, i.e. whether banks that use more FX funds also employ larger core deposits to finance their assets, or not.

The scatterplot in Figure 1, which reports bank (time-varying, quarterly) reliance on savings and checking deposits on the x-axis and bank FX funds on the y-axis, indicates that banks that use more FX liquidity rely less on domestic core deposits. In other terms, banks more exposed to RR are *less* exposed to CC, and over the period of analysis the two variables are correlated negatively (by a factor of 37 percent, significant at 1 percent level). A formal way to discern whether RR and the CC operate independently from each other is to directly horse race them in a regression model. In Table 13, we show results from such an exercise (run over the longer period from 2005Q2 to 2008Q2), in which we contemporarily employ the full interaction of the policy rate spread with banks FX funds and the post dummy, as well as the full interaction of the RR-taxed checking and savings deposits with the post dummy.[35] In those regressions, both the decline in carry trade lending due to CC and in credit provided by banks more reliant on RR-taxed liabilities are significant, suggesting the two macroprudential policies operate independently from each other.

[Insert Table 13 here]

Put differently, CC and RR - i.e. macroprudential measures targeting foreign and domestic bank debt, respectively - affect bank credit supply through different channels, as banks more affected by CC are less impacted by RR, and vice versa. Both measures are therefore needed to slow down a boom driven by both foreign and domestic liquidity.

5. Conclusions

We analyze the effects of capital controls and macroprudential policy on credit supply exploiting: (i) the simultaneous introduction of capital controls and an increase of reserve requirements on domestic bank deposits in Colombia during a strong credit boom; and (ii) administrative credit registry and supervisory bank balance sheet data. In brief, we find the following robust results: first, banks use cheaper FX funding from abroad to arbitrage higher local monetary policy rates (which raises the policy rate spread against the U.S.), by carry trading cheap FX funds with expensive local lending, especially to ex-ante riskier, more opaque local firms. Capital controls, by taxing FX debt, reduce the interest rate differential and break the carry trade, enhancing the bank-lending channel of local monetary (interest rate) policy and reducing bank risk-taking. Second, the increase in reserve requirements on domestic deposits directly reduces credit supply during the boom, and more so for riskier firms, rather than (indirectly) enhancing the effects of monetary policy rates on credit supply.

Our main contribution to the literature is to show that both capital controls and (domestic) macroprudential policy tame credit supply booms, including credit supply to ex-ante riskier firms, by targeting different sources of bank debt. Capital controls target foreign bank debt, thereby improving the effectiveness of the bank lending channel of (local) monetary policy -by halting carry trade lending strategies by local banks- and domestic macroprudential policy targets local

[35] Note that columns 1 through 4 in Table 13 correspond to columns 2 through 5 in Table 4 (check the carry trade coefficients). In Table 13, however, we explicitly show the effect of RR-taxed liabilities, before and after 2007q2.

bank debt, directly attenuating credit supply booms. As credit booms stem from *both* foreign *and* local liquidity, and we find that reliance on domestic deposits *versus* foreign (FX) debt are very negatively correlated across banks (so that financial intermediaries more affected by capital controls are less impacted by reserve requirements, and the other way around), our results suggest that a Tinbergen rule with two (macroprudential) instruments is necessary to tackle the two (intermediate) objectives (sources of liquidity).

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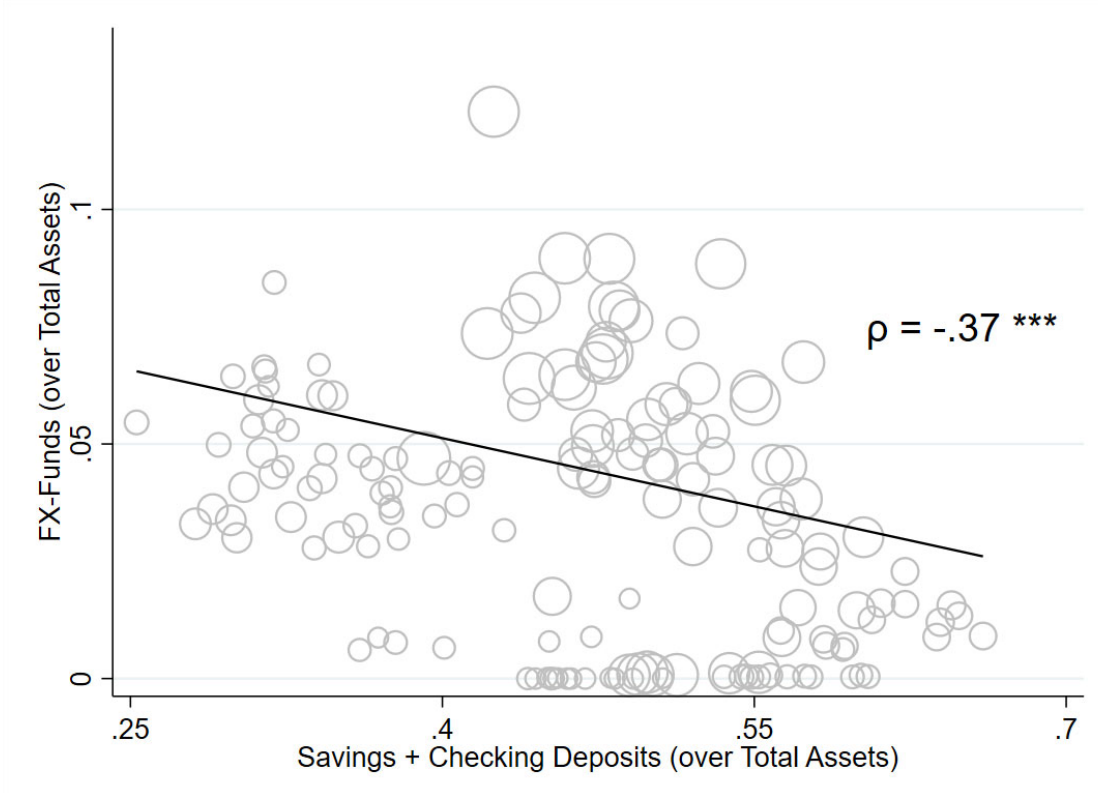
Figures

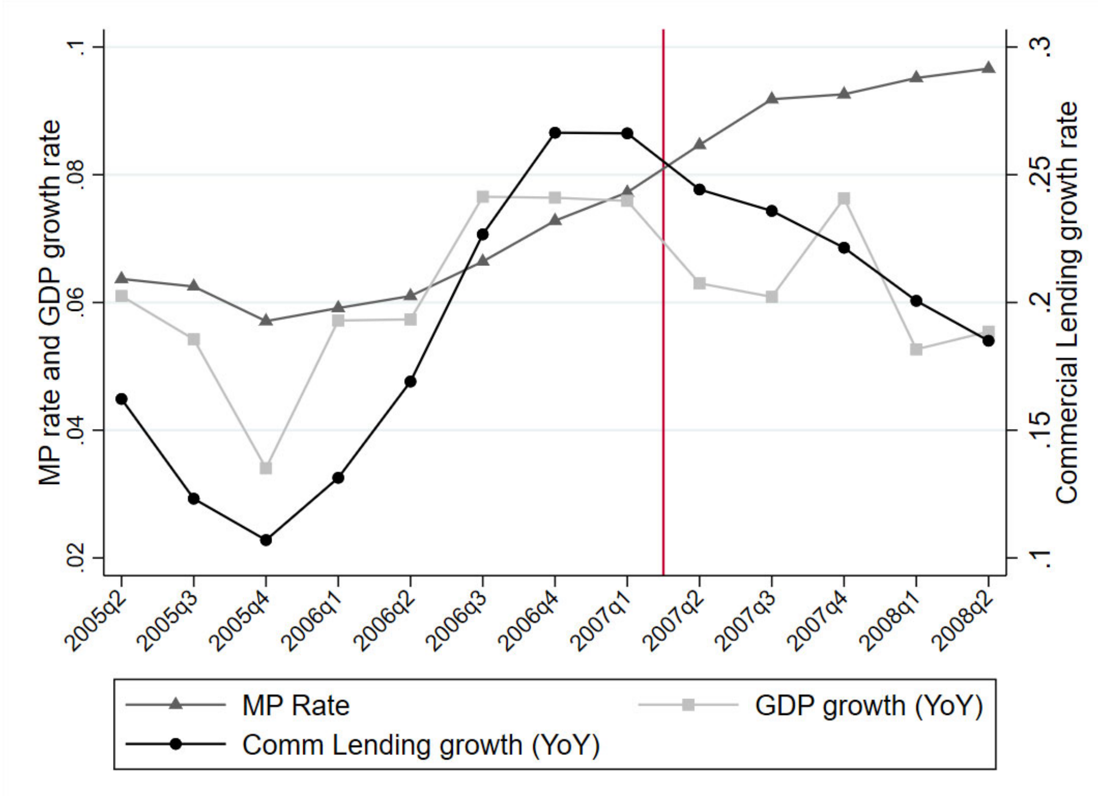
Figure 1: Banks FX-Funds *versus* Savings and Checking Deposits



This chart shows the negative correlation between bank FX-funds (y-axis) and bank Savings and Checking Deposits (x-axis) – affected by Capital Controls and Reserve Requirements, respectively – over the period from 2005Q1 to 2008:Q2. Each marker represents a bank-year:quarter pair and is weighted by the relative size (i.e. total assets) of a bank balance sheet with respect to the overall size of the banking sector in a given year:quarter. The coefficient ρ describes the pairwise correlation among the variables, which is equal to -.37 and statistically significant at 1% level.

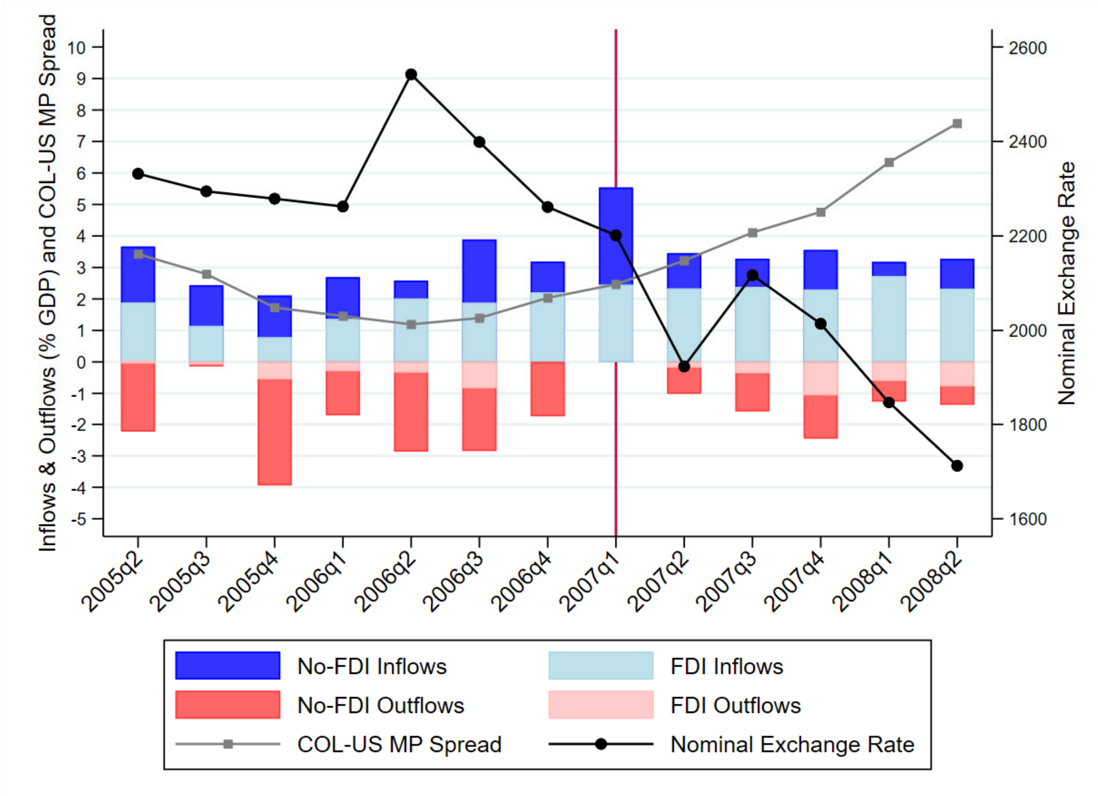
Figure 2: Monetary Policy and Credit Growth

Panel A: Credit Growth, Monetary Policy Rate and Economic Growth



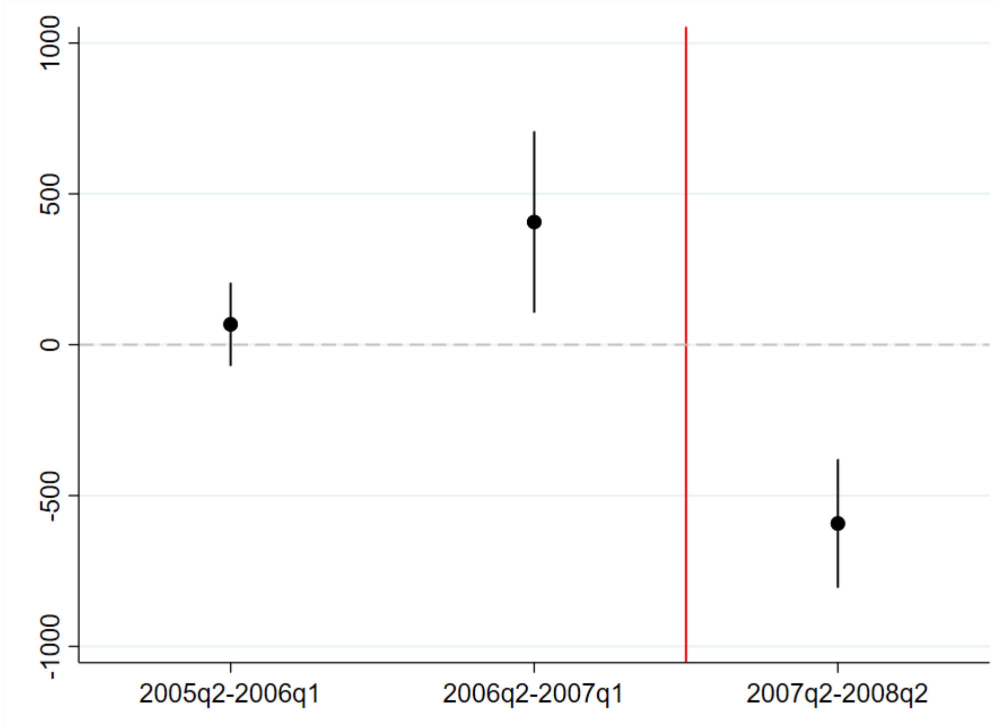
In this figure, the dark gray line – connected by triangles - represents the monetary policy rate (left y-axis), i.e. the prevailing interbank overnight rate. The light gray line – connected by squares - draws the evolution of the yearly growth rate of GDP (left y-axis). The black line – connected by circles - refers to the yearly growth rate of commercial credit (right y-axis). All data are gathered from the Central Bank of Colombia.

Panel B: Exchange Rate, Colombia-US Monetary Policy Rate Spread and Financial Inflows and Outflows



In this figure, the light blue bars represent gross FDI inflows. The dark blue bars denote gross no-FDI inflows, i.e. the sum of gross portfolio inflows and other gross debt inflows. The light red bars represent gross FDI outflows (reported on a negative scale), whereas the dark red bars denote gross no-FDI outflows (also reported on a negative scale). All inflows and outflows measures are expressed as a percentage of GDP on the left y-axis. The gray line - connected by squares - draws the evolution of the spread between the Colombian monetary policy rate, i.e. the prevailing interbank overnight rate, and the Effective FED Funds Rate, expressed in percentage points (left y-axis). The black line – connected by circles - depicts the Colombian Peso/US Dollar nominal exchange rate – i.e. Pesos per 1 US Dollar, so that an increase (decrease) corresponds to a depreciation (appreciation) of the Peso against the US dollar -, measured on the right y-axis. All data are gathered from the Central Bank of Colombia apart from the Effective FED Funds Rate, which are retrieved from FRED.

Figure 3: Monetary Policy Rate and Credit: Carry Trade Mechanism over Time

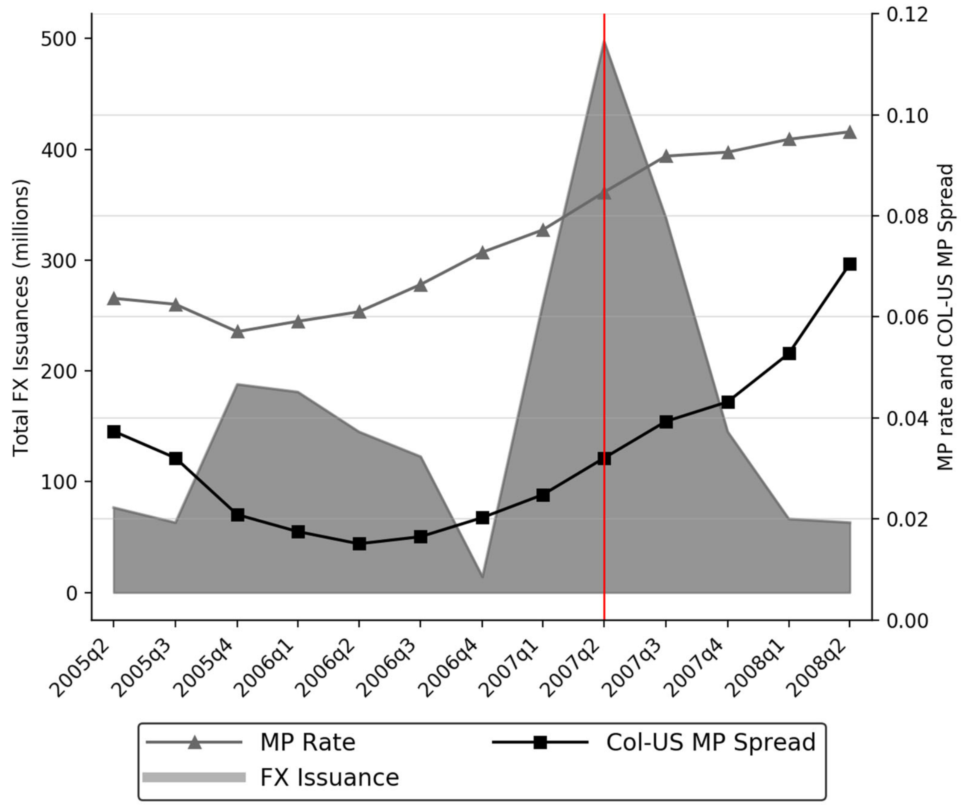


This figure reproduces the time-varying coefficient for the interaction between $MPspread^{US}_{yq-1}$ and $FX\text{-}Funds_{b,yq-1}$ from the following regression:

$$Loan_{f,b,yq}=(\beta_1+\beta_2 Pre_{yq}+\beta_3 Post_{yq})*MPspread^{US}_{yq-1}*FX\text{-}Funds_{b,yq-1}+Controls_{b,yq-1}+\delta_{f,b}+\delta_{f,yq}+\varepsilon_{f,b,yq}$$

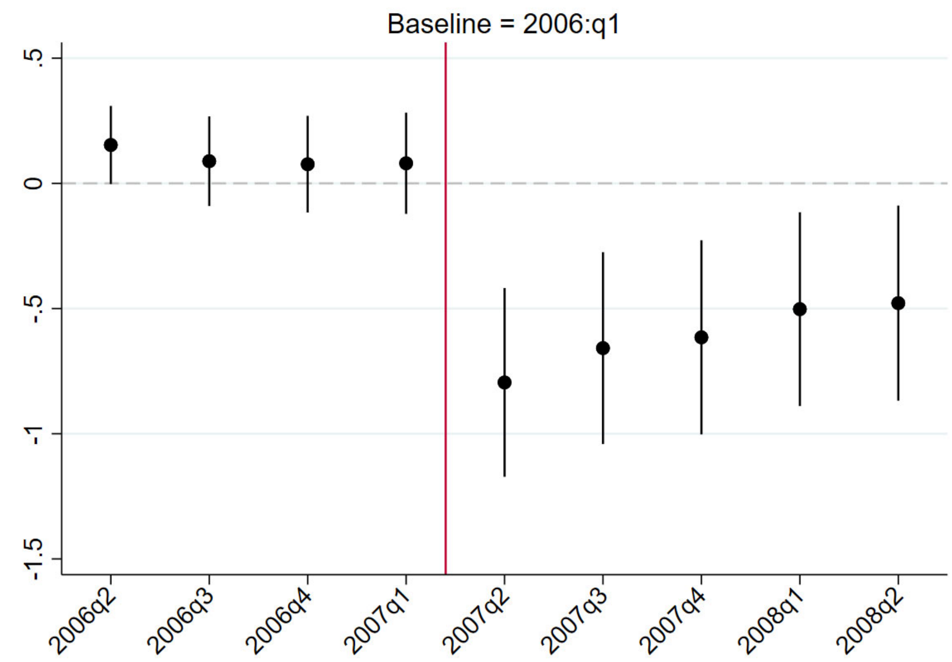
$Loan_{f,b,yq}$ is is the log of total debt provided by bank b to firm f in year:quarter yq. Pre_{yq} is a dummy with value 1 from 2006Q2 onward and with value 0 otherwise. $Post_{yq}$ is a dummy with value 1 from 2007q2 onward and with value 0 otherwise. $Controls_{b,2007Q1}$ is a vector of bank controls (as of 2007Q1) including: ROA, log Total Assets, Common Equity (rescaled by Total Assets), NPL (rescaled by Total Loans) - all being fully interacted with $MPspread^{US}_{yq-1}$ – as well as the full interaction of FX-Funds with the lagged GDP growth rate, CPI index and log exchange rate. $\delta_{f,b}$ is a vector of Firm*Bank fixed effects; $\delta_{f,yq}$ is a vector of Firm*Year:Quarter fixed effects and $\varepsilon_{f,b,yq}$ is an error term. The markers denote the point-estimate of the time-varying coefficients and the lines around them are 95% confidence interval. Standard errors are double-clustered at the firm and bank*industry level.

Figure 4: FX Liabilities, Monetary Policy Rate and Colombia-U.S. Monetary Policy Rate Spread



In this figure, the dark gray area represents the total amount of FX liabilities issued by Colombian banks (left y-axis), measured as the two-quarter moving average of total issuances of bonds and long-term loans (excluding issuances by Colombian banks through foreign subsidiaries). The dark gray line shows the monetary policy rate (right y-axis), i.e. the prevailing interbank overnight rate. The black line represents the evolution of the spread between the Colombian monetary policy rate and the Effective FED Funds Rate (right y-axis). All data are gathered from the Central Bank of Colombia apart from the Effective FED Funds Rate, which is retrieved from FRED.

Figure 5: Reserve Requirements Shock – Time-Varying Coefficient



This figure reproduces the time-varying coefficient for RR-Depo$_{b,2007Q1}$ (given by the sum of checking and savings deposits as of 2007Q1) from the following regression:

$$Loan_{f,b,yq}=\beta_{yq}*(1[year:quarter=yq])*RR\text{-}Depo_{b,2007Q1} + \gamma Post_{yq}*Bank\ Controls_{b,2007Q1} + \delta_{f,b} + \delta_{f,yq} + \varepsilon_{f,b,yq}$$

where: Loan$_{f,b,yq}$ is is the log of total debt provided by bank b to firm f in year:quarter yq; 1[year:quarter=yq] is an indicator function with value 1 in year:quarter yq and 0 in other year:quarters; Bank Controls$_{b,2007Q1}$ is a vector of bank controls (as of 2007Q1) including: ROA, log Total Assets, Common Equity (rescaled by Total Assets), FX-Funds (rescaled by Total Assets), NPL (rescaled by Total Loans); $\delta_{f,b}$ is a vector of Firm*Bank fixed effects; $\delta_{f,yq}$ is a vector of Firm*Year:Quarter fixed effects and $\varepsilon_{f,b,yq}$ is an error term. Bank Controls are interacted with a post dummy, with value 1 (0) from 2007Q2 to 2008Q2 (from 2006Q1 to 2007Q1). The markers denote the point-estimate of the time-varying coefficients - representing the variation of loans relative to 2006Q1 induced by a unitary (100 p.p.) increase of RR-Depo$_{b,2007q1}$ - and the lines around them are 95% confidence interval. For reference, a 1 s.d. change in RR-Depo$_{b,2007q1}$ corresponds to 7.8 p.p.. Standard errors are double-clustered at the firm and bank*industry level.

Tables

Table 1: Summary Statistics

Panel A: Largest Sample for Regressions Exploiting Time Variation

VARIABLES	Definition: Timing	N	Mean	P25	P50	P75	SD
Loan-level Variables							
$Loan_{f,b,yq}$	Log(Loan): current year:quarter	1,475,369	16.843	15.317	17.051	18.507	2.573
$Provision_{f,b,yq-1}$	Loan Losses Provision (over Loan): 1Q-lagged	1,320,710	0.042	0.002	0.008	0.019	0.148
Macro Variables							
i_{yq-1}	Local Policy Rate: 1Q-lagged	1,475,369	0.075	0.062	0.073	0.092	0.014
$\Delta_{1y}GDP_{yq-1}$	1y-Growth of Local Policy Rate: 1Q-lagged	1,475,369	0.062	0.054	0.061	0.076	0.013
e_{yq-1}	Log(Exch. Rate: Pesos per 1 USD) : 1Q-lagged	1,475,369	7.692	7.608	7.724	7.754	0.090
CPI_{yq-1}	CPI (base: 2005Q1): 1Q-lagged	1,475,369	1.077	1.041	1.067	1.117	0.049
$MPspread^{US}_{yq-1}$	Local – US Policy Rate: 1Q-lagged	1,475,369	0.030	0.017	0.028	0.041	0.015
$SOVspread^{US}_{yq-1}$	Local – US (3-m) Sovereign yield: 1Q-lagged	1,475,369	0.036	0.023	0.033	0.047	0.018
CIP_{yq-1}	Deviations from CIP: 1Q-lagged	1,475,369	0.006	0.003	0.007	0.010	0.006
$\Delta_{2q}i_{yq-1}$	2q-Growth of Local Policy Rate: 1Q-lagged	1,475,369	0.005	-0.003	0.007	0.012	0.007
$\Delta_{1y}i_{yq-1}$	1y-Growth of Local Policy Rate: 1Q-lagged	1,475,369	0.008	-0.005	0.016	0.020	0.013
u_{yq-1}	Taylor Residuals (Rule 1) : 1Q-lagged	1,475,369	0.003	-0.002	0.006	0.006	0.006
u^{a}_{yq-1}	Taylor Residuals (Rule 2) : 1Q-lagged	1,475,369	0.002	-0.002	0.003	0.005	0.006
Bank-level Variables							
$FX\text{-}Funds_{b,yq-1}$	FX-Funds (over TA): 1Q-lagged	1,475,369	0.047	0.034	0.047	0.064	0.026
$SavingD_{b,yq-1}$	Savings Deposits (over TA): 1Q-lagged	1,475,369	0.353	0.303	0.348	0.400	0.073
$CheckingD_{b,yq-1}$	Checking Deposits (over TA): 1Q-lagged	1,475,369	0.137	0.108	0.126	0.173	0.045
$Size_{b,yq-1}$	Bank Log(TA): 1Q-lagged	1,475,369	30.301	30.02	30.383	30.704	0.523
$CET_{b,yq-1}$	Common Equity Capital (over TA): 1Q-lagged	1,475,369	0.042	0.032	0.039	0.050	0.013
$NPL_{b,yq-1}$	Non Perf. Loans (over Tot. Loans): 1Q-lagged	1,475,369	0.027	0.020	0.024	0.029	0.010
$ROA_{b,yq-1}$	Return on Assets: 1Q-lagged	1,475,369	0.014	0.008	0.012	0.019	0.007

This table shows summary statistics referred to the sample used in regressions for monetary policy rate which exploit time variation only, over the period 2005Q2 to 2008Q2. All the variables not defined as shares are expressed in (logs of) real Colombian Pesos with base year:quarter 2005Q1. In the definition of the macro variables, the Rule 1 is a Taylor Rule whereby the quarterly local policy rate is regressed against the (lagged) yearly inflation rate and the output gap; in Rule 2, against yearly inflation and log(GDP).

Panel B: Carry Trade Regressions

VARIABLES	Definition: Timing	N	Mean	P25	P50	P75	SD
Loan-level Variables							
$Loan_{f,b,yq}$	Log(Loan): current year:quarter	895,247	17.665	16.434	17.780	19.102	2.309
Macro Variables							
$MPspread^{US}_{yq-1}$	Local – US Policy Rate: 1Q-lagged	895,247	0.031	0.017	0.028	0.041	0.015
i_{yq-1}	Local Policy Rate: 1Q-lagged	895,247	0.075	0.062	0.073	0.092	0.014
$\Delta_{1y}GDP_{yq-1}$	1y-Growth of Local Policy Rate: 1Q-lagged	895,247	0.062	0.054	0.061	0.076	0.013
e_{yq-1}	Log(Exch. Rate: Pesos per 1 USD): 1Q-lagged	895,247	7.690	7.608	7.724	7.754	0.091
CPI_{yq-1}	CPI (base: 2005Q1): 1Q-lagged	895,247	1.078	1.041	1.067	1.117	0.050
VIX_{yq-1}	Log(VIX)$_{yq-1}$: 1Q-lagged	895,247	2.705	2.483	2.640	2.890	0.267
Oil_{yq-1}	Log(Brent Price)$_{yq-1}$: 1Q-lagged	895,247	4.286	4.090	4.246	4.488	0.239
$SOVspread^{US}_{yq-1}$	Local – US (3-month) Sovereign Yield: 1Q-lagged	895,247	0.036	0.023	0.033	0.047	0.018
CIP_{yq-1}	Deviations from CIP: 1Q-lagged	895,247	0.006	0.003	0.007	0.010	0.006
FP_{yq-1}	3-month COP-US$ Forward Premium: 1Q-lagged	895,247	0.030	0.020	0.027	0.040	0.017
Bank-level Variables							
$FX\text{-}Funds_{b,yq-1}$	FX-Funds (over TA): 1Q-lagged	895,247	0.046	0.030	0.047	0.063	0.026
$SavingD_{b,yq-1}$	Saving Deposits (over TA): 1Q-lagged	895,247	0.351	0.299	0.348	0.400	0.077
$CheckingD_{b,yq-1}$	Checking Deposits (over TA): 1Q-lagged	895,247	0.136	0.106	0.125	0.173	0.047
$Size_{b,yq-1}$	Bank Log(TA) : 1q-lagged	895,247	30.262	29.931	30.327	30.640	0.541
$CET_{b,yq-1}$	Common Equity Capital (over TA): 1Q-lagged	895,247	0.043	0.032	0.041	0.052	0.013
$NPL_{b,yq-1}$	Non Perf. Loans (over Tot. Loans): 1Q-lagged	895,247	0.027	0.020	0.024	0.030	0.011
$ROA_{b,yq-1}$	Return on Assets: 1Q-lagged	895,247	0.014	0.008	0.012	0.019	0.007
Firm-level Variables							
Firm $Risk_{f,pre}$	Mean Interest Payments (over Loan): 2005Q1-2007Q1	887,273	0.142	0.110	0.140	0.171	0.047
Short-Term $Debt_{f,pre}$	Mean Share of ST Debt: 2005Q1-2007Q1	887,530	0.341	0.080	0.274	0.548	0.296
$Default_{f,pre}$	At least 1 loan default: 2005Q1-2007Q1	887,874	0.305	0.000	0.000	1.000	0.460
$Supervised_{f,pre}$	Balance Sheet Supervised: 2005Q1- 2007Q1	895,247	0.302	0.000	0.000	1.000	0.459

This table shows summary statistics for the regression sample used for carry trade regressions, over the period 2005Q2 to 2008Q2. All the variables not defined as shares are expressed in (logs of) real Colombian Pesos with base year:quarter 2005Q1. In the definitions of bank variables, TA denotes banks total assets. In the definition of firm-level variables, ST Debt stands for Short-Term Debt, i.e. with maturity no longer than one year. $Default_{f,pre}$ is a 0/1 dummy. A loan default refers to a loan with payments which are at least 90 days past due. $Supervised_{f,pre}$ is a 0/1 dummy, with value 1 if the balance sheet is publicly supervised.

Panel C: Reserve-Requirements Regressions

VARIABLES	Definition: Timing	(1) N	(2) Mean	(3) P25	(4) P50	(5) P75	(6) SD
Loan-level Variables							
$Loan_{f,b,yq}$	Log(Loan): current year:quarter	742,950	17.658	16.437	17.778	19.096	2.314
$Provision_{f,b,yq-1}$	Loan Losses Provision (over Loan): 1Q-lagged	678,483	0.037	0.005	0.009	0.022	0.129
Bank-level Variables							
$RR\text{-}Depo_{b,2007Q1}$	Checking + Saving Dep. (over TA):2007Q1	742,950	0.514	0.483	0.534	0.574	0.078
$SavingD_{b,2007Q1}$	Saving Deposits (over TA): 2007Q1	742,950	0.381	0.309	0.392	0.400	0.071
$CheckingD_{b,2007Q1}$	Checking Deposits (over TA): 2007Q1	742,950	0.133	0.107	0.142	0.173	0.041
$Size_{b,2007Q1}$	Bank Log(TA) – 2007Q1	742,950	30.321	30.067	30.330	30.594	0.512
$CET_{b,2007Q1}$	Common Equity Capital (over TA): 2007Q1	742,950	0.040	0.032	0.034	0.050	0.013
$NPL_{b,2007Q1}$	Non Perf. Loans (over Tot. Loans): 2007Q1	742,950	0.025	0.020	0.023	0.024	0.007
$FX\text{-}Funds_{b,2007Q1}$	FX-Funds (over TA): 2007Q1	742,950	0.052	0.043	0.050	0.067	0.025
$ROA_{b,2007Q1}$	Return on Assets: 2007Q1	742,950	0.006	0.005	0.007	0.007	0.002
Firm-level Variables							
$Firm\ Risk_{f,pre}$	Mean Int. Paym. (over Loan): 2005Q1-2007Q1	734,976	0.142	0.110	0.141	0.173	0.047
$Short\text{-}Term\ Debt_{f,pre}$	Mean Share of ST Debt: 2005Q1-2007Q1	735,233	0.343	0.080	0.277	0.552	0.298
$Default_{f,pre}$	At least 1 loan default: 2005Q1-2007Q1	735,577	0.291	0	0	1	0.454
$Supervised_{f,pre}$	Balance Sheet Supervised: 2005Q1-2007Q1	742,950	0.294	0	0	1	0.455

This table shows summary statistics for the sample used in the regressions on Reserve Requirements policy – computed over the period 2006q1-2008q2. All the variables not defined as shares are expressed in (logs of) real Colombian Pesos with base year:quarter 2005Q1. In the definitions of bank variables, TA denotes banks total assets. In the definition of firm-level variables, ST Debt stands for Short-Term Debt, i.e. with maturity no longer than one year. $Default_{f,pre}$ is a 0/1 dummy: in its definition, a loan default refers to a loan with payments which are at least 90 days past due. $Supervised_{f,pre}$ is a 0/1 dummy, with value 1 if the balance sheet is publicly supervised.

Table 2: Local Monetary Policy Rate and Bank Credit

	(1)	(2)	(3)	(4)	(5)
VARIABLES			$Loan_{f,b,yq}$		
$Post_{yq}*i_{yq-1}$	-3.452***	-5.644***	-5.382***	-6.321***	-3.586***
	(0.552)	(0.757)	(0.751)	(0.663)	(0.813)
i_{yq-1}	2.881***	4.333***	4.519***	4.688***	3.502***
	(0.433)	(0.566)	(0.562)	(0.499)	(0.517)
Observations	1,475,369	1,475,369	1,475,369	1,475,369	1,475,369
R-squared	0.674	0.674	0.678	0.832	0.832
Firm FE	Yes	Yes	Yes	-	-
Macro Control*Post	No	Yes	Yes	Yes	Yes
Post	Yes	Yes	Yes	Yes	Yes
Bank FE	No	No	Yes	-	-
Firm*Bank FE	No	No	No	Yes	Yes
Bank Controls	No	No	No	No	Yes

This table shows the relation between bank credit and the local monetary policy rate. $Loan_{f,b,yq}$ is the log of total debt provided by bank b to firm f in year:quarter yq. i_{yq-1} is the lagged (by one quarter) local monetary policy rate. Macro controls include the lagged values of annual GDP growth, of the CPI index and of the (log) Peso-US$ exchange rate. Bank Controls include lagged (by one quarter): ROA, log Total Assets, Common Equity (rescaled by Total Assets), FX-Funds (rescaled by Total Assets), Savings Deposits (rescaled by Total Assets), Checking Deposits (rescaled by Total Assets). Standard errors are double-clustered at the Bank*Industry and at the Firm level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 3: Local Monetary Policy Rate and Bank Credit – Robustness

Panel A: Alternative Models

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
					$Loan_{f,b,yq}$			
$Post_{yq}*i_{yq-1}$	-10.775***	-3.430**	-2.414***	-8.806***	-3.081**	-3.586*	-3.586***	-3.586*
	(1.499)	(1.414)	(0.692)	(1.280)	(1.225)	(1.973)	(0.798)	(1.731)
i_{yq-1}	8.027***	0.242	3.301***	6.575***	0.505	3.502***	3.502***	3.502**
	(1.495)	(1.391)	(0.452)	(1.266)	(1.199)	(0.745)	(0.815)	(1.437)
Observations	1,362,608	1,203,805	1,475,369	1,362,608	1,203,805	1,475,369	1,475,369	1,475,369
R-squared	0.842	0.853	0.844	0.851	0.861	0.832	0.832	0.832
Loan-Size Weighted	No	No	Yes	Yes	Yes	No	No	No
Macro Control*Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm*Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Provision	No	Yes	No	No	Yes	No	No	No
Firm*Quarter FE	Yes	Yes	No	Yes	Yes	No	No	No

This table shows robustness exercises about the relation between bank credit and the local monetary policy rate. In all columns, the dependent variable is $Loan_{f,b,yq}$, the log of total debt provided by bank b to firm f in year:quarter yq. i_{yq-1} is the lagged (by one quarter) local monetary policy rate. In columns 1 through 2, we augment the baseline model with further controls and/or fixed effects. In columns 3 through 5, the model is estimated weighting variables by log-loan size. In columns 6 through 8, we apply alternative standard errors' clustering strategies. Macro controls include the lagged values of annual GDP growth, of the CPI index and of the (log) Peso-US$ exchange rate. Bank Controls include lagged (by one quarter): ROA, log Total Assets, Common Equity (rescaled by Total Assets), FX-Funds (rescaled by Total Assets), Savings Deposits (rescaled by Total Assets), Checking Deposits (rescaled by Total Assets). Provision is the lagged loan-level provision, rescaled by the loan value. Standard errors are double-clustered at the level of: Bank*Industry and Firm in columns 1 through 5; Bank and Firm in column 6; Bank, Firm and Year:Quarter in column 7; Bank*Industry, Firm and Year:Quarter in column 8. *** p<0.01, ** p<0.05, * p<0.1.

Panel B: Alternative Proxies of Local Monetary Policy Rate and Taylor Residuals

VARIABLES	(1)	(2)	(3)	(4)	(5)
			$Loan_{f,b,yq}$		
$Post_{yq}$*$Proxy_{yq-1}$	-3.224***	-3.438**	-3.514***	-2.869***	-3.957***
	(0.737)	(1.546)	(1.068)	(0.792)	(0.742)
$Proxy_{yq-1}$	2.656***	3.696***	3.139***	2.047***	2.929***
	(0.353)	(0.469)	(0.377)	(0.553)	(0.495)
Observations	1,475,369	1,475,369	1,475,369	1,475,369	1,475,369
R-squared	0.832	0.832	0.832	0.832	0.832
$Proxy_{yq-1}$	$MPspread^{US}_{yq-1}$	$\Delta_{2q}i_{yq-1}$	$\Delta_{4q}i_{yq-1}$	u^1_{yq-1}	u^2_{yq-1}
Macro Controls*Post	Yes	Yes	Yes	Yes	Yes
Firm*Bank FE	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes

This table shows the relation between bank credit and different proxies of local monetary policy rate. In all columns, the dependent variable is $Loan_{f,b,yq}$, the log of total debt provided by bank b to firm f in year:quarter yq. Across different columns, we use alternative proxy of the monetary policy rate. In particular, in column 1, $MPspread^{US}_{yq-1}$ is the lagged spread between Colombian MP rate and the US Effective Federal Funds Rate. In column 2, $\Delta_{2q}i_{yq-1}$ is the lagged 2-quarter (half year) growth of Colombian MP rate. In column 3, $\Delta_{4q}i_{yq-1}$ is the lagged 1-year growth of the Colombian MP rate. In columns 4 and 5, respectively, u^1_{yq-1} and u^2_{yq-1} are Taylor residuals obtained from different policy rules. Macro controls include the lagged values of annual GDP growth, of the CPI index and of the (log) Peso-US$ exchange rate. Bank Controls include lagged (by one quarter): ROA, log Total Assets, Common Equity (rescaled by Total Assets), FX-Funds (rescaled by Total Assets), Savings Deposits (rescaled by Total Assets), Checking Deposits (rescaled by Total Assets). Standard errors are double-clustered at the Bank*Industry and at the Firm level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 4: Local Monetary Policy Rate and Bank Credit – Carry Trade Mechanism: Baseline Results

	(1)	(2)	(3)	(4)	(5)	(6)
			$Loan_{f,b,yq}$			
$MPspread^{US}_{yq-1}$*$FX\text{-}Funds_{b,yq-1}$*$Post_{yq}$		-109.378***	-105.444***	-109.090***	-109.358***	-280.971***
		(36.838)	(36.668)	(33.361)	(37.228)	(59.067)
$MPspread^{US}_{yq-1}$*$FX\text{-}Funds_{b,yq-1}$		55.557***	50.837**	53.148***	81.225***	144.609***
		(21.099)	(21.018)	(17.790)	(21.185)	(28.647)
$FX\text{-}Funds_{b,yq-1}$*$Post_{yq}$		-28.769	-35.367	-41.893	-9.303	19.526
		(32.990)	(32.976)	(30.034)	(35.459)	(36.522)
$FX\text{-}Funds_{b,yq-1}$	-0.950***	-43.477***	-36.322***	-35.900***	-51.056***	-58.943***
	(0.165)	(13.789)	(13.718)	(12.604)	(14.946)	(15.420)
$MPspread^{US}_{yq-1}$*$Post_{yq}$	-1.835*	-21.826***	-	-	-	-
	(1.014)	(2.748)				
$MPspread^{US}_{yq-1}$	2.069***	-0.212	-	-	-	-
	(0.507)	(0.880)				
Observations	895,247	895,247	895,247	895,247	895,247	895,247
R-squared	0.808	0.808	0.808	0.810	0.886	0.886
Firm*Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Macro Controls*Post	Yes	Yes	-	-	-	-
Bank Controls	Yes	-	-	-	-	-
Bank Controls*Post	No	Yes	Yes	Yes	Yes	-
FX-Funds*Macro Controls*Post	No	Yes	Yes	Yes	Yes	Yes
Year:Quarter FE	No	No	Yes	-	-	-
Industry*Year:Quarter FE	No	No	No	Yes	-	-
Firm*Year:Quarter FE	No	No	No	No	Yes	Yes
Bank Controls*$MPspread^{US}_{yq-1}$*Post	No	No	No	No	No	Yes

This table shows how carry trade strategies by local banks impacts the reaction of bank credit to the local monetary policy rate. The dependent variable, $Loan_{f,b,yq}$, is the log of total debt provided by bank b to firm f in year:quarter yq. $MPspread^{US}_{yq-1}$ is the difference between the (lagged) local monetary policy and the US Effective Federal Funds Rate. $FX\text{-}Funds_{b,yq-1}$ represents (lagged) bank FX-Funds (over Total Assets). Macro controls include the lagged values of annual GDP growth, of the CPI index and of the (log) Peso-US$ exchange rate. Bank Controls include lagged (by one quarter): ROA, log Total Assets, Common Equity (rescaled by Total Assets), Savings Deposits (rescaled by Total Assets) and Checking Deposits (rescaled by Total Assets). The sample consists of companies that borrowed from at least two banks. Standard errors are double-clustered at the Bank*Industry and at the Firm level. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Local Monetary Policy Rate and Bank Credit – Carry Trade Mechanism: Robustness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
					$Loan_{f,b,yq}$				
$MPspread^{US}_{yq-1}$*FX-$Funds_{b,yq-1}$*$Post_{yq}$	-288.329***	-231.786***	-244.143***	-414.111***	-328.787***	-297.866***	-280.971**	-280.971**	-280.971**
	(56.723)	(51.920)	(50.517)	(45.070)	(37.933)	(36.776)	(112.997)	(126.842)	(112.734)
$MPspread^{US}_{yq-1}$*FX-$Funds_{b,yq-1}$	156.579***	136.535***	148.287***	157.006***	146.446***	159.482***	144.609**	144.609**	144.609***
	(27.880)	(25.537)	(25.089)	(21.804)	(18.954)	(18.602)	(50.188)	(49.075)	(46.711)
FX-$Funds_{b,yq-1}$*$Post_{yq}$	62.843*	38.665	73.801**	-86.157***	-43.921**	10.150	19.526	19.526	19.526
	(35.608)	(31.420)	(30.929)	(28.092)	(22.269)	(22.102)	(48.747)	(24.538)	(37.841)
FX-$Funds_{b,yq-1}$	-69.324***	-58.978***	-68.475***	-40.601***	-40.857***	-45.649***	-58.943**	-58.943	-58.943
	(15.308)	(13.223)	(13.205)	(9.791)	(8.217)	(8.344)	(26.579)	(34.548)	(37.108)
Observations	791,322	895,247	791,322	1,475,262	1,475,262	1,302,847	895,247	895,247	895,247
R-squared	0.894	0.889	0.898	0.834	0.846	0.857	0.886	0.886	0.886
Loan-Size Weighted	No	Yes	Yes	No	Yes	Yes	No	No	No
Firm*Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FX-Funds*Macro Controls*Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry*Year:Quarter FE	-	-	-	Yes	Yes	Yes	-	-	-
Firm*Year:Quarter FE	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Bank Controls*$MPspread^{US}_{yq-1}$*Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Provision*$MPspread^{US}_{yq-1}$*Post	Yes	No	Yes	No	No	Yes	No	No	No
Companies	Multi-Bank	Multi-Bank	Multi-Bank	All	All	All	Multi-Bank	Multi-Bank	Multi-Bank

This table shows robustness exercises about how carry trade strategies by local banks impacts the reaction of bank credit to the local monetary policy rate. The dependent variable, $Loan_{f,b,yq}$, is the log of total debt provided by bank b to firm f in year:quarter yq. In columns 1 through 3, we augment the baseline model with either further controls and/or fixed effects, under OLS and WLS estimation. In columns 4 through 6, different versions of the model are estimated over a sample of companies consisting also of firms borrowing from bank only, whereas in the other columns Firm*Year:Quarter FE restrict the estimation sample to just those firms with at least two lenders (Multi-Bank firms). In columns 7 through 9, we apply alternative standard errors' clustering strategies. $MPspread^{US}_{yq-1}$ is the difference between the (lagged) local monetary policy and the US Effective Federal Funds Rate. FX-$Funds_{b,yq-1}$ represents (lagged) bank FX-Funds (over Total Assets). Macro controls include the lagged values of annual GDP growth, of the CPI index and of the (log) Peso-US$ exchange rate. Bank Controls include lagged (by one quarter): ROA, log Total Assets, Common Equity (rescaled by Total Assets), Savings Deposits (rescaled by Total Assets) and Checking Deposits (over Total Assets). Provision is the lagged loan-level provision, rescaled by the loan value. Standard errors are double-clustered at the level of: Bank*Industry and Firm in columns 1 through 6; Bank and Firm in column 7; Bank, Firm and Year:Quarter in column 8; Bank*Industry, Firm and Year:Quarter in column 9. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Local Monetary Policy Rate, Global Macroeconomic Factors and Bank Credit

VARIABLES	(1)	(2) Loan$_{f,b,yq}$	(3)
$MPspread^{US}_{yq-1}$*FX-Funds$_{b,yq-1}$*Post$_{yq}$	-280.971***	-347.229***	-339.030**
	(59.067)	(92.252)	(145.969)
$MPspread^{US}_{yq-1}$*FX-Funds$_{b,yq-1}$	144.609***	166.740***	294.263***
	(28.647)	(30.001)	(37.001)
e_{yq-1}* FX-Funds$_{b,yq-1}$*Post$_{yq}$	3.025		
	(2.651)		
e_{yq-1}* FX-Funds$_{b,yq-1}$	-4.190**		
	(1.658)		
VIX_{yq-1}* FX-Funds$_{b,yq-1}$*Post$_{yq}$		5.868	
		(4.661)	
VIX_{yq-1}*FX-Funds$_{b,yq-1}$		-3.476**	
		(1.456)	
Oil_{yq-1}*FX-Funds$_{b,yq-1}$*Post$_{yq}$			-12.577
			(7.905)
Oil_{yq-1}*FX-Funds$_{b,yq-1}$			8.048***
			(1.185)
FX-Funds$_{b,yq-1}$*Post$_{yq}$	19.526	34.926	127.721***
	(36.522)	(21.981)	(49.459)
FX-Funds$_{b,yq-1}$	-58.943***	-91.424***	-157.988***
	(15.420)	(12.862)	(15.510)
Observations	895,247	895,247	895,247
R-squared	0.886	0.886	0.886
Firm*Bank FE	Yes	Yes	Yes
FX-Funds*Macro Controls*Post	Yes	Yes	Yes
Firm*Year:Quarter FE	Yes	Yes	Yes
Bank Controls*$MPspread^{US}_{yq-1}$*Post	Yes	Yes	Yes
H_0: e_{yq-1}*FX-Funds$_{b,yq-1}$+e_{yq-1}*FX-Funds$_{b,yq-1}$*Post$_{yq}$=0	0.58	-	-
H_0: e_{yq-1}*FX-Funds$_{b,yq-1}$=e_{yq-1}*FX-Funds$_{b,yq-1}$*Post$_{yq}$	0.06	-	-
H_0: VIX_{yq-1}*FX-Funds$_{b,yq-1}$+VIX_{yq-1}*FX-Funds$_{b,yq-1}$*Post$_{yq}$=0	-	0.58	-
H_0: VIX_{yq-1}*FX-Funds$_{b,yq-1}$=VIX_{yq-1}*FX-Funds$_{b,yq-1}$*Post$_{yq}$	-	0.08	-
H_0: Oil_{yq-1}*FX-Funds$_{b,yq-1}$+Oil_{yq-1}*FX-Funds$_{b,yq-1}$*Post$_{yq}$=0	-	-	0.56
H_0: Oil_{yq-1}*FX-Funds$_{b,yq-1}$=Oil_{yq-1}*FX-Funds$_{b,yq-1}$*Post$_{yq}$	-	-	0.01

This table shows how bank FX-funding influences bank credit reaction to global macroeconomic and external factors. The dependent variable, Loan$_{f,b,yq}$, is the log of total debt provided by bank b to firm f in year:quarter yq. $MPspread^{US}_{yq-1}$ is the difference between the (lagged) local monetary policy and the FED Effective Funds Rate. e_{yq-1} is the lagged (log) nominal exchange rate, expressed as pesos per 1 USD, so that an increase denotes a depreciation of the Colombian peso against the USD. VIX_{yq-1} is the lagged (log) VIX index, whereas Oil_{yq-1} is the lagged (log) Brent oil price. FX-Funds$_{b,yq-1}$ represents (lagged) bank FX-Funds (over Total Assets). Macro controls include the lagged values of annual GDP growth, of the CPI index and of the (log) Peso-US$ exchange rate. Bank Controls include lagged (by one quarter): ROA, log Total Assets, Common Equity (rescaled by Total Assets), Savings Deposits (rescaled by Total Assets) and Checking Deposits (over Total Assets). The last six rows report the p-values for the tests with null hypothesis specified in the first column. Standard errors are double-clustered at the Bank*Industry and Firm level. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Local Monetary Policy Rate and Bank Credit – Carry Trade Mechanism– *Breakdown by Currency* (smaller sample)

VARIABLES	(1) Peso $Loan_{f,b,yq}$	(2) FX $Loan_{f,b,yq}$	(3) (Peso Loan/ $Loan)_{f,b,yq}$	(4) $Loan_{f,b,yq}$
$MPspread^{US}_{yq-1}$*FX-$Funds_{b,yq-1}$*$Post_{yq}$	-417.566***	230.785	-19.692**	-202.724**
	(113.575)	(427.576)	(8.780)	(96.183)
$MPspread^{US}_{yq-1}$*FX-$Funds_{b,yq-1}$	222.817***	87.433	6.084	169.646***
	(54.926)	(157.764)	(4.440)	(46.026)
FX-$Funds_{b,yq-1}$*$Post_{yq}$	15.964	-430.059	-2.812	96.400^
	(75.847)	(325.617)	(7.105)	(63.617)
FX-$Funds_{b,yq-1}$	-149.157***	14.977	-14.486***	-97.449***
	(30.872)	(119.729)	(2.915)	(26.425)
Observations	315,692	22,686	322,775	322,775
R-squared	0.835	0.891	0.785	0.857
Firm*Bank FE	Yes	Yes	Yes	Yes
FX-Funds*Macro Controls*Post	Yes	Yes	Yes	Yes
Firm*Year:Quarter FE	Yes	Yes	Yes	Yes
Bank Controls*$MPspread^{US}_{yq-1}$*Post	Yes	Yes	Yes	Yes

This table shows how carry trade strategies by local banks impacts the reaction of bank credit to local monetary policy, depending on the currency of denomination of the loans. In column 1, the dependent variable is the log of peso loans provided by bank b to firm f in Year:Quarter yq. Peso $Loan_{f,b,yq}$ is the log of total peso-denominated debt provided by bank b to firm f in year:quarter yq. FX $Loan_{f,b,yq}$ is the log of total FX-denominated debt provided by bank b to firm f in year:quarter yq. (Peso Loan/ $Loan)_{f,b,yq}$ represents the share of peso-denominated debt out of the total debt provided by bank b to firm f in year:quarter yq. $Loan_{f,b,yq}$, is the log of total debt provided by bank b to firm f in year:quarter yq. $MPspread^{US}_{yq-1}$ is the difference between the (lagged) local monetary policy and the FED Effective Funds Rate. FX-$Funds_{b,yq-1}$ represents (lagged) bank FX-Funds (over Total Assets). Macro controls include the lagged values of annual GDP growth, of the CPI index and of the (log) Peso-US$ exchange rate. Bank Controls include lagged (by one quarter): ROA, log Total Assets, Common Equity (rescaled by Total Assets), Savings Deposits (rescaled by Total Assets), Checking Deposits (over Total Assets). Standard errors are double-clustered at the Bank*Industry level and at the Firm level. *** p<0.01, ** p<0.05, * p<0.1.

Table 8: Local Monetary Policy Rate and Bank Credit – Deviations from CIP and Carry Trade Mechanism

VARIABLES	(1)	(2) $Loan_{f,b,yq}$	(3)	(4) Peso $Loan_{f,b,yq}$	(5) FX $Loan_{f,b,yq}$	(6) $(\text{Peso Loan/ Loan})_{f,b,yq}$
$\text{FX-Funds}_{b,yq-1}*\text{SOVspread}^{US}_{yq}*\text{Post}_{yq}$	-184.667***					
	(50.870)					
$\text{FX-Funds}_{b,yq-1}*\text{CIP}_{yq-1}*\text{Post}_{yq}$		-246.815***	-430.574***	-851.442***	-361.149	-69.018***
		(66.541)	(81.650)	(172.725)	(627.477)	(14.050)
$\text{FX-Funds}_{b,yq-1}*\text{FP}_{yq-1}*\text{Post}_{yq}$			-116.129***	-163.204*	489.968^	-8.330
			(44.903)	(88.504)	(331.862)	(6.612)
$\text{FX-Funds}_{b,yq-1}*\text{SOVspread}^{US}_{yq}$	78.632***					
	(21.936)					
$\text{FX-Funds}_{b,yq-1}*\text{CIP}_{yq-1}$		76.099***	132.700***	141.584*	6.630	1.915
		(26.386)	(45.529)	(85.418)	(257.284)	(7.084)
$\text{FX-Funds}_{b,yq-1}*\text{FP}_{yq-1}$			64.305**	94.742*	52.404	2.562
			(25.905)	141.584*	(135.489)	(4.090)
$\text{FX-Funds}_{b,yq-1}*\text{Post}_{yq}$	-48.473	-22.487	87.595**	180.273**	45.107	23.786***
	(46.225)	(57.780)	(39.405)	(79.683)	(295.494)	(6.734)
$\text{FX-Funds}_{b,yq-1}$	-0.741	-10.806	-4.120	-28.259	44.689	-5.787**
	(12.038)	(12.406)	(13.070)	(25.262)	(99.145)	(2.251)
Observations	895,247	895,247	895,247	315,692	22,686	322,775
R-squared	0.886	0.886	0.886	0.835	0.891	0.785
Firm*Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
FX-Funds*Macro Controls*Post	Yes	Yes	Yes	Yes	Yes	Yes
Firm*Year:Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank Controls*Int Rate*Post	Yes	Yes	Yes	Yes	Yes	Yes

This table shows how carry trade strategies by local banks impacts the reaction of bank credit to local monetary policy depending on deviations from CIP. $Loan_{f,b,yq}$ is the log of total debt provided by bank b to firm f in year:quarter yq. $\text{SOVspread}^{US}_{yq-1}$ is the difference between the (lagged) yields on 3-month Colombian and US Sovereign bonds. CIP_{yq-1} is the (lagged) deviation from CIP based on the 3-month yield-differential between Colombian and US Sovereign bonds, computed by Du and Schreger (2016). FP_{yq-1} is the 3-month Peso/US$ forward premium, expressing the difference between the latter two variables, i.e. the 3-month Colombia-US Sovereign yield differential not imputable to deviations from CIP. $\text{FX-Funds}_{b,yq-1}$ represents (lagged) bank FX-Funds (over Total Assets). Macro controls include the lagged values of annual GDP growth, of the CPI index and of the (log) Peso-US$ exchange rate. Bank Controls include lagged (by one quarter): ROA, log Total Assets, Common Equity (rescaled by Total Assets), Savings Deposits (rescaled by Total Assets), Checking Deposits (rescaled by Total Assets). Standard errors are double-clustered at the Bank*Industry and at the Firm level. *** p<0.01, ** p<0.05, * p<0.1, ^ p<0.15.

Table 9: Local Monetary Policy Rate and Bank Credit – Carry Trade Mechanism: Firms Heterogeneity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Firm Risk$_{f,pre}$				Short TermDebt (maturity ≤ 1y)$_{f,pre}$				30-day Past Due$_{f,pre}$		Supervised$_{f,pre}$	
VARIABLES	Q=1	Q=2	Q=3	Q=4	Q=1	Q=2	Q=3	Q=4	No	Yes	Yes	No
MPspread$^{US}_{yq-1}$*FX-Funds$_{b,yq-1}$*Post$_{yq}$	-94.897	-189.267*	-375.565***	-577.257***	-39.874	-430.129***	-257.162**	-342.661***	-233.226***	-374.137***	-175.004	-337.660***
	(126.913)	(98.445)	(108.555)	(122.708)	(117.157)	(111.560)	(103.053)	(119.001)	(70.705)	(97.968)	(108.069)	(67.337)
MPspread$^{US}_{yq-1}$*FX-Funds$_{b,yq-}$	-31.842	152.189***	322.070***	279.582***	-14.109	168.322***	154.613***	240.740***	111.753***	194.653***	194.357***	124.372***
	(56.991)	(48.387)	(53.652)	(67.529)	(56.007)	(52.554)	(50.298)	(60.923)	(35.249)	(46.441)	(52.406)	(32.643)
FX-Funds$_{b,yq-1}$*Post$_{yq}$	-107.802	31.230	145.325**	37.102	51.154	-3.949	53.506	-16.872	17.720	20.539	138.991*	-36.626
	(76.460)	(64.840)	(71.109)	(86.591)	(76.382)	(67.801)	(67.132)	(79.625)	(45.564)	(63.616)	(73.828)	(40.956)
FX-Funds$_{b,yq-1}$	-20.129	-77.012***	-99.150***	-68.918	6.903	-91.306***	-67.837**	-67.443**	-67.479***	-42.008*	-126.701***	-27.548
	(31.973)	(26.460)	(30.018)	(43.452)	(30.011)	(28.247)	(28.826)	(34.031)	(19.552)	(24.355)	(29.847)	(17.506)
Observations	228,530	254,094	224,103	180,546	192,636	226,841	241,978	225,818	617,034	270,840	270,253	624,994
R-squared	0.884	0.863	0.859	0.886	0.914	0.876	0.873	0.876	0.881	0.894	0.862	0.887
Firm*Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FX-Funds*Macro Controls*Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm*Year:Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Controls*Int Rate*Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table shows how carry trade strategies by local banks impact the reaction of bank credit to local monetary policy, across different groups of companies. In columns 1 through 4, companies are sorted according to the distribution of the average interest payments over total assets paid between 2005Q1 and 2007Q1. In columns 5 through 8, companies are sorted according to the distribution of the average share of bank debt with maturity no longer than one year borrowed between 2005Q1 and 2007Q1. In columns 1 through 8, Q=j denotes that a company falls in the j-th quartile of the relevant distribution, j={1,2,3,4}. In columns 9 through 10, companies are divided depending on whether they are 90 days past due with respect to at least one bank loan between 2005Q1 and 2007Q1. Finally, in columns 11 and 12, companies are sorted according to whether their balance sheet is publicly supervised at least once between 2005Q1 and 2008Q2. Loan$_{f,b,yq}$ is the log of total debt provided by bank b to firm f in year:quarter yq. MPspread$^{US}_{yq-1}$ is the difference between the (lagged) local monetary policy and the FED Effective Funds Rate. FX-Funds$_{b,yq-1}$ represents (lagged) bank FX-Funds (over Total Assets). Macro controls include the lagged values of annual GDP growth, of the CPI index and of the (log) Peso-US$ exchange rate. Bank Controls include lagged (by one quarter): ROA, log Total Assets, Common Equity (rescaled by Total Assets), Savings Deposits (rescaled by Total Assets), Checking Deposits (rescaled by Total Assets). Standard errors are double-clustered at the Bank*Industry and at the Firm level. *** p<0.01, ** p<0.05, * p<0.1.

Table 10: Reserve Requirement Shock and Bank Credit

	(1)	(2)	(3)	(4)	(5)	(6)
			$Loan_{f,b,yq}$			
$RR\text{-}Depo_{b,2007Q1}$	0.817***	-	-	-	-	
	(0.295)					
$Post_{yq}$	-2.366***	-0.455	-	-	-	
	(0.577)	(0.528)				
$Post_{yq}$*$RR\text{-}Depo_{b,2007Q1}$	-1.542***	-0.994***	-1.017***	-1.048***	-0.697***	
	(0.196)	(0.181)	(0.181)	(0.160)	(0.178)	
$Post_{yq}$*$SavingD_{b,2007Q1}$						-0.419**
						(0.179)
$Post_{yq}$*$CheckingD_{b,2007Q1}$						-1.845***
						(0.281)
Observations	742,950	742,950	742,950	742,950	742,950	742,950
R-squared	0.536	0.829	0.829	0.830	0.897	0.897
Bank Controls*Post	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	-	-	-	-	-
Firm*Bank FE	No	Yes	Yes	Yes	Yes	Yes
Year:Quarter	No	No	Yes	-	-	-
Industry*Year:Quarter	No	No	No	Yes	-	-
Firm*Year:Quarter	No	No	No	No	Yes	Yes

This table shows the evolution of bank credit in reaction to the Reserve Requirement (RR) shock. The dependent variable is $Loan_{f,b,yq}$, i.e. the log of total debt provided by bank b to firm f in year:quarter yq. RR-Depo is the sum of savings ($SavingD_{b,2007Q1}$) and checking ($CheckingD_{b,2007Q1}$) deposits, both rescaled by total assets, as of 2007Q1. In Panel B, in all columns we include only firms that borrowed from at least two banks. Bank Controls is a vector of bank controls (as of 2007Q1) including: ROA, log Total Assets, Common Equity (rescaled by Total Assets), FX-Funds (rescaled by Total Assets), NPL (rescaled by Total Loans). The $Post_{yq}$ dummy has value 1 from 2007Q2 onward and value 0 before. Standard errors are double-clustered at the Bank*Industry and at the Firm level. *** p<0.01, ** p<0.05, * p<0.1.

Table 11: Reserve Requirement Shock and Bank Credit: Robustness

Panel A: Alternative Models

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
					$Loan_{f,b,yq}$				
$Post_{yq}$*RR-$Depo_{b,2007Q1}$	-0.675***	-0.647***	-0.612***	-0.844***	-0.871***	-0.994***	-0.697^	-0.697*	-0.697**
	(0.183)	(0.159)	(0.166)	(0.134)	(0.116)	(0.119)	(0.414)	(0.367)	(0.221)
Observations	640,136	742,950	640,136	1,219,366	1,219,366	1,049,099	742,950	742,950	742,950
R-squared	0.908	0.900	0.911	0.851	0.862	0.877	0.897	0.897	0.897
Loan-Size Weighted	No	Yes	Yes	No	Yes	Yes	No	No	No
Firm*Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FX-Funds*Macro Controls*Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry*Year:Quarter FE	-	-	-	Yes	Yes	Yes	-	-	-
Firm*Year:Quarter FE	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Bank Controls*Int Rate*Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Provision*MP-spread*Post	Yes	No	Yes	No	No	Yes	No	No	No

This table shows robustness exercises about the reaction of bank credit to the Reserve Requirement (RR) shock. In columns 1 through 3, we augment the baseline model with either further controls and/or fixed effects, under OLS and WLS estimation. In columns 4 through 6, different versions of the model are estimated over a sample of companies consisting of also firms borrowing from bank only, whereas in the other columns Firm*Year:Quarter FE restrict the estimation sample to just those firms with at least two lenders (Multi-Bank firms). In columns 7 through 9, we apply alternative standard errors' clustering strategies. The dependent variable, $Loan_{f,b,yq}$, is the log of total debt provided by bank b to firm f in year:quarter yq. RR-Depo is the sum of savings ($SavingD_{b,2007Q1}$) and checking ($CheckingD_{b,2007Q1}$) deposits, both rescaled by total assets, as of 2007Q1. In Panel B, in all columns we include only firms borrowing from at least two banks. Bank Controls is a vector of bank controls (as of 2007Q1) including: ROA, log Total Assets, Common Equity (rescaled by Total Assets), FX-Funds (rescaled by Total Assets), NPL (rescaled by Total Loans). The $Post_{yq}$ dummy has value 1 from 2007Q2 onward and value 0 before. Provision is the lagged loan-level provision, rescaled by the loan value. Standard errors are double-clustered at the level of: Bank*Industry and Firm in columns 1 through 6; Bank and Firm in column 7; Bank, Firm and Year:Quarter in column 8; Bank*Industry, Firm and Year:Quarter in column 9. *** p<0.01, ** p<0.05, * p<0.1, ^ p<0.12.

Panel B: Cross-Sectional Regressions

VARIABLES	(1) $\Delta_1 Loan_{fb,2007Q2}$	(2)	(3) $\Delta_2 Loan_{fb,2007Q3}$	(4)	(5) $\Delta_3 Loan_{fb,2007Q4}$	(6)	(7) $\Delta_4 Loan_{fb,2008Q1}$	(8)	(9) $\Delta_5 Loan_{fb,2008Q2}$	(10)
$RR\text{-}Depo_{b,2007Q1}$	-0.285**		-0.673***		-1.042***		-0.778***		-0.842***	
	(0.134)		(0.169)		(0.207)		(0.219)		(0.242)	
$SavingD_{b,2007Q1}$		-0.181		-0.548***		-0.870***		-0.458**		-0.498**
		(0.133)		(0.169)		(0.209)		(0.222)		(0.246)
$CheckingD_{b,2007Q1}$		-0.738***		-1.222***		-1.794***		-2.158***		-2.302***
		(0.214)		(0.274)		(0.326)		(0.347)		(0.367)
Observations	66,758	66,758	63,993	63,993	60,865	60,865	58,921	58,921	57,199	57,199
R-squared	0.378	0.378	0.393	0.394	0.405	0.405	0.414	0.414	0.425	0.426
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table shows the evolution of bank credit in reaction to the Reserve Requirement (RR) shock. We perform cross-sectional regressions. The dependent variable is the difference between $Loan_{f,b,2007Q1+j}$ and $Loan_{f,b,2007Q1}$, signaled by the operator Δ_j, j={1,2,3,4,5}. Note that the starting year:quarter is always 2007Q1, the year:quarter before the RR-Shock. RR-Depo is the sum of savings ($SavingD_{b,2007Q1}$) and checking ($CheckingD_{b,2007Q1}$) deposits, both over total assets, as of 2007Q1. In Panel B, in all columns we include only firms borrowing from at least two banks. Bank Controls is a vector of bank controls (as of 2007Q1) including: ROA, log Total Assets, Common Equity (rescaled by Total Assets), FX-Funds (rescaled by Total Assets), NPL (rescaled by Total Loans). The $Post_{yq}$ dummy has value 1 from 2007Q2 onward and value 0 before. Standard errors are double-clustered at the Bank*Industry and at the Firm level. *** p<0.01, ** p<0.05, * p<0.1.

Panel C: Placebo test

VARIABLES	(1)	(2)
	$Loan_{f,b,yq}$	
Post(Fake)$_{yq}$*RR-Depo$_{b,2005Q4}$	0.368	
	(0.256)	
Post(Fake)$_{yq}$ *SavingD$_{b,2005Q4}$		0.800***
		(0.299)
Post(Fake)$_{yq}$ *CheckingD$_{b,2005Q4}$		0.313
		(0.255)
Observations	486,201	486,201
R-squared	0.903	0.903
Bank Controls*Post	Yes	Yes
Firm*Bank FE	Yes	Yes
Firm*Year:Quarter	Yes	Yes

This table performs a placebo test. The sample goes from 2005Q1 to 2006Q4. The dependent variable is $Loan_{f,b,yq}$, i.e. the log of total debt provided by bank b to firm f in year:quarter yq. Banks variables are measured at 2005Q4, a year:quarter with no RR-intervention. RR-Depo is the sum of savings ($SavingD_{b,2005Q4}$) and checking ($CheckingD_{b,2005Q4}$) deposits, both over total assets, as of 2005Q4. Bank Controls is a vector of bank controls (as of 2005Q4) including: ROA, log Total Assets, Common Equity and FX-Funds (both rescaled by Total Assets), NPL (rescaled by Total Loans). The Post(Fake)$_{yq}$ dummy has value 1 from 2006Q1 onward and 0 before. Standard errors are double-clustered at the Bank*Industry and at the Firm level. *** p<0.01, ** p<0.05, * p<0.1.

Table 12: Reserve Requirement Shock and Bank Credit – Firms Heterogeneity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Dependent Variable: $Loan_{f,b,yq}$											
	Firm $Risk_{f,pre}$				Short-Term Debt (maturity ≤ 1y)$_{f,pre}$				30-day Past $Due_{f,pre}$		$Supervised_f$	
	Q=1	Q=2	Q=3	Q=4	Q=1	Q=2	Q=3	Q=4	No	Yes	Yes	No
$Post_{yq}$*RR-$Depo_{b,2007Q1}$	0.290	-0.667**	-1.169***	-1.978***	-0.517	-0.375	-1.083***	-0.770**	-0.680***	-0.724**	-0.066	-0.994***
	(0.378)	(0.298)	(0.362)	(0.411)	(0.414)	(0.343)	(0.326)	(0.341)	(0.216)	(0.313)	(0.327)	(0.217)
Observations	190,069	211,012	184,976	148,919	160,095	190,709	198,522	185,650	521,480	214,097	218,269	524,681
R-squared	0.894	0.880	0.873	0.894	0.921	0.890	0.885	0.888	0.892	0.906	0.877	0.897
Bank Controls*Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm*Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm*Year:Quarter	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table evaluates the effects of the Reserve Requirement on shock on bank credit, across different groups of companies In columns 1 through 4, companies are sorted according to the distribution of the average interest payments over total assets paid between 2005Q1 and 2007Q1. In columns 5 through 8, companies are sorted according to the distribution of the average share of bank debt with maturity no longer than one year borrowed between 2005Q1 and 2007Q1. In columns 1 through 8, Q=j denotes that a company falls in the j-th quartile of the relevant distribution, j={1,2,3,4}. In columns 9 through 10, companies are divided depending on whether they are 90 days past due for at least one bank loan between 2005Q1 and 2007Q1. Finally, in columns 11 and 12, companies are sorted according to whether their balance sheet is publicly supervised at least once between 2005Q1 and 2008Q2. $Loan_{f,b,yq}$ is the log of total debt provided by bank b to firm f in year:quarter yq. RR-Depo is the sum of savings ($SavingD_{b,2007Q1}$) and checking ($CheckingD_{b,2007Q1}$) deposits, both over total assets, as of 2007Q1. In Panel B, in all columns we include only firms that borrowed from at least two banks. Bank Controls is a vector of bank controls (as of 2007Q1) including: ROA, log Total Assets, Common Equity (rescaled by Total Assets), FX-Funds (rescaled by Total Assets), NPL (rescaled by Total Loans). The $Post_{yq}$ dummy has value 1 from 2007Q2 onward and value 0 before. In all columns, the regressions include companies that borrowed from at least two banks. Standard errors are double-clustered at the Bank*Industry and at the Firm level. *** p<0.01, ** p<0.05, * p<0.1.

Table 13: Capital Controls, Domestic Macroprudential Policy and the Bank Lending Channel of Monetary Policy

	(1)	(2)	(3)	(4)
		$Loan_{f,b,yq}$		
$MPspread^{US}_{yq-1}$*FX-$Funds_{b,yq-1}$*$Post_{yq}$	-109.378***	-105.444***	-109.090***	-109.358***
	(36.838)	(36.668)	(33.361)	(37.228)
$MPspread^{US}_{yq-1}$*FX-$Funds_{b,yq-1}$	55.557***	50.837**	53.148***	81.225***
	(21.099)	(21.018)	(17.790)	(21.185)
FX-$Funds_{b,yq-1}$*$Post_{yq}$	-28.769	-35.367	-41.893	-9.303
	(32.990)	(32.976)	(30.034)	(35.459)
FX-$Funds_{b,yq-1}$	-43.477***	-36.322***	-35.900***	-51.056***
	(13.789)	(13.718)	(12.604)	(14.946)
$CheckingD_{b,yq-1}$*$Post_{yq}$	-0.417***	-0.411***	-0.425***	-0.367**
	(0.142)	(0.143)	(0.143)	(0.158)
$CheckingD_{b,yq-1}$	0.003	-0.136	-0.133	-0.055
	(0.107)	(0.120)	(0.103)	(0.123)
$SavingD_{b,yq-1}$*$Post_{yq}$	-0.705***	-0.696***	-0.715***	-0.679***
	(0.110)	(0.113)	(0.098)	(0.108)
$SavingD_{b,yq-1}$	-0.066	-0.069	-0.075	-0.064
	(0.111)	(0.119)	(0.107)	(0.121)
Observations	895,247	895,247	895,247	895,247
R-squared	0.808	0.808	0.810	0.886
Firm*Bank FE	Yes	Yes	Yes	Yes
Macro Controls*Post	Yes	-	-	-
Bank Controls	-	-	-	-
Bank Controls*Post	Yes	Yes	Yes	Yes
FX-Funds*Macro Controls*Post	Yes	Yes	Yes	Yes
Year:Quarter FE	No	Yes	-	-
Industry*Year:Quarter FE	No	No	Yes	-
Firm*Year:Quarter FE	No	No	No	Yes

This table shows the impact of capital controls and reserve requirements on bank credit. The dependent variable, $Loan_{f,b,yq}$, is the log of total debt provided by bank b to firm f in year:quarter yq. $MPspread^{US}_{yq-1}$ is the difference between the (lagged) local monetary policy and the FED Effective Funds Rate. FX-$Funds_{b,yq-1}$ represents (lagged) bank FX-Funds (over Total Assets). $SavingD_{b,yq-1}$ denotes (lagged) bank savings deposits (over total assets). $CheckingD_{b,yq-1}$ denotes (lagged) bank checking deposits (over total assets). Macro controls include the lagged values of annual GDP growth, of the CPI index and of the (log) Peso-US$ exchange rate. Bank Controls include lagged (by one quarter): ROA, log Total Assets, Common Equity (rescaled by Total Assets). The sample consists only of companies that borrowed from at least two banks. Standard errors are double-clustered at the Bank*Industry and at the Firm level. *** p<0.01, ** p<0.05, * p<0.1.

Appendix

Table A1: Summary Statistics for Carry Trade Regressions (Smaller Sample with Currency Breakdown of Loan Volume)

VARIABLES	Definition: timing	(1) N	(2) Mean	(3) P25	(4) P50	(5) P75	(6) SD
Loan-level Variables							
Peso Loan$_{f,b,yq}$	Log(Peso Loan): current year:quarter	315,692	18.347	17.176	18.602	19.890	2.544
FX Loan$_{f,b,yq}$	Log(FX Loan): current year:quarter	22,686	19.525	18.570	19.797	21.002	2.359
(Peso Loan/ Loan)$_{f,b,yq}$	Peso Loan / Total Loan: current year:quarter	322,775	0.941	1.000	1.000	1.000	0.210
Bank-level variables							
FX-Funds$_{b,yq-1}$	FX-Funds (over TA): 1Q-lagged	322,775	0.046	0.030	0.046	0.062	0.025
SavingD$_{b,yq-1}$	Savings Deposits (over TA): 1Q-lagged	322,775	0.346	0.287	0.341	0.400	0.079
CheckingD$_{b,yq-1}$	Checking Deposits (over TA): 1Q-lagged	322,775	0.135	0.105	0.123	0.173	0.047
Size$_{b,yq-1}$	Bank Log(TA) : 1Q-lagged	322,775	16.399	16.052	16.425	16.798	0.549
CET$_{b,yq-1}$	Common Equity Capital (over TA): 1Q-lagged	322,775	0.043	0.032	0.042	0.052	0.013
NPL$_{b,yq-1}$	Non Perf. Loans (over Tot. Loans): 1Q-lagged	322,775	0.027	0.020	0.024	0.029	0.010
ROA$_{b,yq-1}$	Return on Assets: 1Q-lagged	322,775	0.014	0.008	0.012	0.018	0.007

Table A2: Summary Statistics for Reserve-Requirements Policy Regressions (Placebo Sample in *Table 10*)

VARIABLES	Definition: timing	(1) N	(2) Mean	(3) P25	(4) P50	(5) P75	(6) SD
Loan-level Variables							
$Loan_{f,b,yq}$	Log(Loan): current year:quarter	486,201	17.638	16.386	17.745	19.088	7.846
Bank-level variables							
$RR\text{-}Depo_{b,2005Q4}$	Checking + Savings Dep. (over TA): 2005Q4	486,201	0.491	0.459	0.520	0.530	0.079
$SavingD_{b,2005Q4}$	Savings Deposits (over TA): 2005Q4	486,201	0.332	0.273	0.346	0.373	0.070
$CheckingD_{b,2005Q4}$	Checking Deposits (over TA): 2005Q4	486,201	0.159	0.128	0.145	0.226	0.058
$Size_{b,2005Q4}$	Bank Log(TA) – 2005Q4	486,201	16.339	16.092	16.375	16.598	0.523
$CET_{b,2005Q4}$	Common Equity Capital (over TA): 2005Q4	486,201	0.040	0.030	0.034	0.050	0.013
$NPL_{b,2005Q4}$	Non Perf. Loans (over Tot. Loans): 2005Q4	486,201	0.024	0.020	0.020	0.022	0.009
$FX\text{-}Funds_{b,2005Q4}$	FX-Funds (over TA): 2005Q4	486,201	0.045	0.028	0.038	0.059	0.029
$ROA_{b,2005Q4}$	Return on Assets: 2005Q4	486,201	0.024	0.016	0.028	0.031	0.007

Table A3: Local Monetary Policy, Foreign *vs* Domestic Bank Funding and Credit

	(1)
	$Loan_{f,b,yq}$
$MPspread^{US}_{yq-1}$*$FX\text{-}Funds_{b,yq-1}$*$Post_{yq}$	-280.971***
	(59.067)
$MPspread^{US}_{yq-1}$*$FX\text{-}Funds_{b,yq-1}$	144.609***
	(28.647)
$MPspread^{US}_{yq-1}$*$SavingD_{b,yq-1}$*$Post_{yq}$	-11.210
	(10.749)
$MPspread^{US}_{yq-1}$*$SavingD_{b,yq-1}$	-7.413
	(7.117)
$MPspread^{US}_{yq-1}$*$CheckingD_{b,yq-1}$*$Post_{yq}$	-13.325
	(9.307)
$MPspread^{US}_{yq-1}$*$CheckingD_{b,yq-1}$	8.429
	(14.103)
R-squared	0.886
Firm*Bank FE	Yes
FX-Funds*Macro Controls*Post	Yes
Firm*Year:Quarter FE	Yes
Bank Controls*$MPspread^{US}_{yq-1}$*Post	Yes
Bank Controls*i_{yq-1}*Post	No

This table shows the impact of the monetary policy rate spread on bank credit, conditional on different bank funding structures. (Note: this table reproduces column 6 of Table 4, displaying additional coefficients). The dependent variable, $Loan_{f,b,yq}$, is the log of total debt provided by bank b to firm f in year:quarter yq. $MPspread^{US}_{yq-1}$ is the difference between the (lagged) local monetary policy and the FED Effective Funds Rate. $FX\text{-}Funds_{b,yq-1}$ represents (lagged) bank FX-Funds (over Total Assets). $SavingD_{b,yq-1}$ denotes (lagged) bank savings deposits (over total assets). $CheckingD_{b,yq-1}$ denotes (lagged) bank checking deposits (over total assets). Macro controls include the lagged values of annual GDP growth, of the CPI index and of the (log) Peso-US$ exchange rate. Bank Controls include lagged (by one quarter): ROA, log Total Assets, Common Equity (rescaled by Total Assets). The sample includes only those companies that borrowed from at least two banks. Standard errors are double-clustered at the Bank*Industry and at the Firm level. *** p<0.01, ** p<0.05, * p<0.1.

Table A4: Using the Monetary Policy Rate instead of the Colombia-U.S. Policy Rate Spread

	(1)	(2)	(3)	(4)	(5)	(6)
			$Loan_{f,b,yq}$			
i_{yq-1}*FX-$Funds_{b,yq-1}$*$Post_{yq}$		-81.450**	-73.523**	-77.064**	-83.296**	-126.016***
		(35.405)	(35.386)	(31.494)	(35.624)	(48.314)
i_{yq-1}*FX-$Funds_{b,yq-1}$		39.253	31.008	33.505	61.832**	68.681**
		(25.366)	(25.343)	(21.475)	(25.547)	(33.358)
FX-$Funds_{b,yq-1}$*$Post_{yq}$		-7.997	-12.628	-18.946	-20.728	-5.914
		(24.695)	(24.460)	(21.806)	(24.511)	(25.108)
FX-$Funds_{b,yq-1}$	-0.952***	-19.159*	-13.521	-12.200	-16.207	-19.789*
	(0.165)	(11.208)	(11.092)	(10.251)	(11.876)	(12.000)
Observations	895,247	895,247	895,247	895,247	895,247	895,247
R-squared	0.808	0.808	0.808	0.810	0.886	0.886
Firm*Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Macro Controls*Post	Yes	Yes	-	-	-	-
Bank Controls	Yes	-	-	-	-	-
Bank Controls*Post	No	Yes	Yes	Yes	Yes	-
FX-Funds*Macro Controls*Post	No	Yes	Yes	Yes	Yes	Yes
Year:Quarter FE	No	No	Yes	-	-	-
Industry*Year:Quarter FE	No	No	No	Yes	-	-
Firm*Year:Quarter FE	No	No	No	No	Yes	Yes
Bank Controls*i_{yq-1}*Post	No	No	No	No	No	Yes

This table shows how carry trade strategies by local banks impacts the reaction of bank credit to local monetary policy rate. The dependent variable, $Loan_{f,b,yq}$, is the log of total debt provided by bank b to firm f in year:quarter yq. i_{yq-1} is the lagged (by one quarter) local monetary policy rate. FX-$Funds_{b,yq-1}$ represents (lagged) bank FX-Funds (over Total Assets). Macro controls include the lagged values of annual GDP growth, of the CPI index and of the (log) Peso-US$ exchange rate. Bank Controls include lagged (by one quarter): ROA, log Total Assets, Common Equity (rescaled by Total Assets), Savings Deposits (rescaled by Total Assets) and Checking Deposits (over Total Assets). The sample includes only those companies that borrowed from at least two banks. Standard errors are double-clustered at the Bank*Industry and at the Firm level. *** p<0.01, ** p<0.05, * p<0.1.