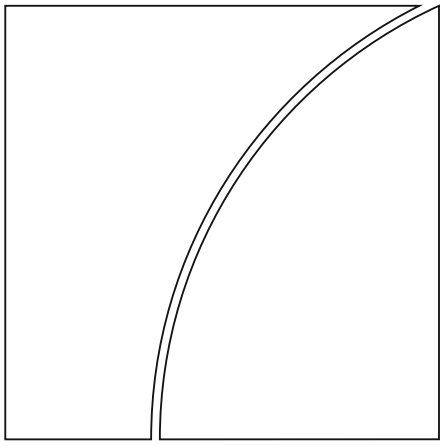

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How capital inflows translate into new bank lending: tracing the mechanism in Latin America

by Carlos Cantú, Catherine Casanova, Rodrigo Alfaro, Fernando Chertman, Gerald Cisneros, Toni dos Santos, Roberto Lobato, Calixto Lopez, Facundo Luna, David Moreno, Miguel Sarmiento and Rafael Nivin

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JEL classification: E0, F0, F1.

Keywords: credit registry data, international capital flows, bank lending, SME financing.

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How capital inflows translate into new bank lending: tracing the mechanism in Latin America

Carlos Cantú (Bank for International Settlements), Catherine Casanova (Swiss National Bank), Rodrigo Alfaro (Central Bank of Chile), Fernando Chertman (Central Bank of Brazil), Gerald Cisneros (Central Reserve Bank of Peru), Toni dos Santos (Central Bank of Brazil), Roberto Lobato (Bank of Mexico), Calixto Lopez (Bank of Mexico), Facundo Luna (Central Bank of Chile), David Moreno (Central Bank of Chile), Miguel Sarmiento (Central Bank of Colombia) and Rafael Nivin (Central Reserve Bank of Peru)[1]

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Abstract

We explore the mechanism that links capital inflows from abroad with domestic bank lending. Five Latin American countries use their credit registry data to examine the changes in outstanding loans and prices that are charged by banks with different balance sheet characteristics. Our meta-analysis sums up their results. We find that high capital inflows generally induce weak banks to relax their lending standards. For the most vulnerable market segment, where weak banks lend to risky firms, only banks with low capital ratios tend to lend more and charge less during periods of high capital inflows. Financial stability concerns could arise, but they are limited as even low-capital banks are above the regulatory minimum.

Keywords: credit registry data, international capital flows, bank lending, SME financing

JEL classification: E0, F0, F1.

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1. Introduction

For small open economies, inflows of capital from abroad are a potentially important source of investment and growth. They can also contribute to the deepening of domestic capital markets. At the same time, openness to international capital flows comes with substantial risks. Exceptionally high inflows can accelerate credit growth to the point of being unsustainable and they imply an allocation of resources that effectively dampens growth (Reinhart and Rogoff (2009) and Schularick and Taylor (2012)). Moreover, sudden reversals of capital inflows can spark currency and financial crises that require major macroeconomic adjustments.

From an individual firm's perspective, changes in capital inflows affect local banks' funding conditions and thus the access of local firms to bank loans. For example, when a local bank receives a cross-border loan or when it sells a bond to investors abroad, capital flows into the local economy. If local banks respond by easing their local lending standards, capital inflows can lead to higher local credit growth. Against this backdrop, however, which types of banks benefit the most from capital inflows? And, which firms benefit from easier access to bank loans? Financial stability concerns could arise if new lending accrues to the riskiest borrowers and, even more so, if the weakest banks made these loans. During an economic downturn, defaults might increase if riskier borrowers failed to service their debt or if they failed to roll over their loans at maturity if financial conditions tightened. These defaults, in turn, would weigh on banks' capital and could threatened their solvency. Hence, the question arises of how capital inflows affect prices and quantities in this most vulnerable market segment where weak banks lend to risky borrowers in the domestic corporate loan market.

Our focus is on five Latin American countries that keep a credit registry database – Brazil, Chile, Colombia, Mexico and Peru. Under the auspices of the BIS Consultative Group of Directors of Financial Stability in the Americas (CGDFS), a working group analysed credit registry data to disentangle the drivers of credit supply from those of credit demand. Unfortunately, pooling the credit registries for a joint analysis is impossible as data at the granular level of individual bank-firm relationships is highly confidential. For this reason, the five countries conducted separate analyses while using a common methodology that was slighted adapted in some cases to suit the national data structure.

For the purpose of econometric identification, our analysis draws on granular observations at the level of individual bank-firm relationships. There is a twofold challenge. First, to separate *banks supply* from *loan demand* effects, and, second, to *isolate the capital inflow effect* from any confounding factors. To grant proper identification with respect to the first challenge, the participating central banks consider only firms with multiple banking relationships. In this way, demand effects can be absorbed by different combinations of fixed effects as shown by Khwaja and Mian (2008). With respect to the second challenge, we exploit the fact that banks are differentially affected by capital inflows given their balance sheet characteristics. We use three balance sheets characteristics as indicators of weak banks: i) the share of non-performing loans to total loans, ii) wholesale funding as a share of total funding and iii) the ratio of capital to risk weighted assets. Banks with a high ratio of the first two measures and a lower ratio of the third have weaker balance sheets and are hence differentially affected by capital inflows. In sum, for the purpose of proper identification our analysis compares credit to the same firm extended by banks with distinct balance-sheet characteristics that are, in turn, differentially exposed to capital inflows. Our meta-analysis then compiles and summarises the results as in Cantú et al. (2021a)).

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Our meta-analysis shows that weak banks ease their lending standards during periods of high capital inflows. Two sets of findings emerge. First, we show that weak banks lend more and charge a lower premium when capital inflows are at their 90th relative to their 10the percentile. This easing of lending standards is broadly shared across different types of capital inflows and indicators for weak banks. Second, our results also replicate the easing of lending standards for the most vulnerable market segment although the effect is restricted to one specific type of bank. During periods of high capital inflows, only banks with low capital ratios contribute to this easing by lending more and charging less to firms with very high borrower risk. Financial stability concerns could arise, but they are limited as even low-capital banks have capital ratios above the regulatory minimum. At the individual country level, our results reveal some interesting nuances.

Related literature and our contributions

Our paper contributes to the literature on capital flows and bank lending. First, it relates to the empirical literature on the benefits and risk of capital inflows from a broader perspective. Openness to capital inflows yields two important benefits for financial stability in terms of firm financing conditions. First, when financial institutions and thus firms can obtain financing from abroad, they have access to more funding sources and are able to better diversify their risk. When this happens, the effects of domestic financial shocks are reduced and there is less amplification and propagation of real shocks. Recently, an increasing number of studies have used firm-level data to investigate the effects of capital flows, including the impacts on the cost of capital, credit risk, and financial constraints (Alfaro et al (2017), Caglio et al (2021), Forbes et al (2017)).

While several studies document a beneficial effect of bank-related capital inflows, evidence on other types of flows is more mixed. In the aggregate using cross-country data Blanchard et al (2015) found that bank-related capital flows are expansionary and portfolio debt flows are not. At the more granular level, Cetorelli and Goldberg (2016) and Cerutti et al (2016) confirm that bank flows have been and remain a very important channel for this diversification of financing. By giving rise to more lending to domestic firms, bank-related inflows generate higher investment and productivity and thus growth (Cingano and Hassan (2020)). Recent work also finds substantial benefits from often volatile portfolio flows, which older research has found to be less beneficial or even negative. In particular, portfolio debt flows have been shown to not only improve domestic financial conditions, but also to boost investment (Williams (2018)), productivity (Larraín and Stumpner (2017)), and output growth (Igan et al (2020)). Somewhat related, portfolio equity inflows are associated with increased equity issuance, which firms use to fund investment (Calomiris et al. (2019), Kacperczyk et al (2021)).

The literature has also established the finding that capital inflows can pose risks to domestic financial stability from shocks either originating locally or from abroad. These risks are often associated with periods of extreme capital inflows that are defined as surges, or sharp reversals that are defined as sudden stops (Forbes and Warnock (2012). Both can make access to foreign funding sources very volatile and lead to huge swings in credit and domestic output (Bruno and Shin (2019), Acharya and Vij, (2021), Sarmiento (2022)). Also, there is evidence showing that capital inflows are associated with a higher probability of banking crises (Caballero (2016)) and financial crises more generally (Li and Su (2020), Frost and van Tilburg (2014)), threatening access to domestic sources of firm funding. As previously discussed, capital flows affect real variables primarily by expanding firms' access to credit. This has macro-level implications, as inflows are associated with faster overall credit growth via increased bank lending or market-based financing channels (Igan and Tan (2017)). Strong credit growth and ample credit availability can in turn contribute to a build-up of debt vulnerabilities and related financial stability risks. When shocks

originate from abroad, banks can act as key transmission devices as discussed by a large body of literature that dates to two seminal papers by Peek and Rosengren (1997 and 2000).

Our work contributes to this strand of the literature by comparing the impact of capital inflows across five Latin American economies with distinct features while distinguishing between different types of flows. These five markets differ in terms of the breadth and depth of the domestic financial markets, foreign bank penetration and local bank characteristics. The comparison allows us to draw conclusions about the relative importance of foreign funding relative to the backdrop of local banking market structures.

Second, our work addresses the literature that explores how distinct individual bank characteristics shape the way in which banks pass on shocks to their domestic borrowers. A vast literature surveyed by Claessens (2017) shows that gains arising from openness to bank flows are closely linked to the presence of foreign banks in local markets. As the subsidiaries of foreign banks draw on local deposits, Cetorelli and Goldberg (2012) show that they are less likely to transmit shocks from abroad. However, banks' reliance on cross-border flows, not necessarily foreign banks, can present challenges for financial stability as it increases the co-movement of domestic credit with global push factors (Di Giovanni et al. (2022)). Banks can also transmit spillover effects that arise from foreign policy decisions, as summarised by Buch and Goldberg (2017) based on evidence from fifteen central bank studies. They find that balance sheet conditions and business models drive the amplitude and direction of spillovers to lending growth rates.

In terms of methodology and empirical approach, our work is closely related to Baskaya et al (2017) and Cantú et al (2021b), showing that stronger banks are more likely to shield their customers from exogenous shocks by maintaining access to credit when weaker banks withdraw. Baskaya et al. (2017) found no significant effect in terms of domestic credit supply by larger and high non-core liability banks during periods of high portfolio debt flows, whereas banking flows captured by other capital flow component drive their main results. Cantú et al (2021b) demonstrates that, if the lending most responsive to foreign liquidity conditions is that of better capitalised banks relying primarily on stable funding sources, then the implications for financial stability are relatively benign. Both papers build on the work of Jimenez et al (2012) which uses granular data on loan applications by firms to analyse how reductions in credit availability due to adverse conditions depend on the strength of banks' balance sheets as measured by capital or liquidity indicators.

While using changes in capital inflows as exogenous shocks that banks are differentially exposed to, we expand on this work by tracking how these shocks translate into local lending to different types of borrowers. By doing so, we can study the potential build-up of risks as stronger or weaker banks can make loans to stronger or weaker borrowers.

Third, our work contributes to the literature that explores how capital inflows can alter the allocation of credit within the economy. Greater openness to capital inflows has been shown to improve the allocation of capital across firms in an important set of emerging markets (Larrain and Stumpner (2017)). However, there are risks, as some types of capital flows circumvent the banking sector. Samarina and Bezemer (2016) conduct country-level analysis to show that capital flows to nonbanking sectors substitute domestic credit to nonbanking sectors, and lead to lower shares of business lending in domestic banks. This results in more fragile bank loan portfolios.

Within the domestic banking sector, the literature has documented several kinds of credit allocation effects from capital flows at the sectoral or at the firm level: from tradeable to non-tradeable sectors, from businesses with little to more collateral, and towards low-performing, so-called zombie firms. First, Benigno et al (2015) have shown that episodes of large or sudden capital inflows are associated with more lending to the non-tradeable sector, like services, at the cost of

the tradeable sector, like manufacturing. This poses a risk to the real economy as aggregate productivity declines if resources shift into less productive sectors. It also poses risks to financial stability as, once the flows subside, the boom gives way to a recession, possibly triggering a credit crunch in a sector that is completely exposed to domestic demand. Second, in countries where domestic financial frictions are relatively more acute, there is evidence that more lending goes to firms with higher net worth or more tangible collateral (Cette et al (2016), Gopinath et al (2017)). While from a financial stability perspective, more collateral might be beneficial, there could still be a drag on aggregate productivity as more innovative, young firms find it hard to borrow. Third, capital inflows might push down the price of credit and thereby facilitate the survival of unproductive so-called zombie firms whose business models are non-viable and who fail to cover their undistorted debt service costs. te Kaat (2016) finds that capital inflows lead to a disproportionate increase in credit growth and a decrease in the price of credit to ex-ante low-performing firms and lowers firms' ex-post performance. Borrowing by zombie firms represents a misallocation because it crowds out borrowing by more productive firms (Banerjee and Hofmann (2018)).

Our study contributes to this literature by analysing the allocation patterns across borrowers that differ in terms of their creditworthiness both along the quantity and price dimension. We use credit scores as a comprehensive measure of borrower creditworthiness. In some countries (Colombia, Mexico and Peru), credit scores are at the loan level, in other countries (Brazil and Chile) the available information is at the firm level. This allows us to explore how capital inflows translate into domestic lending conditions for different market segments. With respect to the quantity dimension, we can examine whether more risky firms have easier access to funding, and if so, which banks are willing to make these loans. With respect to the price dimension, we can examine whether capital inflows can compress risk premia and thus induce banks to distort the pricing of risks.

The rest of this paper is organised as follow. Section 2 introduces our setup. It first describes the different types of capital flows that we consider in this paper before turning to their structure and local banking systems in Latin America. . In Section 3, we present the empirical methodology and other ingredients of our meta-analysis. In Section 4, we present the main results from our empirical analysis. Finally, Section 5 concludes and presents some policy implications.

2. International Capital flows and banking systems in Latin America

International capital flows can be a mixed blessing. Given their size, they can serve as an important source of funding for local economic development, but they can also act as a destabilising factor during periods of sudden and substantial capital outflows (Forbes and Warnock (2012)). This section has three parts. The first part shortly explains the different types of capital inflows that we study in this paper. The second part then sketches how capital flows to Latin America evolved over the 2000 to 2019 period. The third describes how distinct components can translate into local lending before turning to a short description of the banking sector in the five Latin American countries studied in this paper.

2.1 Different types of capital inflows link foreign capital to local banking markets

We distinguish between three different types of capital inflows, as *changes* in these flows can be interpreted as shocks to the local bank's funding sources. Out of these three, two measures are taken from the balance of payments (BOP) statistics, namely inflows of *portfolio debt* and *other investment* inflows. *Portfolio debt* inflows capture debt securities that are possibly issued by local banks and then sold to investors abroad. The *other investment* component of the BOP data refers to loans that are extended to any kind of local borrower from any kind of lender located abroad. In this context, it is worth noting that we focus on capital inflows while explicitly ignoring capital outflows. The reason is that capital inflows capture net purchases (so the difference between purchases and sales) of domestic assets by non-residents and thus capital that is possibly available as a source of funding for local banks. We ignore capital outflows as these are net purchases of *foreign* assets by *domestic* agents and thereby only have an indirect impact on the funding that is available to domestic banks. Our third measure is the outstanding stock of *interbank loans* from the BIS international banking statistics. Broadly speaking, interbank loans are a subset of the *other investment* component as, by definition, it is a bank that is identified as the lender located abroad giving a loan to a borrowing bank located in the recipient country. A higher stock of interbank loans increases the pool of funding that is available to local banks which they, in turn, can pass on to local firms as captured in the empirical analysis of Section 3.

2.2 International capital flows to Latin America

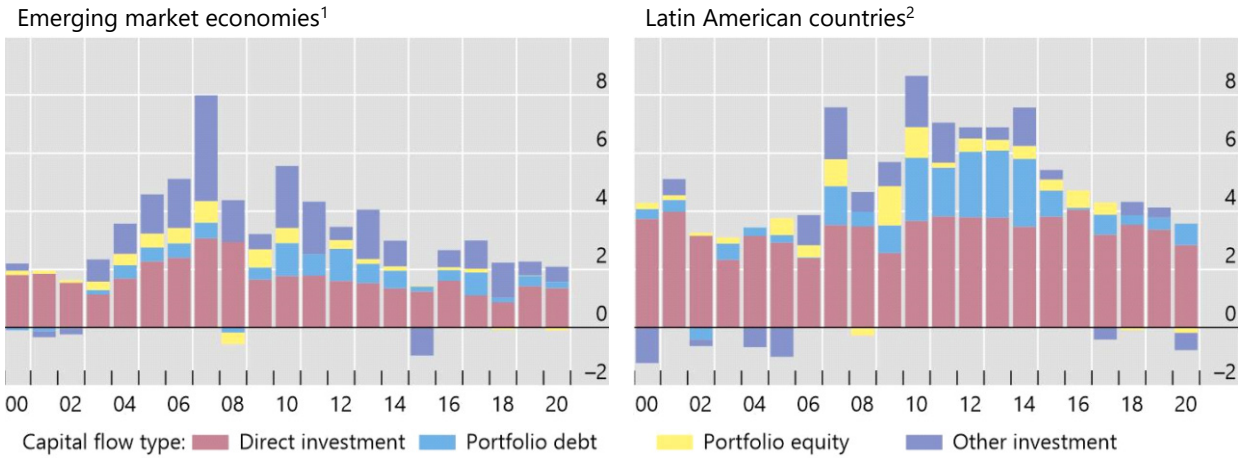
At the global level, the decade following the Great Financial Crisis (GFC) of 2007–09 saw significant changes in the volume and composition of capital flows. The volume of flows declined globally, with the notable exception of flows to China (CGFS (2018, 2021)). Overall, the composition of creditors shifted away from banks and towards market-based sources of funding, with foreign investors increasing their local holdings in some emerging market economies (EMEs). The composition of borrowers saw a similar shift with large corporates and the public sector issuing more debt in local and global markets thereby diversifying their funding sources.

Somewhat different from the global trend, aggregate capital flows to Latin America held up reasonably well after the GFC. When expressed relative to the region's GDP, total gross inflows averaged about 6% over the 2010-14 period (Graph 2), exceeding their pre-GFC level, on average. In 2015, when commodity prices fell and the economic outlook for China deteriorated, capital flows to Latin America also slowed sharply and followed this declining trend until 2020. Overall, direct investment proved as the most stable and largest component of capital flows to Latin America and made up a much larger share in total inflows compared to EMEs as a whole. Portfolio debt and other investment flows to Latin America served as second and third largest source of foreign capital.[2] While portfolio debt flows also remained relatively stable, the "other investment" component which comprises bank loans, became significantly more volatile. It shifted from consecutive substantial net inflows immediately after the GFC to net inflows in some and outflows in other years since 2015.

[2] Portfolio debt corresponds to gross portfolio inflows and other liabilities debt corresponds to gross other inflows excluding transactions vis-a -is IMF and the central bank.

Capital flows by type and region

As a percentage of regional GDP — Graph 2



[1] AR, BR, CL, CN, CO, CZ, EG, HU, ID, IN, KW, MY, MX, PE, PH, PK, PL, RO, RU, SA, TH, TR, ZA, and QA. [2] BR, CL, CO, MX, and PE.

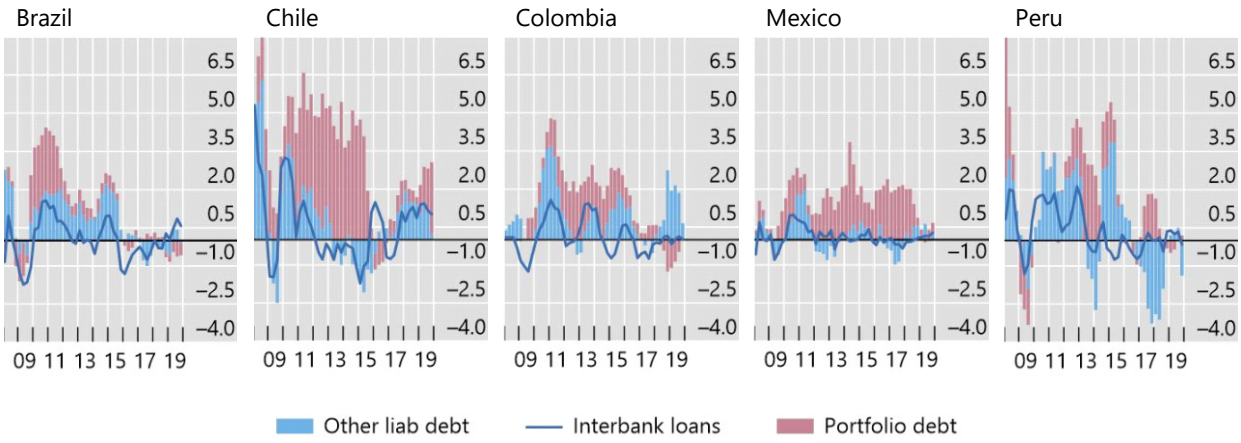
Sources: IMF, Balance of Payment Statistics; IMF; World Economic Outlook; BIS calculations.

At the individual country level, the composition of capital flows varied markedly and showed considerable volatility. For Mexico, portfolio debt flows dominate, reaching more than 4% of GDP in some quarters (Graph 3). For Brazil and Peru, bank-related "other liability" flows adopt that role. But they are very volatile, in particular for Peru with outflows reaching 7.5% and inflows up to 13% of GDP. Chile and Colombia are in the middle of that spectrum with more moderate portfolio debt inflows in the most recent years during which some significant inflows of other liability occurred. That said, several types of flows share the common turning point in 2015 across countries. Portfolio debt saw strong inflows over the 2010 to 2015 period, driven especially by Chile, but also evidenced by flows to Mexico, Peru and Colombia. Quarterly net outflows became more frequent at the country level after 2015 with Chile showing some exceptions. For other liability flows, most countries reported solid inflows in 2010 and 2011 before other liability outflows increased over the 2016 to 2017 period and moderated after that.

Interbank loans act as the most obvious, cleanest part of the mechanism explaining how foreign capital inflows translate into local lending. They are the core sub-component of other liability flows by isolating the share of loans that foreign banks directly give to local banks. In that regards, interbank loans share and sometimes amplify the volatility patters of "other liability" flows. Interbank flows can be substantial in absolute terms, and very relevant when compared size of the local economies. With net inflows reaching negative 3.3% of GDP for Peru, and inflows up to 5.3% for Chile, they are an important source of foreign capital. From a balance sheets point of view, these interbank loans can represent the main source of wholesale funding. In particular, while large local banks can issue bonds that would enter portfolio debt as relevant type of capital flow, small banks are more likely to rely on cross-border loans provided by banks from abroad.

Capital flows to Latin America

As a percentage of GDP Graph 3



Portfolio debt corresponds to gross portfolio inflows and other liabilities debt corresponds to gross other inflows excluding transactions vis a vis IMF and the central bank. Interbank loans are the volume of cross-border loans granted by banks from all reporting countries to borrowing banks in the respective Latin American country.

Sources: IMF, *Balance of Payment Statistics*; BIS LBS; BIS calculations

2.3 The local banking landscape in Latin America

Latin American banking systems expanded significantly after the GFC.[3] Financial reforms and macro-prudential measures allowed bank credit to grow at a steady but solid pace (Graph 4, left-hand panel). Still, except for Chile, financial depth, measured as credit to GDP, remained relatively low compared to other EMEs. By 2019, credit to GDP did not exceed 60% in Colombia, Mexico and Peru. Several factors help to explain this low level of financial depth. One was low financial inclusion. The World Bank reported that in 2017 only 54% of adults in Latin America had an account with a financial institution. Another reason was low competition in Latin America´s banking systems. In most countries, a handful of banks accounted more than 75% of total assets. As a result, financial services costs were high and, particularly, credit was expensive. One last reason was weak financial development. Capital markets were still underdeveloped and a weak rule of law did not quickly resolve financial disputes.

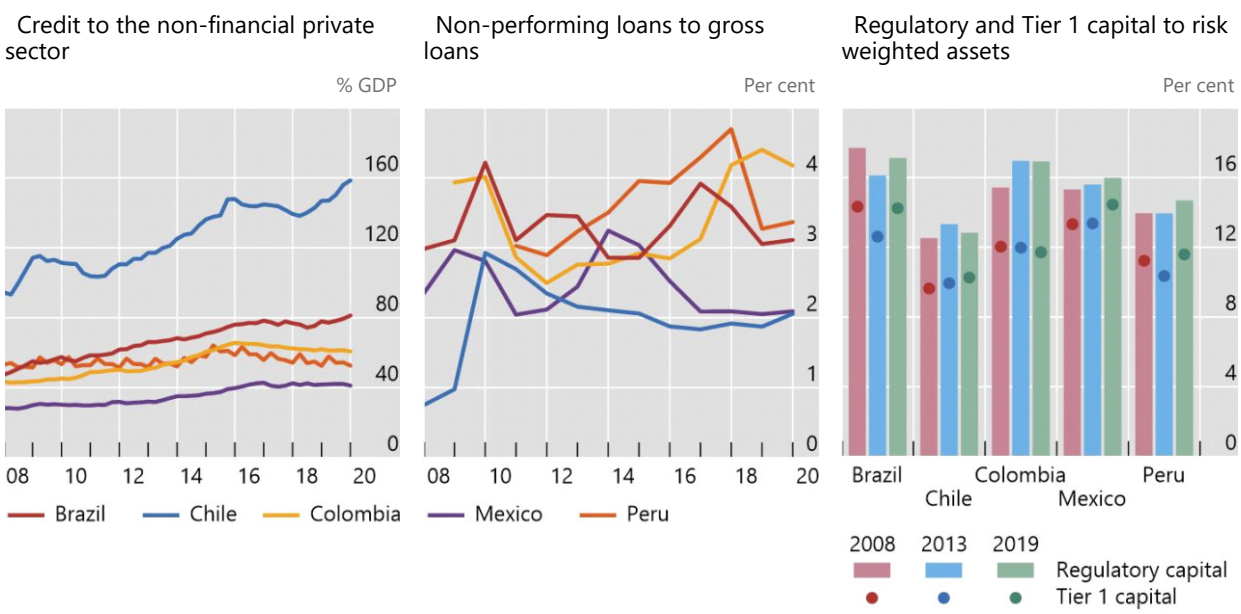
One key feature of the financial systems of countries that enter our analysis is their resilient bank balance sheets. All five countries weathered the financial shock of the GFC quite well and have maintained indicators of bank weakness that stay within a small range at relatively low levels compared to other EMEs. One example of this is how the *share of non-performing loans* (NPLs) to gross loans evolved over time (Graph 4, centre panel). In 2009, the NPL ratio increased sharply but then contracted one year later. In the years that followed, NPL ratios steadily increased in Brazil, Colombia and Peru, but decreased in 2018. For Chile and Mexico, the NPL ratios remained stable, averaging abound 2%. A high NPL ratio can signal a weak loan portfolio. Providers of funding to local banks might worry that the composition of banks' borrowers was not strong enough and that loans might not be repaid. In that case, the solvency of local banks might be in danger and their liquidity situation might deteriorate. These banks might have trouble in rolling over their debt with

[3] From 2007 to 2017, growth of total banking assets to GDP was on average 28%.

existing lenders or finding new funding sources. In turn, banks' curtailed access to funding would negatively affect their capacity to continue lending or to grant new loans to local firms.

Key attributes of the banking system in Latin America

Graph 4



Sources: IMF, *Financial Soundness Indicators*; BIS statistics; national data.

In contrast to the effect of NPL ratio on credit, high *bank capital ratios* in the region have contributed positively to credit growth. One distinctive feature of Latin America is that, even before the crisis, banks' capital ratios were well above the median ratio of banks in most advanced economies (Graph 4, right panel). The high pre-crisis levels of capital reflected lessons learned from previous crises and mitigated the adverse effects of the GFC. Banks have accompanied the post-crisis expansion of their balance sheets and the increase in the density of risk-weighted assets with higher equity capital, ultimately resulting in stable capital ratios. A larger capital base is a positive signal to providers of bank funding. Well-capitalised banks find it easier to renew their debt at relatively low cost, or to explore new funding sources from local lenders or investors located abroad. That in turn allows well-capitalised banks to supply more loans to local firms at reasonable prices.[4]

The GFC and some post-crisis trends had a lasting impact on the funding structure of global banks with repercussion effects around the globe. Banks in advanced economies shifted from wholesale funding to more stable funding sources, such as customer deposits (CGFS (2011), CGFS (2014)). For banks in Latin America, customer deposits have been and remained their main source of funding. However, against the backdrop of ongoing financial integration, they could broaden their pool of lenders. More recently, banks from other emerging markets have made inroads, in particular Chinese banks (Cerutti et al (2020)). This wider access to international capital markets

[4] For example Cantu et al (2021a) find that a 1 percentage point increase in bank capital ratio increases growth in bank credit between 0.14 to 0.86 percentage points, with an estimated mean effect of 0.28 percentage points. Gambacorta and Shin (2018) find that a 1 percentage point increase in the equity-to-total-assets ratio is associated with a 0.6 percentage point increase in total lending growth.

allowed Latin American banks to diversify their sources of funding while increasing their share of wholesale funding with positive implications for domestic credit growth.[5]

We focus on the three balance sheet indicators for our analysis as presented above: the ratio of *non-performing loans* to gross loans, the share of *wholesale funding* to total funding and the *capital* to risk weighted assets ratio. For each characteristic, we define a dummy variable that takes the value of 1 if that ratio is in the top decile for NPL and wholesale funding, or in the lower decile for the capital ratio. Section 3 below shows how this indicator enters the specification that participating central banks estimate and finally, how it is reflected in our meta-analysis.

3. Empirical methodology

Our analysis proceeds in two steps while exploring data on prices and quantities. In the first step, participating central banks estimate the specification below for different lending outcomes, bank balance sheet characteristics and types of capital flows. In the second step, our meta-analysis pools the results obtained from individual central banks along different dimensions. We apply both steps to the post-GFC period that starts in the first quarter of 2009 and ends in the last quarter of 2019. Before describing the two steps in more detail, this section presents our identification strategy and the related design of key variables.

3.1 Empirical identification and variable design

Econometric identification is key to isolate the impact of capital flows on domestic lending in the five Latin American economies. To properly identify the effects of capital inflows, individual empirical analyses must meet a twofold challenge. First, they must be able to separate *bank supply* from borrower-side *demand* effects. Second, they must be able to *isolate the effects of capital inflows* from other, potentially confounding developments.

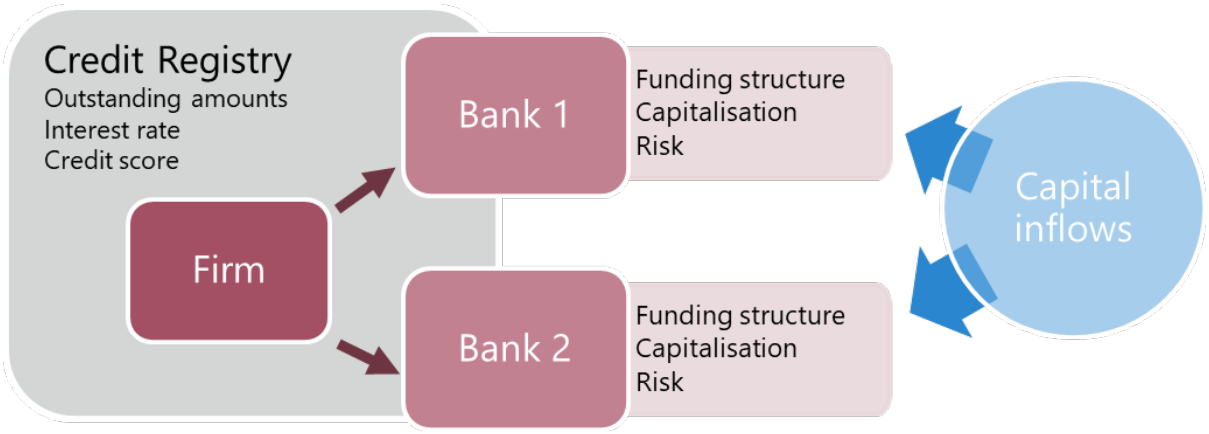
Identification builds on the granular structure and a rich set of bank characteristics

Our identification strategy addresses these challenges by exploiting the granular structure of credit registries. Graph 1 illustrates our twofold approach. First, to separate supply from demand effects, we let firm-by time fixed effects absorb the time-varying demand components in the spirit of Khwaja and Mian (2008). To achieve this aim, the participating central banks only keep firms with multiple bank relationships in their respective sample. Second, local banks are differentially affected by capital inflows given their heterogeneous exposures. This heterogeneous exposure is reflected in the three balance-sheet characteristics that indicate weak banks.

[5] Cantu et al (2021a) show that maintaining stable funding sources had a positive effect on credit growth. In general, a 1 percentage point increase in the share of funding such as deposits or long-term instruments increases the growth of credit by 0.08 percentage points. Lemus et al (2021) find that the internationalisation of domestic banks in Colombia reduces the transmission of domestic monetary policy due to the higher reliance of international banks on both funding and lending abroad.

Identification strategy

Capital inflows differentially affect banks that vary in their bank characteristics. Graph 1



With respect to the credit registry analyses, firms might have single or multiple customer relationship with banks. We focus on firms with multiple bank relationships for proper identification. With respect to the balance-sheet analyses at the bank level, identification exploits the differential bank exposure to capital inflows and draws on macroeconomic variables and time-fixed effects to absorb the demand side.

Source: Authors' illustration

We build on these three balance sheets characteristics as indicators of weak banks in our empirical analysis to link banks' willingness to make loans during periods of high capital inflows. The strength of their balance sheets determines banks' funding conditions in international markets and thus capital inflows (CGFS (2018)).

Taken together, our analysis hence compares credit that is extended to the *same* customer by a bank that is relatively *more* exposed to a bank that is relatively *less* exposed. Further, if two different banks are differentially affected by capital inflows, absorbing the time-varying demand effect that is customer-specific means that any remaining differences in lending outcomes can be attributed to the differential effect of capital inflows on banks' lending behaviour.

3.2 Granular regressions based on credit registry data of individual countries

As key lending outcomes, central banks use the change in outstanding loan amounts or the interest rate spread that banks charge on individual loans. Either one of them enters specification (1) as the dependent variable.

$$\Delta Y_{f,b,t} = \beta_1 BChar_{b,t-1} + \beta_2 FRisk_{f,b,t-1} + \lambda_1 \left(FRisk_{f,b,t-1} \times BChar_{b,t-1}\right) + \lambda_2 \left(Kflow_{t-1} \times BChar_{b,t-1}\right) + \lambda_3 \left(Kflow_{t-1} \times FRisk_{f,b,t-1}\right) + \delta \left(Kflow_{t-1} \times BChar_{b,t-1} \times FRisk_{f,b,t-1}\right) + FE_b + FE_{f,t} + \varepsilon_{f,b,t} \quad (1)$$

More precisely, the dependent variable is the percentage change in outstanding loans granted by bank b to firm f at time t.[6] Alternatively, we use the spread defined as the difference between the interest rate on the loan and a benchmark rate for each quarter[7]. To avoid that outliers drive the results, central banks restrict the dependent variable. For quantities, they restrict loan growth at the individual bank-firm level to a range from -200 to +200%.[8] For prices, they restrict the interest rate spread to values between 0 and 30 %. Further, central banks only keep firms that have lending relationships with several banks in their sample in order to use firm-by-time fixed effects for the purpose of identification.

As previously described, we use three alternative measures of capital inflows ($Kflow_{t-1}$): *portfolio debt liabilities* and *other liabilities* from BOP data, and *cross-border interbank loans* from the BIS locational banking statistics.[9] $FRisk_{f,t-1}$ highlights firms with the highest credit risk, namely those which fall into the top decile in each period (e.g., based on loan rating or high firm leverage).[10] Finally, $BChar_{b,t-1}$ alternates between three different measures that characterise banks that are more exposed to solvency and liquidity risk. First, the *Bank funding* indicator highlights banks with a share of wholesale funding in the top decile. Second, the *Bank risk* indicator switched to one for banks with NPL ratios in the top decile. And finally, the *Bank capital* indicator highlights banks with a capital ratio in the bottom decile. We let bank fixed effects absorb any remaining bank characteristics that is constant over time, and we let firm-by-time fixed effects absorb any demand side effects for the purpose of identification in the spirit of Khwaja and Mian (2008).

The different interaction effects in specification (1) help us to identify the differential impact of capital flows on weak banks' lending in general, and to risky borrowers in specific. In that regard, the interaction effect of capital inflows with bank characteristics tells whether specific types of banks, namely which type of weak banks, are more sensitive to capital inflows. A significant estimate would suggest that these weak banks pass on the effect of higher capital inflows to local borrowers for a distinct lending outcome. Going one step further, the triple interaction tells about lending outcomes for the most risky market segment where different types of weak banks lend to borrowers with a poor credit rating.

[6] As the credit registry setup in Chile is different, their specification also deviates slightly. Their team used the flow of new loans instead of changes in outstanding loans. For this reason, the coefficient estimates for changes in credit from Chile could enter our meta-analysis as such. Still, the effects found are consistent with the rest from other central banks..

[7] Some countries used a short-term interbank rate other used the median of realised rates from the credit register. Colombia, for instance, subtracted the median rate for the respective maturity of the loan to also take the term premium into account. The Chilean team chose the 5th percentile as the reference rate. As a consequence, their spreads ranges between [0,30]. In fact, the 5th percentile is closer to a short-term risk-free interest rate. Further, the Chilean team included only fixed rate loans in Chilean pesos to ensure comparability between the spreads. The Peruvian team defined the spread with respect to the average interest rate of the quarter which yields a spread ranging between -30% to 30%

[8] More specifically, central banks compute the changes in lending based on the following term 100*(D.Xt/(0.5*(Xt-Xt-1))). We thank Egon Zakrajsek for this useful suggestion.

[9] Interbank lending is sourced from the BIS Locational Banking Statistics and indicates the volume of cross-border loans granted by banks from all reporting countries to borrowing banks in the respective Latin American country. It captures loans and debt securities holdings in all currencies. In the context of other types of capital flows that we use, interbank lending is part of other investment liabilities as defined in the BOP data, while restricting senders and recipients to banks on both sides.

[10] The Chilean and Brazilian team did not have access to loan specific measures of risk. The Chilean team used a dummy variable equal to 1 if the firm has at least one loan with 90 days of delinquency. For Brazil the indicator is 1 if weighted average of provisions by value of credit is greater than 3% for the firm in the financial system.

Besides the raw coefficient estimates for standalone indicators and interaction effects, we consider marginal effects for the two different lending outcomes. More precisely, we distinguish between five marginal effects that are estimated by the participating central banks (See Annex B). First, we study how loan growth and credit spreads change for banks with weak ($BChar_{b,t-1}$=1) relative to solid balance sheets ($BChar_{b,t-1}$=0). Second, while focusing on these weak banks ($BChar_{b,t-1}$=1), we analyse how their supply of credit and the spread they charge differ between risky firms ($FRisk_{f,b,t-1} = 1$) and non-risky firms ($FRisk_{f,b,t-1} = 0$). Third, we study how loan growth and credit spread of weak banks ($BChar_{b,t-1}$=1) change when comparing periods where capital flows stand at their 10th relative ($Kflow_{t-1} = p10$) to the 90th percentile ($Kflow_{t-1} = p90$). And finally, we analyse how the credit supply in the most vulnerable market segment ($BChar_{b,t-1}$=1, $FRisk_{f,b,t-1} = 1$) changes when comparing periods of high ($Kflow_{t-1} = p90$) and low capital inflows ($Kflow_{t-1} = p10$).

3.3 A meta-analysis explores common patterns across countries

In the second, step, we use meta-analysis techniques to estimate the mean effects of capital flows on loan growth and credit spreads in Latin America. More precisely, we pool the results obtained from individual central banks along different dimensions. This approach is appropriate as all studies have the same design and, as far as possible, the coefficients are comparable between them. In a meta-analysis, the aim is to obtain a single quantitative estimate (combined effect) by computing a weighted average of the reported coefficients.

For our meta-analysis based on individual results from five Latin American central banks, we apply a random effects model. We assume that the studies included in the meta-analysis are a random sample of the relevant distribution of effects and the combined effect estimates the mean effect in this distribution (Borenstein et al (2009)). There are two levels of sampling and two levels of heterogeneity. First, each study estimates the effect in a specific population (i.e., the effect of bank capital on bank lending in Mexico). The first source of heterogeneity is the within-study sampling error, which is reported as the standard error of the estimated effect. Second, we use these estimates to obtain the mean of the population of effects (i.e., the effect of bank capital on bank lending in Latin America). The second source of heterogeneity is the between-study variance, which is the variation in effect size from one study to the next. It reflects the differences in the institutional and regulatory frameworks of each country's banking system and credit registry structure that could affect the estimated effects. We use these variances to calculate the weight of the study's estimate in the mean effect. The weight of a coefficient that is reported in a specific study is lower, the larger the estimate's standard error and the larger the estimated between-study variance.

4. Results

Our meta-analysis proceeds in three steps while pooling the results obtained from individual central banks along different dimensions. First, it examines how bank characteristics affect lending, in particular to risky firms. Then, it looks at how capital inflows affect weak banks' credit supply. And third, it studies how inflows impact lending in the most vulnerable market segment, where weak banks lend to risky firms. We hence start with the analysis of individual term coefficients and then move to the interaction terms (double and triple). In this way we can trace the mechanism through which capital inflows affect lending.

To illustrate the results of our meta-analysis, we use Tables and forest plots. Tables 1-8 summarise the results of the meta-analysis while individual central bank results disappear in the aggregates. Each table presents the estimated mean effect of the coefficients of interest at different levels of pooling. In the lower part of the tables, we report the I^2 statistic, which is the percentage of variation explained by differences between studies (second source of variance). Although there can be no absolute rule for when heterogeneity becomes important, Harbord and Higgins (2008) suggest that heterogeneity is substantial when $I^2>75\%$.

By contrast, forest plots (Graphs 5–10) graphically present our results while keeping individual central bank estimates. In these graphs, the rows correspond to the reported coefficients, the dots denote the value of the estimates, the lines that cross each dot are the 95% confidence intervals, and the grey squares around the dots are proportional to the coefficient's weight in the mean effect. The vertical dotted line denotes the estimated mean effect and the diamond represents its 95% confidence interval.

4.1. How do bank characteristics affect lending?

Weak banks apply stricter lending standards in general

Our results show that banks with weaker balance sheets generally apply stricter lending standards in terms of credit growth and loan pricing. This holds across different balance sheet characteristics as indicators for weak banks. More precisely, our findings suggest that credit growth at weak banks is between 0.9 and 1.6 pp lower. Also, weak banks charge a higher premium of about 0.3-0.75 pp.

First, we consider the effect of bank characteristics on *credit growth* (Table 1 and Graph 5). Our findings are consistent with the literature in the sense that banks with weak balance sheets grant less credit. This result is independent of the indicator that use for weak balance sheets. Broadly speaking, banks with a high share of non-performing loans, or a high share of wholesale funding or lower capital ratio lend between 0.9 and 1.6 percentage points less than their counterparts with strong balance sheets. There are some differences between countries. In Brazil, Chile and Mexico, banks with a high share of wholesale funding lends less while in Colombia and Peru banks with a high share of non-performing loans lend less. Finally in Peru, banks with a low capital ratio grant less credit.

Banks with weak balance sheets also charge a *higher premium* (Graph 6). This result is again independent of the metric used to measure a weak balance sheets. Among the considered banks in Latin America, those with a high share of non-performing loans, or a high share of wholesale funding or low capital ratios, they charge between 0.3 and 0.75 percentage points more than their counterparts with stronger balance sheets. For the bank funding and bank capital indicator, the results of a higher premium are more homogenous than those of credit. Almost in all countries in the sample, banks with a high share of wholesale funding or low capital ratio charge a higher

premium. By contrast only banks in Mexico with a high share of non-performing loans charge a higher premium.

Bank characteristics' effect on credit and spread (pooled by bank characteristic)[1]

Coefficient estimates for $\beta_1 BChar_{b,t-1}$ Table 1

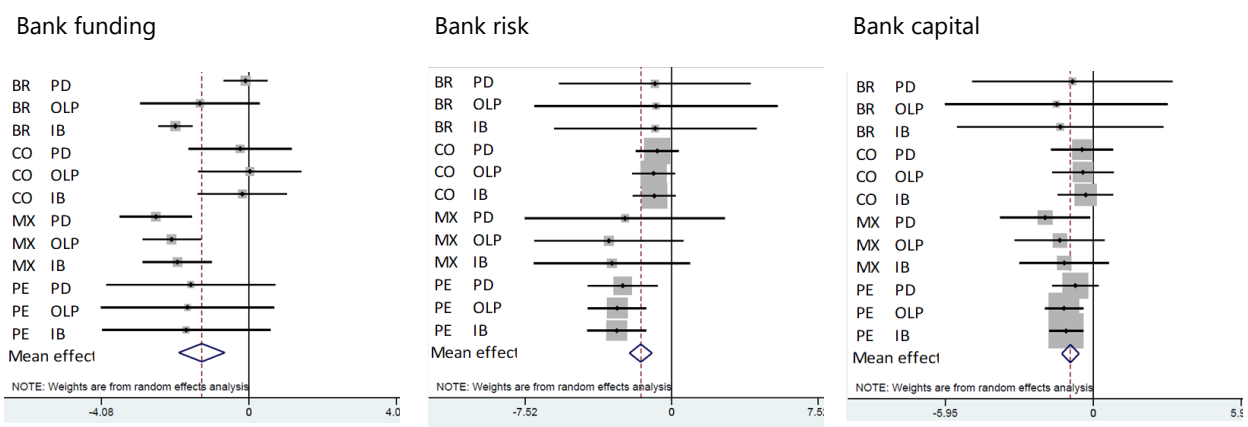
	Credit growth			Spread		
	(1)	(2)	(3)	(4)	(5)	(6)
Bank characteristic[2]	Funding	Risk	Capital	Funding	Risk	Capital
Mean effect:[3]	-1.30***	-1.58***	-0.91***	0.75***	0.29**	0.30***
	(0.33)	(0.3)	(0.18)	(0.12)	(0.12)	(0.05)
Between-study heterogeneity (%):[4]	75.93	14.45	29.58	72.74	51.67	22.08
Observations: [5]	12	12	12	15	15	15

[1] This table presents the results of our meta-analysis for each bank characteristic's coefficient pooled across central bank and types of capital inflows. The dependent variable in Panel A is the percentage change in outstanding loans granted by bank *b* to firm *f* at time *t*. The dependent variable in Panel B is the spread defined as the difference between the charged loan rate and benchmark rate. [2]*Funding* equals to 1 if the bank's share of wholesale funding is in the top decile. *Risk* equals 1 if bank's share of non-performing loans is in the top decile. *Capital* equals 1 if bank's capital ratio is in the lowest decile. [3] Results of a random effects meta-analysis. The mean effect corresponds to a weighted average of the reported coefficient estimates. Individual weights are calculated as the inverse of the respective estimate's standard error, as reported in the underlying study, plus the estimated between-study variance. All results follow specification (1) and include separate firm-by-time and bank fixed effects. [4] Percentage of the residual variation that is attributable to between study heterogeneity. [5] Countries included were Brazil, Chile, Colombia, Mexico and Peru. Chile was not included for credit growth estimates.

Notes: ***,** and * denote significance at the 1%,5%, and 10%, respectively. Standard errors in parentheses.

Bank characteristics' effect on credit (pooled by bank characteristic)

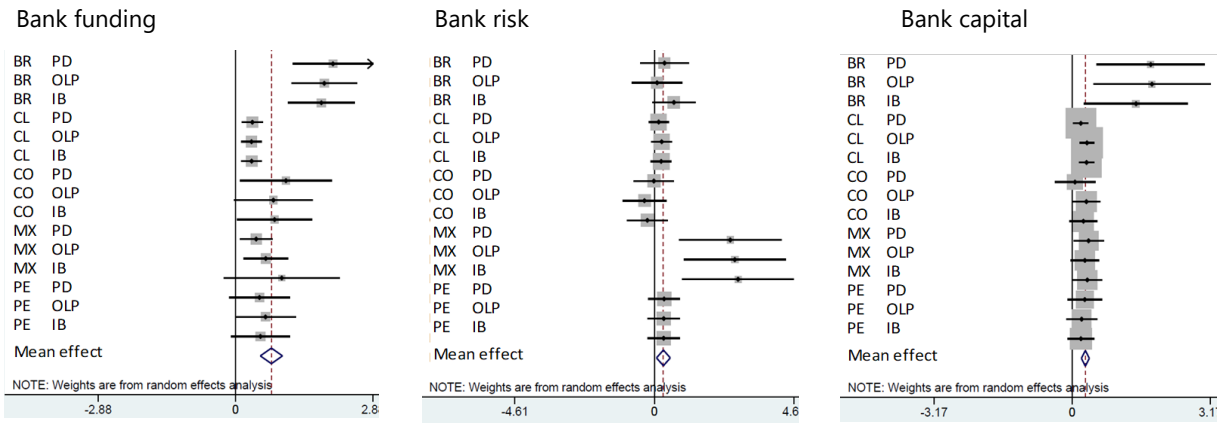
Coefficient estimates for $\beta_1 BChar_{b,t-1}$ Graph 5



This figure presents the results of our meta-analysis for each bank characteristic's coefficient pooled across central bank and types of capital inflows. The dependent variable is the percentage change in outstanding loans granted by bank *b* to firm *f* at time *t*. *Fund*=indicator variable equal to 1 if the bank's share of wholesale funding is in the top decile. *Risk*= indicator variable equal to 1 if bank's share of non-performing loans is in the top decile. *Capital*= indicator variable equal to 1 if bank's capital ratio is in the lowest decile. Capital inflows measured by portfolio debt (PD) and other liabilities private (OLP) from BOP data and by interbank loans (IB) from the BIS locational banking statistics. All results follow specification (1) and include separate firm-by-time and bank fixed effects. Dots correspond to the country-level coefficient estimates of the bank characteristic's term. The horizontal black line is the 95% confidence interval of the country estimate. The size of the grey square represents the weight of the country estimate in the mean effect (dotted line). The diamond corresponds to the mean effect 95% confidence interval. Countries included were Brazil, Colombia, Mexico and Peru.

Bank characteristics' effect on spread (pooled by bank characteristic)

Coefficient estimates for $\beta_1 BChar_{b,t-1}$ Graph 6



This figure presents the results of our meta-analysis for each bank characteristic's coefficient pooled across central bank and types of capital inflows. The dependent variable is *spread* defined as the difference between the charged loan rate and benchmark rate. *Bank funding* is an indicator variable equal to 1 if the bank's share of wholesale funding is in the top decile. *Bank risk* is an indicator variable equal to 1 if bank's share of non-performing loans is in the top decile. *Bank capital* is an indicator variable equal to 1 if bank's capital ratio is in the lowest decile. Capital inflows measured by portfolio debt (PD) and other liabilities private (OLP) from BOP data and by interbank loans (IB) from the BIS locational banking statistics. All results follow specification (1) and include separate firm-by-time and bank fixed effects. Dots correspond to the country-level coefficient estimates. The horizontal black line is the 95% confidence interval of the country estimate. The size of the grey square represents the weight of the country estimate in the mean effect (dotted line). The diamond corresponds to the mean effect 95% confidence interval. Countries included were Brazil, Chile, Colombia, Mexico and Peru.

In the most vulnerable market segment, weak banks apply even stricter lending standards

Our result reveal that lending standards are even tighter in the most vulnerable market segment where weak banks lend to firms with a poor credit rating. This finding applies to both credit growth which reflects how willing a bank is to make a loan, and the premium that banks charge on these loans to risky borrowers (Table 2). More precisely, credit growth at weak banks is about 2 percentage points lower and they charge about 0.5 percentage points more to risky firms.

There could be several reasons for why weak banks are more restrictive when facing risky borrowers. Granting a loan to a risky borrower could further deteriorate the quality of their loan portfolio, especially if the borrower failed to service the debt. That would further increase the share of NPLs and eventually bite into a bank's capital. As a consequence, banks might fear to lose their funding sources if their own quality as a borrower worsens. Further, banks might fear hitting regulatory thresholds meaning that their viability is in danger if they suffered too many losses. That said, it could be that a bank voluntarily decides to be more restrictive when dealing with risky borrowers. But it could also be that regulators in the different countries implicitly urge them to show this behaviour by asking banks to set aside extra capital for very risky loans, depending, for instance, on the sensitivity of risk-weighting schemes to these kinds of loans.

Lending standards of weak banks to risky and non-risky borrowers[1]

Table 2

	Credit growth		Spread	
	(1)	(2)	(3)	(4)
Risky Firm[2]	F=0	F=1	F=0	F=1
Mean effect:[3]	-5.17***	-7.13***	2.64***	3.15***
	(0.59)	(0.61)	(0.23)	(0.22)
Between-study heterogeneity (%):[4]	94.07	90.14	98.95	91.92
Observations: [5]	36	36	44	44

[1] While focusing on weak banks ($BChar_{b,t-1}$=1), this table compares the marginal effects for risky firms ($FRisk_{f,b,t-1} = 1$) and non-risky firms ($FRisk_{f,b,t-1} = 0$). [2] F is an indicator variable equal to 1 if the firm is risky. For Mexico, Colombia and Peru the indicator is at the loan level, while for Chile and Brazil it is at the firm level. [3] Results of a random effects meta-analysis. The mean effect corresponds to the weighted average of marginal effects reported by individual countries. Individual weights are calculated as the inverse of the respective estimate's standard error, as reported in the underlying study, plus the estimated between-study variance. All results follow specification (1) and include separate firm-by-time and bank fixed effects.. [4] Percentage of the residual variation that is attributable to between study heterogeneity. [5] Countries included were Brazil, Chile, Colombia, Mexico and Peru. Chile was not included for credit growth estimates.

Notes: ***,** and * denote significance at the 1%,5%, and 10%, respectively. Standard errors in parentheses.

4.2 Do capital inflows impact weak banks' credit supply?

During periods of high capital inflows, weak banks relax their lending standards. They exhibit higher lending growth and they charge a lower premium. To assess the impact of capital inflows, we compare the predicted values that central banks compute for realised observations during periods when capital inflows are at their 90th percentile to periods when capital inflows are at their 10th percentile.

When pooling across the predicted values across bank characteristics and types of capital flows, we find that during periods of high capital inflows credit growth at weak banks is about 0.4 percentage points higher, on average (Table 3). For the spread, our results indicate that the premium charged by weak banks is about 0.3 percentage points lower during periods of high capital inflows. To rationalise these findings, one might point to the larger supply of funds that is available to local banks and can be passed on to local borrowers. But the supply of funds is also more diverse as capital inflows add to the pool of local savings. More supply and more diverse sources of funding possibly compress the price of loans and thereby improve the access of local firms to bank credit. In the two parts that follow, we show that these findings are broadly shared across different types of capital inflows, while the different indicators of bank weakness reveal some interesting nuances.

How weak banks adjust lending standards during high capital inflows[1]

Table 3

	Credit growth		spread	
	(1)	(2)	(3)	(4)
Capital flows[2]	Low	High	Low	High
Mean effect:[3]	-5.10***	-4.70***	3.21***	2.94***
	(0.64)	(0.67)	(0.19)	(0.22)
Between-study heterogeneity (%):[4]	92.48	94.84	96.9	97.93
Observations: [5]	36	36	44	44

[1] While focusing on weak banks ($BChar_{b,t-1}$=1), this table compares how the marginal effects change when capital flows stand at their 10th ($Kflow_{t-1} = p10$) relative to the 90th percentile ($Kflow_{t-1} = p90$). We pool across central bank studies and different indicators of weak banks [2] Capital inflows measured by portfolio debt and other liabilities private from BOP data *and by interbank loans* from the BIS locational banking statistics. Low corresponds to the 10th percentile and high to the 90th percentile. [3] The mean effect corresponds to the weighted average of marginal effects reported by individual countries. Individual weights are calculated as the inverse of the respective estimate's standard error, as reported in the underlying study, plus the estimated between-study variance. All results follow specification (1) and include separate firm-by-time and bank fixed effects. [4] Percentage of the residual variation that is attributable to between study heterogeneity. [5] Countries included were Brazil, Chile, Colombia, Mexico and Peru. Chile was not included for credit growth estimates.

Notes: ***,** and * denote significance at the 1%,5%, and 10%, respectively. Standard errors in parentheses.

Different indicators of weak banks reveal a more nuanced pattern

In this part, we study whether the effect of capital inflows varies for different indicators of weak banks. To do so, we pool the marginal effects obtained by participating central bank only across types of capital inflows (Table 4). First, we show the result for credit growth at weak banks, then we turn to the risk premium that they charge.

It now turns out that, in contrast to our previous results, the effect of capital inflows on the supply of credit depends on the type of indicator. The indicator of a low capital ratio effectively drives our results. Neither banks with a high share of wholesale funding, nor with a higher share of non-performing loans offer more credit during periods of high capital inflows. However, banks with low capital ratios exhibit higher lending growth during periods of high capital inflows. On average, low-capital banks increase their credit supply by around 1.2 percentage points during periods of high capital inflows. That said, at the level of individual central bank results, we find evidence that other indicators of weak banks also support this finding. We find that Peruvian and Chilean banks with a high share of wholesale funding, and Brazilian banks with a high share of non-performing loans grant more credit when comparing periods of low and high capital inflows (Graph 7).

How weak banks adjust their lending standards (pooled by bank charact)[1] Table 4

	Credit growth						Spread					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Capital flows[2]	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
Bank charact[3]	Fund	Fund	Risk	Risk	Cap	Cap	Fund	Fund	Risk	Risk	Cap	Cap
Mean effect:[4]	-4.5***	-4.6***	-4.7***	-5.1***	-5.3***	-4.1***	3.0***	2.8***	2.7***	2.5***	3.8***	3.4***
	(0.99)	(1.15)	(0.88)	(1.02)	(1.23)	(1.11)	(0.28)	(0.42)	(0.36)	(0.42)	(0.38)	(0.38)
Between-study het (%):[5]	91.2	93.98	77.67	88.26	94.74	95.59	95.41	97.87	94.84	97.41	98.18	98.42
Observations: [6]	12	12	12	12	12	12	15	15	15	15	15	15

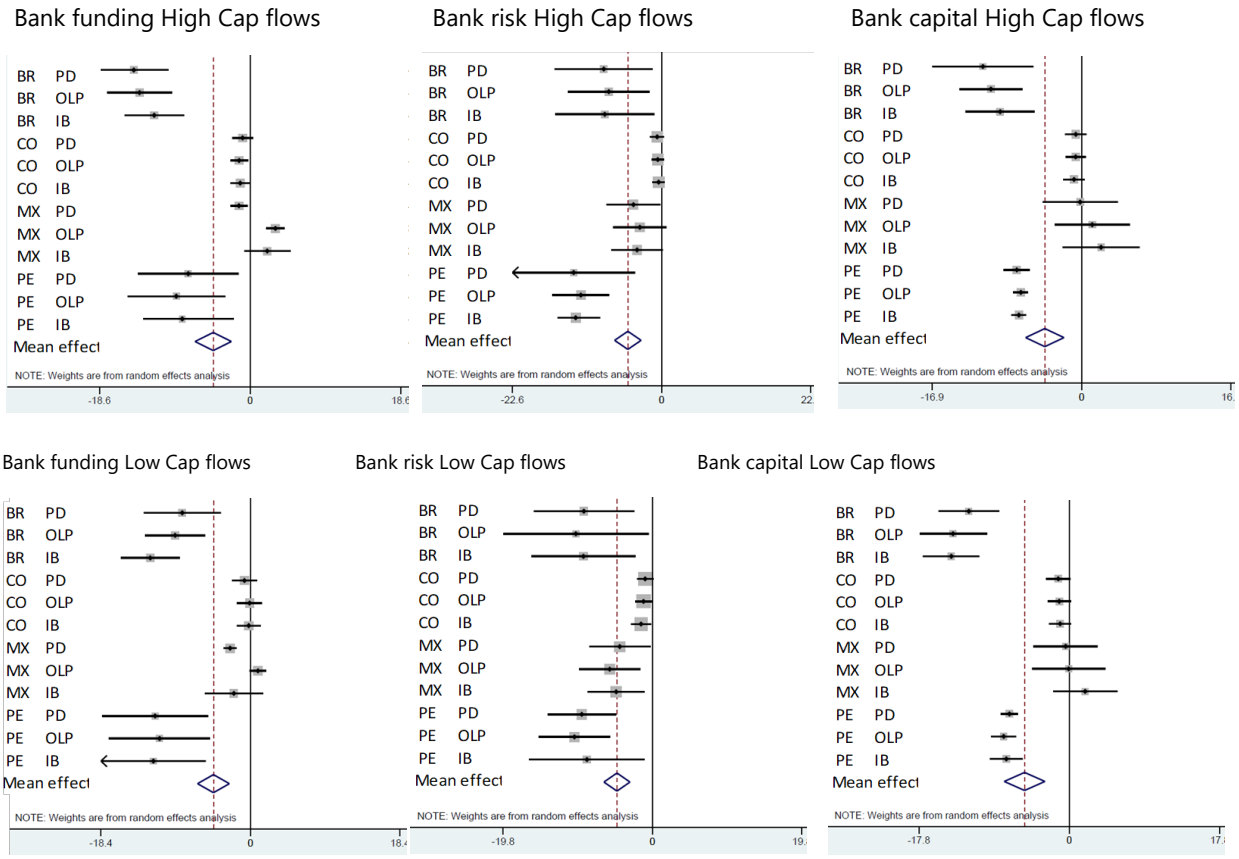
[1] For different types of weak banks, this table compares how the marginal effects change when capital flows stand at their 10th ($Kflow_{t-1} = p10$) relative to the 90th percentile ($Kflow_{t-1} = p90$). We pool across central bank studies [2] Capital inflows measured by portfolio debt and other liabilities private from BOP data and by interbank loans from the BIS locational banking statistics. Low corresponds to the 10th percentile and high to the 90th percentile. [3] *Fund*=indicator variable equal to 1 if the bank's share of wholesale funding is in the top decile. *Risk*= indicator variable equal to 1 if bank's share of non-performing loans is in the top decile. *Capital*= indicator variable equal to 1 if bank's capital ratio is in the lowest decile [4] Results of a random effects meta-analysis. The mean effect corresponds to the weighted average of marginal effects reported by individual countries. Individual weights are calculated as the inverse of the respective estimate's standard error, as reported in the underlying study, plus the estimated between-study variance. All results follow specification (1) and include separate firm-by-time and bank fixed effects.. [5] Percentage of the residual variation that is attributable to between study heterogeneity. [6] Countries included were Brazil, Chile, Colombia, Mexico and Peru. Chile was not included for credit growth estimates.

Notes: ***,** and * denote significance at the 1%,5%, and 10%, respectively. Standard errors in parentheses.

Our result also indicate that capital inflows reduce the price of lending that local banks charge on their lending. This effect of high capital inflows on the price of lending holds across all indicators for weak banks. Banks with a low capital ratio not only exhibit higher credit growth, but they also charge a lower premium during periods of high capital inflows. On average, these banks charge 0.4 percentage points less during periods of high capital inflows compared to periods of low capital inflows. Banks with a high share of wholesale funding or non-performing loans do not grant more credit, but they do reduce the premium that they charge. On average they charge 0.2 percentage points less when there are high capital inflows.

How weak banks adjust their *credit growth* (pooled by bank characteristics)

Country-level results Graph 7

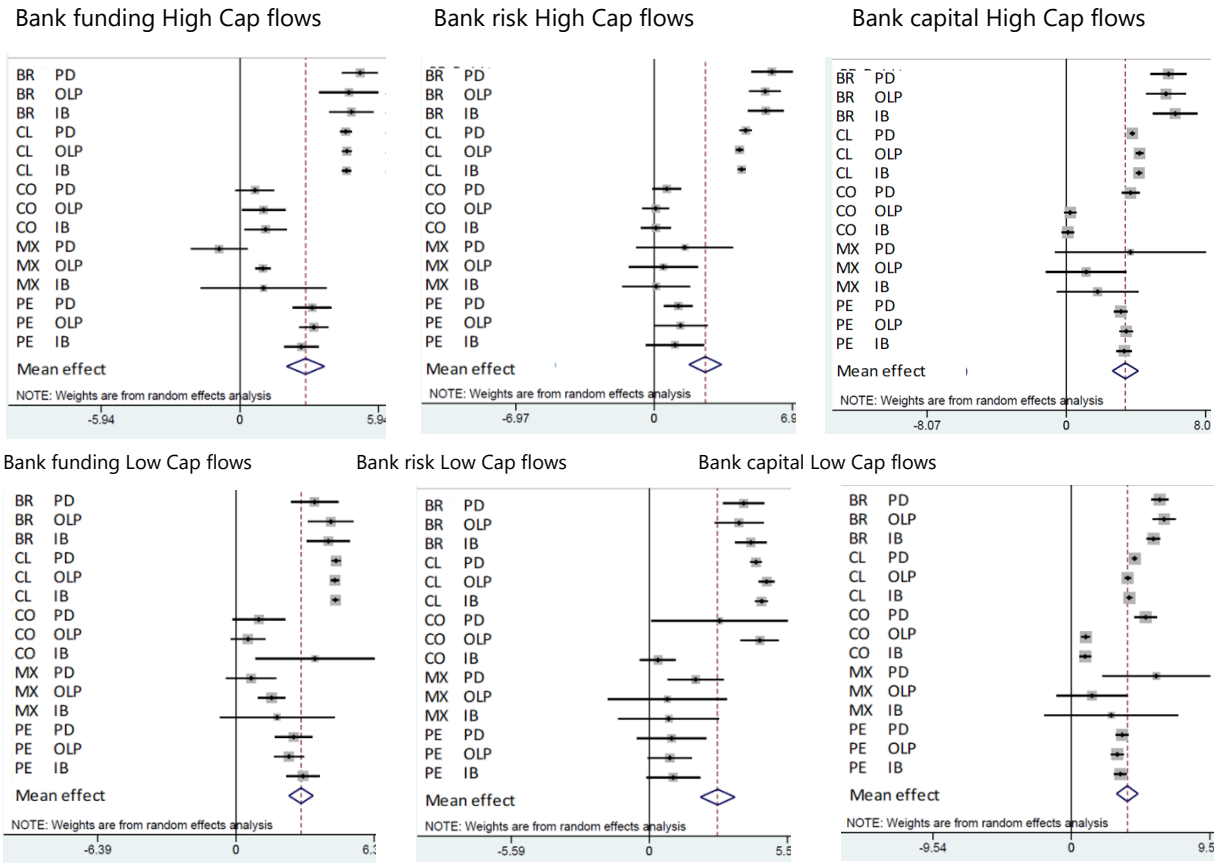


For different types of weak banks, these trees show the marginal effects obtained from individual central bank studies. The dependent variable is the change in outstanding credit to a particular borrowing firm. All marginal effects follow specification (1) and include separate firm-by-time and bank fixed effects. *Fund*=indicator variable equal to 1 if the bank's share of wholesale funding is in the top decile. *Risk*= indicator variable equal to 1 if bank's share of non-performing loans is in the top decile. *Capital*= indicator variable equal to 1 if bank's capital ratio is in the lowest decile. Capital inflows measured by portfolio debt (PD) and other liabilities private (OLP) from BOP data and by *interbank loans* (IB) from the BIS locational banking statistics. Low corresponds to the 10th percentile and high to the 90th percentile. Dots correspond to the country-level marginal effects. The horizontal black line is the 95% confidence interval for the country-level marginal effects The size of the grey square represents the weight of the country estimate in the mean effect (dotted line). The diamond corresponds to the mean effect 95% confidence interval. Countries included were Brazil, Colombia, Mexico and Peru.

Some country-specific findings complement our meta-analysis. These more granular results shared by participating central banks show that Brazilian and Peruvian banks with a high share of wholesale funding or a high share of non-performing loans charge a lower premium during periods of high capital inflows (Graph 8). In Colombia and Chile, it is the banks with a high share of non-performing loans or a low capital ratio which cut the premium that they charge when capital inflows are relatively high.

How weak banks adjust the *spread* that they charge (pooled by bank characteristics)

Country-level results Graph 8



For different types of weak banks, these trees show the marginal effects obtained from individual central bank studies. The dependent variable is the spread that weak banks charge to a particular borrowing firm. All marginal effects follow specification (1) and include separate firm-by-time and bank fixed effects. *Fund*=indicator variable equal to 1 if the bank's share of wholesale funding is in the top decile. *Risk*= indicator variable equal to 1 if bank's share of non-performing loans is in the top decile. *Capital*= indicator variable equal to 1 if bank's capital ratio is in the lowest decile. Capital inflows measured by portfolio debt (PD) and other liabilities private (OLP) from BOP data and by interbank loans (IB) from the BIS locational banking statistics. Low corresponds to the 10th percentile and high to the 90th percentile. Dots correspond to the country-level marginal effects. The horizontal black line is the 95% confidence interval of the country-level marginal effects. The size of the grey square represents the weight of the country estimate in the mean effect (dotted line). The diamond corresponds to the mean effect 95% confidence interval. Countries included were Brazil, Chile, Colombia, Mexico and Peru.

Different types of capital inflows confirm the relaxed lending standards of weak banks

While we saw some heterogeneity across bank characteristics, our findings are broadly supported by different types of capital inflows. Table 5 shows the impact of high capital inflows on credit growth and the charged spread. We now pool the marginal effects across the different indicators for weak banks, while distinguishing between three measures of capital inflows. Our meta-analysis shows that increases in all three types of flows (portfolio debt, other investment liabilities and interbank loans), they all point into the same direction. Table 5 shows that credit growth at weak banks is higher (Columns 1-6) during periods of high capital inflows. Also, Columns 7-12 confirm that the spread that weak banks charge is lower when capital flows stand at their 90th relative to the 10th percentile at the individual country level.

How weak banks adjust their lending standards (pooled by capital flow)[1]

Table 5

	Credit growth						spread					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Capital flows[2]	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
Type cap flow	Portfolio		Other inv liab		Interbank		Portfolio		Other inv liab		Interbank	
Mean effect:[3]	-4.9***	-4.6***	-5.1***	-4.7***	-5.4***	-4.6***	3.5***	3.1***	3.0***	2.7***	3.1***	2.8***
	(0.99)	(1.04)	(1.23)	(1.32)	(1.31)	(1.27)	(0.25)	(0.32)	(0.41)	(0.45)	(0.35)	(0.42)
Between-study het (%):[4]	92.02	91.04	93.86	96.47	91.9	95.22	92.38	96.12	97.92	98.57	97.17	98.16
Observations: [5]	12	12	12	12	12	12	15	15	15	15	15	15

[1] For different types of capital inflows, this table compares how the marginal effects change when capital flows stand at their 10th ($Kflow_{t-1} = p10$) relative to the 90th percentile ($Kflow_{t-1} = p90$). We pool across central bank studies and types of weak banks. [2] Capital inflows measured by portfolio debt and other liabilities private from BOP data and by *interbank loans* from the BIS locational banking statistics. Low corresponds to the 10th percentile and high to the 90th percentile. [3] Results of a random effects meta-analysis. The mean effect corresponds to the weighted average of marginal effects reported by individual countries. Individual weights are calculated as the inverse of the respective estimate's standard error, as reported in the underlying study, plus the estimated between-study variance. All results follow specification (1) and include separate firm-by-time and bank fixed effects. [4] Percentage of the residual variation that is attributable to between study heterogeneity. [5] Countries included were Brazil, Chile, Colombia, Mexico and Peru. Chile was not included for credit growth estimates.

Notes: ***,** and * denote significance at the 1%,5%, and 10%, respectively. Standard errors in parentheses.

How capital inflows impact the weakest market segment [1]

Table 6

	Credit growth		spread	
	(1)	(2)	(3)	(4)
Capital flows[2]	Low	High	Low	High
Mean effect:[3]	-6.342***	-6.664***	2.692***	3.001***
	(0.65)	(0.67)	(0.31)	(0.31)
Between-study heterogeneity (%):[4]	87.42	87.31	93.28	93.2
Observations: [5]	36	36	44	44

[1] For weak banks and risky borrowers, this table compares how the marginal effects change when capital flows stand at their 10th ($Kflow_{t-1} = p10$) relative to the 90th percentile ($Kflow_{t-1} = p90$). We pool across central bank studies, types of capital inflows and indicators of weak banks.. [2] Capital inflows measured by portfolio debt and other liabilities private from BOP data and by interbank loans from the BIS locational banking statistics. Low corresponds to the 10th percentile and high to the 90th percentile. [3] Results of a random effects meta-analysis. The mean effect corresponds to the weighted average of marginal effects reported by individual countries. Individual weights are calculated as the inverse of the respective estimate's standard error, as reported in the underlying study, plus the estimated between-study variance. All results follow specification (1) and include separate firm-by-time and bank fixed effects.. [4] Percentage of the residual variation that is attributable to between study heterogeneity. [5] Countries included were Brazil, Chile, Colombia, Mexico and Peru. Chile was not included for dcredit estimates. ***,** and * denote significance at the 1%,5%, and 10%, respectively. Standard errors in parentheses.

4.3. Do capital inflows affect the most vulnerable market segment

In the most vulnerable market segment, where weak banks lend to risky firms, only banks with low capital ratios relax their lending standards during periods of high capital inflows. They tend to lend more and charge a lower premium when capital flows stand at their 90th relative to the 10th percentile. By contrast, if we pool the marginal effects across all types of capital inflows and all weak bank indicators, the cross-country evidence in inconclusive (Table 6). This asks for a more sophisticated approach. We first distinguish between the different indicators for weak banks and then look at different types of capital inflows.

Only low-capital banks weaken their lending standards

During periods of high capital inflows, low-capital banks weaken their lending standards for risky borrowers. Table 7 pools the marginal effects across types of capital inflows, while present the results for different indicators of weak banks. For both lending outcomes, credit growth and the charged premium, our results show that low capital banks relax their standards.

Cross-country evidence suggests that, lending growth to risky borrowers at banks with a low capital ratio is about 0.8 percentage points higher during periods of high capital inflows, on average. By contrast, there is no such evidence for other indicators of weak bank balance sheets at the aggregate level. Turning to the individual results that have been submitted by the participating central banks, we find that Brazilian and Colombian banks contribute to this finding. By contrast, in Mexico, banks with a high share of non-performing loans grant more credit to riskier firms when comparing episodes of high and low capital inflows.

How capital inflows impact the weakest market segment (pooled by bank characteristic)[1]

Table 7

	Credit growth						spread					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Capital flows[2]	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
Bank charact[3]	Fund	Fund	Risk	Risk	Cap	Cap	Fund	Fund	Risk	Risk	Cap	Cap
Mean effect:[4]	-4.6***	-5.7***	-5.8***	-7.2***	-7.8***	-7.0***	2.8***	3.1***	2.2***	3.1***	2.9***	2.6***
	(0.82)	(1.08)	(1.19)	(1.23)	(1.2)	(1.17)	(0.43)	(0.55)	(0.34)	(0.6)	(0.66)	(0.47)
Between-study het (%):[5]	77.6	83.55	77.79	85.99	90.14	88.78	84.67	91.97	75.92	92.22	97.18	93.4
Observations: [6]	12	12	12	12	12	12	15	15	15	15	15	15

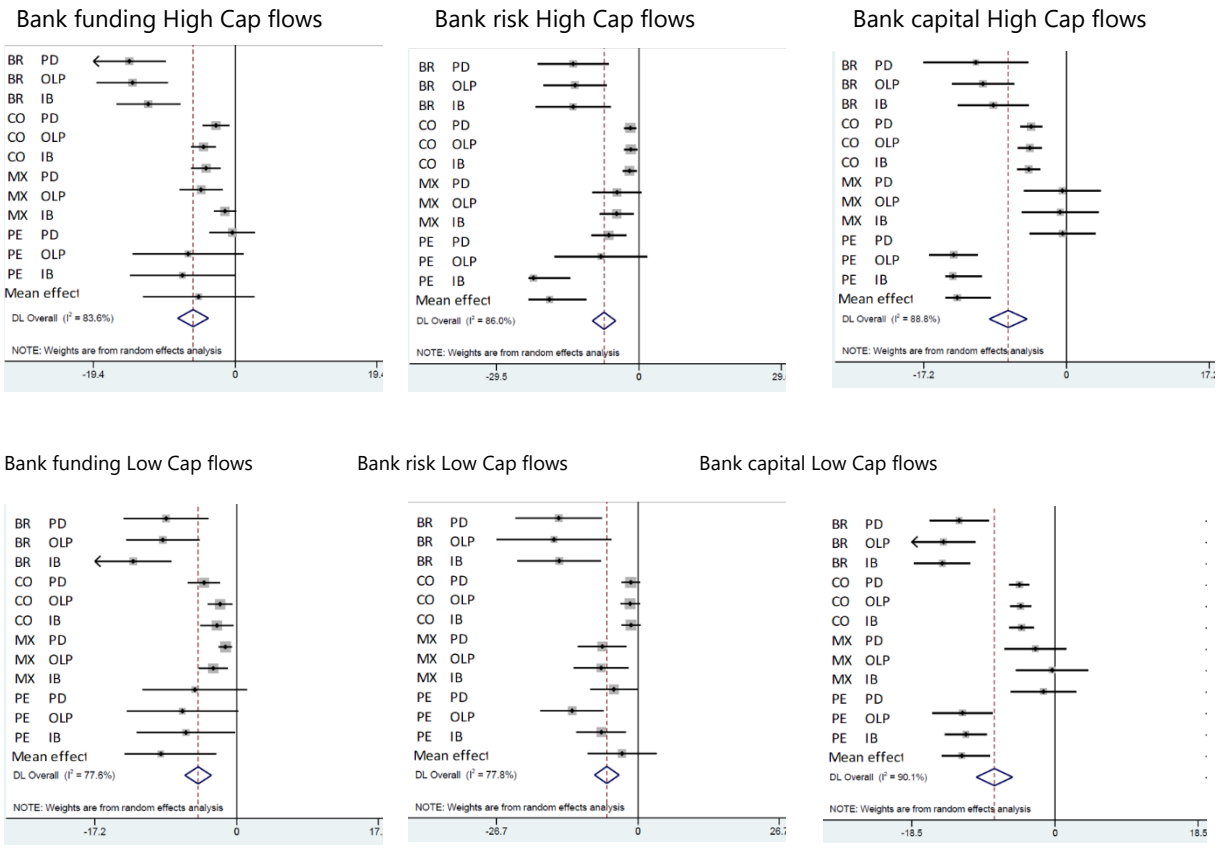
[1] For weak banks and risky borrowers, this table compares how the marginal effects change when capital flows stand at their 10th ($Kflow_{t-1} = p10$) relative to the 90th percentile ($Kflow_{t-1} = p90$). We pool across central bank studies and types of capital inflows. . [2] Capital inflows measured by portfolio debt and other liabilities private from BOP data and by interbank loans from the BIS locational banking statistics. Low corresponds to the 10th percentile and high to the 90th percentile. [3] *Fund*=indicator variable equal to 1 if the bank's share of wholesale funding is in the top decile. *Risk*= indicator variable equal to 1 if bank's share of non-performing loans is in the top decile. *Capital*= indicator variable equal to 1 if bank's capital ratio is in the lowest decile [4] Results of a random effects meta-analysis. The mean effect corresponds to the weighted average of marginal effects reported by individual countries. Individual weights are calculated as the inverse of the respective estimate's standard error, as reported in the underlying study, plus the estimated between-study variance. All results follow specification (1) and include separate firm-by-time and bank fixed effects.. [5] Percentage of the residual variation that is attributable to between study heterogeneity. [6] Countries included were Brazil, Chile, Colombia, Mexico and Peru. Chile was not included for dcredit estimates.***,** and * denote significance at the 1%,5%, and 10%, respectively. Standard errors in parentheses.

Low-capital banks also reduce the premium that the charge to risk borrowers during periods of high capital inflows. At the cross-country level, our results for the charged premium differ partially from the ones for credit growth. On average, weak-capital banks charge 0.3 percentage points less to risky firms when capital inflows are high. This finding is broadly shared across countries and very pronounced for Mexico (Graph 10). For Brazilian and Peruvian banks, there is evidence that banks with a high share of wholesale funding charge less to risky borrowers during periods of high capital inflows. And for Chilean banks, those with a high share of non-performing loans lower the price of credit to riskier firms when capital inflows are high.

How capital inflows impact *credit growth* in the weakest market segment (pooled by bank characteristic)

Country-level results

Graph 9

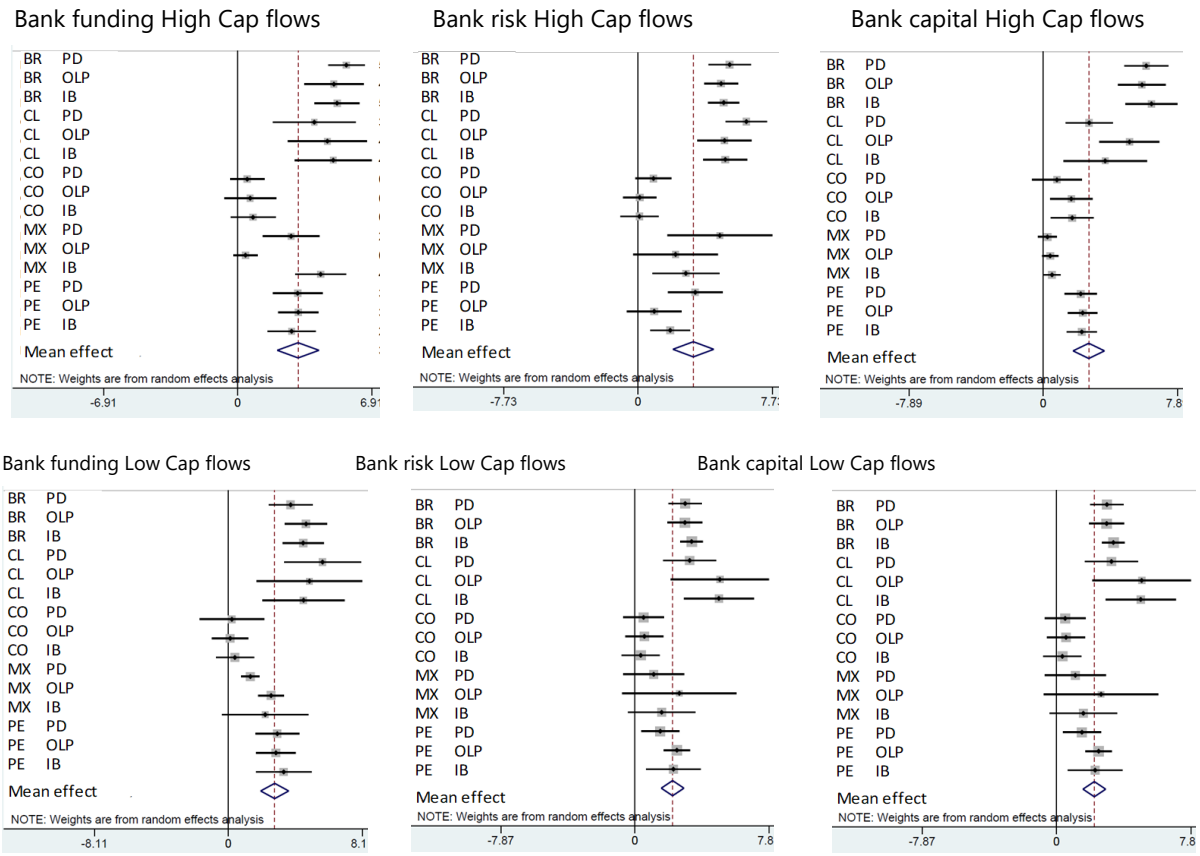


For different types of weak banks, these trees show the marginal effects obtained from individual central bank studies. The dependent variable is the change in outstanding credit to a particular borrowing firm. All marginal effects follow specification (1) and include separate firm-by-time and bank fixed effects *Fund*=indicator variable equal to 1 if the bank's share of wholesale funding is in the top decile. *Risk*= indicator variable equal to 1 if bank's share of non-performing loans is in the top decile. *Capital*= indicator variable equal to 1 if bank's capital ratio is in the lowest decile. Capital inflows measured by portfolio debt (PD) and other liabilities private (OLP) from BOP data and by *interbank loans* (IB) from the BIS locational banking statistics. Low corresponds to the 10th percentile and high to the 90th percentile. Dots correspond to the country-level marginal effects. The horizontal black line is the 95% confidence interval for the country-level marginal effects. The size of the grey square represents the weight of the country estimate in the mean effect (dotted line). The diamond corresponds to the mean effect 95% confidence interval. Countries included were Brazil, Colombia, Mexico and Peru.

How capital inflows impact *the pricing of loans* in the weakest market segment (pooled by bank characteristic)

Country-level results

Graph 10



For different types of weak banks, these trees show the marginal effects obtained from individual central bank studies. The dependent variable is the spread that weak banks charge to a particular borrowing firm. All marginal effects follow specification (1) and include separate firm-by-time and bank fixed effects.. *Fund*=indicator variable equal to 1 if the bank's share of wholesale funding is in the top decile. *Risk*= indicator variable equal to 1 if bank's share of non-performing loans is in the top decile. *Capital*= indicator variable equal to 1 if bank's capital ratio is in the lowest decile. Capital inflows measured by portfolio debt (PD) and other liabilities private (OLP) from BOP data and by *interbank loans* (IB) from the BIS locational banking statistics. Low corresponds to the 10th percentile and high to the 90th percentile. Dots correspond to the country-level marginal effects. The horizontal black line is the 95% confidence interval for the country-level marginal effects. The size of the grey square represents the weight of the country estimate in the mean effect (dotted line). The diamond corresponds to the mean effect 95% confidence interval. Countries included were Brazil, Colombia, Mexico and Peru.

Different types of capital inflows confirm the effect for weak banks in general

Our finding that weak banks relax their lending standards for risky borrowers during periods of high capital inflows is confirmed across all different types of capital inflows. Table 8 pools the marginal effects across different balance sheet indicators while showing the results for different types of capital inflows. This finding is hence not sensitive to the different indicators, but broadly supports our previous results. It is well likely that low-capital banks drive these findings at the aggregate level although there is some cross-country heterogeneity. We interpret this as supportive evidence without further discussions of the country-level results.

How capital inflows impact the weakest market segment (pooled by type of capital flow) [1]

Table 8

	dcredit						spread					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Capital flows[2]	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
Type cap flow	Portfolio		Other inv liab		Interbank		Portfolio		Other inv liab		Interbank	
Mean effect:[3]	-7.7***	-7.2**	-7.6***	-7.2***	-8.1***	-6.6***	3.3**	2.3**	2.5**	2.9***	2.8**	2.7***
	(2.33)	(2.99)	(2.74)	(2.61)	(2.88)	(2.33)	(1.35)	(1.01)	(1.26)	(0.99)	(1.28)	(0.94)
Between-study het (%):[4]	88.82	92.61	93.05	90.86	92.68	87.57	97.97	94.62	96.92	94.82	97.63	93.4
Observations: [5]	4	4	4	4	4	4	5	5	5	5	5	5

[1] For weak banks and risky borrowers, this table compares how the marginal effects change when capital flows stand at their 10th ($Kflow_{t-1} = p10$) relative to the 90th percentile ($Kflow_{t-1} = p90$). We pool across central bank studies and indicators of weak banks. [2] Capital inflows measured by portfolio debt and other liabilities private from BOP data and by *interbank loans* from the BIS locational banking statistics. Low corresponds to the 10th percentile and high to the 90th percentile. [3] Results of a random effects meta-analysis. The mean effect corresponds to the weighted average of marginal effects reported by individual countries. Individual weights are calculated as the inverse of the respective estimate's standard error, as reported in the underlying study, plus the estimated between-study variance. All results follow specification (1) and include separate firm-by-time and bank fixed effects.. [4] Percentage of the residual variation that is attributable to between study heterogeneity. [5] Countries included were Brazil, Chile, Colombia, Mexico and Peru. Chile was not included for dcredit estimates.

Notes: ***,** and * denote significance at the 1%,5%, and 10%, respectively. Standard errors in parentheses.

5. Conclusion

Capital inflows can improve the access of local firms to bank loans in EMEs. If credit to productive borrowers had been mispriced, capital inflows might translate into higher credit growth and possibly lead to a more efficient allocation of financial resources. This paper has explored the transmission mechanism that links foreign capital inflows and domestic bank lending for the post-GFC period.

Our focus is on five Latin American countries with a credit register. As the granular data on prices and quantities of local lending is confidential, the participating central banks from Brazil, Chile, Colombia, Mexico and Peru have followed a common research protocol. They conducted separate analyses at the level of individual bank-firm relationships and then shared their results with us. Based on this input, our meta-analysis pools their results along different dimensions to shed light on how capital inflows translate into local bank lending.

To properly identify the impact of capital inflows on domestic bank lending to firms, we apply a twofold identification strategy. First, central banks restrict the analysis to firms with multiple bank relationships. In this way, demand effects can be absorbed by different combinations of fixed effects as in Khwaja and Mian (2008). Second, we exploit the fact that, banks are differentially affected by capital inflows given their balance-sheet characteristics. Hence, our analysis compares credit to the same firm extended by banks with distinct characteristics that are, in turn, differentially exposed to capital inflows. Overall, our paper contributes to the literature by comparing the impact of capital inflows on prices and quantities of bank lending across five Latin American economies for different types of capital inflows and different indicators of week banks.

Three broad sets of findings emerge. First, our results have shown that banks with weak balance sheets apply stricter lending standards in general. Across the different countries, they

exhibit lower credit growth and charge a higher premium to their borrowers. This finding holds for different indicators of weak banks, namely banks with a high share of wholesale funding, a high share of non-performing loans, and banks with low capital ratios. Our findings also suggest that these weak banks apply even stricter lending standards in the most vulnerable market segment, where weak banks lend to risky borrowers. Our second set of results shows that weak banks lend more and charge a lower premium during periods of high capital inflows. Evidence for all three different types of capital flows (portfolio debt inflows, other liability inflows and interbank lending) supports this result. Our third set of results zooms into the most vulnerable market segment where weak banks lend to risky firms. We find that it is only the low-capital banks that lend more and charge less to risky borrowers during periods of high capital inflows. By contrast, there is no such evidence for other indicators of weak banks that is broadly shared across countries.

In terms of policy implications, our results point to an easing of financing conditions during periods of high capital inflows, particularly for banks with weaker balance sheets. Borrowers of lower credit quality also benefit. A downside of these surges could be the build-up of systemic risks as more vulnerable banks increase their loan supply to riskier firms. However, we found that only banks with low capital ratios were the ones that increase credit to risky firms. Yet, these banks' capital ratios were still above the regulatory minimum which implies that they had sufficient buffers to absorb shocks. Still, an unexpectedly severe shock could leave banks undercapitalised. A key message to policy makers and supervisors could hence be to look at different indicators of weak banks at the same time instead of focussing only on just one metric.

References

Acharya, V and S Vij (2021): "Foreign Currency Borrowing of Corporations as Carry Trades: Evidence from India", NBER Working Paper 28096.

Alfaro, L, A Chari and F Kanczuk (2017): "The real effects of capital controls: firm-level evidence from a policy experiment", Journal of International Economics, vol 108, pp 191–210.

Banerjee, R and B Hofmann (2018): "The rise of zombie firms: causes and consequences", BIS Quarterly Review, September.

Baskaya, Y, J di Giovanni, S Kalemli-Özcan, JL Peydro and M Ulu (2017): "Capital flows and the international credit channel", Journal of International Economics, vol 108, issue S1, pp S15-S22.

Benigno, G, N Converse and L Fornaro (2015): "Large capital inflows, sectoral allocation, and economic performance", Journal of International Money and Finance, vol 55, pp 60–87.

Blanchard O, J Ostry, A Ghosh and M Chamon (2015): "Are Capital Inflows Expansionary or Contractionary? Theory, Policy Implications, and Some Evidence", IMF Working Paper, no 226.

Borenstein, M, L Hedges, J Higgins and H Rothstein (2009): Introduction to Meta-analysis, Wiley.

Bruno, V and HS Shin (2019): "Dollar Exchange Rate as a Credit Supply Factor: Evidence from Firm-level Exports," BIS Working Paper 819.

Buch, C and L Goldberg (2017): "Cross-border prudential policy spillovers: how much? How important? Evidence from the International Banking Research Network", International Journal of Central Banking, vol 13, pp 505-558.

Caballero, J (2016): "Do surges in international capital inflows influence the likelihood of banking crises?", The Economic Journal, vol 126, no 591, pp 281–316.

Caglio, C, R Darst, and S Kalemli-Özcan (2021): "Risk-taking and monetary policy transmission: Evidence from loans to SMEs and large firms", NBER Working Paper, no w28685.

Calomiris, C, M Larrain and S Schmukler (2019): "Capital inflows, equity issuance activity, and corporate investment", Journal of Financial Intermediation.

Cantu C, S Claessens and L Gambacorta (2021a): "How do bank-specific characteristics affect lending: New evidence based on credit registry data from Latin America", Journal of Banking and Finance, vol 135.

Cantu, C, R Lobato, C Lopez and F Lopez-Gallo (2021b): "A loan-level analysis of bank lending in Mexico" Journal of Banking and Finance, vol 135.

Cerutti, E, Claessens, S and L Ratnovski (2016): "Global liquidity and drivers of cross-border bank flows", IMF Working Paper, no 14/69.

Cerutti, E, Koch, C and S-K Pradhan (2020): "Banking Across Borders: Are Chinese Banks Different?", BIS Working Paper, no 892.

Cetorelli N and L Goldberg (2011): "Global Banks and International Shock Transmission: Evidence from the Crisis", IMF Economic Review, vol 59, no 1, pp 41–76.

Cetorelli, N and L Goldberg (2012): "Banking globalization and monetary transmission", The Journal of Finance, vol 67, no 5, pp 1811–43.

Cette, G, J Fernald and B Mojon (2016): "The pre-Great Recession slowdown in productivity", European Economic Review, vol 88, pp 3–20.

Cingano, F and F Hassan (2020): "International financial flows and misallocation", CEP Discussion Paper, no 1697, Centre for Economic Performance.

Claessens, S, H Tong, H Zuccardi (2015): "Saving the Euro: Mitigating Financial or Trade Spillovers?", Journal of Money, Credit and Banking, vol 47, no 7, pp 1369–1402.

Claessens, S (2017): "Global banking: recent developments and insights from research", Review of Finance, vol 21, no 4, pp 1513–55.

Committee on the Global Financial System and Markets Committee (2011): "Global liquidity – concept, measurement and policy implications, Report submitted by an Ad-hoc Group established by the Committee on the Global Financial System", CGFS Papers, no 45, November.

Committee on the Global Financial System (2014): "EME banking systems and regional financial integration", CGFS Papers, 51.

Committee on the Global Financial System (2018): "Structural changes in banking after the crisis", CGFS Papers, 60.

Committee on the Global Financial System (2021): "Changing Patterns of Capital flows", no 66, May.

di Giovanni, J, S Kalemli-Özcan, MF Ulu and YS Baskaya (2022): "International Spillovers and Local Credit Cycles", The Review of Economic Studies, 89(2), pp 733–773.

Forbes, K and F Warnock (2012): "Capital flow waves: Surges, stops, flight, and retrenchment," Journal of International Economics, Elsevier, vol. 88(2), pages 235-251.

Forbes, K, D Reinhardt and T Wieladek (2017): "The spillovers, interactions, and (un)intended consequences of monetary and regulatory policies", Journal of Monetary Economics, vol 85, pp 1–22.

Frost, J and R van Tilburg (2014): "Financial Globalization or Great Financial Expansion? The Impact of Capital Flows on Credit and Banking Crises", De Nederlandsche Bank Working Paper, no 441.

Gambacorta, L and HS Shin (2018): "Why bank capital matters for monetary policy", Journal of Financial Intermediation, vol 35, pp 17-29.

Gopinath, G, S Kalemli-Özcan, L Karabarbounis and C Villegas-Sanchez (2017): "Capital allocation and productivity in South Europe", The Quarterly Journal of Economics, vol 132, no 4, pp 1915–67.

Igan, D and Z Tan (2017): "Capital inflows, credit growth, and financial systems", Emerging Markets Finance and Trade, vol 53, no 12, pp 2649–71.

Igan, D., Lauwers, A. R., & Puy, D. (2022). Capital flows and institutions. BIS Working Paper No. 994.

Jimenez, G, S Ongena, JL Peydro, J Saurina (2012): "Credit Supply and Monetary Policy: Identifying the Bank Balance-sheet Channel with Loan Applications". American Economic Review, vol 102, no 5, pp 2301-2326.

Kacperczyk, M, S Sundaresan and T Wang (2021): "Do foreign institutional investors improve price efficiency?", The Review of Financial Studies, vol 34, no 3, pp 1317–67.

Khwaja, A and A Mian (2008): "Tracing the impact of bank liquidity shocks: evidence from an emerging market", American Economic Review, vol 98, pp 1413-1442.

Larrain, M and S Stumpner (2017): "Capital account liberalization and aggregate productivity: the role of firm capital allocation", The Journal of Finance, vol 72, no 4, pp 1825–58.

Lemus, JS, P Morales, D Osorio and M Sarmiento (2021): "The internationalization of domestic banks and the credit channel of monetary policy", Journal of Banking & Finance, vol 135, pp 1-21.

Li, X and D Su (2020): "Capital inflow surges and the corporate debt maturity structure", mimeo

Peek, J and E Rosengren (1997): "The international transmission of financial shocks: The case of Japan", The American Economic Review, vol 87, no 4, pp 495-505.

Peek, J and E Rosengren (2000): "Collateral damage: Effects of the Japanese bank crisis on real activity in the United States", The American Economic Review, pp 30-45.

Reinhart, C, and K Rogoff (2009): "The aftermath of financial crises", American Economic Review, vol 99, pp 466-72.

Samarina, A and D Bezemer (2016): "Do capital flows change domestic credit allocation?" Journal of International Money and Finance, vol 62, issue C, pp 98-121.

Sarmiento, M (2022): "Sudden Yield Reversals and Financial Intermediation in Emerging Markets", Journal of Financial Stability (forthcoming).

Schularick, M and A Taylor (2012): "Credit booms gone bust: Monetary policy, leverage cycles, and financial crises, 1870-2008", American Economic Review, vol 102, no 2, pp 1029-61.

Te Kaat, D (2016): "International Capital Flows and the Allocation of Credit Across Firms", VfS Annual Conference 2016 (Augsburg): Demographic Change 145584, Verein für Socialpolitik / German Economic Association.

Williams, T (2018): "Capital inflows, sovereign debt and bank lending: micro-evidence from an emerging market", The Review of Financial Studies, vol 31, no 12, pp 4958–94.

Xia, D and C Wu (2016): "Measuring the Macroeconomic Impact of Monetary Policy at the Zero Lower Bound", Journal of Money, Credit and Banking, vol 48, pp 253–291.

Appendix A: Definition of Variables

Variable Name	Description	Data Source
$\Delta Y_{f,b.t}$	Log change in lending by bank b to firm f in quarter t.	National Sources
$BChar_{b,t-1}$	0/1 indicator for bank characteristics: a *Bank funding* indicator highlights banks with a share of wholesale funding in the top decile, *Bank risk* highlights those with NPL ratios in the top decile and *Bank capital* indicates whether a bank reports a capital to asset ratio which falls in to bottom decile	National Sources
$FRisk_{f,b,t-1}$	0/1 indicator for firms with the highest credit risk, namely those which fall into the top decile in each period (eg based on a rating or high firm leverage)	National Sources
$Kflow_{t-1}$	Capital inflows ($Kflow_{t-1}$) were measured by three alternative indicators: *portfolio debt liabilities* and *other investment debt* from BOP data and *cross-border interbank loans* from the BIS locational banking statistics	IMF BOP data, BIS LBS

[1] Dependent variables are trimmed such that quarterly changes exceeding 500% are dropped. Also, only firms with at least two bank relationships are kept in the sample.

Appendix B: Margins

Besides the standard regression coefficients, we run the meta-analysis for five different marginal effects. To obtain these marginal effects, we use the standard "margins" command as implemented in Stata. Basically, marginal effects are predicted values for a subset of observations for which the specified conditions apply. On the one hand, this means that we stay as close as possible to reality (For instance, we do not impose that each risky firm has a borrowing relationship with a poorly capitalised bank). On the other hand, this procedure comes at the cost of considerably reducing the number of observations.

Below, we list the command, the respective Stata output and the possible interpretation for each marginal effect.

Margin Name	Description	Stata Code
Cap_F1B1	For banks with B_Char=1 and firms with F_Char=1, Stata gives the predicted values for kflow at the 10th and 90th percentile, respectively.	margins if L.F_Char==1 & L.B_Char==1, at(L.kflow=(`flow_p10' `flow_p90')) post
Cap_F1	For firms with F_Char=1 (while using an average value for B_Char), Stata gives the predicted values for kflow at the 10th and 90th percentile, respectively.	margins if L.F_Char==1, at(L.kflow=(`flow_p10' `flow_p90')) post
Cap_B1	For banks with B_Char=1 (while using an average value for F_Char), Stata gives the predicted values for kflow at the 10th and 90th percentile, respectively.	margins if L.B_Char==1, at(L.kflow=(`flow_p10' `flow_p90')) post
F_B1	For banks with B_Char=1 (while using an average value for kflow), Stata gives the predicted values for F_Char=0 and F_Char=1, respectively.	margins if L.B_Char==1, at(L.kflow=(`flow_p10' `flow_p90')) post
B_F1	For banks with F_Char=1 (while using an average value for kflow), Stata gives the predicted values for F_Char=0 and B_Char=1, respectively.	margins L.B_Char if L.F_Char==1, post

[1] Dependent variables are trimmed such that quarterly changes exceeding 200% are dropped. Also, only firms with at least two bank relationships are kept in the sample.

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