Global Banks and International Shock Transmission: Evidence from The Crisis

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Abstract

As banking has become more globalized, the consequences of shocks originating in home and host markets have likewise evolved. Global banks played a significant role in the transmission of the 2007 to 2009 crisis to emerging market economies. We examine the relationships between adverse liquidity shocks on main developed-country banking systems to emerging markets across Europe, Asia, and Latin America, isolating lending supply from lending demand shocks. Lending supply in emerging markets was affected through three separate channels: a contraction in direct, cross-border lending by foreign banks; a contraction in local lending by foreign banks' affiliates in emerging markets; and a contraction in lending supply by domestic banks as well, as a result of the funding shock to their balance sheet induced by the decline in interbank, cross-border lending. There is no evidence, however, that openness to international banking flows *per se* caused the propagation of the financial crisis.

Keywords: Bank, global, liquidity, transmission, capital markets, cross border lending

JEL Classification: E44, F36, G32

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I. Introduction

Global banks expanded international activities through the past decade, at least until the Great Recession of 2008. The consequences of increased internationalization of banking are much debated, with one dimension of the debate focused on the advantages and disadvantages of expanded positions vis-à-vis emerging market economies. To date, the balance of evidence has supported the view that foreign bank entry into local banking systems is a stabilizing force for host markets and results in more efficient allocation of productive resources in globalized economies [see survey by Goldberg (2009)]. Much of the analysis, however, has been in the context of shocks originating in emerging markets. Moreover, banking globalization can lead to institutional and regulatory or supervisory improvements, which promote "strong property rights and a financial system that directs capital to its most productive uses [which] are crucial to achieving high economic growth and the eradication of poverty" (Mishkin 2009). [1]

The statement that globalization of banking is a stabilizing force may seem at odds with the view that such linkages have contributed to the spread to emerging markets of profound difficulties in international financial markets in the crisis that began in 2007 and continued into 2009. Indeed, dramatic changes in capital flows to emerging markets, as shown in Chart 1, are cited as evidence for such concerns. There was strong growth in these capital flows through 2007 and then pronounced contractions across Emerging Asia, Latin America, and Emerging Europe. The initial boom period was common to alternative forms of private international capital flows, as shown in Chart 2. The expansion of foreign direct investment, bank loans, portfolio equity, and net debt securities was followed by steep reversal in all broad categories of inflows, with by far the sharpest decline in international bank loans. After jumping to levels of over $500 billion in 2007, these flows dropped to just slightly above $100 billion in 2008. The International Monetary Fund's April 2009 *World Economic Outlook* (WEO) report argues that global bank linkages "fuel the fire" of the current crisis to emerging markets (page 149).

[1] See also the discussion by Crystal, Dages, and Goldberg (2001) and by Calomiris and Powell (2001). Additionally, globalization of banking weakens the lending channel for monetary policy within the United States, while extending the transmission of U.S. policy and liquidity shocks to foreign markets (Cetorelli and Goldberg, 2008). The home market shocks are transmitted into the lending of foreign affiliates. At the same time, such internal capital markets mean that foreign bank subsidiaries do not need to rein in their credit supply during a (local) financial crisis at the same time that domestically-owned banks need to (De Haas and van Lelyveld, 2009).

In this paper we provide a conceptual and econometric examination of the international transmission of the balance sheet shocks that pummeled industrialized-country banks. We conjecture the existence of multiple channels of transmission of the original shock through the operations of global banks. Using bilateral lending data covering cross-border lending and local claims between countries, as well as data from destination emerging markets, we identify the magnitude and consequences of this international bank transmission. To achieve this goal, we econometrically isolate loan demand from loan supply shocks, both of which contributed to the patterns shown in Chart 2, adapting a methodology recently utilized by Khwaja and Mian (2008). Loan demand shocks are important to consider as one reason for lending declines, since the crisis also induced declines in home investment, home consumption, and international trade.[2]

In Section II we use the heuristic of T-accounts for bank balance sheets to show that the loan supply effects through global banks and international capital markets take different forms. Changes in the sources of funds for banks initiate the lending channel reactions (Kashyap and Stein 2000). Banks typically rely on local deposits and other host market funding sources, as well as cross-border funds - together constituting "external capital market" funding. Banks that are not stand-alone organizations can also rely on funding from related affiliates, or "internal capital market" funding.[3] Both funding sources are particularly important to shed light on the international transmission mechanism of the crisis.[4] A foreign bank in a developed country which is subject to a liquidity shock may cut down on its cross-border lending activity. Moreover, the same bank may also activate an "internal capital market" transfer with affiliates

[2] The dramatic collapse of global trade in goods and services during the crisis has spawned a debate about the reasons for this collapse. Some studies posit that banking and trade credit disruptions played a key role (Amiti and Weinstein, 2009; Chor and Manova 2009). Other studies argue that global demand and the expanded role of vertically integrated production account for most of the observed collapse of trade (Eaton, Kortum et al. 2009, Levchenko, Lewis, and Tesar 2009).

[3] Internal capital markets have received earlier attention in domestic banking contexts. For example, Houston, Marcus, and James (1997) emphasize active internal capital markets in banking organizations, with banks relying on related entities in a bank holding company to get insulation from localized shocks within the United States. Likewise, Ashcraft (2008) shows that bank holding companies are a source of strength to their affiliates, while Campello (2002) shows that parent bank insulation from access to external capital markets extends to small affiliated banks, leaving them less vulnerable to shocks than other small banks that are unaffiliated. See also Ashcraft and Campello (2007). The application to global banks by Cetorelli and Goldberg (2008, 2009) argues that there is often internal borrowing and lending between parent organizations and their overseas affiliates.

[4] Studies from industrialized country markets show that small local banks that are stand-alone in structure are least able to access liquidity when market liquidity conditions tighten (Kashyap and Stein 2000); By contrast, larger banks have better access to external capital markets, obtaining funds by equity-financing, interbank borrowing, and/or issuing certificates of deposits (CDs).

in foreign countries, thus affecting the balance sheet and therefore the potential local lending of the affiliates themselves. Finally, the cut in cross-border lending may also represent a funding shock for *domestically*-owned banks in foreign countries, with a possible impact on their own lending capacity. Which of these respective shocks are larger and elicit a greater lending channel response is an empirical question.

Thus, we point to the roles of cross-border lending and internal capital market transfers as conduits for global banks to transmit shocks abroad. A substantial part of these cross-border flows are to unaffiliated banks in host markets. If such cross-border capital inflows are important for the overall liquidity in the host market, the external capital markets of small host country banks can be quite volatile. These banks could potentially have lending activity that is hostage to the boom and bust features of cross-border lending. Ex ante, however, it cannot be concluded that domestically-owned banks operating in emerging markets will necessarily be more stable or effective lenders in those markets than the foreign banks that have entered over the past decades.

Section III provides an econometric analysis of the lending channel in emerging markets at work during the financial crisis of 2007 to 2009. Our methodology, an adaptation of Khwaja and Mian (2008), uses a difference-in-difference approach to isolate loan demand from loan supply in a matrix of lending between 17 source and 24 destination countries across Emerging Asia, Latin America, and Emerging Europe. Three types of lending are considered: cross-border loans, local claims by foreign-owned banks, and loans by domestically-owned banks. The econometric exercise finds evidence of substantial lending supply shocks to emerging markets though all three channels conjectured ex ante. Foreign banks that were particularly affected by the original liquidity shock to their balance sheet cut both cross-border lending and local lending in emerging markets. The point estimates suggest a stronger contraction, in relative terms, for local lending. The data also show that lending supply contracted for domestic banks in emerging markets, but the extent of this contraction was not attributable to reliance on cross-border funding sources per se. Instead, the contraction was greater for those countries that had more cross-border funding from banking systems that were more imbalanced ex ante: Those destination markets that had higher ex ante exposure to the banks from countries with greater dollar imbalances had higher initial domestic bank loan supply growth, and lower ex post domestic bank loan supply growth.

Section IV concludes with a discussion of related policy themes. While cross-border lending and internal capital markets are both conduits for international shock transmission, both positive and negative, these features are not an argument for concluding that closed access to international capital markets is welfare-improving for emerging markets.

II. A Brief Primer on Internal and External Capital Markets and Bank Balance Sheets

What can a bank do when confronted with a shock to its balance sheet? In basic terms, alternative responses to a liquidity shock are illustrated using a simplified version of bank balance sheets in Box 1, providing intuition about the relationship between shocks to deposits and the ultimate consequences for bank lending. For example, consider a contraction in available liquidity, such as through a bank's reservable deposits. The Box illustrates how options may differ across types of banks, for example small stand-alone banks, small banks affiliated with larger bank holding companies, or larger banks. The larger banks or bank holding companies can either be domestically oriented or have operations spread across global markets.

Suppose the initial balance sheet shock is a reduction in reservable deposits arising from tighter monetary policy or some other systemic source of liquidity conditions. The lending channel for monetary policy to be transmitted to the real economy—or more generally the link between an exogenous policy-induced change in liquidity and the amount of loans extended by a bank—arises because a bank faces a significant wedge between the cost of acquiring insured, reservable deposits and the cost of acquiring other sources of funds such as large denomination CDs, money market funds, and securities. The generic bank T-account has bank assets on the left side of the T and bank liabilities on the right side. In broad terms, bank liabilities are divided into deposits, other funds, and bank capital; bank assets are divided into liquid assets and less liquid assets such as loans extended to bank customers. In our discussion, the initial change in the bank balance sheet is denoted with an open red arrow, while subsequent responses are indicated with solid blue arrows.

A contractionary monetary policy that reduces the amount of reservable deposits (or other shock to bank funds) can translate into a reduction in bank lending activity when banks are unable to replace each dollar of lost deposits with other liabilities. The reduced liabilities will lead to a combination of reduced liquid assets and reduced lending. Kashyap and Stein's

(2000) compelling analysis of why large banks and small banks differ in the effects of such a shock is illustrated in the middle panels of Box 1. Banks differ in their access to external capital markets that would facilitate replacing lost assets. Large banks have much better access than, for example, small stand-alone banks. The conclusion of Kashyap and Stein was that the consequences of the initial liquidity shock (appearing through deposits) for lending is much weaker for larger banks (defined as being in the top 5 or 10 percent of the distribution of banks by asset size at any point in time) than for smaller banks (those in the bottom 90^{th} percentile of banks by asset size at any point in time). The difference in the contraction rate on loans from tighter monetary policy arises because the cost of accessing funds through capital markets that are external to the bank is sufficiently high for the smaller banks, pushing the balance of adjustment to the liquidity shock onto the loan book of the bank.

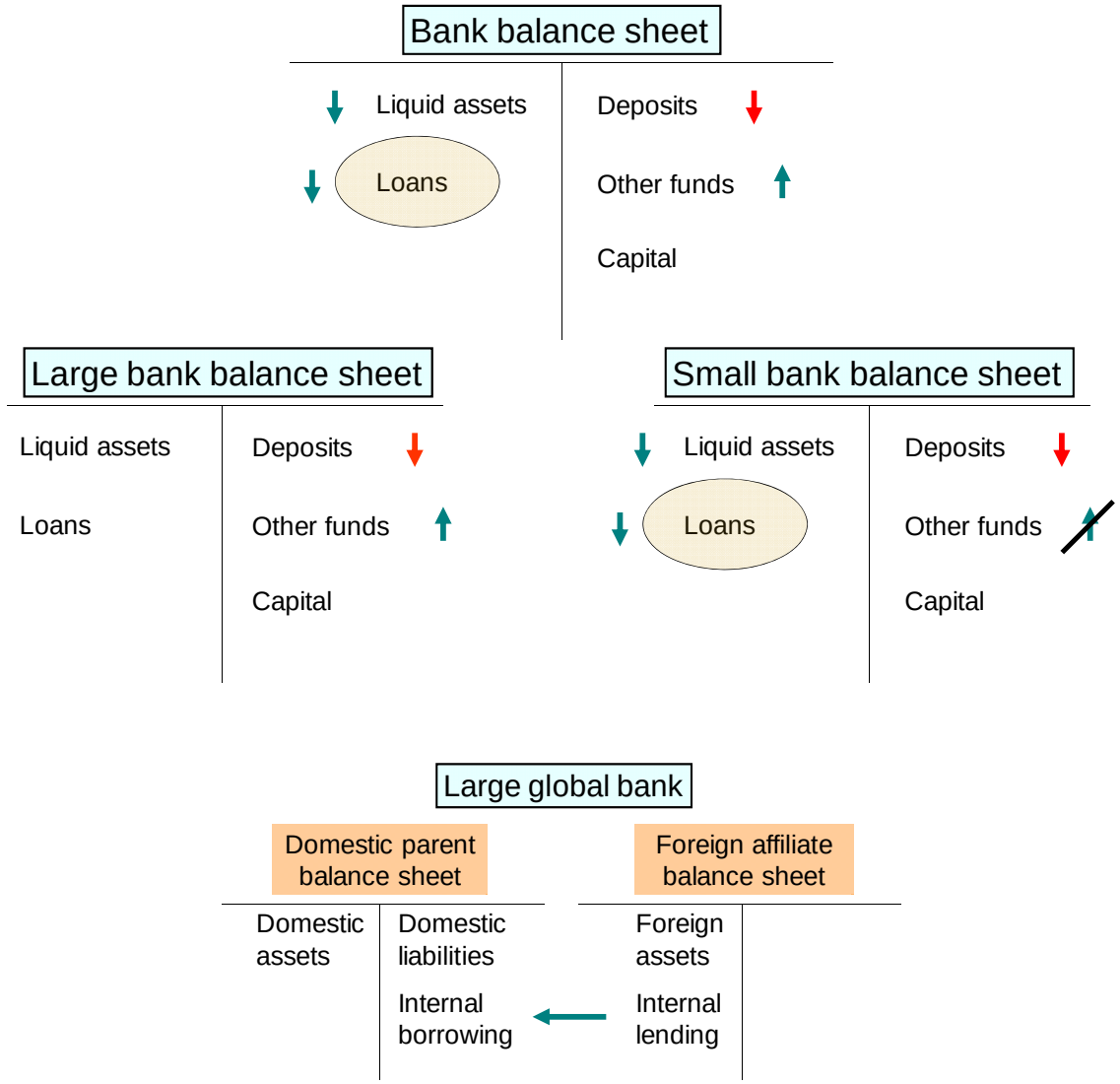
The lower panel of Box 1 shows an additional channel, through internal capital markets, that Cetorelli and Goldberg (2008) argue leads to differentiation even among large banks in available funding sources. Such differences are associated with the "globalness" of the banks. Global banks that have overseas affiliates may have an extra advantage in replacing liquidity lost from a decline in reservable deposits at home. Global banks can raise some part of their liquidity needs by borrowing from (or lending less to) overseas affiliates. This internal capital market channel supplements the funds available to the bank through capital markets that are external to the banking organization.

In practice, Cetorelli and Goldberg (2008) show that the Kashyap and Stein (2000) results on shock insulation of large U.S. banks can be recast by separating those banks that are domestically oriented from those that are globally oriented. It is only the globally-oriented large U.S. banks for which a significant lending channel response to U.S. monetary policy appears to be absent. The foreign affiliates served, to some degree, as liquidity hedges, potentially giving global banks access to capital internal to the entire banking organization. Moreover, the globalization of banking contributes to U.S. policy and liquidity shocks being damped at home, but also transmitted to affiliate markets through these channels internal to the banking organization.

It is important to point out that international transmission also occurs through cross-border flows by global banks, even those without overseas branches and affiliates. Using this data from U.S. banks, Correa and Murry (2009) show that the transmission of policy and

liquidity shocks through U.S. bank cross-border flows has been statistically and economically significant: a significant reduction in the level of cross-border claims occurs during periods of U.S. monetary tightening, pointing to the existence of a cross-border lending channel.[5]

Box 1: Bank Balance Sheets and the Lending Channel



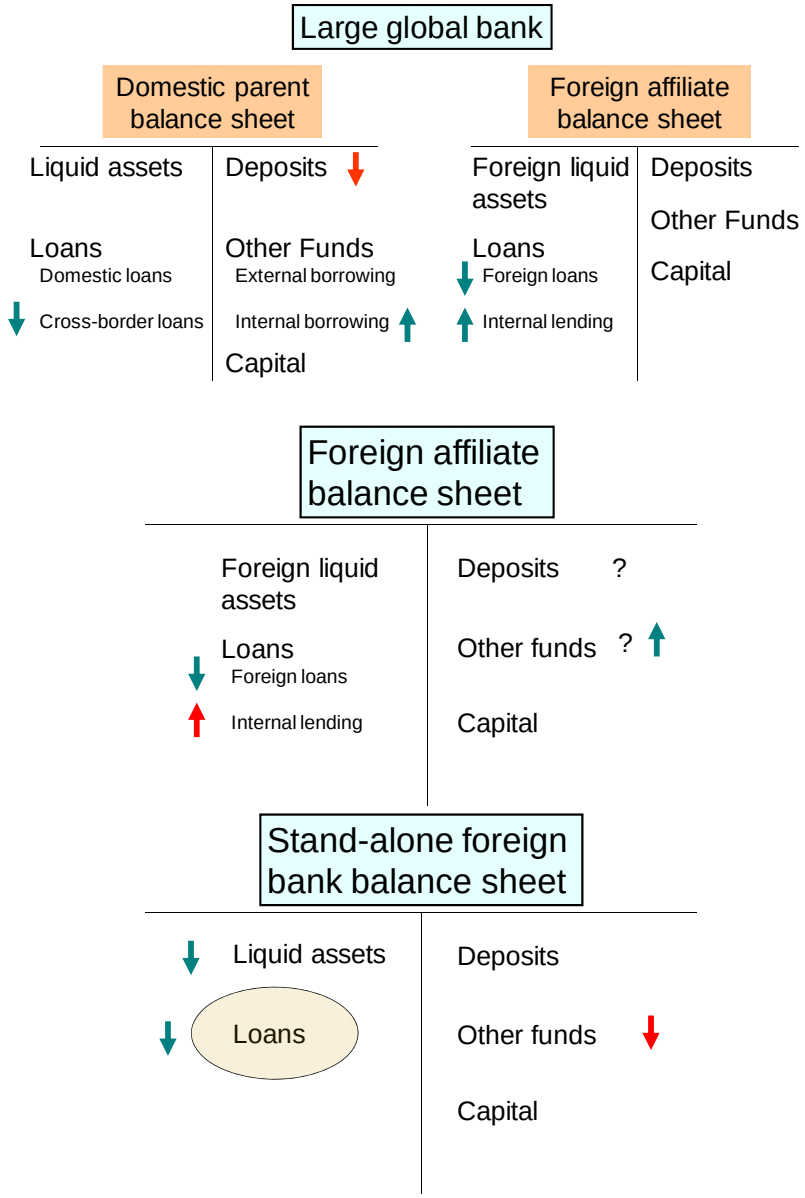
[5] Interestingly, during this period Correa and Murry (2009) do not find statistically significant transmission of U.S. policy into the foreign office claims on local residents. This finding is still to be reconciled with the Cetorelli and Goldberg (2008) result that during a period of U.S. monetary policy tightening the overseas affiliates appear to have lending relies less on the state of the parent bank balance sheet.

Liquidity Shocks Abroad and the Balance Sheets of Emerging Market Banks: Box 2 provides balance sheet insights for banks operating within emerging markets. Consider two types of banks: domestically-owned, relatively small banks and foreign-owned banks that are the local affiliates of the overseas banks. The top panel presents the foreign parent bank balance sheet with assets divided into liquid assets, loans in the domestic economy, and cross-border loans. In addition to adjusting to a shock to deposits by altering external borrowing and borrowing from affiliates if available, foreign banks can attempt to insulate home market lending by pushing more of the lending adjustment onto cross-border loans. Correa and Murry (2009) confirm that this cross-border lending channel is activated by U.S. banks. Of course, the form of loan commitments, and regulatory environments, and lines of credit extended by this bank in different markets influence the feasibility of this cross-border lending response.

The consequences for lending in foreign markets are illustrated in the bottom panel of Box 2, which compares the balance sheet response to a decline in deposits of a foreign affiliate bank with the balance sheet response of a stand-alone bank in the host market. The foreign affiliate bank confronts a balance sheet "shock" that arises from the transfer of funds to the parent via internal lending. If an increase in deposits or other funds are not available as an offset, the affiliate bank may either reduce liquid assets or loans in the host market economy. This reduction in loans, defined as local claims, was documented to be significant and economically relevant for the local claims of U.S. banks with foreign operations (Cetorelli and Goldberg 2009).

By contrast, the initial transmission channel to the domestically-owned stand-alone bank may be through cross-border flows. This foreign bank reduction in cross-border lending contracts the "Other funds" part of the balance sheet. Without access to offsetting alternative funding sources, the loans extended by the domestic bank might contract in line with the reduced availability of cross-border funds. Moreover, it is possible that deposits move between the domestically-owned banks and the foreign affiliates. The direction of these flows is not straight-forward to predict. In either case, it is clear that foreign ownership within the domestic banking system is not necessary for international transmission of shocks and the lending channel.

Box 2: Global Balance Transmission through Different Channels



III. Bank Funding and Lending Volatility in the Financial Crisis

This section provides our econometric analysis of the channels of transmission of global bank shocks emerging market regions in the crisis that pummeled the global economy

from late 2007 through the present. We provide a discussion of the main data sources, then present the econometric methodology, and conclude with the empirical findings.

III.1 Data.

The bilateral data on international bank lending are from the Bank for International Settlements' (BIS) Consolidated International Banking Statistics. This database contains information on positions of banks from BIS reporting countries with respect to counterparties in countries around the world, aggregated across all banks from the reporting countries. The data used are International Claims, which are the sum of cross border lending and local claims extended in foreign currency, and local claims in local currency. These variables are, respectively, our proxies for cross-border lending and local lending by foreign-owned banks in destination markets. The treatment of local claims in foreign currency in the database makes these proxy variables instead of true representations. Overall, we include data from 17 source countries (3 regions), into three emerging market regions: Latin America (8 countries), Emerging Asia (8 countries), and Emerging Europe (8 countries). The source countries are: United States, Japan, Australia, Belgium, Canada, Switzerland, Denmark, Germany, Spain, France, Great Britain, Ireland, Sweden, Portugal, the Netherlands, Luxembourg, and Italy. The destination countries are: Argentina, Brazil, Chile, China, Colombia, Costa Rica, Croatia, Czech Republic, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Peru, Philippines, Poland, Romania, Russia, Slovakia, Taiwan, Thailand, Turkey, and Venezuela.[6]

These data present a rich array of flows between source and destination markets. Table 1 illustrates the breadth of partnering in these international banking flows, presenting the destination countries as rows and showing how many of the seventeen source countries were partners in international or local claims, respectively, in the pre-crisis and crisis period. International claims come from a wider array of source countries compared with local claims, where financial sector FDI is a precondition for activities in the destination market. The similarity of pre- and post columns shows that the capital flow adjustments were on the

[6] Some gaps appear in the data available in DBSonline, it is due to confidentiality concerns of the reporting central banks. For example, Both Denmark and Finland no longer have a numerous national banking system, as most of their domestic banks have over time been bought up by larger banks from other Scandinavian countries. When reported data is the aggregate from a small number of commercial banks, the reporting central banks may report the observations to the BIS marked with Observation Level Confidentiality C Confidential, and this data is suppressed from export to DBSonline. The bank type B Domestic Banks amounts vis-à-vis developing countries are not in DBSonline, but the bank type A All Banks amounts are available there.

intensive margin and not the extensive margin, at least as measured by bank-country observations. Table 2 shows how many destination markets in our sample were served by banks from respective source countries. In cross border flows, all of the emerging markets were served by all countries except Australia and Portugal. Local claims provide an entirely different profile. While the United States, Germany, Japan, Great Britain, and the Netherlands have affiliated banks in most of the emerging markets of our sample, some countries have very little activity through affiliate banking visible in the database (Australia, Denmark, Ireland, Portugal, and Luxembourg).

We also draw on the International Monetary Fund's IFS database to get data on bank lending within emerging markets. From the IFS data we extract series representing Bank Claims on Private Sector and Bank Claims on the Central Government.[7] We use this data in conjunction with the BIS data to generate a proxy for lending by domestically-owned banks within emerging markets. Specifically: Domestic Lending = (Claims on Private Sector + Claims on Central Government from IFS) - (Local Claims/Local Currency from all reporting countries vis-a-vis destination country from BIS).

Based on these data, there were clear ex ante versus ex post difference in the patterns of growth of these flows between source and destination regions. Two windows of time are presented in Table 3: 2006Q3-2007Q2 is clearly an interval that can be described as pre-crisis from the perspective of international capital markets; 2008Q3-2009Q2 is clearly a period that follows the strong balance sheet shocks to source country banks. While it is possible to define the post-shock period as starting at an earlier date, for example with the accelerated pressures in dollar funding markets, our post-shock period begins just after the critical market turning point associated with the default of Lehman Brothers. The data reflect, as previously noted, contributions of loan demand and loan supply adjustments.

European banks had the biggest proportional contractions in cross-border lending, except with respect to Emerging Europe. By contrast, the changes in local claims by European-owned banks in emerging Europe were more muted. For Asian banks, the local claims contractions were more pronounced, especially with respect to Emerging Europe. Overall, the

[7] IFS 22d for bank lending means something slightly different for different countries (most often claims on private sector from banking institutions, but sometimes claims on other sectors from deposit money banks or another combination. 22a through c are claims on central government, state and local governments, and nonfinancial public enterprises.

lending changes from North American banks took the form of substantially slower or contracted local claims, but continued funding via cross-border markets. Domestically-owned banks in the emerging markets contracted lending by similar orders of magnitude as the foreign flows, with the exception of emerging Asia where overall lending was relatively stable.

A third type of data used is a constructed indicator of banking system vulnerability at the onset of the crisis. As we make clear in the next section, the strategy to identify lending supply shocks relies on the observation that, from an ex ante perspective, banks from different developed countries had differing degrees of vulnerability to U.S. dollar funding shocks. This was the result of different dynamics in the buildup of dollar-denominated assets on their balance sheets, and likewise of degrees of maturity mismatching between dollar assets and corresponding funding sources, an argument made clearly and convincingly by McGuire and von Peter (2009a, b).

Using confidential components of the BIS International and Consolidated Banking Statistics, McGuire and von Peter have constructed three alternative measures capturing the degree of dollar vulnerability for a number of developed-economy banking systems. We use the values of three alternative measures of country-specific dollar vulnerability at the time right before the onset of the crisis.[8] The definitions of the three measures are as follows.

V1: Liabilities to official monetary authorities + International liabilities to non-banks + Local liabilities to US residents booked by US offices + Liabilities to banks + cross-currency FX swap (if negative);

V2: Liabilities to official monetary authorities + International liabilities to non-banks + Local liabilities to US residents booked by US offices + Net Liabilities to banks + cross-currency FX swap (if negative);

V3 either : Liabilities to official monetary authorities + Net Liabilities to banks + cross-currency FX swap (if negative) + Net positions vis-à-vis non-banks (if negative), or Liabilities to official monetary authorities + Net Liabilities to banks + cross-currency FX swap (if negative) (if Net positions vis-à-vis non-banks is positive).

[8] We thank Patrick McGuire and Goetz von Peter for providing us with some of the source data needed to construct measures of country specific dollar vulnerability at the time right before the onset of the crisis. We also appreciate their generous discussions of alternative types of measures that might be useful for the purpose of our study.

All measures include the summed external liabilities of banking systems, with differences in whether some exposures are treated in gross forms, or net of corresponding asset positions. We use each of these measures normalized by each country's total international claims. We report the basic summary statistics in Table 4, together with the computation of the pair wise correlations. Because of the confidentiality constraints associated with the original data, we do not report the full cross-section of indexes. As the table shows, there is indeed a substantial degree of cross-sectional variability for each measure. The three measures are highly correlated, especially V1 and V2 (definitions in the footnote of the Table). By construction, V3 is the one that is more different from the other two (reflected also in the lower correlations), but this last measure is also the one that the authors considered to be based on the strongest assumptions.

Finally, our econometric exercise allows for the possibility of global bank transmission consequences of the so-called "Vienna Initiative" that was contracted between banks and internally active banks in Europe in February 2009 with the goal of preventing a destabilization of Emerging Europe. This joint international financial institution action plan resulted in a total of $10.8 billion of support that was committed to a range of European banks to support their lending to ten European Union countries, the Western Balkans, and Turkey. Beyond the private banks participating in this program, the public policy partners included the European Bank for Reconstruction and Development, the European Investment Bank Group, and the World Bank. Appendix Table 1 provides details on reported disbursements through this program through September 2009, by bank and by destination country.

III. 2 The econometric analysis

As said above, the goal of this study is to look for evidence of specific channels of propagation of the financial crisis of 2007-2008 to emerging market economies. The mechanism of transmission, we argue, is through the reduction in international lending activity by those banking systems that were especially affected by the crisis. More precisely, we want to assess to what extent the balance sheet shock suffered by banks in many developed countries determined a corresponding shock to their supply of, 1) cross-border loans to emerging economies and, 2) local loans from their offices located in emerging market countries. Subsequently, we also want to assess the potential impact on the supply of loans by *domestic*

banks in emerging markets, to the extent that the retreat in cross-border lending corresponded to a shock to their domestic bank funding sources.

The empirical implementation of these conjectures presents important and well known identification challenges. Most importantly, it requires showing that if banks are affected by a shock to their funding sources, their ultimate response is to accommodate such shock with an equivalent adjustment in their lending activity. However, as our section II exposition of bank balance sheets shows, this accommodation of lending does not need to occur: banks may be able to substitute away from shocked funding sources into other, readily available ones. Moreover, even in the presence of imperfect substitution on the liability side of the balance sheet, banks may still be able to insulate lending activity by absorbing the liability shock with a corresponding change in available liquid asset buffers.

The main problem with establishing the existence of a bank lending channel is in the identification of an effective lending *supply* shock, separate from potential contamination by concomitant changes in credit *demand* conditions. Recall from Charts 1 and 2 and Table 3 the substantial drop in international bank lending to emerging markets in the aftermath of the crisis. This decline in lending however is not evidence *per se* of a supply shock, since the same decline could have also been observed in the event banks had been able to insulate their lending books from the original liquidity shock – either through funding substitution and/or utilization of existing liquid asset buffers – and yet firms, simultaneously hit on current product demand or on their future investment opportunities, may have simply reduced their overall loan demand. Given the extent of the crisis and the after-the-fact impact on global GDP growth, we cannot exclude a priori this alternative explanation.

In a recent paper, Khwaja and Mian (2008) propose a simple but elegant identification strategy that very effectively isolates a lending supply shock from observable data around a well-defined funding shock on banks' balance sheet. The authors focused their attention on bank lending activity in Pakistan around the time of an exogenous macroeconomic shock that occurred in 1998 as a result of nuclear testing by India and Pakistan.[9] Capital controls were

[9] In retaliation to unanticipated nuclear tests in India in May 2008, Pakistan followed through in a matter of days with their own nuclear tests. As a result of such tests, both countries were promptly sanctioned by the international community, with the suspension of exchange rate support to the Pakistani rupee as part of the sanction package. This chain of events, unrelated to the functioning of the Pakistani banking industry, ultimately resulted in a severe bank liquidity crunch. Since many Pakistani banks had a substantial deposit base in dollar-denominated accounts. The dollars collected through these bank deposits, however, had to be transferred to the government, which upon

imposed in response, generating a liquidity shock and a resulting *quasi* natural experiment that Khwaja and Mian (2008) exploited to assess the extent of both the bank lending channel and the ultimate impact on firm borrowings. The authors relied heavily on the fact that the liquidity shock was *not* felt homogeneously across banks, since ex ante not all Pakistani banks had built similar levels of dollar-denominated liabilities. Moreover, they also took advantage of the fact that many firms had been borrowing simultaneously from more than one bank; hence firm funding sources were heterogeneously affected. In light of this set of conditions, Khwaja and Mian (2008) explored the change in the growth of lending supply by an array of individual banks vis-à-vis an array of firms to which they make loans. This informative difference-in-difference approach facilitates isolation of loan supply versus loan demand effects.

We argue that, at least from the perspective of a natural experiment design, the characteristics of our empirical study have strong similarities to those in Khawja and Mian (2008). The financial crisis of 2007-2008 mainly originated as a sudden and exceptional shortage of dollar funding on the balance sheet of banks in many developed economies, the result of previous large build ups of dollar denominated assets from structured products that in the summer of 2007 became virtually unmarketable (See Coffey, Hrung, Nguyen, and Sarkar 2009). Bank funding problems eventually mounted in the following months, and with the Lehman Brothers bankruptcy event in September 2008, dollar funding sources for banks effectively froze across the board. With the ex ante vulnerability to dollar funding significantly heterogeneous across banks, and, when aggregated to the country level, also significantly heterogeneous across banking systems, similar to Khwaja and Mian (2008), we argue that the original balance sheet shock was felt differently across banking systems. These differences created associated balance sheet shocks and the potential lending supply shocks to differ across countries that previously had been a common source of funding to emerging market economies.

Deferring to the original article for the details of the model, Khwaja and Mian (2008) derived a lending supply schedule in terms of (log) changes from before to after the shock as

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withdrawal requests from bank clients would eventually release such dollars at the exchange rate at the time of the original deposit. In essence, the government bore all the currency risk on bank deposits. In response to the financial sanctions cited above, the Pakistani government announced the suspension of this convertibility agreement, releasing instead dollars at the current, much devalued exchange rate, effectively imposing a partial default on this liability. Despite the much less favorable conditions, a substantial amount of dollars were withdrawn by depositors, thus determining a severe funding crisis for the Pakistani banking system.

$$(1) \qquad \Delta L_{ij} = \beta_0 + \beta_1 \cdot \Delta D_i + \eta_j + \varepsilon_{ij}$$

In their article, the dimension *i* represented individual banks, and *j* individual borrowing firms. β_0 is a constant term, ΔD_i the indicator of the liquidity shock sustained by bank *i*, and η_j an unobservable term capturing simultaneous shocks to firm *j* credit demand. The term ΔL_{ij} captures the change in lending from before to after the event, and banks that were hit more by the liquidity shock should be those that reduce more (or grow less) their lending. As shown by Khawja and Mian, specification (1), estimated with basic OLS would likely generate biased estimates of $\hat{\beta}_1$, because of a correlation with simultaneous demand shocks embedded in the unobservable term η_j. In normal circumstances, for instance, one would expect a simultaneous reduction in credit demand when there is a liquidity shock, so that not taking this effect into account would lead to an over-estimate of the true supply shock.[10] However, introducing borrowers' fixed effects on model specification (1) would absorb any demand driven contamination thus resolving the bias problem affecting the OLS estimation. Consequently, their proposed model specification is

$$(2) \qquad \Delta L_{ij} = \gamma_1 \cdot \Delta D_i + \gamma_j \cdot FE_j + \varepsilon_{ij}$$

with γ_1 now unbiased and γ_j being a vector of fixed effect coefficients. In essence, this alternative model specification achieves identification comparing the impact on lending of separate banks *i* to the *same* firm *j*. Under the less stringent assumption that the same firm uses multiple banks to obtain similar type of loans, any common shock on demand factors would not affect the identification of the supply effect.

In our study, we instead use data on the aggregate international lending activity (cross border claims and local claims) of developed countries *i* to emerging market economies *j*, and we rely on the fact that from an ex ante perspective the banking systems of the lending countries had significantly different degrees of dollar funding vulnerability, hence different ΔD_i . We also test an equivalent model specification (2), where including destination country fixed effect indicators we can test if the lending to a certain emerging market economy by banking systems that were ex ante highly vulnerable to dollar funding shocks changed more

[10] In Khawja and Mian (2008), the authors actually argue for a possible negative correlation and in their case found evidence consistent with their prior.

than the lending to the same emerging market by banking systems that were instead ex ante less dollar vulnerable. We perform these tests separately for cross-border lending and for local lending by foreign-owned banks. We also explore whether controlling for the Vienna Initiative influences the lending supply conclusions.

While our empirical exercise lends itself very nicely to the same identification strategy, we are obviously limited by the scope of our sample size: Khawja and Mian (2008) could count on extensive micro-level data where each observation was a bank-firm loan, with a total sample size above 20,000 observations.[11] In our case, we use data for 17 source countries lending to 24 emerging economies, with a total theoretical sample size of 408 observations, but that in practice is smaller since not all source countries may be lending to all destinations.

Another part of our empirics considers whether domestically-owned banks in emerging markets had balance sheet vulnerabilities to supply shocks via their reliance on cross-border sources of funding which led to contracted lending in emerging markets. The small sample for testing – domestic lending by banks in 24 emerging markets – seriously constrains economic methods. Instead, we engage in more basic descriptive exercises. We use estimated "loan-demand" shocks in emerging markets that are generated from the prior exercise estimating equations (1) and (2). The resulting data, out proxy for "loan supply" growth for each country, is regressed against two variables related to cross-border funding. One variable is cross-border lending to the emerging market (summed across all source markets) relative to total domestic bank lending in the emerging market. The second variable embeds a more nuanced view of which source countries accounted for this cross-border lending. Specifically, using the bank vulnerability measures mentioned earlier, we consider the extent of funding sourced from low vulnerability countries (those with a measure of V1 below the median) or from high vulnerability countries (those with V1 above the median).

[11] The constraint imposed by the fixed effect specification is that, by relying on a *within* firm comparison of lending by two separate banks, it can only be implemented on the subset of firms borrowing ex ante from more than one bank. This limitations lead to a drastic reduction in sample size in the Khawja and Mian (2008) exercise (but still leaving them with more than 5,000 unique bank/firm observations). I our case, it turns out that this is not really a constraint, because at an aggregate level all destination countries in the dataset borrow from more than one source country.

III.3 Bank transmission from industrialized to emerging markets

The identification strategy can be appreciated first with a simple, non-parametric exercise comparing average international lending to emerging markets before and after the crisis event, by banking systems that were ex ante highly vulnerable to dollar funding shocks and those that were instead less vulnerable. We defined the pre-crisis period from 2006q2 to 2007q2, and the post-crisis period from 2008q3 to 2009q2. As previously noted, we leave out purposefully the intermediate period between 2007q3 and 2008q2. Arguably the Lehman's events in September 2008 mark the cleanest and most important crisis event, but at the same time the last quarter of "normal" market functioning goes back to the time prior to August 2007.[12] We defined as high (low) dollar vulnerable countries those with values of the vulnerability measure V1 above (below) the median.

We report in Table 5, as in Khawja and Mian, time averages across each of the intervals and vulnerability divisions. For cross-border lending, shown in the top panel, countries with high dollar vulnerability before the crisis exhibited higher average lending growth than low vulnerability countries (first row comparison). While these level differences can be attributed to basic country-specific factors, such differences are not what drive the identification. In the period after the crisis hit, the data indicates higher average numbers for both sub group of countries and the same rank order (second row comparison).[13] However, even the post crisis lending levels *per se* are not driving the identification. What matters is the comparison of the lending growth pre to post period between the high and the low vulnerability countries. This comparison, obtained taking the difference-in-difference value from the table (figure in bold) shows that ex ante high vulnerability countries displayed ex post about 6 percent lower cross-border lending growth to emerging markets than low vulnerability countries. Another way to interpret this result, based on comparing the level difference pre crisis with the level difference post crisis (figures in the row marginals), is that due to the crisis and the consequent liquidity

[12] We have experimented with having 2007q3 as the beginning of the post crisis period, and we have also experimented with changing the length of both the pre and post periods, without really any material impact on the results.

[13] Higher numbers post crisis are likely driven by a steep increase in the pre-crisis quarters, so that time averaging yields relatively lower numbers pre than post. We could have chosen the observation right at the quarter before the crisis and the last quarter in the data set to do the comparison, but the time averages have the advantage of smoothing out quarter-specific idiosyncratic factors. In any case, as argued in the main text, the identification does not rely on the simple pre-post comparison on levels but on the comparison in the pre-post growth *between* the two sub-group of countries.

shock, countries that were ex ante less exposed to the shock were more able to partially close the cross-border lending gap to emerging markets than the more exposed source countries.

We repeat the same exercise for the local lending in local currencies by the foreign banks, shown in the right-most cells of the same rows of Table 5. As with cross border lending, local lending exhibits similar pre and post patterns for both high and low vulnerability funding source countries. The only difference is in the scale. As the difference-in-difference comparison shows, low vulnerability countries exhibited a 23 percent higher growth rate in the crisis aftermath, compared with the high vulnerability countries.

These results are suggestive of a potentially important lending supply shock from developed country banks to emerging market economies. This non-parametric exercise, however, cannot take into account differences in the lending *destinations*. It could be that high vulnerability countries were focusing their lending in emerging markets disproportionately, with a subset of that the emerging markets perhaps experienced stronger credit demand shocks. To address this issue, we next turn to the more formal approach involving the estimation of equations (1) with OLS and then equation (2), where destination country differences are taken into account by the fixed effect (FE) indicator variables. Both OLS and FE specifications are informative. While the OLS estimates are by construction biased, from their comparison with the FE estimates we obtain insights on the simultaneous shocks to lending demand.

The first econometric specifications address patterns in cross-border lending. Since we have three alternative measures of vulnerability, we have run similar regressions using the three measures separately. Moreover, in order to fully exploit the information contained in the vulnerability measures, in the regression analysis we use the actual indexes rather than the simpler dummy grouping countries that indicated ex ante vulnerability above or below the median of the source countries. The first three columns in Table 6 present results for the basic OLS estimations. The results confirm the indication suggested in the non-parametric comparison. Countries that ex ante exhibited a more severe exposure to a dollar funding crisis had a significantly lower ex post cross-border lending growth to emerging markets. The results are consistent across the three different vulnerability measures. To gauge the magnitude of the effect we use the estimates from the second vulnerability measure. Using the estimated coefficient of -0.222, we calculate the effect on the dependent variable of a two standard deviation change around the mean of this vulnerability measure. From Table 1, this such

standard deviation is 0.4, hence, a change in the vulnerability measure equal to 0.4 · 2 translates into a 17.8 percent decrease in cross-border lending growth from before to after the crisis event (0.4 · 2 · -0.222). Given that the mean lending growth around the crisis event was about 23 percent (also this from Table 1), the impact of increased ex ante dollar vulnerability on ex post cross border loans seems quite large.

Of course, this OLS model specification is not insulated from possible contamination by simultaneous changes in credit demand in the destination countries. In columns 4 to 6 we report the results from the corresponding fixed effect estimations. The estimates of γ_1 still are largely negative and significant. As expected, the comparison with the OLS estimates indicates the role played by concomitant changes in demand. The fixed effect estimates are systematically lower (in absolute value) than the corresponding OLS ones. Repeating the assessment of the economic magnitude, the fixed effect, unbiased estimate indicates a reduction in cross-border lending growth by 16.8 percent in response to a two standard deviation change around the mean of the vulnerability distribution. The comparison of the estimates indicates that at least part of the reduction in cross-border lending activity is attributable to a simultaneous decline in demand for cross-border loans. The magnitude of this loan demand shock, however, seems to be relatively small.

The analysis of local claims is reported in Table 7. As before, the results from the OLS specifications using the three distinct measures of vulnerability are reported in the first three columns. The estimated effects of the shock event are again quite strong and in the expected direction. Assessing the impact on local claims growth using the second measure of vulnerability, we determine that a two standard deviation change around the mean of its distribution yields a reduction in local lending growth of about 25 percent (0.4 · 2 · -0.314). Since the mean value in local lending growth around the crisis was 33 percent, we assess a similarly very substantial impact of the liquidity shock on this alternative form of international lending in emerging market economies.

Next, we repeat the analysis estimating the model with fixed effects. As for cross-border lending, we obtain relatively smaller estimated coefficients (in absolute value), and despite some loss in statistical power a confirmation of the result that the lower growth in local claims on emerging markets is largely due to the supply shock from ex ante vulnerable banking systems. Repeating the same type of exercise, the FE estimate indicates a reduction in local

lending due to supply conditions by about 20 percent. Comparing again the OLS and FE estimated effects, it seems that the impact of changes in loan demand for foreign banks in local EM markets is substantially larger. The difference from the cross-border and the local lending estimates is not necessarily a surprise, since it is plausible that the same foreign banks would be facing different demand schedules for their cross-border or local lending activity.

The analysis thus suggests that the original liquidity shock experienced by developed country banking systems has propagated to emerging market economies through both a reduction in their supply of cross-border and local lending. Next, we perform a couple of empirical refinements. First, we can investigate to what extent the supply shocks hit emerging market *regions* differently. This investigation, however, requires the use of the OLS specification. In Table 8, the leftmost columns report the results of an extension of model specification (1), where we have added indicator variables for the regions of origin of the destination emerging markets, keeping emerging Europe as the excluded group. For this part of the analysis, and for ease of exposition, we report only the results obtained using the second measure of vulnerability, but the results with the other measures are qualitatively the same.

The results are quite interesting and indicative of some heterogeneous impact across regions: regarding cross-border lending, the negative impact seems to be felt substantially on emerging Europe, then on emerging Latin America, with lending to emerging Asia declining the least. Using the estimated coefficients, and repeating the magnitude assessment exercise done above, cross-border lending to emerging Europe by highly vulnerable banking system declines by about 41 percent ($0.4 \cdot 2 \cdot -0.509$), or more precisely grows by 41 percent less than that from less vulnerable banking system, since the constant term is significant and equal to 0.68. Cross-border lending to emerging Latin America grows about 12 percent less, while lending to emerging Asia by less than one percent. We compare these three changes to the mean growth in each area: the mean growth in cross-border lending to emerging Europe was 38 percent, to emerging Latin America was 22 percent and to emerging Asia 9 percent. Hence, in relative terms, the effects are in fact more substantial, even for LA and Asia.

The same specification run for local lending shows estimated coefficients of comparable relative magnitudes across regions to those exhibited by the cross-border lending estimation, but there is no statistical power to make any stronger statement. Again, these results cannot rule out the potential contamination of region-specific changes in demand conditions.

However, some information on the potential impact of demand-side shocks can be obtained from the comparison of the OLS and FE estimates. By construction, the residuals from the OLS regressions of equation (1) should reflect a noise component plus the idiosyncratic demand component for each country of destination. Instead, the residuals from the corresponding fixed effect estimation should only reflect the noise component. Hence taking the difference in residuals, residuals_OLS – residuals_FE, yields an estimate of the demand contribution to the overall observed lending growth rate. Therefore we constructed an estimate of demand shocks in the period around the crisis, for both cross-border and local lending. We report these estimates in a scatter plot combining both, in Chart 3. The result shows a certain degree of heterogeneity across countries and across the two sources of demand shocks, but at least as a contribution to the results of Table 8 on differential regional effects, the chart seems to indicate that, if anything, emerging market European countries experienced relatively less negative demand shock conditions: in fact, both residual differentials are positive for most European EM countries. That would suggest that the strongest impact on European EM markets estimated in Tables 6 to 8 is likely due to effective supply changes.

A second refinement focuses instead on a potential differentiation across source countries. There are noteworthy consequences of introducing a dummy variable that captures support to specific European Union source countries banks supplying specific emerging Europe markets. We compare the V2 estimates from the last two column of Table 8 with corresponding estimates in Tables 6 and 7. The direct effects of higher ex ante vulnerability on lending contractions are now significantly larger for both cross-border and local claims. However, this effect is halted if not reversed for the Vienna initiative counterparties as indicated by summing V2 and V2·Vienna coefficients.

Finally, we provide some evidence on the third channel of propagation of the shock to emerging market economies that we mentioned earlier: do local, domestic banks experience a loan supply shock of their own as a result of the changes in cross-border lending of foreign banks? Again, if a component of cross-border lending in a given country of destination is lending to local banks in addition to lending to the private sector, then the original supply shock could also determine a second round lending supply effect through the impact on the

balance sheet of the local banks.[14] Of course the identification of such effect is at least as affected by the same issues of confounding changes in demand exposited earlier. Moreover, for this part of the empirical exercise, by looking at the aggregate lending by domestic banks we are left with just the cross-sectional variability of destination countries, the 24 emerging market economies. For this reason, we can at best produce qualitative results that can provide indications of the existence of this effect, but we are much more limited in terms of statistical power.

If local domestic banks experience a lending supply shock as a result of changes in cross-border lending by foreign banks, then one could expect that – all else equal – this shock would be larger exactly in those emerging markets where cross-border borrowing came predominantly from those banking systems that were ex ante more vulnerable to the original credit market disruptions. Using the cross border lending data by source and destination country we compute total cross-border lending for each destination country during the pre-crisis period, and then the fraction of this total that came from ex ante vulnerable countries, using the same vulnerability dummy used in the non-parametric exercise of Table 5. Subsequently, we classified each destination country as having high (low) ex ante exposure to the cross-border lending of vulnerable countries if the fraction of total cross-border borrowing from high vulnerable countries was above (below) the median.

Given this classification, we trace domestic lending in the quarters before and after the crisis for the two subgroups and observe any difference. The results of this comparison are presented in Chart 4. On the chart, time zero on the horizontal axis correspond to 2007q2. On the vertical axis we report the quarterly averages of the (log) domestic lending across countries, with the respective curves representing countries with above median or below median exposure to high vulnerable cross-border flows. Each of the two series reported are normalized, so that they take value zero at time zero. Despite the sample size limitations, the comparison provides interesting insights. First, the pattern in lending growth of domestic banks in the two separate sub-groups was not so different in the quarters prior to the event. Both had an upward trend but the difference between the two was perhaps just up to a constant component. However, in the quarters after the first crisis event, the difference between the two lines widens, and it widens

[14] At least for Latin American countries we know of significant tightening in domestic funding sources as a result of the crisis (Jara, Moreno and Tovar, 2009)

in the expected direction: the lending growth of domestic banks in countries with high exposure to high vulnerable cross border flows grows less than the lending of the less exposed countries, and the wide margin persists even through mid 2009.

The comparison provided in the chart is still, of course, affected by potential demand side contaminations. While there is not much we can do about that in comparing time series, we can apply similar refinements to the cross-sectional comparison in the lending growth rates from before to after the event. As we did earlier, we construct the same growth rates in lending, for domestic banks, as those constructed and analyzed for the cross-border and local lending of foreign banks. Using this cross-sectional comparison we repeat the same non-parametric exercise that we did for the other two sources of lending. We present this exercise in the bottom panel of Table 5. There is a 16 percent higher growth in domestic lending in EM countries with an ex ante low exposure to the cross-border activity of ex ante vulnerable banking system. A simple OLS regression of the pre-post growth rates on the dummy that captures the high or low exposure shows that the 16 percent difference is even statistically significant (results in Table 9, columns 1, 3, and 5).

However, under the assumption that local domestic banks face a similar demand schedule to that faced by local foreign banks, we attempt to remove from the growth rate calculated on the raw data a common component representative of the demand shock. This procedure yields a "corrected" cross-sectional series of pre-post domestic lending growth rates. Repeating the non-parametric mean comparison between high and low exposure countries should yield a cleaner estimate of our third component of lending supply shock. The result, shown in the last row of the bottom panel of Table 5, is that the gap between the two growth rates is now smaller. From a difference of 16 percent, the "corrected" series indicate a difference of about 7 percent. One would have expected exactly that from the adjustment for the unobservable demand shock: in countries where the first two supply shocks from foreign banks were stronger, it is also likely to observe firms revising future investment plans more, and vice versa. Consequently, the concomitant demand shocks were pulling the growth rate in domestic lending of the less affected countries up and the growth rate of the more affected countries down. With just 22 observations we cannot make strong claims on the statistical significance of the 7 percent difference. However, given the broader patterns observed across all the data observed, we speculate that this observable difference in growth rate in domestic

lending is “real” and it constitutes an additional channel of propagation of the financial crisis to emerging market economies through the balance sheet funding strategies of domestic banks.

If lending of domestic banks in emerging markets was exposed to the financial crisis through cross-border linkages, is it the case that countries with the highest reliance on cross-border borrowing overall were the one to suffer the largest declines in domestic lending? We try to answer this question regressing domestic lending growth – both calculated from the raw data and applying the demand shock correction – on the ratio of total cross-border borrowing to total domestic lending in the pre-crisis period. Countries with a high ratio would be those where domestic banks’ balance sheets are likely to be more dependent on cross-border funding. The results in the third and fourth columns of Table 9 do not support this hypothesis. If anything, there is some mild evidence of the opposite finding. Even combining both this ratio and the ratio capturing ex ante exposure to high vulnerable countries – columns 5 and 6 – does not change the results. Hence, openness of emerging market banking systems to international funding *per se* does not seem to have been a source of propagation of the original shock. Exposure to international funding from source countries that were ex ante more likely to suffer from the shock instead provided for multiple and independent channels of shock transmission.

IV. Concluding Remarks

The opening of capital markets to allow foreign bank participation, either through expanded cross-border lending activity and/or via direct entry into local banking markets, has been documented as producing significant local benefits in terms of enhanced efficiency, liquidity provision, risk-sharing, and overall superior growth opportunities. Global banks also have been demonstrably more resilient and better prepared to handle shocks originating in emerging markets. Both foreign-owned banks and local stand-alone banks are expected to be impacted by foreign liquidity conditions but to differing degrees based on their exposure to cross-border funding and to the capital markets internal to the broader banking organizations in which they participate. Overall lending fluctuations in host market economies in response to shocks can reflect the composition of banks with exposure to these sources of investable funds. Financial globalization also implies that the scope of the intervention of monetary authorities

increasingly extends beyond domestic borders. It is not just market shocks that are transmitted internationally but also policy interventions.[15]

While cross-border lending and internal capital markets are both conduits for international shock transmission, both positive and negative, these features are not an argument for concluding that closed access to international capital markets is welfare-improving for emerging markets. Instead, the results suggest the importance of achieving smaller balance sheet imbalances in source countries so that internal and external capital market transmission are reduced.

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[15] This argument was also made recently by the vice chairman of the Federal Reserve: "… when liquidity conditions tighten in one country, globally active banks may attempt to pull liquidity from overseas affiliates, reducing the liquidity consequences at home but simultaneously transmitting the shock abroad. What is particularly interesting is that in some cases, financial linkages might now be more important for transmission than the traditional trade linkages." (Kohn, 2008).

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Table 1 Number of BIS Countries (of 17) Engaged in Lending to Specific Emerging Markets

	International Claims (Cross-Border)		Local Claims in Local Currency	
EM Borrower	Pre Crisis 2006Q3-2007q2	Post Crisis 2008q3-2009q2	Pre Crisis 2006Q3-2007q2	Post Crisis 2008q3-2009q2
Argentina	16	16	13	13
Brazil	17	17	14	13
Chile	17	17	10	11
Colombia	17	17	9	9
Costa Rica	17	17	7	7
Mexico	17	17	9	9
Peru	16	16	8	8
Venezuela	16	16	5	5
China	17	17	12	11
India	17	17	10	11
Indonesia	17	16	9	9
Malaysia	16	16	10	10
Philippines	17	16	8	8
Korea	17	17	10	10
Taiwan	16	16	9	9
Thailand	16	16	10	10
Turkey	17	17	11	10
Slovakia	16	16	9	9
Russia	17	16	9	9
Romania	17	16	8	8
Poland	16	16	13	13
Hungary	17	16	11	11
Czech Republic	17	16	10	10
Croatia	15	15	5	5

Table 2 Number of Emerging Market Countries (of 24) in BIS Reporting Country Lending

	International Claims (Cross-Border)		Local Claims in Local Currency	
Source Country	Pre Crisis 2006Q3-2007q2	Post Crisis 2008q3-2009q2	Pre Crisis 2006Q3-2007q2	Post Crisis 2008q3-2009q2
United States	24	24	23	23
Japan	24	24	21	21
Australia	19	14	0	0
Belgium	24	24	17	17
Canada	24	24	12	12
Switzerland	24	24	19	19
Germany	24	24	22	22
Denmark	24	24	1	1
Spain	24	24	14	14
France	24	24	18	19
Great Britain	24	24	21	21
Ireland	24	24	1	2
Sweden	24	24	17	17
Portugal	19	18	5	5
Netherlands	24	24	22	22
Luxembourg	24	24	4	4
Italy	24	24	12	9

Table 3 Growth and Decline in Lending, percent change by source and destination

		Emerging Europe		Emerging Asia		Latin America	
Source Region	Type of claim	2006Q3 - 2007Q2	2008Q3 - 2009Q2	2006Q3 - 2007Q2	2008Q3 - 2009Q2	2006Q3 - 2007Q2	2008Q3 - 2009Q2
North America	International	49.3	10.6	30.3	40.6	13.5	21.8
	Local	36.1	-4.5	21.8	6.5	18.4	-0.5
Europe	International	52.0	-9.8	27.0	-21.5	18.4	-15.6
	Local	55.1	-10.6	55.1	-9.6	31.6	-4.1
Asia	International	29.1	-16.1	21.1	-8.2	28.1	-3.3
	Local	113.9	-39.7	12.7	-6.2	7.3	-15.6
Domestic Banks	Lending	32.1	-21.3	16.2	14.6	25.0	-13.5

Note: North America comprises the United States and Canada; Asian Banks cover Japan, European Banks include Belgium, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Spain, Sweden, Switzerland, United Kingdom. European Banks excludes Finland and Portugal (sources). Australia is excluded from this table due to some missing observations, but included in the broader empirical exercise. Chile, Philippines, Malaysia, and Slovakia (destinations) are excluded from Domestic Lending due to missing 2009q2 observations.

Table 4. Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Pre-post cross-border lending growth	390	0.230	0.663	-2.376	2.943
To EM Europe	129	0.385	0.714	-1.507	2.943
To EM Latin America	128	0.221	0.630	-2.376	2.327
To EM Asia	130	0.089	0.620	-1.545	2.278
Pre-post local lending growth	185	0.331	0.866	-6.788	3.379
To EM Europe	66	0.559	0.674	-0.766	3.206
To EM Latin America	54	0.208	0.845	-2.100	3.379
To EM Asia	65	0.201	1.010	-6.788	1.244
Pre-post domestic lending growth	22	0.427	0.218	-0.021	0.811
Ex-ante dollar vulnerability Correlations					
V1	18	0.780	0.492	0.064	1.674
V2 0.992	18	0.611	0.434	0.051	1.455
V3 0.701 0.710	18	0.208	0.201	0.009	0.831

Lending in the "pre" crisis period is defined as the time average between 2006q2 and 2007q2. Lending in the "post" crisis period is defined as the time average between 2008q3 and 2009q2. Cross-border lending is lending of foreign banks to an EM destination country originated in the source country. Local lending is the lending of local offices of foreign banks in local currency in each EM country. Domestic lending is the aggregate lending by domestic banks in each EM country. Pre-post lending growth is calculated as the log change between the post- and the pre-crisis periods. The measures of ex-ante dollar vulnerability are calculated using country-specific gross and net US Dollar aggregates. The definitions of the three measures are as follows. V1: Liabilities to official monetary authorities + International liabilities to non-banks + Local liabilities to US residents booked by US offices + Liabilities to banks + cross-currency FX swap (if negative); V2: Liabilities to official monetary authorities + International liabilities to non-banks + Local liabilities to US residents booked by US offices + Net Liabilities to banks + cross-currency FX swap (if negative); V3 either : Liabilities to official monetary authorities + Net Liabilities to banks + cross-currency FX swap (if negative) + Net positions vis-à-vis non-banks (if negative), or Liabilities to official monetary authorities + Net Liabilities to banks + cross-currency FX swap (if negative) (if Net positions vis-à-vis non-banks is positive).

Table 5 Non-Parametric Comparisons of Lending Growth

	Cross-Border Lending			Local Lending		
	Low Vulnerability	High Vulnerability	Low-High	Low Vulnerability	High Vulnerability	Low-High
Pre-Crisis	11.004	11.338	-0.334	10.438	11.657	-1.218
Post-Crisis	11.341	11.614	-0.272	10.884	11.870	-0.986
Post-Pre	0.336	0.275	**0.061**	0.445	0.213	**0.231**

	Domestic Lending		
	Low Exposure to Vulnerable Countries	High Exposure to Vulnerable Countries	Difference
Pre-Crisis	11.318	11.727	-0.410
Post-Crisis	11.825	12.074	-0.249
Post-Pre	0.508	0.347	**0.161**
Corrected Data			
Post-Pre	0.461	0.395	**0.066**

Low vulnerability countries are those developed economies with a measure of vulnerability V1 below the median. High vulnerability countries have a measure V1 above the median. In the bottom panel, Exposure is calculated as the ratio of total cross-border lending from ex-ante highly vulnerable countries to total cross-border lending. High (low) exposure is calculated as values above (below) the median of such ratio. "Raw" data refers to the reported domestic lending data for each EM country. The "corrected" data is obtained as the difference between the growth rate from raw data and a country-specific term capturing contemporaneous lending demand shocks. The adjustment term is obtained as the difference between the OLS residuals and the FE residuals of the regressions on local lending growth (Table 7). The "pre" crisis period is defined as the time average between 2006q2 and 2007q2. The "post" crisis period is defined as the time average between 2008q3 and 2009q2. The figures reported in the table are time averages of quarterly log lending data.

Table 6 Cross-border lending growth to emerging markets

VARIABLES		(1) OLS	(2) OLS	(3) OLS	(4) FE	(5) FE	(6) FE
ΔD_i proxy	V1	-0.185***			-0.176***		
		(0.0685)			(0.0659)		
	V2		-0.222***			-0.211***	
			(0.0777)			(0.0747)	
	V3			-0.263			-0.218
				(0.182)			(0.176)
Constant		0.373***	0.365***	0.282***			
		(0.0626)	(0.0577)	(0.0493)			
Observations		390	390	390	390	390	390
R-squared		0.018	0.021	0.005	0.239	0.241	0.228

The measures of ex-ante dollar vulnerability are calculated using country-specific gross and net US Dollar aggregates. The definitions of the three measures are as follows. V1: Liabilities to official monetary authorities + International liabilities to non-banks + Local liabilities to US residents booked by US offices + Liabilities to banks + cross-currency FX swap (if negative); V2: Liabilities to official monetary authorities + International liabilities to non-banks + Local liabilities to US residents booked by US offices + Net Liabilities to banks + cross-currency FX swap (if negative); V3 either : Liabilities to official monetary authorities + Net Liabilities to banks + cross-currency FX swap (if negative) + Net positions vis-à-vis non-banks (if negative), or Liabilities to official monetary authorities + Net Liabilities to banks + cross-currency FX swap (if negative) (if Net positions vis-à-vis non-banks is positive). The first three columns report results from OLS regressions. The last three columns from fixed effect regressions. Fixed effect coefficients not reported. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7. Local claims lending growth in emerging markets

VARIABLES		(1) OLS	(2) OLS	(3) OLS	(4) FE	(5) FE	(6) FE
ΔD_i proxy	V1	-0.248*			-0.198		
		(0.133)			(0.134)		
	V2		-0.314**			-0.261*	
			(0.152)			(0.154)	
	V3			-1.074**			-0.984**
				(0.431)			(0.427)
Constant		0.555***	0.556***	0.530***			
		(0.136)	(0.126)	(0.102)			
Observations		185	185	185	185	185	185
R-squared		0.019	0.023	0.033	0.310	0.313	0.323

The measures of ex-ante dollar vulnerability are calculated using country-specific gross and net US Dollar aggregates. The definitions of the three measures are as follows. V1: Liabilities to official monetary authorities + International liabilities to non-banks + Local liabilities to US residents booked by US offices + Liabilities to banks + cross-currency FX swap (if negative); V2: Liabilities to official monetary authorities + International liabilities to non-banks + Local liabilities to US residents booked by US offices + Net Liabilities to banks + cross-currency FX swap (if negative); V3 either : Liabilities to official monetary authorities + Net Liabilities to banks + cross-currency FX swap (if negative) + Net positions vis-à-vis non-banks (if negative), or Liabilities to official monetary authorities + Net Liabilities to banks + cross-currency FX swap (if negative) (if Net positions vis-à-vis non-banks is positive). The first three columns report results from OLS regressions. The last three columns from fixed effect regressions. Fixed effect coefficients not reported. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 8. Regional differences in lending and the impact of the Vienna initiative

	Regional differences		Vienna initiative	
VARIABLES	Cross-border lending (OLS)	Local lending (OLS)	Cross-border lending (FE)	Local lending (FE)
V2	-0.509***	-0.339	-0.262***	-0.408**
	(0.134)	(0.278)	(0.0813)	(0.193)
V2 · Latin America	0.362*	0.272		
	(0.189)	(0.390)		
V2 · Asia	0.505***	0.0395		
	(0.185)	(0.378)		
Latin America	-0.377***	-0.501		
	(0.139)	(0.311)		
Asia	-0.596***	-0.323		
	(0.138)	(0.301)		
Constant	0.686***	0.761***		
	(0.0971)	(0.196)		
Vienna countries			-0.268	-1.317***
			(0.254)	(0.468)
V2 · Vienna			0.461	3.573***
			(0.742)	(1.285)
Observations	390	185	390	185
R-squared	0.072	0.054	0.247	0.346

Latin America and Asia are indicator variables of EM countries from each corresponding region. Europe is the excluded region. Vienna initiative countries in our sample are Belgium, France, Italy and Germany. The first two columns report results from OLS regressions. The last two columns from fixed effect regressions. Fixed effect coefficients not reported. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 9. Domestic bank lending growth change across emerging markets

VARIABLES	(1) Raw data	(2) Corrected data	(3) Raw data	(4) Corrected data	(5) Raw data	(6) Corrected data
V2	-0.161*	-0.0656			-0.145*	-0.0573
	(0.0885)	(0.144)			(0.0851)	(0.148)
Share of cross-border lending			0.229*	0.119	0.207*	0.110
			(0.126)	(0.204)	(0.121)	(0.210)
Constant	0.508***	0.462***	0.328***	0.377***	0.410***	0.409**
	(0.0626)	(0.102)	(0.0705)	(0.114)	(0.0828)	(0.144)
Observations	22	22	22	22	22	22
R-squared	0.142	0.010	0.141	0.017	0.256	0.024

The dependent variable is a measure of domestic bank lending growth pre-post crisis for each emerging market country. Lending in the "pre" crisis period is defined as the time average between 2006q2 and 2007q2. Lending in the "post" crisis period is defined as the time average between 2008q3 and 2009q2. The results are obtained with growth measures calculated either from raw or "corrected" data. The "corrected "data is obtained as the difference between the growth rate from raw data and a country-specific term capturing contemporaneous lending demand shocks. The adjustment term is obtained as the difference between the OLS residuals and the FE residuals of the regressions on local lending growth (Table 7). Share of cross-border lending is the ratio of total cross-border lending in a country and total domestic lending. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1 .

Chart 1

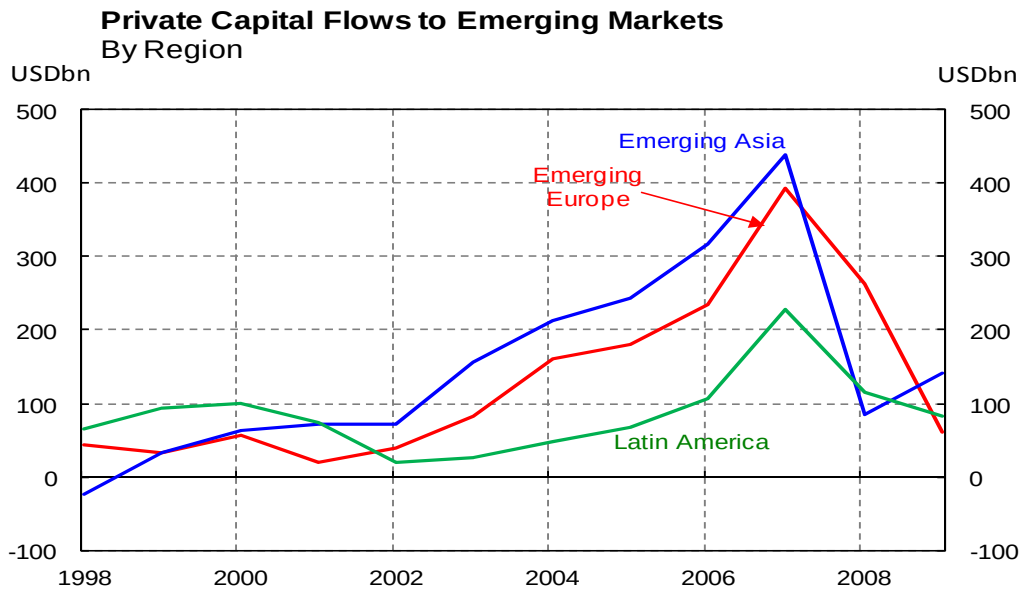
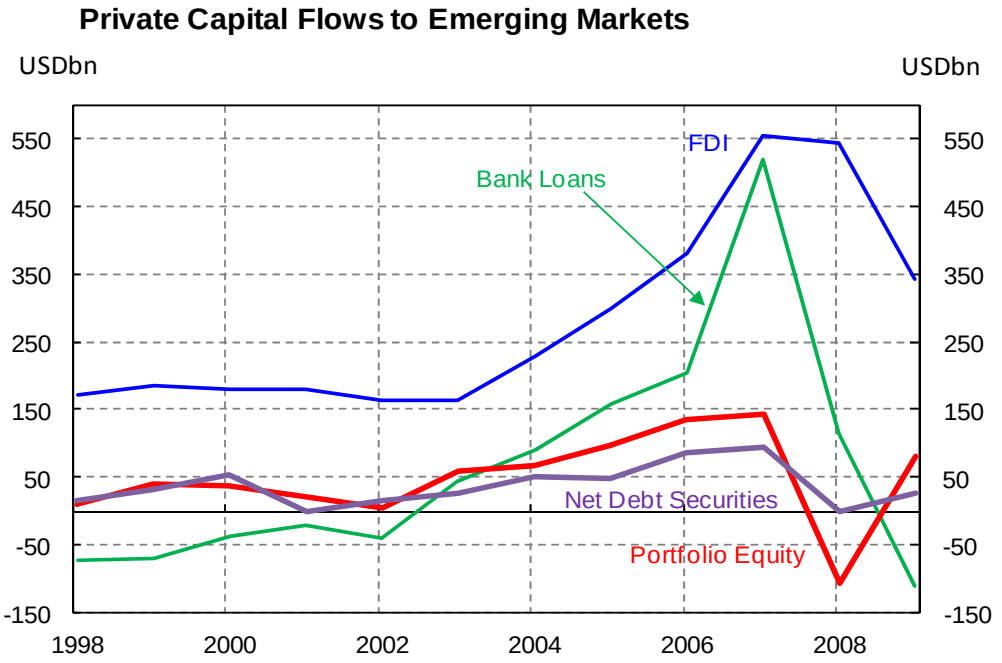
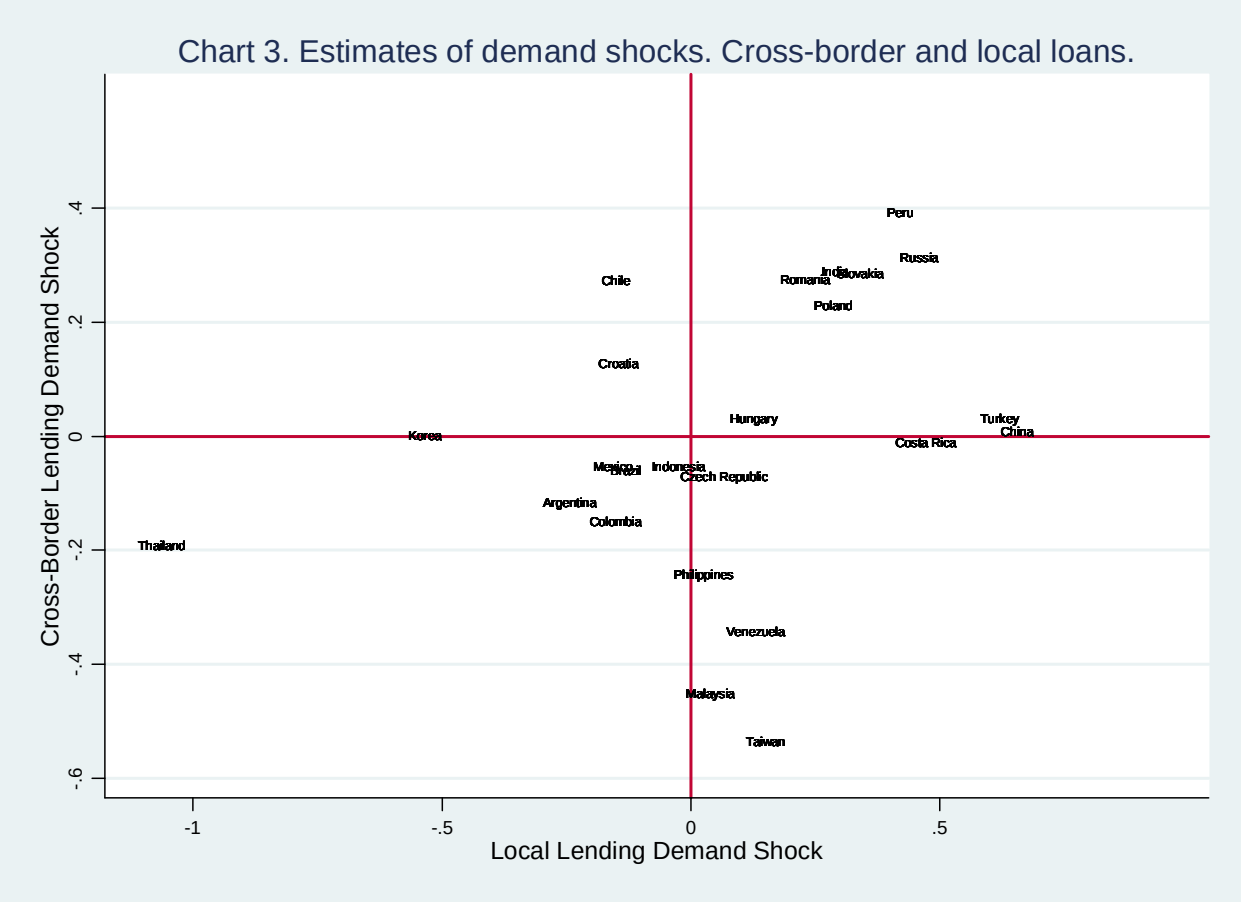


Chart 2



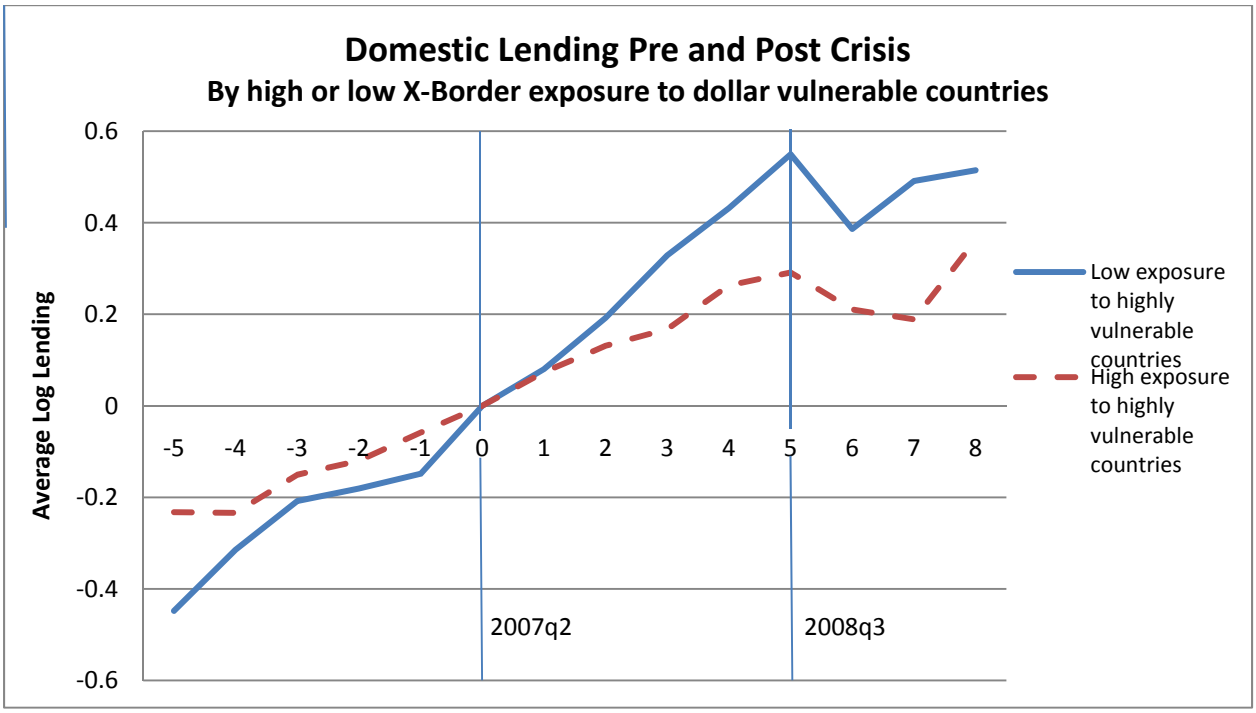
Source for Charts 1 and 2: BIS Locational Banking Statistics, Bank Loans (Table 7c), Net Bond Issues (Table 11); Foreign Direct Investment from the Global Development Fund; Portfolio equity data from CEIC; also Federal Reserve Bank of NY staff estimates. Annual data.

Chart 3 Estimated Demand Shocks by Emerging Market Economy



Local lending demand shock is an estimate of local lending demand growth pre-post crisis, and is obtained as the difference between the OLS residuals and the FE residuals of regressions for local lending growth. Cross-border lending demand shock is an estimate of cross-border lending demand growth pre-post crisis, and is obtained as the difference between the OLS residuals and the FE residuals of regressions for cross-border lending growth.

Chart 4 Domestic Lending Growth over Time, by Type of Cross-Border Funding



The chart depicts quarterly averages of log domestic lending for emerging markets with a low or a high cross-border exposure to ex-ante dollar vulnerable countries. Exposure is calculated as the ratio of total cross-border lending from ex-ante highly vulnerable countries to total cross-border lending. High (low) exposure is calculated as values above (below) the median of such ratio. Figures on the vertical axis are rescaled so that they are both equal to zero at time zero. Time zero is 2007q2.

Appendix Table 1 Delivery on EIB's Commitments under the *Joint IFI Action Plan*

By Institution up to end-September 2009 (Euro millions)

Bank	Available	Disbursed	2009 pipeline	Total
UniCredit Group (Italy)	951	204	75	1,230
Erste Bank Group (Austria)	446	280	0	726
Société Générale (France)	393	59	40	492
Intesa Sanpaolo (Italy)	265	139	50	454
Dexia Group (Belgium)	226	117	100	443
Bayern LB (Germany	242	100	100	442
EFG Eurobank (Greece)	315	35	0	350
BNP Paribas / Fortis (France)	300	30	0	330
RZB (Austria)	230	8	40	278
KBC Group (Belgium)	110	63	100	273
Total	**3,478**	**1,035**	**505**	**5,018**
Other Banks	4,051	682	1,005	5,738
Grand Total	**7,529**	**1,717**	**1,510**	**10,756**

By Country up to end-September 2009 (Euro millions)

Country	Available	Disbursed	2009 pipeline	Total
Bulgaria	169	25	60	254
Czech Republic	591	269	0	860
Estonia	25	50	0	75
Hungary	679	409	0	1,088
Latvia	115	30	145	290
Lithuania	25	23	0	48
Poland	1,023	211	275	1,509
Romania	424	65	50	539
Slovakia	260	22	100	382
Slovenia	709	40	100	849
Total EU – 10	**4,019**	**1,144**	**730**	**5,893**
Albania	0	0	20	20
Bosnia Herzegovina	291	37	120	449
Croatia	540	34	40	613
FYROM	110	0	0	110
Montenegro	132	0	0	132
Serbia	583	44	100	727
Total Western Balkans	**1,655**	**115**	**280**	**2,050**
Total Turkey	**1,855**	**459**	**500**	**2,813**
Total	**7,529**	**1,717**	**1,510**	**10,756**

"Progress Report on the Joint IFI Action Plan," European Bank for Reconstruction and Development, European Investment Bank Group, and World Bank Group, October 2009, pp. 14-15.

Appendix Table 2. Pre-post growth in cross-border lending from each source country to each destination emerging market country

	Argentina	Brazil	Chile	China	Colombia	Croatia	Hungary	India	Indonesia	Korea	Malaysia	
Australia	na	-0.703	0.376	-0.122	0.321	na	na	0.205	0.509	0.708	-0.152	
Belgium	0.838	0.315	0.371	0.235	0.328	0.304	0.272	0.906	-0.158	-0.041	-0.091	
Canada	-0.399	-0.025	0.292	0.492	0.321	-1.423	-0.419	0.809	0.971	0.558	0.133	
Denmark	-0.394	0.016	2.145	-0.511	0.000	-0.449	0.129	-0.708	-0.364	-0.457	-0.993	
France	-0.137	0.647	0.393	0.018	-0.066	-0.376	-0.016	0.450	0.228	0.760	-0.465	
Germany	-0.463	0.077	0.419	-0.269	-0.437	1.357	0.251	0.432	-0.225	0.014	-0.422	
Ireland	1.029	-2.376	0.076	-1.545	1.214	0.826	-0.001	-0.094	0.799	0.368	-0.625	
Italy	0.104	0.305	0.105	0.460	-0.437	0.189	0.870	0.930	0.607	0.645	-0.216	
Japan	-0.729	0.766	0.329	0.161	-0.142	0.280	0.586	0.354	0.195	0.417	0.353	
Luxembourg	0.517	0.843	na	2.278	1.035	0.907	0.533	1.326	0.000	0.482	0.413	
Netherlands	0.351	0.009	0.643	0.540	-0.352	-0.009	0.494	0.428	0.164	0.400	-0.470	
Portugal	0.817	0.133	1.162	0.396	-1.256	na	0.008	0.973	-0.791	-1.121	na	
Spain	0.412	0.832	0.378	1.260	0.297	2.523	0.841	1.338	-0.437	1.282	-0.034	
Sweden	0.276	0.659	0.197	0.595	0.699	0.452	0.455	0.648	0.629	-0.428	-0.303	
Switzerland	-0.590	0.266	-0.143	-0.269	-0.304	0.148	-0.227	-0.181	0.110	-0.589	-0.630	
UK	0.505	0.676	0.622	-0.087	0.133	0.014	0.598	0.721	0.319	0.500	-0.098	
US	-0.193	0.434	0.603	0.410	0.014	0.720	-0.057	0.286	0.434	0.427	0.030	***Continued***

Appendix Table 2 (continued). Pre-post growth in cross-border lending from each source country to each destination emerging market country

	Mexico	Peru	Philippines	Poland	Romania	Russia	Slovakia	Taiwan	Thailand	Turkey	Venezuela
Australia	-0.317	na	0.484	na	na	0.990	na	-0.176	-0.836	0.870	na
Belgium	-0.416	0.871	-0.539	0.648	1.315	1.241	0.674	-1.172	0.041	0.253	0.222
Canada	-0.011	0.464	0.951	-1.203	-1.507	0.681	0.539	-0.680	0.712	0.590	-0.384
Denmark	-0.749	0.392	-0.066	0.574	1.996	0.613	-0.599	-0.540	-0.151	0.277	0.792
France	0.485	1.496	-0.099	0.434	0.321	0.959	0.067	0.522	0.443	0.120	-0.595
Germany	0.012	0.387	0.021	0.589	-1.281	0.123	0.318	0.124	-0.246	-0.016	-0.725
Ireland	0.612	2.327	-1.306	0.214	-0.437	-0.566	0.777	-0.639	-0.262	0.130	na
Italy	0.353	-0.038	0.760	0.380	0.868	1.168	0.310	-0.722	0.000	0.081	-0.607
Japan	0.365	0.947	0.267	0.265	-0.457	0.594	0.980	0.045	0.156	0.243	-0.023
Luxembourg	1.640	na	0.387	1.608	2.090	0.156	0.154	0.288	1.336	2.071	0.629
Netherlands	0.406	1.309	-0.031	0.460	0.943	0.469	0.717	-0.535	0.243	0.584	-0.476
Portugal	-0.314	-1.106	na	0.744	2.943	0.145	na	na	na	-0.751	0.590
Spain	0.459	0.648	-0.189	0.396	1.437	1.321	0.431	0.494	-0.182	-0.371	0.208
Sweden	0.262	-0.192	0.911	1.046	0.151	1.344	1.877	-0.455	0.601	0.194	-0.766
Switzerland	-0.014	0.124	-1.295	0.875	0.526	-0.084	0.578	-1.116	-0.521	-0.136	0.075
UK	0.180	1.229	-0.361	0.147	-0.543	0.137	0.820	-0.428	-0.073	0.236	-0.401
US	0.057	0.538	-0.136	0.307	-0.160	-0.040	0.200	0.071	-0.700	0.079	-0.226

Lending in the “pre” crisis period is defined as the time average between 2006q2 and 2007q2. Lending in the “post” crisis period is defined as the time average between 2008q3 and 2009q2. Cross-border lending is lending of foreign banks to an EM destination country originated in the source country. Pre-post lending growth is calculated as the log change between the post- and the pre-crisis periods.

Appendix Table 3. Pre-post growth in local lending from each source country to each destination emerging market country

	Argentina	Brazil	Chile	China	Colombia	Croatia	Hungary	India	Indonesia	Korea	Malaysia	
Australia	na	na	na	na	na	na	na	na	na	na	na	
Belgium	na	na	na	1.152	na	0.304	0.385	0.651	1.188	na	na	
Canada	na	na	1.250	1.177	na	na	na	0.309	na	-0.548	0.217	
Denmark	na	na	na	na	na	na	na	na	na	na	na	
France	0.746	0.387	na	1.214	na	0.101	1.610	0.659	-0.535	-0.511	1.160	
Germany	-0.995	-0.042	na	0.663	-0.437	na	0.221	0.857	-0.434	-0.337	0.336	
Ireland	na	na	na	na	na	na	na	na	na	na	na	
Italy	-0.288	na	na	na	na	0.266	0.150	na	na	na	na	
Japan	-0.077	0.430	0.426	0.687	na	na	na	0.616	0.107	0.086	0.056	
Luxembourg	0.517	0.843	na	na	1.035	na	na	na	na	na	na	
Netherlands	0.101	-2.030	0.474	0.690	-0.511	na	0.358	0.103	-0.029	-0.196	-0.263	
Portugal	na	0.472	na	na	na	na	0.169	na	na	na	na	
Spain	0.154	0.970	0.234	na	0.273	na	0.280	na	na	na	na	
Sweden	na	na	na	na	na	na	na	na	na	na	na	
Switzerland	0.211	0.146	-0.134	0.942	-0.182	na	0.080	1.121	1.228	-0.544	0.454	
UK	0.073	0.382	0.312	0.857	0.568	na	0.739	0.412	0.223	-0.151	0.117	
US	-0.089	0.097	-2.100	0.804	-0.027	na	0.112	0.228	0.092	-0.161	0.026	***Continued***

Appendix Table 3 (continued) Pre-post growth in local lending from each source country to each destination emerging market country

	Mexico	Peru	Philippines	Poland	Romania	Russia	Slovakia	Taiwan	Thailand	Turkey	Venezuela
Australia	na	na	na	na	na	na	na	na	na	na	na
Belgium	na	na	na	0.499	1.409	na	0.375	0.149	na	0.130	na
Canada	-0.153	0.863	na	na	na	na	na	1.244	-6.788	na	na
Denmark	na	na	na	0.274	na	na	na	na	na	na	na
France	na	na	na	1.285	0.277	2.169	2.374	0.129	-0.494	0.454	na
Germany	na	na	-0.043	0.483	na	0.509	0.488	0.276	0.100	1.107	na
Ireland	na	na	na	0.488	na	na	na	na	na	na	na
Italy	na	-1.605	na	0.265	0.490	0.952	0.455	na	na	na	na
Japan	0.680	na	0.726	0.683	na	na	na	0.280	0.114	na	na
Luxembourg	na	na	na	na	na	na	na	na	na	na	na
Netherlands	0.426	na	-0.002	0.688	0.185	-0.015	-0.331	-0.170	-0.320	3.206	0.180
Portugal	na	na	na	0.340	na	na	1.721	na	na	-0.004	na
Spain	-0.032	0.585	na	0.550	na	na	na	na	na	na	0.365
Sweden	na	na	na	0.684	na	2.246	na	na	na	na	na
Switzerland	-0.651	na	0.297	1.478	0.466	-0.766	na	0.325	0.276	1.532	na
UK	-0.024	3.379	0.262	na	na	0.788	-0.115	0.779	0.193	0.359	na
US	0.103	0.058	0.247	0.215	0.100	0.016	0.162	0.563	0.211	0.365	0.481

Lending in the "pre" crisis period is defined as the time average between 2006q2 and 2007q2. Lending in the "post" crisis period is defined as the time average between 2008q3 and 2009q2. Local lending is the lending of local offices of foreign banks in local currency in each EM country. Pre-post lending growth is calculated as the log change between the post- and the pre-crisis period.